# Volume 3

# Appendix F. Groundwater Impact Assessment

# Marinus Link

## Heybridge Groundwater Impact Assessment

Marinus Link Pty Ltd

**Reference: 754-MELEN215878ML_R18**

November 2024

# HEYBRIDGE GROUNDWATER IMPACT ASSESSMENT

Marinus Link

**Report reference number: 754-MELEN215878ML_R18**

November 2024

## PREPARED FOR

**Marinus Link Pty Ltd**
1-7 Maria Street
Lenah Valley TAS 7008

## PREPARED BY

**Tetra Tech Coffey**
Level 11, 2 Riverside Quay,
Southbank
VIC 3006 Australia
p: +61 3 9290 7000
f: +61 3 9290 7499
ABN 55 139 460 521

## QUALITY INFORMATION

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### Restriction on Disclosure and Use of Data

# EXECUTIVE SUMMARY[1]

Tetra Tech Coffey Pty Ltd (Tetra Tech Coffey) was contracted by Marinus Link Pty Ltd (MLPL) to conduct a groundwater impact assessment to inform the environmental impact assessment of the proposed Marinus Link (the project).

The project is a proposed 1,500 megawatt (MW) HDVC electricity interconnector between Heybridge in northwest Tasmania and the Latrobe Valley in Victoria. The portion of the project covered in this assessment is located at Heybridge in Tasmania. The scope of the groundwater impact assessment was to characterise groundwater within the study area and identify potential groundwater impacts from the project to groundwater values.

This assessment included a desktop review to support a baseline characterisation drawing on publicly available spatial information on ground surface elevation, the inferred average water table elevation, surface geological conditions and groundwater quality. The baseline characterisation also draws on limited hydrogeological data that has been collected at the site as part of geotechnical studies (Jacobs 2022a, 2022b) conducted for the project. The information obtained by the desktop literature and data review was considered sufficiently detailed to characterise baseline groundwater conditions to a level that is proportionate to the risk of adverse effects posed by the project.

The site is mapped as being underlain by Quaternary deposits of aeolian sand, and river and marine gravels, sand and clays, which overlie bedrock. These two main geological formations were assessed by the geotechnical investigation and are expected to comprise the two primary aquifers present beneath the site; the Quaternary sand aquifer and the bedrock aquifer. Four groundwater monitoring wells were installed to assess the bedrock aquifer and one shallow well was installed to assess the shallow Quaternary sand aquifer.

The water table in the Quaternary sand aquifer is likely to be shallow (within 0.5 m below ground surface) and is expected to follow a northerly flow direction towards the coastline. The Quaternary sand aquifer is likely to be recharged by rainfall infiltration and the upward discharge of groundwater from the underlying bedrock aquifer. Hydraulic conductivity may be high in the Quaternary sand aquifer and variable in the bedrock aquifer where presence of fracture and fault zones and weathered horizons may influence groundwater flow rates.

The site was previously occupied by the former Tioxide Australia plant which may have caused soil and potentially groundwater contamination. Previous remediation efforts are reported to have occurred, and subsequent contamination investigations have been completed by Tetra Tech Coffey (2023). Limited groundwater sampling from the upper Quaternary sand aquifer did not encounter significant groundwater contamination.

Where potential impacts are identified as having potential to result in an impact to groundwater levels or quality, the assessment has identified measures to avoid and minimise the risk of harm arising from project activities to human health and the environment so far as reasonably practicable.

Based on the findings and results of the assessment, potential impacts were determined based on the associated environmental values of groundwater that may be threatened by project construction and operation activities.

A significance assessment approach has been adopted to assess potential impacts which identified mostly negligible and minor magnitude impacts, resulting in low impacts. The following project construction and operation activities were identified as potential hazards to groundwater and its associated groundwater values (groundwater dependent ecosystems (GDEs) and groundwater users):

- Temporary dewatering and groundwater drawdown for the construction of the converter station foundations, HDD entry/exit pits or other minor excavations that extend below the shallow water table.

[1] This executive summary must be read in the context of the full report and the attached limitations.

- Temporary dewatering and groundwater drawdown, which can lead to groundwater acidification (due to enhance presence of acid sulphate soils) or saline intrusion.
- Mobilisation of existing groundwater contamination towards the project's dewatering activities, and releases of contaminated groundwater during temporary dewatering to the environment.
- Storage, handling, use, transport, disposal and accidental spills and leakage of hazardous materials, including chemicals, herbicides, pesticides, and fuels during construction and operation (including an onsite septic tank, interceptor traps and storage tanks).

The following potential impacts were assessed to have raised initial moderate to major magnitude of impacts, which corresponds to an overall moderate un-mitigated impact on groundwater values and were considered further:

- Mobilisation of existing groundwater contamination towards the project's dewatering activities.
- Release of contaminated groundwater generated during dewatering to the environment.
- Saline groundwater intrusion due to temporary groundwater level drawdown.
- Groundwater acidification due to temporary groundwater level drawdown.
- Groundwater contamination from operational activities including leaks of hazardous chemicals (e.g., transformer oil, lead acid batteries, and diesel fuel).

A total of six mitigation and management measures were developed to reduce the level of all potential impacts further (Table A), in addition to other relevant measures developed by the Contaminated Land and Acid Sulfate Soil Assessment. All residual impacts were considered to be low.

Groundwater management plans (GMPs) will be developed prior to, and implemented during construction (GWMM05) and operation (GWMM06). The GMPs will document the monitoring requirements informed by the pre-construction hydrogeological assessment proposed (GWMM01) and groundwater monitoring program (GWMM05) to ensure that adequate understanding of shallow groundwater conditions are established prior to construction commencing. These measures will also ensure that any additional mitigations, such as dewatering controls, are developed to ensure low potential impact significance (GWMM02).

This report is presented within the limitations of the work which has been undertaken. Data gaps are summarised in Section 10. This executive summary should be read in conjunction with the body of the report and statement of limitation, which is provided in Appendix A.

**Table A: Summary of management and mitigation measures**

| Measure ID | Mitigation and management measures | Project Stage |
|---|---|---|
| GWMM01 | Conduct a pre-construction hydrogeological assessment at the converter station site to inform appropriate detailed design and construction methods. | Design |
| GWMM02 | Minimise groundwater inflow into excavations, limit groundwater level drawdown, avoid mobilising contaminated or saline groundwater, and prevent groundwater acidification. | Design, Construction |
| GWMM03 | Prevent groundwater movement and contamination as a result of Horizontal Directional Drilling (HDD) and other drilling activities. | Construction |
| GWMM04 | Develop and implement a groundwater management plan to manage, monitor, reuse, treat, and dispose of groundwater during construction dewatering. | Design, Construction |
| GWMM05 | Develop and implement a construction groundwater monitoring plan to establish baseline and background groundwater conditions prior to construction and monitor potential project impacts during construction. | Design, Construction |

| Measure ID | Mitigation and management measures | Project Stage |
|---|---|---|
| GWMM06 | Develop and implement an operational groundwater management plan to detect and minimise potential contamination impacts during the project's operation. | Operation |

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## APPENDICES

# ACRONYMS/ABBREVIATIONS

| Acronyms/Abbreviations | Definition |
|---|---|
| AEMO | Australian Energy Market Operator |
| AEP | Annual exceedance probability |
| ARI | Average recurrence interval |
| ASS | Acid sulfate soils |
| BOD | Biological oxygen demand |
| CEMP | Construction Environment Management Plan |
| CMPP | Conservation Management Priority – Potential |
| EMPCA | Environmental Management and Pollution Control Act 1994 (Tas) |
| EPA | Environment Protection Agency |
| GED | General environmental duty |
| GMA | Groundwater management area |
| HDD | Horizontal directional drilling |
| HSEQ | Health Safety, Environment and Quality |
| ICV | Integrated Conservation Value |
| ISP | Integrated System Plan |
| NATA | National Association of Testing Authorities |
| OEMP | Operation Environment Management Plan |
| OHTL | Overhead transmission line |
| PCB | Polychlorinated biphenyl |
| PFAS | Per- and poly-fluoroalkyl substances |
| RCV | Representative Conservation Value |
| SDS | Safety Data Sheet |
| SOBN | State observation bore network |
| SRW | Southern Rural Water |
| SV | Special Value |
| WMIS | Water Measurement Information System |
| % | Percentage |
| °C | Celsius |
| µg/L | Microgram per litre |
| AHD | Australian Height Datum |
| BoM | Bureau of Meteorology |
| C | Centigrade |
| CEMP | Construction Environment Management Plan |
| CFEV | Conservation of Freshwater Ecosystems Values |
| CIA | Cumulative impact assessment |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation |

| Acronyms/Abbreviations | Definition |
|---|---|
| DAWE | Department of Agriculture, Water and the Environment |
| DCCEEW | Australian Department of Climate Change, Energy, Environment and Water |
| DTP | Department of Transport and Planning (DTP) (previously known as the Department of Environment, Land, Water and Planning (DELWP)) |
| DNRE (DPIPWE/DPIWE) | Department of Natural Resources and Environment Tasmania (previously known as Department of Primary Industries, Parks, Water and Environment (DPIPWE)/Department of Primary Industries, Water and Environment (DPIWE)) |
| EC (µS/cm) | Electrical conductivity (microsiemens per centimetre) |
| EES | Environment effects statement |
| EIS | Environmental impact statement |
| EMP | Environmental Management Plan |
| EMPCA | *Environmental Management and Pollution Control Act 1994* (Tas) |
| EPA | Environmental Protection Authority |
| EPBC Act | Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) |
| EV | Environmental Values |
| GDEs | Groundwater dependent ecosystems |
| GED | General environmental duty |
| GL | Gigalitres |
| GMP | Groundwater Management Plan |
| ha | hectares |
| HDD | Horizontal directional drilling |
| HVAC | High voltage alternating current |
| HVDC | High voltage direct current |
| IFC | International Finance Corporation |
| km | Kilometres |
| $km^2$ | Square kilometres |
| kV | Kilovolt |
| KVA | Kilovolt-amp |
| L/s | Litres per second |
| m | Metres |
| m AHD | Metres Australian Height Datum |
| mbgl | Metres below ground level |
| m/day | Metres per day |
| mg/kg | Milligrams per kilogram |
| mg/L | Milligrams per litre |
| mm | millimetres |
| Mva | Megavolt-amp |
| MW | Megawatt |

| Acronyms/Abbreviations | Definition |
|---|---|
| NEM | National Electricity Market |
| NORM | naturally occurring radioactive materials |
| NWTD | North West Transmission Developments |
| PAH | Polycyclic Aromatic Hydrocarbon |
| PEV | Protected environmental value |
| REZ | Renewable Energy Zones |
| SPWQM | State Policy on Water Quality Management |
| sVOCs | Semi-Volatile Organic Compounds |
| TasNetworks | Tasmanian Networks Pty Ltd |
| TDS | Total Dissolved Solids |
| TRH | Total Recoverable Hydrocarbons |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| V DC | Volts of direct current |
| VOCs | Volatile Organic Compounds |
| WQO | Water quality objective |

# 1. INTRODUCTION

The proposed Marinus Link (the project) comprises a high voltage direct current (HVDC) electricity interconnector between Tasmania and Victoria, to allow for the continued trading and distribution of electricity within the National Electricity Market (NEM).

The project was referred to the Australian Minister for the Environment 5 October 2021. On 4 November 2021, a delegate of the Minister for the Environment determined that the proposed action is a controlled action as it has the potential to have a significant impact on the environment and requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) before it can proceed. The delegate determined that the appropriate level of assessment under the EPBC Act is an environmental impact statement (EIS).

In July 2022 a delegate of the Director of the Environment Protection Authority Tasmania determined that the project be subject to environmental impact assessment by the Board of the Environment Protection Authority (the Board) under the *Environmental Management and Pollution Control Act 1994* (Tas) (EMPCA).

On 12 December 2021, the former Victorian Minister for Planning under the *Environment Effects Act 1978* (Vic) (EE Act) determined that the project requires an environment effects statement (EES) under the EE Act, to describe the project's effects on the environment to inform statutory decision making.

As the project is proposed to be located within three jurisdictions, the Tasmanian Environment Protection Authority (Tasmanian EPA), Victorian Department of Transport and Planning (DTP), and Australian Department of Climate Change, Energy, Environment and Water (DCCEEW) have agreed to coordinate the administration and documentation of the three assessment processes. Two EISs are being prepared to address the Tasmanian EPA requirements for the Heybridge converter station and shore crossing. A separate EIS/EES is being prepared to address the requirements of DTP and DCCEEW.

This report has been prepared by Tetra Tech Coffey for the Tasmanian jurisdiction as part of the two EISs being prepared for the project.

## 1.1 PURPOSE AND OBJECTIVES

This report incorporates the groundwater impact assessment relevant to the Heybridge study area located in the Tasmanian jurisdiction. The purpose of this study is to characterise the baseline condition of groundwater and identify and assess any potential impacts to groundwater which may arise from project-related activities. This report will also recommend management strategies or measures to be implemented with the interest of avoiding and/or minimising the groundwater impacts to human health and the environment, so far as is reasonably practicable.

The key objectives of this groundwater impact assessment are to:

- Describe applicable policy, legislation, regulations, standards, and guidelines for the minimisation and management of impacts to groundwater;
- Characterise existing groundwater conditions based on a desktop review of available data;
- Undertake a desktop study to obtain sufficient hydrogeological information to allow potential impacts on groundwater associated with the construction and operation of the project to be identified;
- Undertake a groundwater impact assessment that will inform the EIS for the project; and
- Identify potential residual groundwater impacts and describe the proposed inspection and monitoring programs that will demonstrate achievement of the relevant environmental objectives.

This report documents the outcomes of the groundwater impact assessment within the Heybridge site. The Victorian component is provided within a separate groundwater impact assessment, which is specific to the Victorian assessment guidelines.

## 1.2 PROJECT OVERVIEW

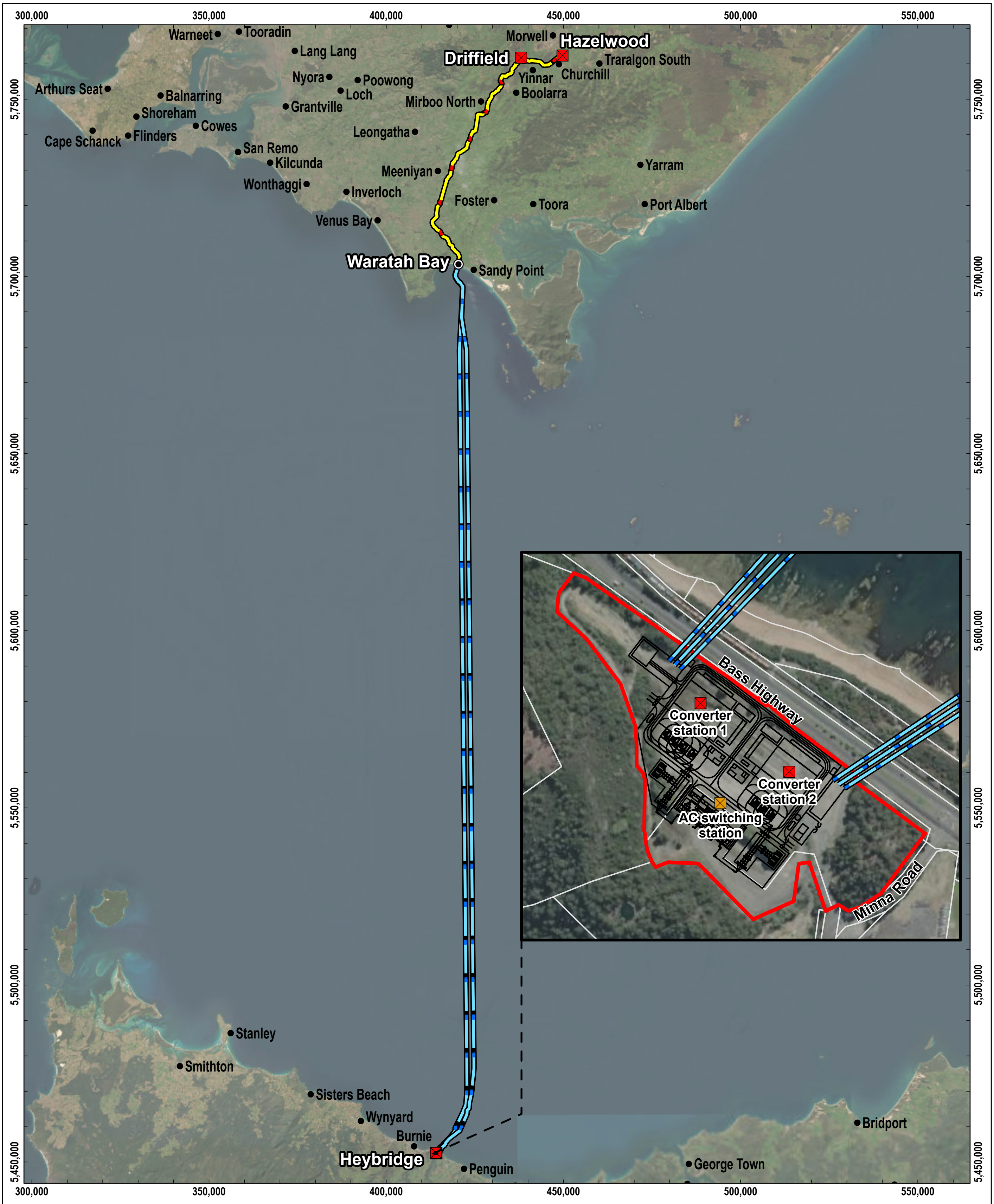
The project is a proposed 1,500 megawatt (MW) HVDC electricity interconnector between Heybridge in North West Tasmania and the Latrobe Valley in Victoria (Figure 1-1). The project is proposed to provide a second link between the Tasmanian renewable energy resources and the Victorian electricity grids enabling efficient energy trade, transmission and distribution from a diverse range of generation sources to where it is most needed, and will increase energy capacity and security across the National Electricity Market (NEM).

Marinus Link Pty Ltd (MLPL) is the proponent for the project and is a wholly owned subsidiary of Tasmanian Networks Pty Ltd (TasNetworks). TasNetworks is owned by the State of Tasmania and owns, operates, and maintains the electricity transmission and distribution network in Tasmania.

Tasmania has significant renewable energy resource potential, particularly hydroelectric power and wind energy. The potential size of the resource exceeds both the Tasmanian demand and the capacity of the existing Basslink interconnector between Tasmania and Victoria. The growth in renewable energy generation in mainland states and territories participating in the NEM, coupled with the retiring of baseload coal-fired generators, is reducing the availability of dispatchable generation that is available on demand.

Tasmania’s existing and potential renewable resources are a valuable source of dispatchable generation that could benefit electricity supply in the NEM. The project will allow for the continued trading, transmission and distribution of electricity within the NEM. It will also manage the risk to Tasmania of a single interconnector across Bass Strait and complement existing and future interconnectors on mainland Australia. The project is expected to facilitate the reduction in greenhouse gas emissions at a state and national level.

Interconnectors are a key feature of the future energy landscape. They allow power to flow between different regions to enable the efficient transfer of electricity from renewable energy zones to where the electricity is needed. Interconnectors can increase the resilience of the NEM and make energy more secure, affordable, and sustainable for customers. Interconnectors are common around the world including in Australia. They play a critical role in supporting Australia’s transition to a clean energy future.




**LEGEND**

- Landfall
- Proposed converter station
- Proposed switching station

Proposed route

- HVDC subsea cable
- Underground HVDC cable
- Heybridge converter station site boundary
- Indicative station layout

MARINUS LINK

SCALE 1:1,500,000
0 10 20 km
PAGE SIZE: A4
PROJECTION: GDA2020 MGA Zone 55

SOURCE
Proposed route from Tetra Tech Coffey.
Imagery from ESRI Online.

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MARINUS LINK HEYBRIDGE GROUNDWATER IMPACT ASSESSMENT REPORT

**FIGURE 1-1**

**Marinus Link location and overview**

TETRA TECH COFFEY

DATE: 30.04.24 PROJECT: 754-MELEN215878ML FILE: 215878ML_R18_F001.1_GIS

## 1.3 ASSESSMENT CONTEXT

Groundwater refers to the water present in saturated natural geological formations (aquifers) beneath the ground surface. It is an essential resource that can provide reliable drinking water supplies to communities, support agriculture, and offer alternative water supplies to the community during periods of drought. In many settings groundwater is critical component of the water cycle, supplying water to the environment, and sustaining the aquatic ecosystems associated with our creeks and rivers, swamps, wetlands and estuary systems. Groundwater also directly supports some areas of terrestrial vegetation where their root systems access shallow groundwater.

Changes to land use, water management practices, and the effects of large construction projects can alter groundwater levels or quality to the extent that it may adversely affect the groundwater resource and those users and segments of the environment that rely on it.

It is important that the project considers the potential interactions that it may have with groundwater particularly where construction activities might extend below the water table and require dewatering, or where project activities might cause groundwater contamination.

It is also important to assess whether these activities could impact the environmental values of groundwater, including groundwater users and/or groundwater dependent ecosystems (GDEs). Groundwater users include those people who pump water from existing groundwater bores and GDEs. GDEs are those ecosystems that require access to groundwater to meet all or some of their water requirements to maintain the terrestrial and aquatic communities and ecological processes they support, and ecosystem services they provide. These can include streams or lakes that groundwater flows into, vegetation with roots that access groundwater or biota living in cave systems. This assessment provides an understanding of the areas of potential groundwater level and groundwater quality impacts that may arise from the project, potential risks to groundwater users and EVs, and informs the development of suitable management and mitigation measures that avoid or mitigate these risks.

# 2. ASSESSMENT GUIDELINES

This section outlines the assessment guidelines relevant to groundwater and the linkages to other technical studies completed for the project. Two separate EISs are being prepared to address the EIS guidelines published by EPA Tasmania for the Heybridge converter station and shore crossing.

## 2.1 EPA TASMANIA GUIDELINES

EPA Tasmania has published two sets of guidelines (September 2022) for the preparation of an EIS for the Marinus Link converter station and shore crossing. A separate set of guidelines have been prepared for each of these project components:

- *Environmental Impact Statement Guidelines Marinus Link Pty Ltd Converter Station for Marinus Link, September 2022,* Environment Protection Authority Tasmania (Tas converter station EIS guidelines)
- *Environmental Impact Statement Guidelines Marinus Link Pty Ltd Shore Crossing for Marinus Link, September 2022,* Environment Protection Authority Tasmania (Tas shore crossing EIS guidelines)

The sections relevant to the groundwater impact assessment are provided in Table 2-1.

**Table 2-1 Tasmanian EIS guideline requirements**

| Relevant section of EIS guidelines | Requirements | Relevant section of this report |
|---|---|---|
| **Converter station** | | |
| 5.2 Environmental aspects – overview | A description of the general physical characteristics of the site/route and surrounding area, including topography, local climate, geology, geomorphology, soils (including erodibility and acid sulphate soils), vegetation, fauna, groundwater and surface drainage (including waterways, lakes, wetlands, coastal areas etc). | Section 6 |
| 6.4 Water quality (surface and groundwater) | Discuss potential impacts of construction and operation of the proposal on surface and groundwater, including: | Section 6.6.3 |
| | Results of any baseline water quality, biological and sediment monitoring undertaken of potentially impacted waterways. | |
| | Consideration of Protected Environmental Values under the *State Policy on Water Quality Management 1997*. | Section 7.2 |
| | Where any subsurface works are proposed: | |
| | Provide a map showing the location of any groundwater bores (refer to the Groundwater Information Portal), a conceptual groundwater model for regional and local aquifer flows and details of any baseline groundwater quality monitoring undertaken; | Section 6.6.6 |
| | Identify any surface water and groundwater dependant ecosystems that may receive groundwater from areas impacted by the proposal. | Section 6.6.5 |
| | Discuss potential impacts of the proposal on groundwater (quality and quantity), including interruption of flow and release of sediment, and cumulative impact with proposed shoreline crossing works. | Section 7.3 |
| | Discuss proposed avoidance and mitigation measures to minimise potential impacts on surface and groundwater quality. | Section 9 |
| | Provide justification for any potential impact to groundwater in accordance with the principles under the *State Policy on Water Quality Management 1997* and with reference to likely groundwater community values, associated guideline values and guideline values for receiving surface waters. For information regarding the water quality management framework and evaluation criteria in Tasmania refer to *Technical Guidance for Water Quality Objectives (WQOs) Setting for Tasmania*, August 2020. | Section 7.2 and 7.7 |

| Relevant section of EIS guidelines | Requirements | Relevant section of this report |
|---|---|---|
| 6.12 Hazard analysis and risk assessment | Provide a quantitative analysis of any identified risk of impact to groundwaters or surface water quality and aquatic ecosystems as a result of a major hazard event and detail relevant mitigation measures. The analysis should systematically identify all potential major environmental hazards (internal and external) to people and the environment associated with the construction, operation, maintenance and decommissioning of the proposal. It is expected that risks to receiving aquatic waterbodies and ecosystems will be considered through HAZOPS and emergency management planning and that environmental impact mitigation measures will be incorporated into emergency response plans as appropriate. | Section 7 |
| **Shore crossing** | | |
| 9.2 Environmental aspects – overview | A description of the general physical characteristics of the site/route and surrounding area, including topography, local climate, geology, geomorphology, soils (including erodibility, potential contamination, and acid sulphate soils), vegetation, fauna, groundwater and surface drainage (including waterways, lakes, wetlands, coastal areas etc), and seabed characteristics. | Section 6 |
| 10.5 Water quality (surface and groundwater) | Discuss potential impacts of construction and operation of the proposal on surface and groundwater, including: | Section 7.1 |
| | Results of any baseline water quality, biological and sediment monitoring undertaken of potentially impacted waterways. | Section 6.6.3 |
| | Consideration of Protected Environmental Values under the *State Policy on Water Quality Management 1997*. | Section 7.2 |
| | Where any subsurface works are proposed: | |
| | Provide a map showing the location of any groundwater bores (refer to the Groundwater Information Portal), a conceptual groundwater model for regional and local aquifer flows and details of any baseline groundwater quality monitoring undertaken. | Section 6.6 |
| | Identify any surface water and groundwater dependant ecosystems that may receive groundwater from areas impacted by the proposal. | Section 6.6.5 |
| | Discuss potential impacts of the proposal on groundwater (quality and quantity), including interruption of flow, release of sediment, disturbance of contaminated material, and cumulative impact with proposed converter station works. | Section 7.1 |
| | Discuss proposed avoidance and mitigation measures to minimise potential impacts on surface and groundwater quality. | Section 9 |
| | Provide justification for any potential impact to groundwater in accordance with the principles under the *State Policy on Water Quality Management 1997* and with reference to likely groundwater community values, associated guideline values and guideline values for receiving surface waters. For information regarding the water quality management framework and evaluation criteria in Tasmania refer to *Technical Guidance for Water Quality Objectives (WQOs) Setting for Tasmania, August 2020*. | Section 7.7 |

## 2.2 LINKAGE TO OTHER TECHNICAL ASSESSMENTS

The groundwater impact assessment is informed by or informs the technical assessments outlined in Table 2-2.

**Table 2-2 Relevant technical studies**

| Technical assessment | Relevance to this assessment |
|---|---|
| **Geotechnical factual report (Jacobs, 2022a)** | Study provides factual summary of desktop review of geological setting, site investigation works including drilled boreholes, monitoring well installation, groundwater monitoring, test pits, geophysical investigations, and contamination assessment.<br>The information provided in the report supported the development of a conceptual hydrogeological model, baseline groundwater characterisation, and preliminary assessment of soil and groundwater contamination status. |
| **Geotechnical interpretive report (Jacobs, 2022b)** | The interpretive report provides further discussion and interpretation of the primary data presented in the geotechnical factual report (Jacobs, 2022a), including assessment of water-bearing formations, comparison of water quality against adopted screening criteria, estimation of aquifer hydraulic properties and assessment of likelihood that construction activities may intersect groundwater.<br>The information provided was considered during development of the hydrogeological conceptual model and identification of potential impacts to groundwater. |
| **Climate and climate change assessment (Katestone, 2023)** | Characterises the climate change predictions and risk that could affect the project.<br>This report provides review of climate setting and anticipated range of climate change scenarios for the Heybridge site, including changes to rainfall allowing inferred changes to groundwater recharge rates and future changes to average groundwater levels. |
| **Contaminated land and acid sulfate soils impact assessment**<br>**(Tetra Tech Coffey, 2023)** | Report identifies the potential for contamination and/or acid sulfate soils (ASS) to be present in the study area and assesses the risks and residual impacts to the environment and human health posed by the potential contamination. This assessment includes a review of previous site investigations and publicly available information, as well as sampling and analysis of soil and surface water within the study area for contaminants of potential concern. |
| **Terrestrial ecology baseline and impact assessment**<br>**(Entura, 2023)** | Report characterises the ecological setting relevant to groundwater within the study area. |

# 3. LEGISLATION, POLICY AND GUIDELINES

The legislation, policies and guidelines applicable to this report are described below.

## 3.1 TASMANIA

In Tasmania the key documents that relate to the groundwater management and this impact assessment are:

- *Environment Management and Pollution Control Act 1994* (Tas) (EMPCA)
- EPA Tasmania, *State Policy on Water Quality Management 1997* (EPA Tas, 1997)

### 3.1.1 Environment Management and Pollution Control Act 1994 (Tas)

The *Environment Management and Pollution Control Act 1994* (Tas) (EMPCA) is the primary environmental protection legislation in Tasmania. The basis of the EMPCA is prevention, reduction and remediation of environmental harm. In Tasmania, the responsibility for environmental management is shared by the EPA and local councils under the EMPCA.

### 3.1.2 State Policy on Water Quality 1997

Surface waters and groundwater in Tasmania are protected under the *State Policy on Water Quality Management* (EPA Tas, 1997) (State Policy). The State Policy provides a framework for the sustainable management of water quality throughout Tasmania and refers to water quality guidelines and objectives to be implemented.

Section 7.1 of the State Policy defines six protected environmental values which are defined as values or uses of the environment which should be protected. These are summarised in Table 3-1 below and assessed further in Section 7.

**Table 3-1 Protected environmental values of water**

| | PEV |
|---|---|
| **A** | Protection of aquatic ecosystems |
| | A1 – Surface waters, including estuaries, but not including coastal waters:<br>i) Pristine or nearly pristine ecosystems<br>ii) Modified (not pristine) ecosystems<br>(a) from which edible fish, crustacea and shellfish are harvested<br>(b) from which edible fish, crustacea and shellfish are not harvested |
| | A2 – Coastal waters<br>i) Coastal waters ecosystems |
| | A3 – Groundwaters<br>i) Groundwater ecosystems<br>*Environmental Value's relevant to groundwater are defined by the observed Total Dissolved Solids (TDS) concentration. Refer to Table 1 of the State Policy.* |
| **B** | Recreational water quality and aesthetics:<br>i) Primary Contact<br>ii) Secondary Contact<br>iii) Aesthetics only |
| **C** | Raw water for town drinking water supply*<br>** All raw water from any surface water source or groundwater source which is to be used for domestic purposes should comply with the Australian Drinking Water Guidelines (NHMRC 2022), at the point of use, regardless of source.* |
| **D** | Raw water for homestead supply* |
| **E** | Agricultural water uses:<br>i) irrigation, and<br>ii) stock watering. |
| **F** | Industrial water supply<br>*The specific industry type for which the water is to be used must be specified to identify appropriate guidelines (Australian Water Quality Guidelines for Fresh and Marine Water Quality, ANZG 2018)* |

# 4. PROJECT DESCRIPTION

This section discusses the key component and details of the project and activities that are relevant to the groundwater impact assessment.

## 4.1 OVERVIEW

The project is proposed to be implemented as two 750 MW circuits to meet transmission network operation requirements in Tasmania and Victoria. Each 750 MW circuit will comprise two power cables and a fibre-optic communications cable bundled together in Bass Strait and laid in a horizontal arrangement on land. The two 750 MW circuits will be installed in two stages with the western circuit being laid first as part of stage one, and the eastern cable in stage two.

The key project components for each 750 MW circuit, from south to north are:

- HVAC switching station and HVAC-HVDC converter station at Heybridge in Tasmania. This is where the project will connect to the North West Tasmania transmission network being augmented and upgraded by the North West Transmission Developments (NWTD).
- Shore crossing in Tasmania adjacent to the converter station.
- Subsea cable across Bass Strait from Heybridge in Tasmania to Waratah Bay in Victoria.

In Tasmania, a converter station is proposed to be located at Heybridge near Burnie. The converter station will facilitate the connection of the project to the Tasmanian transmission network. There will be two subsea cable landfalls at Heybridge with the cables extending from the converter station across Bass Strait to Waratah Bay in Victoria. The preferred option for shore crossings is horizontal directional drilling (HDD) to about 10 m water depth where the cables would then be trenched, where geotechnical conditions permit.

Approximately 255 kilometres (km) of subsea HVDC cable would be laid across Bass Strait. The preferred technology for the project is two 750 megawatt (MW) symmetrical monopoles using ±320 kV, cross-linked polyethylene insulated cables and voltage source converter technology. Each symmetrical monopole is proposed to comprise two identical size power cables and a fibre-optic communications cable bundled together. The cable bundles for each circuit will transition from approximately 300 m apart at the HDD (offshore) exit to 2 km apart in offshore waters.

This assessment is focused on the Tasmanian terrestrial and shore crossing section of the project. This report will inform the two EISs being prepared to assess the project's potential environmental effects in accordance with the legislative requirements of the Tasmanian government (Figure 4-1).

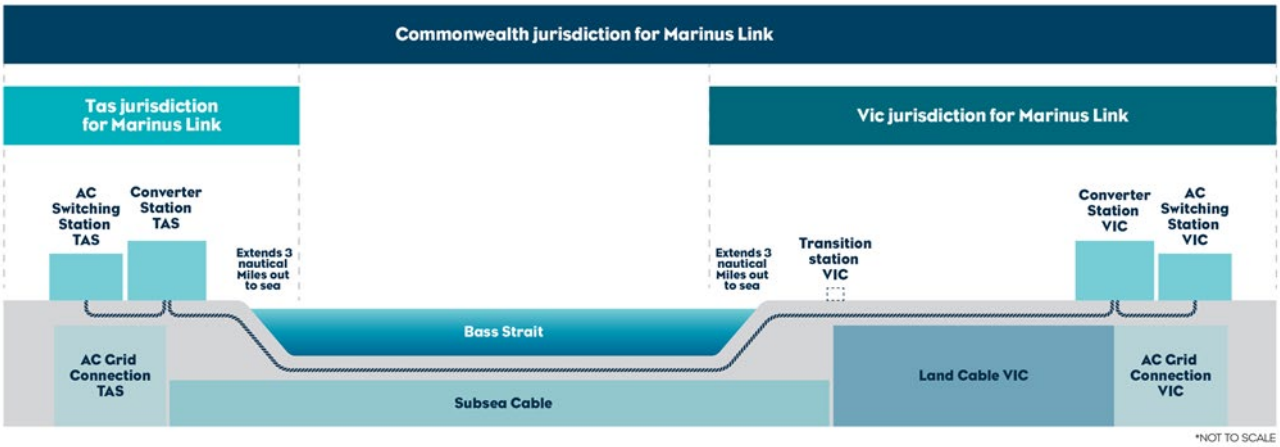



**Figure 4-1 Project components considered under applicable jurisdictions (MLPL, 2022)**

The project is proposed to be constructed in two stages over approximately five years following the award of works contracts to construct the project. On this basis, stage 1 of the project is expected to be operational by 2030, with Stage 2 to follow, with final timing to be determined by market demand. The project will be designed for an operational life of at least 40 years.

## 4.2 CONSTRUCTION

A description of the project's key components during the construction phase that have the potential to impact on environmental or social groundwater values considered within this groundwater impact assessment are summarised below.

- **Bass Highway and shore crossing** – HDD launch pits (two) and drilling activities.
- **Converter station** – Site preparation, earthworks and civil works.

The project description outlines the following components that will be constructed at the Heybridge converter station which are highlighted by this report as having potential relevance to the groundwater impact assessment:

- Greywater and sewerage will be managed through two septic tanks to be located towards the centre of the site.
- A stormwater drainage system that will receive water from the converter station site including areas surrounding bunded infrastructure which will be directed to and collected in a gross pollutant trap or triple interceptor trap.
- The site will have underground oil separator tanks, in the centre-east of the site, which will be periodically pumped out by a licensed wastewater disposal contractor.
- Two 1500 kVA diesel generators with above ground fuel storage of 5000 L (sufficient for 8 hours at full load), to power a 2500 L diesel converter.
- Clean surface water runoff and overflow from the traps will discharge to a stormwater management system that adopts water sensitive urban design principals (e.g., swale drain), before discharge to the ocean via the existing site drainage culvert.
- An above ground fire water tank.

The following sections provide further detail on some key aspects of the project's construction that may interact with groundwater.

### 4.2.1 HDD launch pit

The shore crossing will comprise of six HDD bores, one for each cable (two power and one fibre optic per pad) drilled from two pads located within the Heybridge Converter Station site. Three ducts will be installed from each of the two drill pads. The crossings will be drilled under Bass Highway and Western Line which are adjacent to the proposed converter site.

The HDD rigs will be located within the Heybridge site and drill out along the subsea project alignment. The HDD bores will extend approximately 1 km offshore and end in approximately 10 m water depth. The subsea cables will be pulled from the cable laying vessel to the converter station HDD drill pads.

Two HDD launch pits are likely to be located at the converter site to provide subsurface access for deployment of the drill rods. Specific depths of the HDD launch pits have not been provided for the Heybridge site but are assumed to be in the order of 3 m below the existing ground surface.

### 4.2.2 Converter station earthworks

An elevated bench will be constructed to provide a stable base for the converter station and situate it above the 1 in 200-year flood level. The site will have a gentle slope from an RL of approximately 10 m in the south-eastern corner of the site towards an RL of 6.8 m at the north-western boundary with Bass Highway (over a 340 m section across the site).

Areas of unsuitable material and contaminated soil will be excavated and managed in accordance with relevant regulatory requirements.

A preliminary conceptual design of the Heybridge site’s cut and fill requirement during construction has been provided by Jacobs (2022b). The draft concept design cut and fill isopach figure is reproduced as Figure 4-2. It indicates that excavation of the southwestern and eastern boundaries of the site will be required to level and fill the lower elevations in the centre and north of the site. The Jacobs (2022b) concept design describes the proposed earthworks which notes excavation of up to approximately 2.5 m depth in the east and southwest of the site (Figure 4-2). An excavated entryway is also shown from the east with similar maximum cut depths.

Jacobs (2024) provides further assessment of potential construction earthworks based on the revised assumption that the existing fill material at the site may not be geotechnically suitable for construction and may require excavation and offsite disposal. Excavation depths and the corresponding soil volumes that would require offsite disposal have been reproduced in Figure 4-3. The finished site level would be achieved by importing and placing clean fill.

Contaminated soil generated during removal of unsuitable fill material and construction of the converter station bench (if encountered) will be either remediated prior to onsite reuse or will be disposed offsite to a licenced landfill.

Civil works including station access and internal roads, stormwater drainage system, converter hall (comprising phase reactor, valve and HVDC reactor halls), building foundations, cable trenches and foundations for electrical apparatus and transformer bays, may all potentially encounter shallow groundwater which may be less than 0.5 m below ground level (m bgl) (refer to Section 6.6.1).

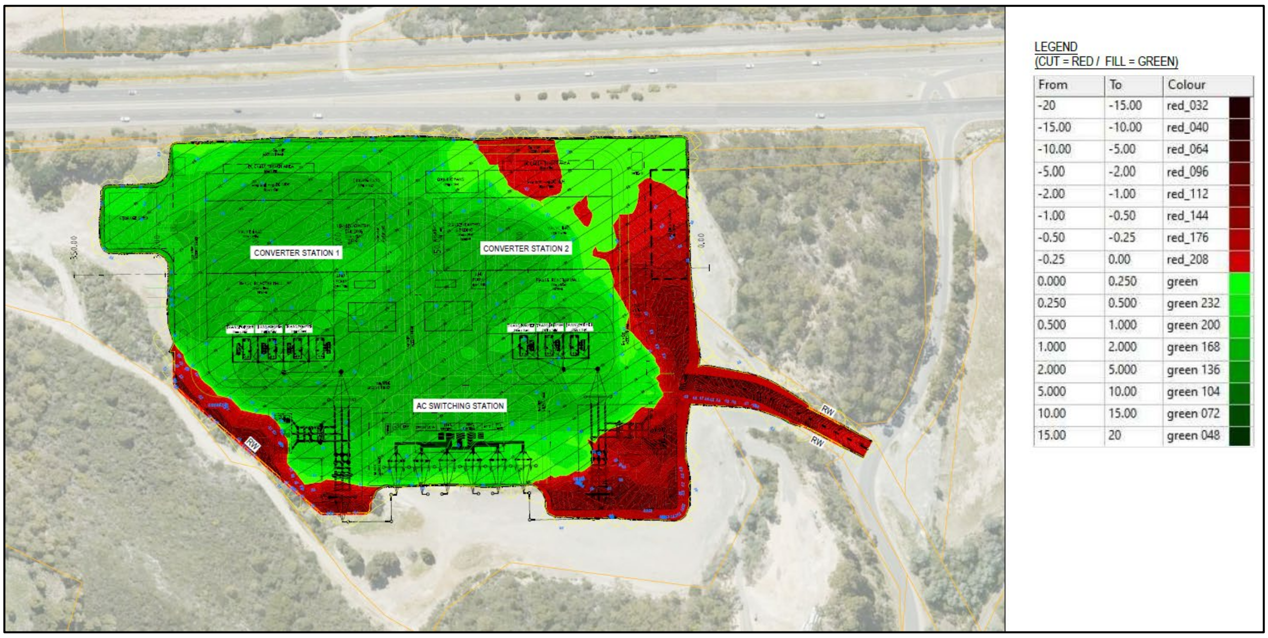



**Figure 4-2 Heybridge converter station site cut/fill plan (sourced from Jacobs, 2022b)**

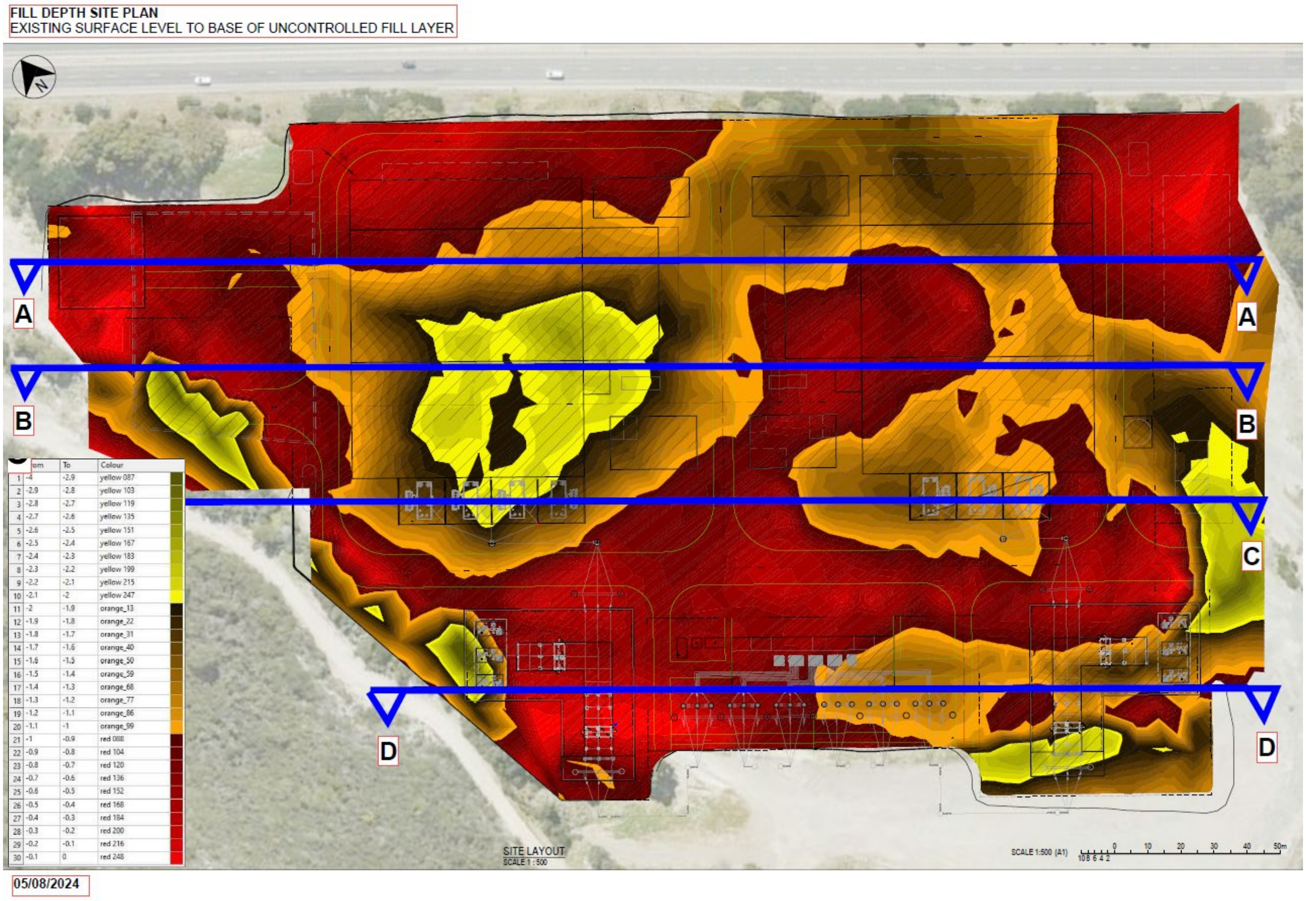



**Figure 4-3 Heybridge converter station fill depth plan (sourced from Jacobs, 2024)**

### 4.2.3 Converter station foundations

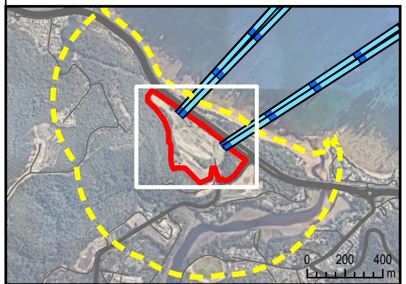
Jacobs (2022b, 2024) provided an assessment of the subsurface geotechnical conditions and concluded that bored piles would likely be adopted for foundations at the converter station which would be anchored to the underlying competent rock. Piles would extend below the water table and would require temporary casing or other means to maintain the pile hole stability through the saturated, unconsolidated fill and sediments (where it remains). Figure 4-4 presents the proposed site infrastructure layout including buildings that may require bored piled foundations.


MARINUS LINK

LEGEND

Proposed route

- HVDC subsea cable
- Indicative station layout
- Heybridge converter and switching station site boundary
- 500 m site buffer
- Major road
- Minor road




Source:
Routes from Tetra Tech Coffey.
Station layout from Jacobs.
Roads and watercourses from DPIPWE.
Imagery from NearMap (8 March 2022).

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MARINUS LINK PTY LTD

MARINUS LINK HEYBRIDGE GROUNDWATER IMPACT ASSESSMENT REPORT

**FIGURE 4-4**

**Heybridge converter station infrastructure layout**

TETRA TECH COFFEY

DATE: 30.04.24 PROJECT: 754-MELEN215878ML FILE: 215878ML_R18_F003.3_GIS

## 4.3 OPERATION

During the operational and maintenance phase, site workers will be undertaking tasks such as waste collection, triple interceptor trap maintenance, routine maintenance, changing filters, inspecting equipment, alarm response, outage coordination and planning, switching, and training.

Of relevance to the groundwater impact assessment, the following infrastructure is proposed to be installed at the Heybridge site for use during the operation phase:

- Two 1.5 MVA gensets with 2500 L of fuel storage each (assume to be consumed during testing and refuelled annually).
- Septic tank for onsite sewage treatment.
- Oil-cooled electrical transformers.

The following operational project activities have been considered:

- Accidental spills and leaks of transformer oil, lead acid batteries, and diesel fuel stored in above ground tanks;
- Accidental leaks from triple interceptor traps;
- Herbicide application (approximately 20 L every three months) at the converter station; and
- Discharge of treated effluent to subsurface soils and groundwater from the septic tank.

During operation, the site will generate very little waste. Any waste generated will be managed in accordance with the waste management hierarchy and the operational EMP. While there will be several transformers onsite containing large amounts of oil, this oil has a significant lifespan (40 years approximately) and is not expected to generate waste during that time.

Waste may be generated from operation and maintenance activities related to:

- Lead acid batteries that will need to be replaced approximately every 10 years. There are four 110/125 V DC battery banks which consist of 58 lead acid cells each (or equivalent lithium batteries).
- Approximately five rat bait stations will be required to be replaced every six months.

## 4.4 DECOMMISSIONING

The operational lifespan of the project is a minimum 40 years. At this time, the project will be either decommissioned or upgraded to extend its operational lifespan.

Decommissioning will be planned and carried out in accordance with regulatory requirements at the time. A decommissioning plan in accordance with approvals conditions will be prepared prior to planned end of service and decommissioning of the project.

Requirements at the time will determine the scope of decommissioning activities and impacts. The key objective of decommissioning is to leave a safe, stable and non-polluting environment.

In the event that the project is decommissioned, all above-ground infrastructure will be removed, the site rehabilitated.

Decommissioning activities required to meet the objective will include, as a minimum, removal of above ground buildings and structures. Remediation of any contamination and reinstatement and rehabilitation of the site will be undertaken to provide a self-supporting landform suitable for the end land use.

Decommissioning and demolition of project infrastructure will implement the waste management hierarchy principles being avoid, minimise, reuse, recycle and appropriately dispose. Waste management will accord with applicable legislation at the time.

Decommissioning activities may include recovery of land and subsea cables. The conduits and shore crossing ducts will be left in-situ as removal will cause significant environmental impact. Subsea cables will be recovered by water jetting or removal of rock mattresses or armouring to free the cables from the seabed.

A decommissioning plan will be prepared to outline how activities will be undertaken and potential impacts managed.

# 5. ASSESSMENT METHOD

This section describes the method used to assess the potential groundwater impacts associated with project activities considering the values present in the project area. This assessment method addresses the requirements outlined in the Tasmanian assessment guidelines for the project (Section 2).

The assessment method has key three steps:

The first step is the evaluation of the baseline conditions to identify environmental values and potential of impacts. This includes:

- Defining a study area to provide context for identifying potential issue and assessing impacts.
- Baseline characterisation of groundwater quality, uses, levels and influences from factors such as climate, hydrology, existing land uses and geological conditions.
- Understanding the geology and nature of aquifers within and surrounding the project area.
- Developing a conceptual model of groundwater levels and flows.

The second step is the hydrogeological assessment to assess the possible range of changed to groundwater level or quality in response to proposed construction methods, such as groundwater dewatering.

The third step includes the assessment of the sensitivity of groundwater values and aquifers to change, the assessment of the magnitude of potential impacts, and the significance of those impacts. This step also includes considering possible mitigation measures to reduce the impact and assess a residual impact significance after application of further controls.

## 5.1 STUDY AREA

The study area of the groundwater impact assessment is defined as the converter and switching stations located in Heybridge, Tasmania which comprises an approximate area of 10.6 hectares (ha) (referred to as the site) plus a 500 m onshore zone surrounding the site (Figure 4-4).

The 500 m zone was set based on the inferred small groundwater catchment that is likely to interact with the proposed converter station location. This inferred catchment size was based on the site's position on a promontory of land that is bounded on three sides by major hydrogeological boundaries: the coastline of Bass Strait to the north, and the Blythe River estuary to the south and east. The remaining south and western boundaries are defined by the steeply rising topography formed by the outcropping bedrock formation which would likely form a groundwater catchment divide or low-flow boundary. Local hydrogeological conditions are discussed further in Section 6.6.

It is noted that the sub-sea cables and the NWTD project are excluded from the study area.

## 5.2 BASELINE GROUNDWATER CHARACTERISATION

Characterisation of the existing groundwater conditions within the study area has been based on the desktop review of published literature and data for the site and the region. It provides the necessary level of understanding of the existing groundwater environment at the Heybridge site to allow for an assessment of potential project impacts.

Data sources reviewed during the groundwater baseline characterisation (Section 6) include:

- Bureau of Meteorology (BoM):
  - Climate data.
  - Groundwater Dependent Ecosystem Atlas.

- Publicly available reports and mapping products commissioned by State (i.e., Mineral Resources Tasmania (MRT)), Department of Natural Resources and Environment Tasmania (DNRE)) and Federal agencies (i.e., Commonwealth Scientific and Industrial Research Organisation (CSIRO), (BoM), Department of Agriculture, Water and the Environment (DAWE)).
- DNRE ListMap geospatial datasets including:
  - River catchments, rivers, creeks and water bodies.
  - Water management plan areas.
  - Conservation of Freshwater Ecosystems Values (CFEV) wetlands, waterbodies, karsts and GDEs.
  - Sites currently regulated by EPA Tasmania under the EMPCA.
  - Geological mapping information including 1:25,000 and 1:250,000 scale geological maps.
- DNRE Groundwater Information Access Portal.
- CFEV spatial database tool and project database.
- Site geotechnical and contamination investigation reports prepared for the site (Table 2-2)

## 5.3 HYDROGEOLOGICAL ASSESSMENT METHOD

This assessment has considered the change in hydrogeological conditions due to the likely requirement for temporary dewatering during construction, resulting in groundwater level drawdown. The following sections describes the approach to the hydrogeological assessment to estimate the potential groundwater levels changes over distance. The assessment is then presented in Section 7.3.1.

### 5.3.1 Project dewatering requirements

Temporary dewatering may be required at excavations that extend below the water table beneath the site during construction.

Planned construction earthworks will be required to remove geotechnical unsuitable fill material and level the site (described in Section 4.2.2). In the case where fill material requires excavation and removal, a large portion of the site will require excavation below the water table. Extensive zones of dewatering are likely to be required during earthworks unless mitigations are put in place to prevent or minimise groundwater ingress. Given the suspected high hydraulic conductivity of the shallow fill material and the Quaternary aquifer, the unmitigated rate of groundwater ingress into dewatered excavations could be high.

It is noted that the final site levels conditions result in the water table periodically rising above the final finished ground level. This might feasibly occur along the southwestern and eastern site boundaries where site levelling earthworks may require retaining walls will be built. Depending on the groundwater levels in these areas, groundwater may emerge at the new ground surface and drain to the site stormwater management system.

Examples of possible infrastructure that may require dewatering for a period include:

- HDD launch pits
- Bored piles.

Two HDD launch pits are likely to be located at the converter site to provide subsurface access for deployment of the drill rods. Specific depths of the HDD launch pits have not been provided for the Heybridge site but are assumed to be in the order of 3 m below the existing ground surface. There are no indications that permanent infrastructure will be installed below the watertable that would require long term dewatering during operation.

A qualitative dewatering assessment method has been adopted to consider the potential drawdown impacts, which is discussed further in Section 7.3.1.

## 5.4 IMPACT ASSESSMENT

The assessment of potential groundwater impacts has been conducted by assessing the significance of an impact. This considers the project activities that might potentially impact on the protected environmental values of groundwater (identified in Section 7). This approach assesses the sensitivity of the environmental segment (in this case groundwater aquifers or sensitive receptors) (described further in Section 5.4.2) and the magnitude of the impact to relevant environmental values if it did occur (described further in Section 5.4.3).

Impacts are assessed initially based on the implementation of standard mitigation or management measures that are either proposed by the proponent or are common across the industry. If necessary, additional mitigation or management measures may need to be needed to reduce the residual predicted impact so far as reasonably practicable. The recommended mitigation and management measures are further discussed in Section 9.

### 5.4.1 Identifying potential impacts

The impact assessment approach requires that all credible potential impacts to groundwater are identified and considered.

This assessment included a review of the project description (Section 4) by Tetra Tech Coffey's technical specialist (hydrogeologists) to consider the potential adverse impacts that construction, operation, and decommissioning activities may have on groundwater.

Credible potential impacts were identified if any of the proposed activities might interact with groundwater and could cause changes to groundwater levels or quality. The identification of potential impacts was also informed by the understanding of the existing environment presented in Section 6 and draws on knowledge gained on other linear infrastructure projects.

The potential impacts identified are listed in Section 7.1 and are carried through the impact assessment in Section 7.3 through to Section 7.8.

### 5.4.2 Identification and sensitivity assessment of environmental values

The sensitivity of an identified environmental value of groundwater is determined with respect to the following factors as they relate to the aquifers on which those values rely:

- *Conservation status*: assigned to an environmental value by governments (including statutory and regulatory authorities) or recognised international organisations (e.g., United Nations Educational, Scientific and Cultural Organization (UNESCO)) through legislation, regulations, and international conventions.
- *Intactness*: an assessment of how intact an environmental value is. It is a measure (with respect to its characteristics or properties) of its existing condition, particularly its representativeness.
- *Uniqueness or rarity*: an assessment of its occurrence, abundance, and distribution within and beyond its reference area (e.g., bioregion/biosphere).
- *Resilience to change*: determined by the extent to which an environmental value can cope with change including that posed by threatening processes. This factor is an assessment of the ability of an

environmental value to adapt to change without adversely affecting its conservation status, intactness, uniqueness, or rarity.

- *Replacement potential*: the potential for a representative or equivalent example of the environmental value to be found to replace any losses.

The criteria for the different sensitivity levels of an EV, as applied in the groundwater significance impact assessment, are described in Table 5-1. The process of identifying groundwater values, which inform aquifer sensitivity, is presented in Section 5.4.1. The sensitivity assessment is presented in Section 7.2.1.

**Table 5-1 Definitions for the sensitivity of aquifers (based on their capacity to support groundwater values)**

| Sensitivity criteria | Very high sensitivity | High sensitivity | Moderate sensitivity | Low sensitivity | Not sensitive |
|---|---|---|---|---|---|
| **Environmental Values of groundwater**<br>*Potential uses of groundwater related to the suitability of the water to support ecosystems, and consumptive and productive uses.* | Attributes of the groundwater system support connected features that are of high ecological importance and/or cultural or spiritual significance.<br>Intrinsic attributes support the use of the groundwater for potable supply, agricultural use, and food production. | Attributes of the groundwater system support ecosystems that are of high importance but may be slightly modified.<br>Intrinsic attributes support the use of the groundwater for secondary domestic supply and some agricultural uses. | Attributes of the groundwater system support ecosystems that are characterised as slightly to moderately disturbed and may have reduced biodiversity and ecological value.<br>Groundwater quality or levels may be altered from natural conditions and partly affect some environmental values.<br>Intrinsic attributes support the use of the groundwater for construction and irrigation purposes, and might support some short-term agricultural uses (such as during drought) | The groundwater system supports ecosystems of limited ecological importance, which are characterised as highly altered from their natural state.<br>Groundwater quality is highly altered from natural conditions. Groundwater supports a limited range of consumptive and productive uses. | Attributes of the groundwater system (quality, occurrence, volume, extraction potential) are not suitable for environmental values.<br>Groundwater quality may be highly altered from natural conditions and may be impacted by existing contamination sources. Groundwater supports a very limited range of consumptive and productive uses and ecosystems that have low dependence on water quality parameters. |
| **Uniqueness and rarity**<br>*Abundance of the aquifer type and availability of equivalent or representative alternatives. Uniqueness of the aquifer or connected feature that carries conservation status.* | Attributes of the groundwater system (including connected features) are unique. There are no known available alternatives.<br>The groundwater system, or connected feature, is listed on a recognised or statutory state, national or international register as being of conservation significance. | Attributes of the groundwater system are locally unique, and with few regionally available alternatives.<br>The groundwater system, or connected feature, is listed on a recognised or statutory state or national register as being of conservation significance. | Attributes of the groundwater system are locally unique but have regionally available alternatives.<br>The groundwater system, or connected feature, is recorded as being important at a regional level, and may have been nominated for listing on recognised or statutory registers. | Attributes of the groundwater system are common on a regional and national basis, and therefore, have regionally available alternatives.<br>The groundwater system, or connected feature, is not listed on any recognised or statutory register. | Attributes of the groundwater system are common on a local and regional scale, and therefore have both local and regionally available alternatives.<br>The abundance and widespread distribution of the groundwater system, and any connected features, ensures replacement of unavoidable losses is assured. The groundwater system, and its connected features, are not listed on any recognised or statutory register, nor are they recognised locally by relevant suitably qualified experts or organisations. |
| **Resilience to change**<br>*Groundwater properties such as water level or pressure changes, and quality change, and the nature of the aquifer's connection to the environment.* | The groundwater system, or connected features, have a very low capacity to adjust to level or quality change or disturbance.<br>Intrinsic properties of the groundwater system are very susceptible to change. The overall function of the groundwater system would be permanently altered. | The groundwater system, or connected features, have a low capacity to adjust to level or quality change or disturbance.<br>Intrinsic properties of the groundwater system are susceptible to change. The overall function of the groundwater system would be temporarily altered. | The groundwater system, or connected features, have a moderate capacity to adjust to level or quality change or disturbance.<br>Intrinsic properties of the groundwater system are moderately susceptible to change. The overall function of the groundwater system could be partly altered. | The groundwater system, or connected features, have a high capacity to adjust to level or quality change or disturbance.<br>Intrinsic properties of the groundwater system are slightly resistant to change. The overall function of the groundwater system remains relatively unchanged. | The groundwater system may be confined and deep. The groundwater system, or connected features are not sensitive to level or quality change or disturbance and is able to fully recover.<br>Intrinsic properties of the groundwater system are resilient to change. The overall function of the groundwater system is unchanged. |
| **Recovery potential**<br>*Potential for groundwater systems to recover from a level or quality change naturally.* | The groundwater system has very low recharge rates and very long recovery periods are expected. Permanent quality or quantity changes may occur. | Groundwater systems with low recharge rates and slow recovery periods. Recovery potential is limited or only successful in the minority of cases. Impact may require decades to centuries to resolve. | Groundwater systems with moderate recharge rates and medium-term recovery periods. Recovery is likely to be slow or only partially successful. | Groundwater systems with relatively high recharge rates and short recovery periods. Recovery will be successfully achieved in most cases. | Groundwater systems with very high recharge rates and very short recovery periods. Recovery will be successfully achieved in all cases. |
| **Replacement potential**<br>*Potential for temporary replacement with alternative supply where relevant.* | There are no local water features (surface water or groundwater) that could provide alternative water sources to users. | There are very limited local water features (surface water or groundwater) could provide an alternative water source to users. | There are limited local water features (surface water or groundwater) that could provide alternative water sources to users. | There are several local water features (surface water or groundwater) that could provide alternative water sources to users. | There are numerous local water features (surface water or groundwater) that could provide alternative water sources to users. |

### 5.4.3 Assessing the magnitude of impacts

The magnitude of impacts on an environmental value is assessed according to the following criteria:

- **Geographical extent***:* an assessment of the spatial extent of the impact where the extent is defined as site, local, regional or widespread (meaning state-wide or national or international).
- **Duration:** the timescale of the effect (i.e., short, medium or long term).
- **Severity:** an assessment of the scale or degree of change from the existing condition (positive or negative), as a result of the impact.

The criteria for determining the magnitude level of a potential impact, as applied in the groundwater significance impact assessment are described in Table 5-2. The assessed magnitude of potential groundwater impacts are presented throughout Section 7 and are summarised in Section 7.6.

**Table 5-2 Magnitude criteria for groundwater impact assessment**

| Magnitude level | Criteria |
|---|---|
| Severe | An impact that causes permanent changes and irreversible harm to the environmental value(s) of the groundwater system, including in its capacity to support connected features.<br>Avoidance through appropriate design responses is required to address the impact. |
| Major | An impact that is widespread, long lasting and results in substantial change to the environmental value(s) either temporarily or permanently to the groundwater system, including its capacity to support connected features. The impact can only be partially rehabilitated or there is some uncertainty it can successfully be rehabilitated.<br>Appropriate design responses are required to address the impact. |
| Moderate | An effect that extends beyond the operational area to the environmental value(s) of the surrounding groundwater system and its connected features but is contained within the region where the project is being developed.<br>The impacts are short term and result in changes that can be ameliorated with specific environmental management controls. |
| Minor | A localised impact to environmental value(s) of the groundwater system and its connected features that is short term and could be effectively mitigated through standard environmental management controls.<br>Remediation work and follow-up required. |
| Negligible | A localised impact to environmental value(s) of the groundwater system and its connected features that is temporary and does not extend beyond the operational area.<br>Either unlikely to be detectable or could be effectively mitigated through standard environmental management controls. Full recovery is expected. |

### 5.4.4 Significance assessment

The significance of impacts on an environmental value is determined by the sensitivity of the value itself (and considering the aquifer(s) on which it relies) and the magnitude of the change it experiences. The matrix presented in Table 5-3 demonstrates how the significance of impacts is determined by considering the sensitivity of the environmental value and the magnitude of the expected change. This approach adopts a five-by-five matrix that has been established for the project and consistent across all technical studies that support the project EISs.

**Table 5-3 Impact assessment matrix**

| Magnitude of impact | Sensitivity of value | | | | |
|---|---|---|---|---|---|
| | Very high | High | Moderate | Low | Very low |
| Severe | Major | Major | Major | High | Moderate |
| Major | Major | Major | High | Moderate | Low |
| Moderate | High | High | Moderate | Low | Low |
| Minor | Moderate | Moderate | Low | Low | Very low |
| Negligible | Moderate | Low | Low | Very low | Very low |

The impact assessment process considers the initial impact significance based on an assessment of magnitude prior to applying any additional controls (such as the proposed avoidance, mitigation and management measures).

A description of the assessed significance rating of an impact is provided in Table 5-4. The potential significance of impacts derived using Table 5-3 above are presented throughout Section 7 and summarised in Section 7.6.

**Table 5-4 Description of significance of potential groundwater impacts**

| Significance of impact | Description |
|---|---|
| Major impact | Occurs when impacts will potentially cause irreversible or widespread harm to an environmental value(s) of the groundwater system, including its capacity to support connected features, that is irreplaceable because of its uniqueness or rarity.<br>Avoidance through appropriate design responses is the only effective mitigation. |
| High impact | Occurs when the proposed activities are likely to exacerbate threatening processes already affecting the environmental value(s) of the groundwater system, including its capacity to support connected features.<br>While replacement of unavoidable losses is possible, avoidance through appropriate design responses is preferred to preserve its intactness or conservation status. |
| Moderate impact | Occurs where, although reasonably resilient to change, the groundwater system would be further degraded, as would its capacity to support connected features, due to the scale of the impacts or its susceptibility to further change.<br>The widespread occurrence of the groundwater system, and its connected receptors, ensures it has adequate representation in the region, and that replacement, if required, is achievable. |
| Low impact | Occurs where the groundwater system, and its connected features, are of local importance and temporary and transient changes will not adversely affect its viability to support environmental values provided standard environmental controls are implemented. |
| Very low impact | A degraded (very low sensitivity) groundwater system exposed to minor changes (negligible magnitude impact) will not result in any noticeable change in its intrinsic value and hence the proposed activities will have negligible or no effects. This typically occurs where activities occur in industrial or already highly disturbed areas. |

## 5.4.5 Application of mitigation and management measures to determine residual impacts

Residual impacts are those remaining after the implementation of avoidance, mitigation, and management measures. The extent to which potential impacts have been reduced is determined by undertaking an assessment of the significance of the residual impacts. This is a measure of the effectiveness of the avoidance, mitigation, or mitigation measures expected to be implemented to reduce the magnitude of the potential impacts.

Avoidance, mitigation and management measures outline action that must be taken during design, construction, operation, and decommissioning of the project. If proposed measures or design responses are ineffective in reducing the residual impacts to an acceptable level, additional management measures will be developed. In addition, contingency measures will be documented in the GMP which will be developed prior to construction, may be formalised as a sub plan to the CEMP, and will be implemented during construction if unexpected groundwater issues are encountered. The management plan will be developed in consultation with relevant water authorities and the EPA Tasmania.

The summary of outcomes of the residual impact assessment and the details of the recommended management and mitigation measures are presented in Section 7.7 and 9, respectively.

### 5.4.6 Cumulative impact assessment

The EIS guidelines include requirements to assess cumulative impacts. Cumulative impacts result from incremental impacts caused by multiple projects occurring at similar times and within proximity to each other.

To identify possible projects that could result in cumulative impacts, the International Finance Corporation (IFC) guidelines on cumulative impacts have been adopted. The IFC guidelines (IFC, 2013) define cumulative impacts as those that ‘result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones.

The approach for identifying projects to be considered as by the cumulative impact assessment considered:

- Temporal boundary: the timing of the relative construction, operation, and decommissioning of other existing developments and/or approved developments that coincides (partially or entirely) with the project.
- Spatial boundary: the location, scale, and nature of the other approved or committed projects expected to occur in the same area of influence as the project. The area of influence is defined as the spatial extent of the impacts a project is expected to have.

Proposed and reasonably foreseeable projects were identified based on their potential to credibly contribute to cumulative impacts due to their temporal and spatial boundaries. Projects were identified based on publicly available information at the time of assessment and relevant projects are listed in Section 7.8.

The assessment of the potential cumulative impacts of these projects draws on the findings from the impact assessment (see Section 7.7) and considers the potential effects from these credible projects and where they may interact and accumulate with the project’s own effects, and therefore result in a cumulative impact on groundwater values within the study area. The cumulative impact assessment is provided in Section 7.8.

## 5.5 ASSUMPTIONS AND LIMITATIONS

The groundwater impact assessment recognises the following assumptions and limitations, which are informed by the data gaps described in Section 10.

Whilst site specific geotechnical and hydrogeological data was used together with regional and historical published information to identify baseline groundwater conditions, local variations in groundwater conditions across the converter station site may alter the assessed sensitivity of groundwater values or the impact magnitude. This introduces a level of uncertainty to the groundwater impact assessment.

The groundwater impact assessment has incorporated investigation results from other technical studies where relevant to gain site-specific information related to groundwater, such as investigations carried out by others (Jacobs, 2022a, 2022b) (see Section 2.2). These investigations focus predominantly on the lower bedrock aquifer and do not provide a complete assessment of the levels and quality of upper Quaternary aquifer that is likely to be encountered during construction. While substantially different groundwater quality conditions would not be anticipated, this is a noted limitation. The groundwater impact assessment has not undertaken site inspections and field investigations to further characterise hydrogeological features or attributes of the study area. Given this; the level of detail regarding the location, nature, and significance of groundwater values within and surrounding the site is limited.

Although constrained by these limitations, this groundwater impact assessment is based on information and data with a level of uncertainty that is considered sufficiently low to be suitable for the purpose of the EIS, specifically the identification and assessment of project activities that may pose a risk to groundwater. Various mitigation and management measures have been recommended in Section 9, which formalise the requirement to complete a pre-construction hydrogeological investigation where dewatering may be required.

No potential impacts to groundwater are considered for the decommissioning phase as the project has not identified the need for additional subsurface work or an increased environmental risk associated with future climate scenarios. However, it is acknowledged that during the decommissioning phase, some underground infrastructure may be removed, which could result in minimal impacts on groundwater (see Section 4.4). A decommissioning management plan will include mitigation measures to avoid and minimise any potential impacts to groundwater, specific to the conditions present at the time of decommissioning.

Overall, this groundwater impact assessment provides a level of data considered by the technical specialist and author of this assessment to be sufficiently detailed for the purpose of the two EISs, specifically the characterisation of baseline groundwater conditions and assessment of project activities that may pose impacts to groundwater.

As part of the recommended mitigation and management measures for the project, additional site inspection and monitoring programs have been recommended (Section 8 and Section 9) to address knowledge gaps and manage project risks to groundwater EV's and associated sensitive receptors.

The assumptions and limitations mentioned above were informed by the data gaps described in Section 10.

# 6. EXISTING CONDITIONS

The baseline groundwater characterisation assessed the following existing environmental features:

- Land use (Section 6.1)
- Climate and climate change (Section 6.2)
- Physiography and drainage (6.3)
- Geology (Section 6.4), including:
  - Regional geology (Section 6.4.1)
  - Local geology (Section 6.4.2)
- Acid sulfate soil (Section 6.5)
- Hydrogeology (Section 6.6), including:
  - Groundwater levels and flow direction (Section 6.6.2)
  - Groundwater quality (Section 6.6.3)
  - Groundwater-surface water interaction (Section 6.6.4)
  - GDEs (Section 6.6.5), including:
    - Terrestrial GDEs (Section 6.6.5.1)
    - Aquatic GDEs (Section 6.6.5.2)
  - Groundwater use (Section 6.6.6)
- Existing contamination issues (Section 6.7), including:
  - Naturally occurring radioactive material (Section 6.7.1)
  - Offshore sediment contamination (Section 6.7.2).

## 6.1 LAND USE

Land use can have a direct influence on the hydrogeological conditions within a groundwater catchment and the potential environmental values of groundwater that require protection. Surface activities, the presence of vegetation, and other land management practices in developed areas can all alter groundwater recharge rates, levels, and flow directions, and affect groundwater quality.

The land tenure of the proposed converter station site is listed as Private Freehold and is classified as a Rural (zone 20) under the Burnie Local Provisions Schedule (Burnie City Council, 2018). The site is currently vacant and, based on inspection of recent aerial imagery, appears to be largely undeveloped with sparse grasses and gravel covering most of the site. There is a 1.5 ha remnant dry eucalypt forest and woodland in the eastern corner of the site that is not proposed to be impacted by the project infrastructure (Entura, 2023). Areas of possible hardstands from past land uses are observed in places. Minimal vegetation is present on the site in areas where redevelopment is planned.

Historically, the proposed converter site was used as a paint pigment factory by Tioxide Australia (formerly known as Australian Titan Products (pre-1972)), which is a subsidiary of British Titan Products Ltd England (Figure 6-1). The factory commenced operation in 1949 and produced up to 35,000 tons of paint pigment (titanium dioxide) per year prior to closure of the plant in 1996 (Centre for Tasmanian Historical Studies, 2023). The factory was subsequently demolished by 1998.

Demolition of the factory was completed in 1998 however concrete footings and reinforcement, as well as deleterious materials (building rubble), were noted as still being present by Jacobs (2022b).

Rehabilitation activities were reported to have occurred immediately following the site's closure in 1996; the details of the remediation completed, and the current contamination status of the site is unknown. A subsequent contamination assessment was conducted during 2007 at the site including Bullant ridge, immediately east of the site. Buried asbestos and crushed titanium tetrachloride drums were encountered at Bullant Ridge, which was subsequently investigated with test pitting, sampling and radiometric surveying. An estimated 3,00 to 4,000 $m^3$ of waste and fill was estimated in the southeastern embankment facing the Blythe River estuary. With the exception of the asbestos contamination, the chemical impact to soil was assessed to be "low level contaminated soil' if it were to be transported offsite. The leachability of detected contaminants suggested low potential for impact to groundwater. The site was subsequently capped to minimise infiltration and mobilisation to groundwater, which would be expected to migrate towards Blythe River estuary, away from the proposed converter station site.

Review of historical aerial imagery indicates that the site was vacant from 2007 to 2015, with periods of use as a wood mill or timber laydown area through until 2020. The study area was sold by the Burnie City Council to TasNetworks in 2021.

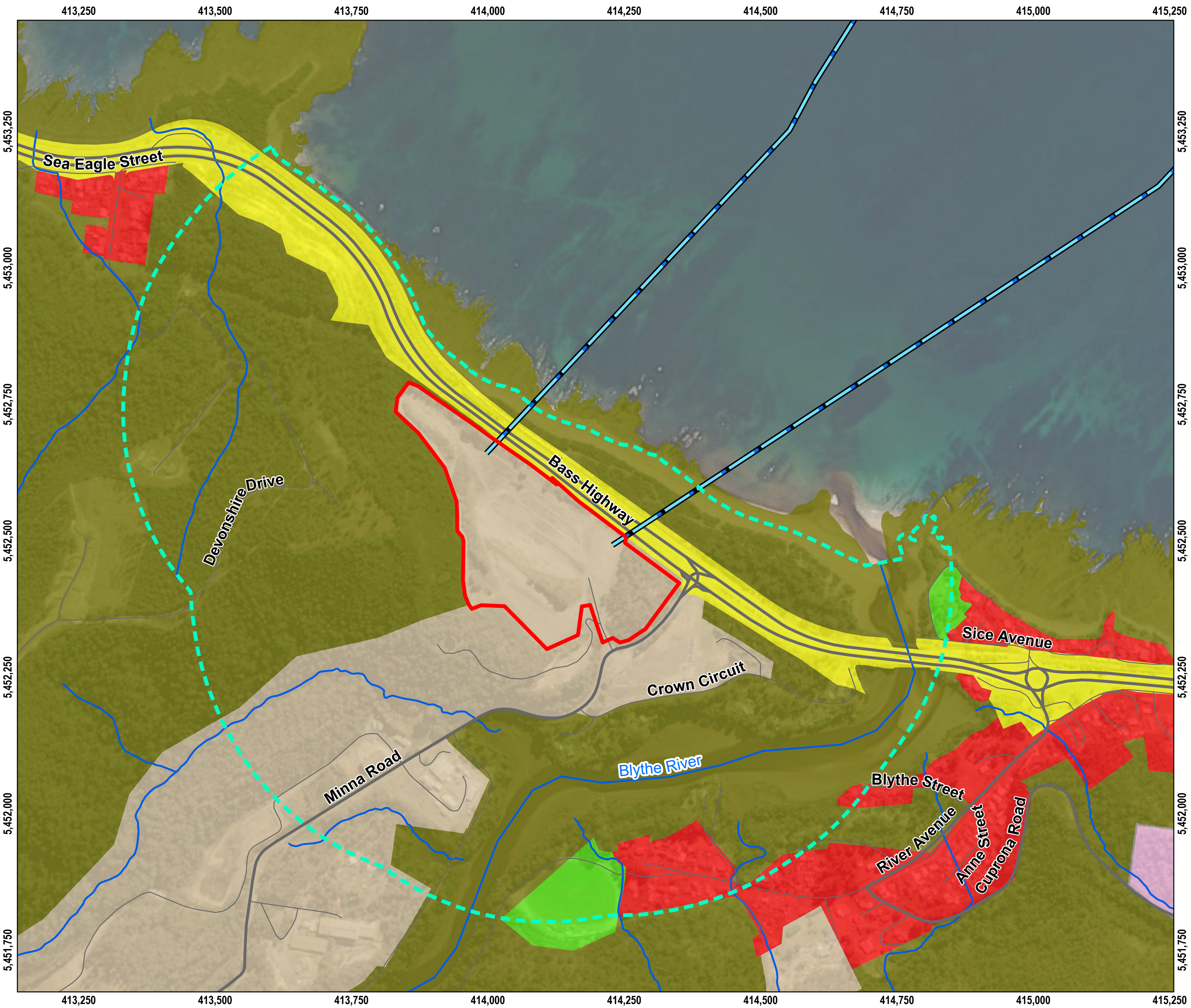
**Figure 6-1 Photograph of the former Tioxide Australia manufacturing facility (ABC Radio Hobart, 2022)**

The land surrounding the proposed development site is largely unsealed, vacant and comprises of native forest, bushlands and habitats associated with the Blythe River located approximately 240 m to the southeast (Figure 6-2). The Blythe River discharges into Bass Straight, approximately 380 m to the east of the site. The north of the study area is bordered by a sealed highway (Bass Highway) which separates the proposed redevelopment site from Bass Strait shore front (approximately 100 m north). A small number of residential properties are located to the west and south, with a small rural town located along Blythe River to the southeast.

Surrounding land within the study area is zoned for the following uses (Figure 6-2):

- Rural (zone 20) to the south with an associated Priority Vegetation Area overlay.
- Landscape Conservation (Zone 22) and Environmental Management (Zone 23) to the north, south and west.
- Areas of General Residential (Zone 8) and Recreation (Zone 28) follow the eastern bank of Blythe River estuary and are mostly positioned outside of the study area.

No agricultural land exists within the study area.




**LEGEND**

Proposed route

- HVDC subsea cable
- Heybridge converter and switching station site boundary
- 500 m site buffer

Planning zones

- General Residential
- Rural Living
- Rural
- Landscape Conservation
- Environmental Management
- Utilities
- Recreation
- Watercourse
- Major road
- Minor road

Source:
Routes from Tetra Tech Coffey.
Roads, watercourses and planning zones from DPIPWE.
Imagery from NearMap (8 March 2022).

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**FIGURE 6-2**

**Surrounding land use and topography**

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## 6.2 CLIMATE

### 6.2.1 Study area climate

Northwestern Tasmania is subject to a temperate marine climate. Heat absorption and storage by the ocean generates milder winters and cooler summers than in continental climates at the same latitudes. This effect diminishes with altitude and distance from the ocean.

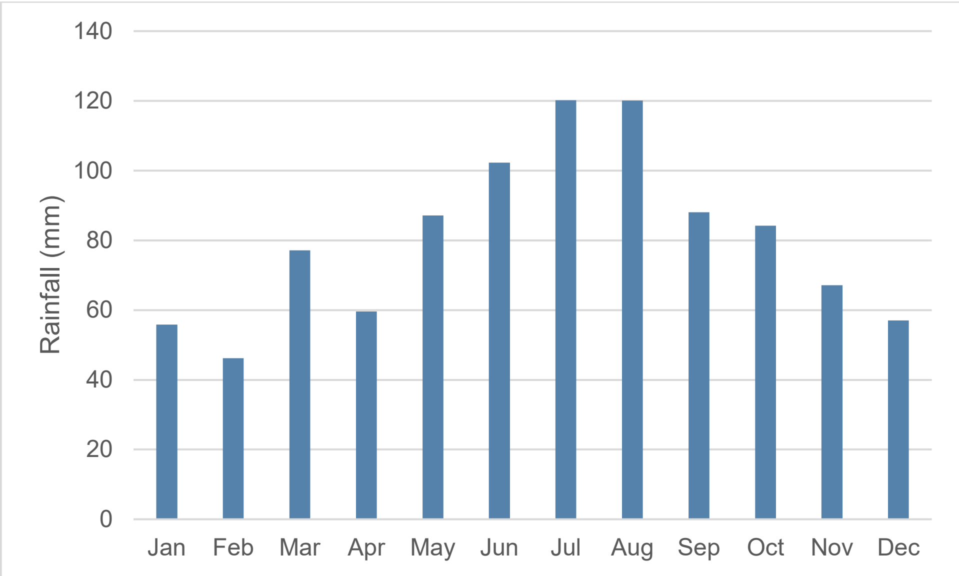



**Figure 6-3 Mean monthly rainfall (Burnie Park Grove, Station ID 091355)**

Average annual rainfall in the study area is approximately 970 mm (Burnie (Park Grove), Station ID: 091355). Average monthly rainfall is presented in Figure 6-3 for Burnie (Park Grove), Station ID: 091355. The highest rainfalls are experienced in winter, with 25 % of annual rainfall occurring in July and August. The driest period is between January to February, accounting for 11 % of annual rainfall.

Due to the lower temperatures and solar radiation levels in the region, potential evapotranspiration is relatively low. No evaporation data is available for the selected weather stations; however, the BoM mapped average areal actual evapotranspiration is approximately 600-700 mm/year (BoM, 2005).

A rainfall residual mass curve has been prepared based on average monthly rainfall from September 2009 to March 2022 (Figure 6-4). Rainfall residual mass curves show the cumulative sum of differences between the value at any time point and the average and, therefore, how individual monthly rainfall compares to average monthly rainfall. As the average is subtracted from each value, the cumulative sum also finishes at zero. A rising slope of the curve indicates a period of excess rainfall compared to the long-term monthly average (e.g., wetter than average period). Conversely, where the slope of the curve is falling, a rainfall deficit period has been recorded, relative to the long-term average (e.g., drier than average period).

Figure 6-4 demonstrates that annual to biennial rainfall trends are experienced within the longer term (5 to 10 years) above or below average rainfall cycles. Since 2017 (to August 2020), a generally negative slope is indicated, representative of below average rainfall conditions. Since mid-2021, above average rainfall has generally been observed.

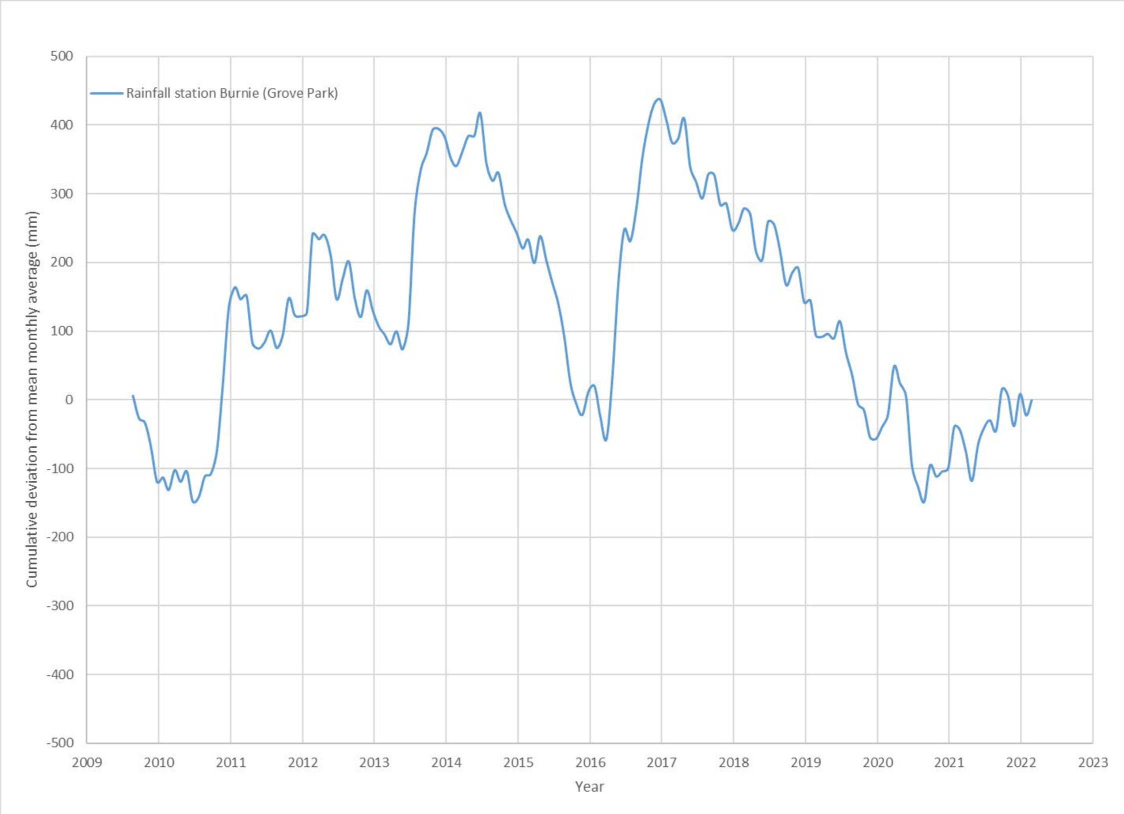



**Figure 6-4 Rainfall residual mass curves for the Burnie (Park Grove; Station ID 091355) weather station**

## 6.2.2 Climate change

In general terms, climate change is projected to result in higher, and more extreme temperatures, more extreme weather events, and sea-level rise. Some of the direct impacts of climate change in coastal zones are expected to include more hazardous storm surges, flood inundation, increased erosion, and increased seasonality in groundwater recharge. This is expected to have direct impacts on groundwater including rising groundwater levels and potentially areas of saline groundwater intrusion into coastal aquifers (Anderson, 2017).

The maximum projected median summer temperatures increase ranges from 0.9°C (2030) to 3.3°C (2090), with the hottest day at the Heybridge site projected to increase from 37°C to 39°C (Katestone, 2023).

There has been a trend towards decreased annual rainfall in southern Australia with a decline of 12% in April to October rainfall since 1970 (CSIRO and BoM 2020), particularly as the number of low-pressure systems that bring heavy rainfall to southern Australia is declining (Katestone, 2023). Median annual rainfall is projected to decrease further by 2 % by 2030 and 5 % by 2090.

The projected effects of climate change might result in long term declining groundwater levels particularly in the water table aquifers present at the site. These effects are considered further in Section 7.5.

The rate of global mean sea level rise is increasing and was 3.5 cm (± 0.4 cm) from 1993 to 2019 as derived from offshore satellite altimetry. The rate of future sea level rise in southeast Australia predicted to be is higher than the global average with median estimates for Burnie of 0.13 m by 2030 and 0.61 m by 2090 (Katestone, 2023).

## 6.3 PHYSIOGRAPHY AND DRAINAGE

The converter station development site is located on a small, lower elevation promontory of land that is bordered by steeply rising topography along the western and part of the southern boundary (Figure 6-5). The study area and surrounding region is characterised by mountain ranges and undulating plateaus dissected by deeply incised rivers and creeks.

The study area includes the coastline of Bass Strait to the north and the Blythe River estuary to the east. The tidally influence Blythe River estuary wraps partly around the southern side of the development site where the smaller, Minna Creek discharges.

Blythe River catchment drains 273 $km^2$ of the northern side of the Grasstree Ridge, originating at headwaters at an elevation of 670 m above the Australian Height Datum (AHD), flowing in a northerly direction across undulating plans over a 62 km course to the estuary and mouth of the river on the northern coastline (DPIWE, 2001). A substantial portion of the catchment includes native vegetation and forest, protected by The Blythe River Conservation Area which commences near Heybridge and follows the river alignment upstream for approximately 10 km. The Upper Blythe Conservation Area continues through to the headwaters with an approximately 3 km intervening zone of cleared agricultural land.

The Blythe River estuary is understood to have experienced significant impact on the integrity of the estuarine ecosystem and environment and local investigations have determined that the estuary is rated as being of low conservation significance and of a moderately degraded nature (DPIWE, 2001). It is understood that the lower section of the 145 ha Minna Creek catchment hosts three waste sludge dams that were formally used by the Tioxide Australia site, and a disposal location of waste generated during the former efforts to remediate the site (DPIWE, 2000). Leachate from these dams was pumped to the existing tioxide beach outfall for marine disposal at the time of the report’s publishing in 2000. A waste dump associated with the tioxide site remediation program is also located between the two upstream sludge dams on Minna Creek (DPIWE, 2000). These former land uses and waste disposal practices have contributed to reported water quality impacts to the estuary.


**Figure 6-5 Local hill shade physiography and drainage in the vicinity of the site**

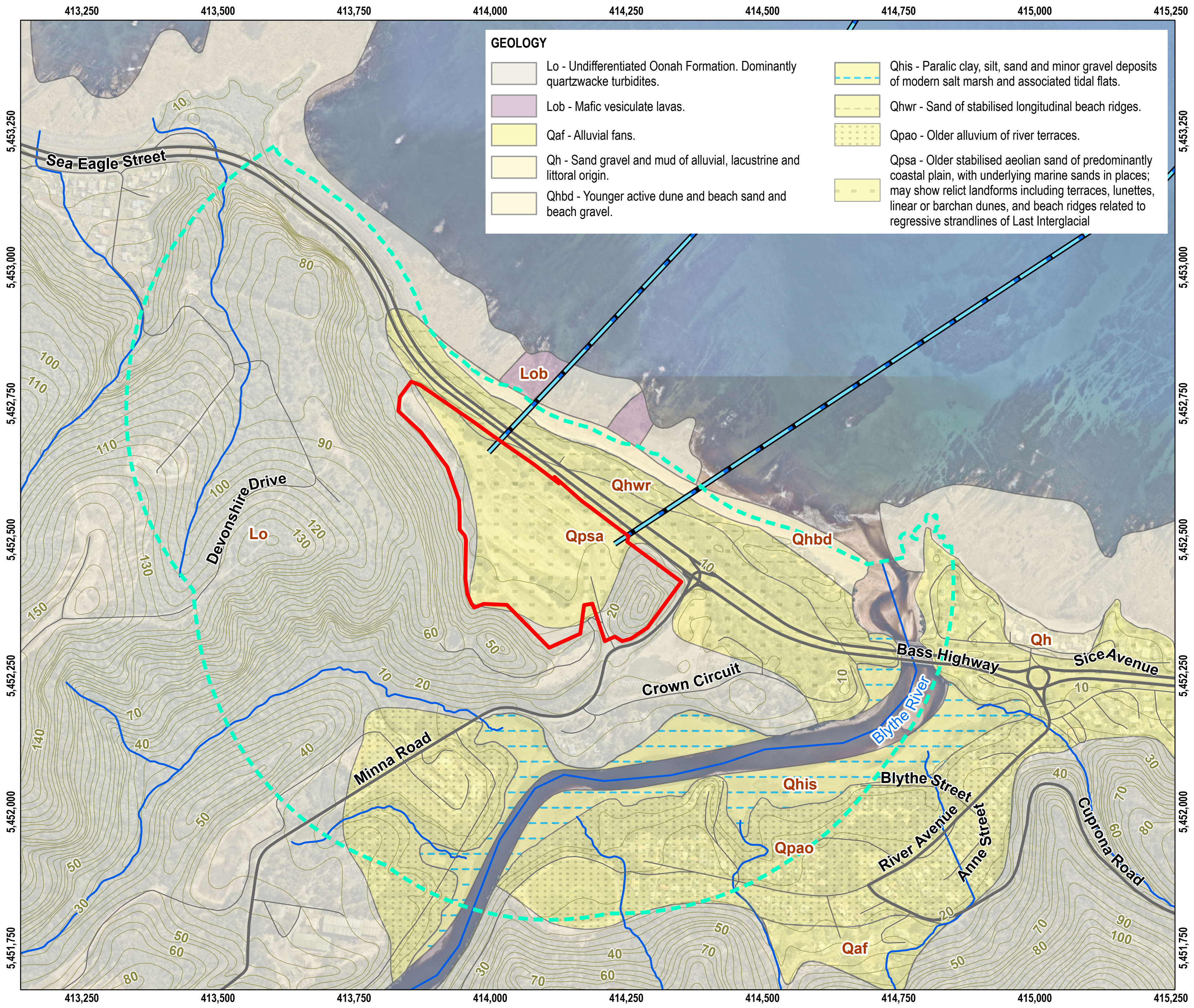
## 6.4 GEOLOGY

### 6.4.1 Regional geology

The site is located within the Sheffield Element, which is one of several Precambrian aged geological blocks in the north of Tasmania. The site is mapped as being underlain by more modern Quaternary deposits of aeolian sand, and river and marine gravels, sand and clays, which are expected to overlie the Precambrian aged Burnie and Oonah Formation (Po, Lo) bedrock of the Sheffield Element. This formation is comprised of pale grey coloured metamorphosed turbidite sequences of interbedded quartz sandstone, siltstone, and mudstone. It is expected to include an upper weathered horizon.

The more recent Quaternary sands, gravels, and clays are deposited in the lower elevation embayment of the outcropping Burnie and Oonah Formation bedrock, which extends across Bass Highway to the coastal landside landfall zone. The bedrock outcrops where the topography rises steeply around the site to the west, south, and east. Interbedded Tertiary basalts are present in the region but are expected to be absent from the study area.

The regional geology within the study area is show in Figure 6-6.




LEGEND

Proposed route

- HVDC subsea cable
- Heybridge converter and switching station site boundary
- 500 m site buffer
- Watercourse
- Major road
- Minor road
- Elevation contours (5m interval)

Source:
Routes from Tetra Tech Coffey.
Geology from MRT.
Roads and watercourses from DPIPWE.
Imagery from NearMap (8 March 2022).

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GROUNDWATER IMPACT ASSESSMENT REPORT

**FIGURE 6-6**

**Regional geology**

TETRA TECH COFFEY

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### 6.4.2 Local geology

Jacobs was engaged to conduct a combined geotechnical, contaminated land and groundwater investigation for the EIS (Jacobs, 2022a,b). A total of nine test pits (maximum 3 m depth) and six drilled boreholes (maximum 15 m depth) were completed across the site to assess geotechnical soil properties, soil chemical quality, and groundwater level and quality conditions.

Table 6-1 provides a summary of the local geological conditions encountered beneath the site during the Jacobs (2022a,b) assessment. A geological map of the site is provided in Figures 2-3 and 2-4 of the Jacobs (2022b) report.

**Table 6-1 Local geological summary (Jacobs, 2022b)**

| Unit | Geological unit | Depth to top | Thickness (m) | Description |
|---|---|---|---|---|
| HB-1 | Fill | 0 | 0.15 to 2.2 | Highly variable, ranging from sandy SILT to sandy GRAVEL. Includes solid inert waste. |
| HB-2 | Colluvium | 0.15 to 0.25 | 0.15 to 2.75 | Silty CLAY / Clayey SILT |
| HB-3 | Aeolian | 1.0 to 2.30 | 0.3 to 0.8 | Sandy SILT to Gravelly SAND |
| HB-4 | Residual soil | 0.2 to 2.2 | 0.3 to 2.6 | Gravelly/sandy/clayey SILT to Sandy GRAVEL |
| HB-5 | Quartzwacke – Burnie and Oonah Formation | 0.00 to 3.10 | Base not encountered | Highly to slightly weathered quartzwacke, low to high strength. Occasional extremely weathered seams |

## 6.5 ACID SULFATE SOIL

A preliminary acid sulfate soil assessment has been conducted for both the onshore soils beneath the converter station (Jacobs, 2022a) and the offshore environment that may be encountered during HDD (Tetra Tech Coffey, 2022b). This work found that the field tests conducted on unconsolidated soils beneath the converter station development site may generate acidic conditions if previously unoxidized soils are exposed during construction activities (Jacobs, 2022a). There was some uncertainty with this assessment due to the presence of organic sulfur which generally does not pose a significant risk of acidification.

Further site assessment work was conducted by Tetra Tech Coffey (Tetra Tech Coffey, 2023) which concluded that potential ASS is present at the northwest and southeast ends of the site in the vicinity of the planned HVDC subsea cable landfall points. In the northwest part of the site potential ASS was encountered at a depth of 1.4 mbgs while at the southeast end of the site it was encountered at depths ranging from 0.4 mbgs to the assumed maximum excavation depth of 1.5 mbgs. The extent of potential ASS is not consistent across the site, and some units have neutralising capacity to mitigate potential acid generation. Analysis of marine sediments also identified a potential oxidation response, which could suggest the presence of potential acid sulfate soils; however, the neutralising capacity of the sediments was sufficiently high to neutralise all acid that may be generated with at least a 20 times factor of safety (Tetra Tech Coffey, 2022b). The assessment concluded that if the sediments were brought to the surface, it is unlikely that acid generation would result in measurable acidic impacts to the environment (Tetra Tech Coffey, 2022b).

## 6.6 HYDROGEOLOGY

### 6.6.1 Hydrogeological setting

Review of the geological setting of the study area (Section 6.4) provides an indication of the likely hydrogeological setting that will be encountered beneath the site. The site is mapped as being underlain by Quaternary deposits of aeolian sand, and river and marine gravels, sand, and clays, which overlie Precambrian aged Burnie and Oonah Formation (Po, Lo) bedrock.

Groundwater within the study area is likely to be present within two primary aquifers identified based on the site geotechnical investigations (Jacobs, 2022a,b). The two primary aquifers identified are:

- Quaternary sand aquifer – a shallow unconfined porous media aquifer represented by the unconsolidated Quaternary deposits of aeolian sand, and river and marine gravels, sand and clays; and
- Bedrock aquifer – a fractured rock aquifer formed by the Precambrian aged Burnie and Oonah Formation turbidite sequence. The bedrock aquifer is likely to be weathered in the upper horizon, and may be confined or semi confined by the overlying Quaternary sand aquifer at the development site and unconfined to the south and west where the bedrock outcrops at surface.

### 6.6.2 Groundwater levels and flow direction

Jacobs (2022a,b) installed four groundwater monitoring wells in the study area; HB-BH01-C, HB-BH02-C, HB-BH03-C, and HB-BH06-C. Location HB-BH06-C was installed as a nested well site with BH06-C(S) being a shallow well (to 2 m bgl) and HB-BH06-C being deeper (to 14 m bgl). A summary of well construction details is provided in Table 6-2 and monitoring well locations are shown on Figure 6-9.

All monitoring wells were installed to screen the bedrock aquifer, logged as 'quartzwacke' lithology, with the exception of the shallow well (HB-BH06-C(S)), which screened the fill, sand and gravel of the shallow aquifer (Table 6-2).

Groundwater levels were measured in all wells on one occasion and results are provided in Table 6-3. Calculated groundwater elevations relative to the AHD are provided.

The water table beneath the site, as measured at the single well screening the upper Quaternary aquifer (HB-BH06-C(S)), was shallow at a depth of 0.74 m bgl (8.72 m AHD).

The measured groundwater levels in the deeper wells screening the bedrock aquifer relate to the groundwater potentiometric surface at depth. In confined systems, the potentiometric surface of the underlying aquifer may be different to the water table of the unconfined aquifer. In this case, the measured water table elevation at well HB-BH06-C(S) was comparable to the potentiometric surface of the fractured rock aquifer at the same location (8.74 m AHD at HB-BH06-C). This comparison suggests that the Quaternary sand aquifer and the bedrock aquifer may be hydraulically connected, with a slight upward gradient that would promote flow of groundwater from the deeper bedrock into the overlying sand aquifer.

Based on the available information, the water table is likely to be shallow across the development area, typically less than 1 m bgl. The relative elevation of groundwater has been inferred based on measured levels in the deeper bedrock aquifer, which ranges from approximately 8 m AHD at the southern site boundary to 5 m AHD on the northern site boundary near Bass Highway. The hydraulic gradient of the bedrock aquifer shows an inferred northerly groundwater flow direct towards the coastline, which is likely to represent the main groundwater discharge point.

Shallow groundwater in the Quaternary sand aquifer is likely to follow a similar northerly flow direction. The Quaternary sand aquifer is likely to be recharged by a combination of rainfall infiltration uniformly across the area of outcrop and the upward discharge of groundwater from the underlying bedrock aquifer. The bedrock aquifer, in turn, is likely to be recharged by rainfall infiltration in areas of higher topography to the west and south where the bedrock outcrops.

An assessment of groundwater level fluctuation has not been completed and natural fluctuations may occur in response to seasonal changes in groundwater recharge which can frequently be observed to range up to 0.5 m or more. Groundwater levels within the study area may also be variably affected by tidal influences depending on the proximity to the coast or estuary.

An assessment of aquifer hydraulic properties was completed by Jacobs (2022a, 2022b), which included completion of rising and falling head test (commonly referred to as slug tests) to estimate the aquifer hydraulic conductivity (Jacobs, 2022a). These tests were completed at three wells that screen the bedrock aquifer. Estimated hydraulic conductivity results ranged from 0.009 m/day to 13.2 m/day, indicating potentially high variability, which is not uncommon for fractured rock aquifers (Table 6-4). Groundwater flow directions and flow velocities in the bedrock aquifer are likely to be highly variable and may be based on the presence of fault or fracture zones.

While no aquifer hydraulic tests were completed on wells screening the shallow Quaternary aquifer, hydraulic conductivities are conservatively assumed to be relatively high based on the frequently logged presence of sands and gravels. High hydraulic conductivities would also be expected in the fill material present across the site.

**Table 6-2 Monitoring well construction summary**

| Monitoring well ID | Screened material | Completed Date | Surface RL (m AHD) | Screened interval (m bGL) | Drilled depth (m bGL) | Groundwater levels (m bTOC) | Approximate groundwater elevation (m AHD) |
|---|---|---|---|---|---|---|---|
| HB-BH01-C | Quartzwacke | 7/02/2022 | 6.21 | 5.8-11.8 | 12.5 | 1.12 | 5.09 |
| HB-BH02-C | Quartzwacke | 4/02/2022 | 6.59 | 3.5-6.5 | 8.5 | 0.96 | 5.63 |
| HB-BH03-C | Quartzwacke | 3/02/2022 | 8.68 | 6.5-9.5 | 9.9 | 3.05 | 5.63 |
| HB-BH06-C | Quartzwacke | 1/02/2022 | 9.42 | 10.0-14.0 | 15.4 | 0.68 | 8.74 |
| HB-BH06-C(S) | Fill / silty sand/gravel | 44593 | 9.46 | 1.0-2.0 | 2.5 | 0.74 | 8.72 |

**Table 6-3 Summary of groundwater monitoring wells (Jacobs, 2022a)**

| Borehole ID | Screened material | Surface elevation (m AHD) | Date | Groundwater levels (m bTOC) | Approximate groundwater evaluation (m AHD) |
|---|---|---|---|---|---|
| HB-BH01-C | Quartzwacke | 6.21 | 14/02/22 | 1.12 | 5.09 |
| HB-BH02-C | Quartzwacke | 6.59 | 14/02/22 | 0.96 | 5.63 |
| HB-BH03-C | Quartzwacke | 8.68 | 14/02/22 | 3.05 | 5.63 |
| HB-HB06-C | Quartzwacke | 9.42 | 14/02/22 | 0.68 | 8.74 |
| HB-BH06-C(S) | Fill / silty sand/gravel | 9.46 | 14/02/22 | 0.74 | 8.72 |

**Table 6-4 Summary of aquifer hydraulic testing (Jacobs, 2022a)**

| Borehole ID | Screened material | Effective screened interval (m) | Test type | Estimated hydraulic conductivity (m/day) |
|---|---|---|---|---|
| HB-BH02-C | Quartzwacke | 4.0 | Falling head test<br>Rising head test | 0.89<br>0.90 (avg 0.9)<br>0.009 |
| HB-BH03-C | Quartzwacke | 3.9 | Falling head test | 0.009 |
| HB-HB06-C | Quartzwacke | 4.8 | Falling head test | 13.2 |

*Note: Individual results of repeated tests at HB-BH02-C are included*

## 6.6.3 Groundwater quality

Five groundwater samples were collected by Jacobs (2022a) from boreholes HB-BH01-C, HB-BH02-C, HB-BH03-C, HB-BH06-C and HB-BH06-C(S) and were submitted for the following analysis:

- pH, Total Dissolved Solids (TDS), major cations and anions
- Ammonia, nitrite, nitrate, total nitrogen
- Total cyanide, free cyanide
- Sulfate, sulfide
- Dissolved metals (arsenic, boron, barium, beryllium, cadmium, chromium, cobalt, copper, manganese, nickel, lead, selenium, titanium, vanadium, zinc)
- Volatile organic compounds (VOCs), semi-volatile organic compounds (sVOCs)
- Perfluoroalkyl and polyfluoroalkyl substances (PFAS).

Groundwater quality was found to be relatively fresh, with TDS concentrations ranging from 260 mg/L (HB-BH03-C) to 1,400 mg/L (HB-BH01-C), electrical conductivity (EC) values ranging from 370 µS/cm to 1,290 µS/cm. TDS and EC values were not reported for shallow aquifer well HB-BH06-C(S). Samples indicated that groundwater across both the shallow aquifer (represented by well HB-BH06-C(S)) and the deeper bedrock aquifer was generally oxidising (redox potential ranging from 78 to 375 mV and had slightly acidic pH (5.49 to 6.55).

The laboratory dataset reported by Jacobs (2022a) provides a preliminary assessment of groundwater quality expected beneath the site. With the exception of monitoring well HB-BH06-C(S) which screens the shallow aquifer, the reported results are expected to represent mostly the lower fractured bedrock aquifer.

The following metals were reported to exceed the ANZG (2018) Marine Water 95 % ecosystem protection criteria: cobalt (2 to 18 µg/L), copper (3 to 8 µg/L), and zinc (22 to 57 µg/L) at most locations, including both the shallow and deep wells. Concentrations of titanium were below the 10 µg/L laboratory limit of report (LOR) with the exception of a concentration of 20 µg/L reported at HB-BH02-C. The location of elevated metals concentrations in groundwater are distributed across the converter station site, do not appear to be associated with any particular point source, and may in some cases reflect background water quality in the area. No background groundwater analysis has been undertaken to confirm the concentrations of naturally occurring metals, however given the widespread nature of the impacts, and that zinc and cobalt are not associated with any known anthropogenic activities that have been conducted at the converter station site, it is likely that the concentrations are naturally occurring.

No detectable concentrations of polycyclic aromatic hydrocarbons (PAHs), monocyclic aromatic hydrocarbons (MAHs), phenols, phthalates, herbicides, pesticides, explosives, halogenated benzenes and halogenated hydrocarbons, solvents or other volatile organic compounds (VOCs) were reported, with the exception of detectable concentrations of chloroform reported at HB-BH01-C (6 ug/L) and HB-BH02-C (13 ug/L). Total recoverable hydrocarbons were not analysed by the laboratory.

Several PFAS were detected in both the Quaternary sand aquifer and the fractured bedrock aquifer. The compounds detected included PFOS and PFHxS, which represented the highest concentration PFAS (maximum of 0.11 ug/L for both compounds), PFOA (maximum of 0.02 ug/L), and PFPeA (maximum of 0.04 ug/L). PFAS concentrations were generally greatest at HB-BH06-C and C(S), showing comparable results between the shallow and deep wells at this location. The reported concentration of PFOS may exceed the marine ecosystem protection criteria based on a requirement to achieve either 95 % (0.13 ug/L) or 99 % (0.00023 ug/L) species protection (NEMP, 2020).

Based on the preliminary groundwater quality data available, groundwater produced during construction dewatering and may not be suitable for disposal to surface water without further assessment and permissions from the relevant regulators.

As most of the installed wells screen the deeper fractured bedrock aquifer, it is possible that if groundwater contamination is present in the shallow Quaternary aquifer, it may not have been detected by monitoring the deeper wells.

### 6.6.4 Groundwater-surface water interaction

Groundwater – surface water interactions occur in a catchment when water moves from groundwater to surface water (or to the marine environment), or vice versa. These flow dynamics can change or be absent in different sections of a catchment and can also vary or reverse over time. Typically, in the highlands region, rainfall infiltration and surface water (as losing streams) recharges outcropping aquifers and groundwater discharges to connected gaining surface water systems in the lowlands.

Groundwater-surface water interactions in the study area are expected to be predominantly characterised by discharge from shallow groundwater to gaining rivers, creeks, and wetlands (typically considered as GDEs, which are discussed in Section 6.6.5).

Similar interactions occur between groundwater and the marine environment where aquifers are connected in the coastal zone and the tidally influenced Blythe River estuary. At low tide, the water table within the surrounding groundwater system may be higher than the coastal and estuarine waters and groundwater will discharge freshwater into the marine environment. At high tide, the marine water level may be higher than the onshore groundwater level, resulting in reversal of hydraulic gradients and the recharge of saline water back into the groundwater system (Anderson, 2017). The magnitude of this natural tidal influence on groundwater decreases with distance from the coast and estuary, creating a naturally occurring fresh-saline transition or dispersion zone that typically extends onshore into the freshwater aquifer (Figure 6-7).

Sustained dewatering activities may cause groundwater level drawdown to propagate towards the coastal zone and can induce further saltwater encroachment into the aquifer, increasing salinity of the groundwater resource. Further discussion of potential groundwater interactions with groundwater dependant surface water courses and waterbodies are provided in Section 7.3.3. Potential dewatering impacts to groundwater and migration of the saline interface are further discussed in Section 7.3.5.

Long term climate change and rising sea levels are likely to alter the freshwater-seawater interface dynamics, promoting further inland encroachment, increasing groundwater salinity in the coastal zone. Overland inundation of the estuarine wetlands and nearshore zone is also expected to increase in the future due to higher tidal and storm surge activity (Section 6.2.2). These effects would be relevant to the long-term operation phase of the project.

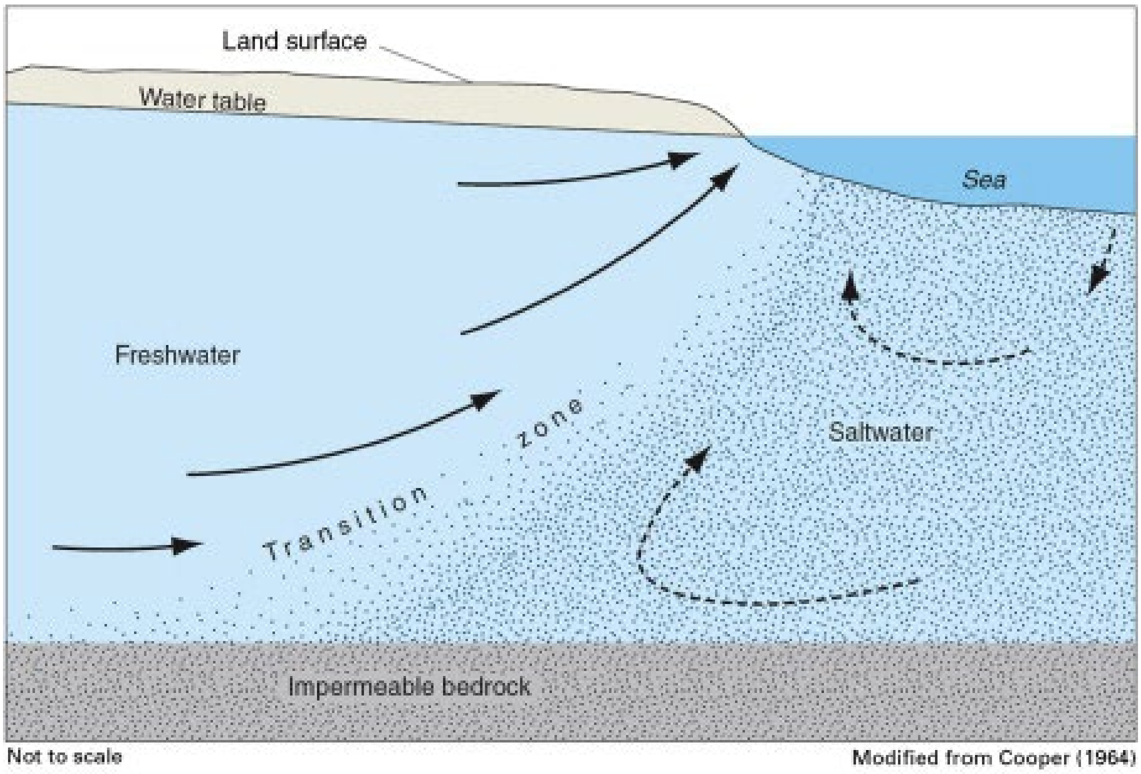



**Figure 6-7 Conceptual diagram of freshwater – saline water interface in an idealised, homogeneous coastal aquifer (source: USGS 2017)**

### 6.6.5 Groundwater dependent ecosystems

GDEs are receptors that rely wholly or partially on groundwater to provide all or some of their water needs. GDEs relevant to this project can broadly be categorised as:

- Terrestrial GDEs: Ecosystems reliant on the subsurface presence of groundwater (i.e., vegetation that is accessing the water table and/or capillary fringe).
- Aquatic GDEs: Ecosystems reliant on the surface expression of groundwater (i.e., wetlands, swamps, springs, estuaries and baseflow fed watercourses).
- Subterranean GDEs: Ecosystems associated with caves and aquifers (stygofauna).

A desktop assessment was conducted to identify potential GDEs within 500 m of the site, where these ecosystems might interact with groundwater that also interacts with the site. The approach to identifying GDEs has relied on published resources such as the Bureau of Meteorology's Groundwater Dependent Ecosystem Atlas (BoM, 2012) and the state-wide freshwater ecosystem mapping provided by the CFEV spatial database tool project.

The GDE mapping tool provides information concerning both known and potential GDEs (SKM, 2012). Known GDEs are those identified during previous desktop or field studies, and potential GDEs are those derived through analysis of spatial data sets. Derivation of potential GDEs relies heavily upon remote sensing data to identify vegetation growth response patterns.

Information pertaining to CFEVs within the search area was sourced from ListMap (https://maps.thelist.tas.gov.au/listmap/app/list/map; DPIW, 2008a). This included a range of aquatic ecosystems (that may include both GDE and non-GDE) as well as specified GDEs, mostly relating to springs and karst areas.

#### 6.6.5.1 Terrestrial GDEs

**Vegetation communities**

Terrestrial GDEs are ecosystems with vegetation that rely on the availability of shallow groundwater, which is within reach of the root zone. Mature, large trees are likely to have the deepest root systems and are the most likely vegetation type in a given ecosystem to access groundwater.

In the case of terrestrial GDEs, ecosystems may be either obligate GDEs, with a continuous or entire dependence on groundwater, or facultative GDEs, with an infrequent or partial dependence on groundwater (Zencich et al., 2002). Published data does not typically distinguish between obligate or facultative terrestrial GDEs, and site-specific investigations may be required to determine this should it be necessary.

One 0.44 ha area of wet heathland vegetation (Eucalyptus amygdalina coastal forest and woodland) located at the study boundary along Minna Rd (Entura, 2023) was mapped with a moderate potential for groundwater dependence (Figure 6-8). Entura (2023) completed local vegetation surveys and describe this stand of vegetation as being comprised of small, relatively young trees on elevated ground.

This vegetation is unlikely to be groundwater dependent based on the elevated topography (and therefore greater depth to groundwater) and the juvenile age of the trees, which would be less likely to have deep root systems and have established dependence on groundwater.

It is suspected that the GDE atlas's assessment of moderate likelihood of groundwater dependence may be attributed to the remote sensing data detecting the effect of rainfall runoff from Mina Road and the former treatment ponds to the north, which has provided an additional water source to the wet heathland vegetation and supported it during drought periods rather than the vegetation accessing groundwater.

No terrestrial GDEs are considered to be present within the study area.

**Burrowing crayfish**

The GDE Atlas includes records of listed "karstic aquifer/cave" terrestrial GDEs in the wider Burnie region, which identify relatively small (approximately 2,000m$^2$) areas where two species of burrowing crayfish habitat have been identified by on local assessments (BoM, 2012b). The crayfish species are:

- *Engaeus yabbimunna* (Burnie Burrowing Crayfish); and
- *Engaeus fossor*

*Engaeus yabimunna* is listed as Vulnerable under the EPBC Act. No similar state or EPBC Act listings have been identified for *Engaeus fossor*. This species of crayfish is rarely seen above ground or in water bodies, preferring to live mostly within deep burrows. Their burrow networks require a connection with a water source, which can include either direct connection to streams or lakes (type 1), connection to the water table (type 2), or alternatively they may rely on runoff inputs (type 3) (Doran, 2000).

Past reviews completed by Tetra Tech Coffey found that these habitat areas generally corresponded with areas of Tertiary basalt outcrop where basaltic clays are likely to overlie weathered basalt rock.

No published accounts of burrowing crayfish habitat exist within the study area and suitable habitat was absent from the study area (Entura, 2023). The closest mapped habitat is located 4 km south of the site (Entura, 2023).

#### 6.6.5.2 Aquatic GDEs

This section identifies creeks and rivers that are reported with moderate or high likelihood for groundwater dependence based on published layers in the BoM GDE Atlas.

The Blythe River is identified as an aquatic GDE with high likelihood for groundwater dependence. It passes the site boundary approximately 260 m to the south at its closest point. The BoM GDE Atlas entry for Blythe

River notes the presence of associated terminal wetlands which are also identified separately on the southern side of the estuary (Figure 6-8).

These wetlands are likely to have aquatic ecosystems that rely on periodic fresh groundwater input to balance the saline inundations that may occur during tidal fluctuations. As the Blythe River estuary will act as a regional groundwater boundary the wetlands are expected to be effectively isolated from the groundwater environment on the northern side.

This means that while the estuary itself may receive a component of groundwater discharge from the groundwater sub-catchment on the northern side of the estuary (including those which hosts the converter station site), the wetlands on the southern side of the estuary are unlikely to either receive groundwater discharge from the site or be influenced by future development activities.

The rate of groundwater discharge to the Blythe River estuary is unknown. However, the small size of the sub-catchment that hosts the proposed converter station would result in equally small contribution of fresh groundwater input (based on professional experience in similar environments).

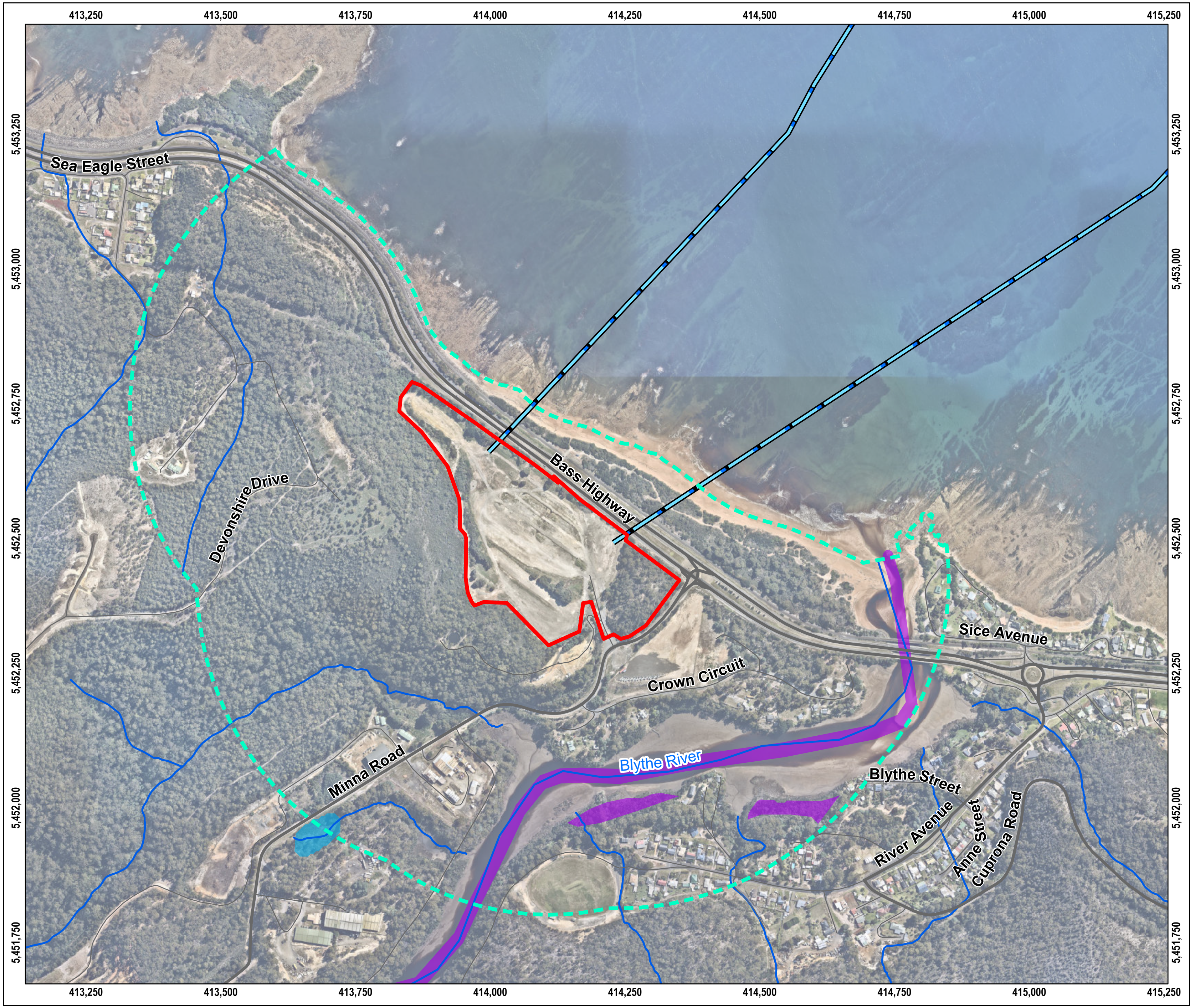
The assessment that informs the potential groundwater impacts related to aquatic GDEs, such as the Blythe River estuary are discussed in Section 7.3.

### 6.6.6 Groundwater use

Groundwater extraction in Tasmania is not metered and as such there are limited records of groundwater use. The available information on registered groundwater bores was obtained for the study area.

One registered bore (ID: 41789) was identified approximately 350 m south of the site on the left bank of the Blythe River. The bore is located in an area where Quaternary deposits are mapped as present. The bore is listed with an unknown use and ‘capped’ status, suggesting that it is unlikely to remain in active use. The bore was originally drilled to 66 m depth and would have likely screened the deeper bedrock aquifer.

Based on the bore search completed, it is unlikely that any active groundwater users are present within the study area.




MARINUS LINK

**LEGEND**

Proposed route

HVDC subsea cable

GDEs Aquatic

High potential GDE (national assessment)

GDEs Terrestrial

Moderate potential GDE (national assessment)

Source:
Routes from Tetra Tech Coffey.
GDEs from BoM.
Roads and watercourses from DPIPWE.
Imagery from NearMap (8 March 2022).

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PROJECTION: **GDA2020 MGA Zone 55**

MARINUS LINK PTY LTD

MARINUS LINK HEYBRIDGE
GROUNDWATER IMPACT ASSESSMENT REPORT

**FIGURE 6-8**

**Groundwater users and GDEs**

TETRA TECH COFFEY

DATE: **30.04.24** PROJECT: **754-MELEN215878ML** FILE: **215878ML_R18_F005.9_GIS**



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## 6.7 EXISTING CONTAMINATION ISSUES

The proposed converter stations site in Heybridge, Tasmania is located at the site of the former Tioxide Australia plant, west of the Blythe River mouth. The plant produced titanium dioxide pigment between 1949 and 1996, primarily for use in paints and plastics, and the factory was subsequently demolished by 1998.

Titanium dioxide is a non-toxic white pigment used in products ranging from paint, plastics, printing ink, paper, flooring, cement products, wall coverings, cosmetics, ceramics, rubber and textiles. The Heybridge site was chosen because of the availability of sulphuric acid, cheap electricity, local coal, water and access to the deep-water port of Burnie (Queen Victoria Museum and Art Gallery, Undated). The location of the site also facilitated the direct discharge of effluent into Bass Strait.

The location of the site also facilitated the direct discharge of effluent into Bass Strait (Queen Victoria Museum and Art Gallery, Undated). While it is unknown what volume or types of waste were discharged, the Heybridge factory was subjected to criticism for the discolouration of the ocean and coast. It is understood that iron salts effluent (ferro sulphates) generated during operations were responsible for causing significant discolouration (red) of the sea water and beach sands, which extended more than a kilometre along the coast. Following the 1973 State Government Environmental Protection Act, Tioxide Australia invested in reducing the volume of waste being discharged to Bass Strait.

The tioxide plant used chemicals and practices that could have resulted in site contamination including groundwater contamination. Sulphuric acid and ilmenite ore were used to produce high grade titanium dioxide. Iron, titanium and manganese are the three main contaminants in ilmenite. Thorium 232 and Radium 228 are also present in ilmenite in minute concentrations, and this can be enriched in lead in the process. Due to this historical use of the site and potential for contamination due to these chemicals, the site was rehabilitated when the plant was decommissioned.

There is known contamination present within the study area that is associated with the former tioxide factory, including naturally occurring radioactive materials (NORM). NORM, consisting of uranium (U238), thorium (Th232) and their decay products, occur at various concentrations in the titanium ore used at the site. U238 and Th232 become concentrated as titanium ore is processed, resulting in levels that can exceed regulatory exemption levels in waste materials such as mineral sludges, dusts and sands (Jacobs, 2022a).

Throughout the operation of the tioxide plant, an acid-iron liquor waste from the production process was discharged directly to Bass Strait via outfall pipelines which extends approximately 2.8 km offshore from the plant. Anecdotal evidence suggests that at the time of operations, the discharged effluent caused red (iron oxide) staining of nearshore waters and the coastline. The construction method of the pipelines is also unknown; however, it is expected that it was constructed from multiple lengths of pipe. If the lengths of pipe were joined by bolting the sections together with a flange joint, there is the potential that any gaskets within the flange joints are asbestos containing.

Following the decommissioning and remediation of the titanium dioxide plant the site was utilised as a timber storage and loading yard between 2007 and 2020.

A site contamination assessment, including the assessment of groundwater contamination, is provided in a separate contamination assessment report prepared by Tetra Tech Coffey (Tetra Tech Coffey, 2023).

Jacobs have issued factual (Jacobs, 2022a) and interpretive (Jacobs, 2022b) reports of the ground conditions which included assessment of the site contamination status at the Heybridge converter site. This work included contamination assessment from nine test pits and four boreholes which was interpreted by Jacobs (2022b) to not report any contaminant concentrations above the adopted health and ecological guideline values. Fragments of non-friable asbestos sheeting were identified on the ground surface at HB-TP09-C. Management of soil contamination and asbestos for the project are discussed further in the Tasmanian Contaminated Land and Acid Sulphate Soil Impact Assessment (Tetra Tech Coffey, 2023).

The landfall site was not investigated as it was outside of the former industrial site and was considered to have a lower likelihood of contamination from past industrial activities.

The reported findings from previous site investigations indicate that levels of contamination within the soil on the converter station site are unlikely to present an unacceptable risk to human health or ecological receptors based on the proposed commercial/industrial site use. However, it is noted that the contamination status of soil underlying the remaining foundations of the former Tioxide factory have not been assessed. Previous investigations also suggest that, should shallow fill soils within the study area require excavation and offsite disposal, there are potential for contaminants (metals and hydrocarbons) to be at concentrations that exceed EPA Tasmania IB105 Fill Material criteria.

Beneath the eastern portion of the converter station site is a former effluent tunnel that is understood to have been blocked at both ends. It is unknown whether the tunnel is to remain at the site, or be removed, however no testing of any residual sediments or scale within the tunnel has been undertaken and the contamination status of these materials is unknown.

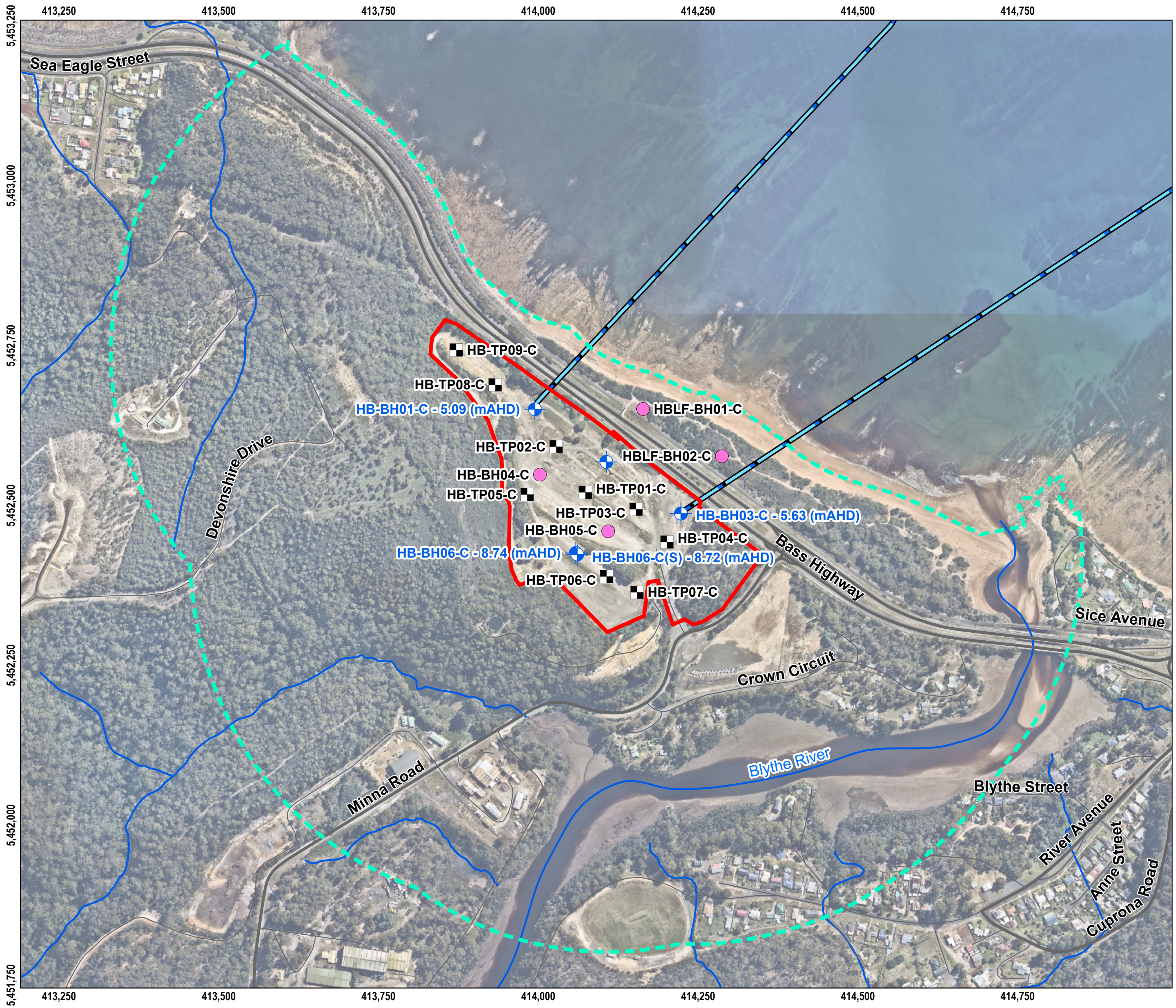
### 6.7.1 Naturally occurring radioactive material

Jacobs (2022a) completed a site assessment of naturally occurring radioactive material (NORM) which occurs in titanium ore at various concentrations. As the ore is processed, uranium (U238), thorium (Th232), and their decay products are concentrated and can exceed the regulatory levels for waste materials such as mineral sludges, dusts and sands from the titanium extraction process.

During test pit excavation and borehole advancement, NORM measurements were taken at regular intervals in accordance with the Radiation Management Plan 2021.

Jacobs (2022a) concluded that, *“background radiation levels for the site were found to range from approximately 41 nSv/hr to 73 nSv/hr. Readings from test pits and boreholes were found to be within the background radiation levels and below trigger values trigger levels were defined as > than two times background radiation levels. Specific readings recorded during test pit excavation and borehole advancement ranged from 43 nSv/hr through to 115 nSv/hr. The highest measured reading of 115 nSv/hr was found in TP01 at a depth of 1 m bgl.”*

Based on the reported results of the assessment completed by previous consultants, it is considered unlikely that NORM is present within the study area at levels that will impact on the proposed development of the site (Tetra Tech Coffey, 2023).




MARINUS LINK

**LEGEND**

- Groundwater monitoring well (Groundwater level Feb 2022)
- Soil bore
- Test pit

Proposed route

- HVDC subsea cable
- Heybridge converter and switching station site boundary
- 500 m site buffer
- Watercourse
- Major road
- Minor road

Source:
Routes from Tetra Tech Coffey.
Monitoring locations from Jacobs.
Imagery from NearMap (8 March 2022).

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MARINUS LINK PTY LTD

MARINUS LINK HEYBRIDGE
GROUNDWATER IMPACT ASSESSMENT REPORT

**FIGURE 6-9**

**Soil and groundwater assessment locations**

TETRA TECH COFFEY

DATE: 20.11.24 PROJECT: 754-MELEN215878ML FILE: 215878ML_R18_F005.6_GIS

### 6.7.2 Offshore sediment contamination

Tioxide Australia Pty Ltd contracted CSIRO to undertake a survey of the waters surrounding its discharge point to determine the levels of heavy metals in fish and marine sediments (reported in Commonwealth of Australia, 1991). Benthic surveys of the seabed sediments and local species identified that the effluent had a minor local impact. The levels of metals in fish were found to be low and there was no evidence of significant contamination of the sediments. The primary impact of the effluent was the noticeable visible discolouration of the inshore waters.

Other historic contamination sources, such as copper mining in the Blythe River catchment and submarine calcine dumping near Burnie, may have also contributed to marine sediment contamination.

Limited sampling of the offshore sediment profile was conducted and has been considered where the results might provide an indication of the sediment quality that may be generated during HDD (Tetra Tech Coffey, 2022b). Sediment samples may not be representative of the bulk spoil generated by HDD activities, as drilling will extend to depths greater than the <1.0 m depth achieved for sediment assessment.

Sediment samples were compared against the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZ, 2018) for sediment guidelines.  Two levels of screening criteria were applied (Tetra Tech Coffey, 2022) including:

- Default guideline values (DGVs), which indicate the concentrations below which there is a low risk of biological effects occurring.
- Upper guideline values (GV-high), which provide an indication of concentrations at which toxicity related effects would be expected.

The results of the metals analysis showed that some samples contained concentrations of metals that exceeded the Default Guideline Values for sediment quality, but the majority did not exceed the upper guideline values at which point benthic toxicity effects are likely to be observed.

Concentrations of arsenic exceed the DGV at most sediment sampling locations, with a median value of 24.5 mg/kg and a 95 % upper confidence limit of 39.7 mg/kg across the entire dataset. This indicates that the arsenic may be naturally elevated in sediments in the area. In general, the shallow sediment samples reported lower concentrations of metals, which likely represents fresh sediments that have been deposited over the last 20 years. Patterns in metals concentrations with depth were generally not observed at locations closer to the shore, with no clear pattern in metals concentration changes with depth. This may partially be attributable to the shallow rock depth at some of these locations meaning that an aged sediment profile was not present to be sampled.

At the furthest location from shore a marked change in metals concentrations with depth was observed, with concentrations of most metals (aluminium, arsenic, chromium, iron, nickel, vanadium and titanium) all increasing in concentration with depth.

This location, based on the increased metals (in particular iron and titanium) may represent an area where former effluent from the processing of titanium oxides has increased metals concentrations, but has more recently been covered by sediments more representative of natural sediments from the area.

# 7. IMPACT ASSESSMENT

The following sections present the groundwater impact assessment for the periods of construction (Section 7.3) and operation (Section 7.4) of the project.

## 7.1 POTENTIAL IMPACTS

Each potential impact is discussed with an assessment of impact magnitude and significance provided. A summary of the individual impact magnitudes is provided in Section 7.6. Where residual impacts are likely to occur that warrant further mitigation, measures have been recommended throughout the impact assessment and are summarised in Section 9. The subsequent assessment of both initial and residual impact significance, following the application of additional mitigation or management measures, is summarised in Section 7.7.

The groundwater impact assessment considers potential impacts to groundwater level and quantity and groundwater quality may occur from the following construction and/or operational activities:

**Groundwater levels and quantity**:

- Temporary dewatering of onshore HDD entry/exit pits and other minor excavations during construction leading to groundwater level drawdown.
- Temporary dewatering of bored piles during construction leading to groundwater level drawdown.
- Permanent alteration of the land surface leading to permanent groundwater level changes.

**Groundwater quality:**

- Mobilisation of existing groundwater contamination towards the project due to temporary groundwater level drawdown.
- Release of contaminated groundwater to the environment generated during dewatering.
- Groundwater acidification due to temporary or permanent groundwater level drawdown.
- Saline water intrusion to aquifers due to temporary groundwater level drawdown.
- Herbicide application at the converter station migrating to groundwater.
- Discharge from the septic tank system causing groundwater contamination.
- Accidental spills and leaks of transformer oil, lead acid batteries, and diesel fuel stored in above ground tanks at the converter station.
- Enhanced recharge of stormwater runoff (including flood waters) to shallow groundwater via higher-conductivity backfilled cable trench.

No potential impacts to groundwater are identified for the decommissioning phase as the need for subsurface work is not expected. It is assumed the subsurface infrastructure will be left in place.

There are a range of potential impacts that are common to most construction sites, and which are routinely addressed by well-established standard operating procedures or guidelines in the construction industry, including construction and operation environmental plans. Examples of these potential impacts considered to be negligible or not feasible are summarised below:

- Contamination of groundwater from storage and handling of small volumes of cleaning chemicals, fuels, and other materials.
- Contamination of groundwater from subsurface construction materials (sealing products, chemical grouts etc).
- Minor excavations for roads and drainage infrastructure intercepting groundwater and altering levels.
- Infiltration of water from temporary construction sedimentation ponds recharging groundwater and altering levels or quality.

- Removal of topsoil and vegetation leading to enhanced groundwater recharge.

## 7.2 GROUNDWATER VALUES AND SENSITIVITY ASSESSMENT

The State Policy on Water Quality Management (1997) sets protected environmental values for groundwater based on the reported TDS concentrations. Groundwater protected environmental values are reproduced in Table 7-1.

Mineral Resources Tasmania published a series of groundwater quality maps and corresponding protected environmental values for some regions of Tasmania. The study area falls within the Northwest Map zone but outside of areas where groundwater quality and associated potential uses have been declared.

Groundwater TDS in the lower bedrock aquifer ranged from 261 mg/L to 1,400 mg/L and would likely be assigned to the Category A band (<1,000 mg/L) and all protected environmental values may need to be considered (Table 7-1). While TDS concentrations were not reported for the Quaternary aquifer, this aquifer is also likely to be assigned Category A.

**Table 7-1 Protected environmental values of groundwater (reproduced from DPIWE, 2000)**

| Category | A | B | C | D |
|---|---|---|---|---|
| TDS (mg/L) | Less than 1,000 | 1,000 – 3,500 | 3,500 – 13,000 | Greater than 13,000 |
| Protected Environmental Value | | | | |
| Drinking water | ✓ | | | |
| Irrigation | ✓ | ✓ | | |
| Industry | ✓ | ✓ | ✓ | |
| Stock | ✓ | ✓ | ✓ | |
| Ecosystem Protection | ✓ | ✓ | ✓ | ✓ |

Category A groundwater requires the protection of the environmental values of drinking water, irrigation, industrial water use, stock watering, and ecosystem protection. The Board of the Tasmanian EPA may determine that these beneficial uses do not apply when:

- There is insufficient yield;
- The background level of water quality indicator other than TDS precludes a beneficial use;
- The soil characteristics preclude a beneficial use; or
- A groundwater quality restricted use zone has been declared.

Additional values have been conservatively adopted that are not referenced by Tasmanian legislation, but which are protective of values commonly recognised in other states of Australia, and which are likely to apply in the receiving environment at the site. Specifically, the following values are adopted in addition to the minimum legislated values:

- Recreational use - including swimming in baseflow-fed rivers and creeks, and the marine environment.
- Cultural or spiritual values - including Indigenous cultural values that may exist at the point of discharge.

Table 7-2 presents a preliminary assessment of groundwater protected environmental values, taking into account the known existing and potential future uses of groundwater, and existing groundwater quality issues which may preclude some protected environmental values.

Based on this assessment, the following environmental values of groundwater will be adopted by the groundwater impact assessment when assessing the sensitivity of groundwater:

- Industrial water use
- Ecosystem protection
- Recreational use
- Indigenous cultural values

**Table 7-2 Assessment of environmental values of groundwater requiring protection**

| Protected Environmental Value | Existing Use | Potential Future Use | Value requiring protection | Comments |
|---|---|---|---|---|
| Drinking water | No | Unlikely | No | There are no registered groundwater users in the vicinity of the study area. The industrial setting of Heybridge and known existing groundwater contamination beneath the site would likely preclude this value from being realised in the immediate vicinity of the site in the future. Reticulated potable water supply is readily available and would be a preferred potable supply due to cost, reliability and quality aspects of exploiting the groundwater resource. |
| Irrigation | No | Unlikely | No | Land use zoning in study area includes Rural which may include some limited agricultural activities, such as those associated with hobby farming. Irrigated agriculture for food or fibre production is highly unlikely, particularly given the topography in the study area and the limited land available between the site and the coastline. Sports fields and public parks which might view groundwater as a preferred water supply during drought periods, are not located within the study area and would be unlikely due to the limited available land. |
| Industry | No | Possible | Yes | Groundwater is not currently exploited for industrial use and is unlikely to be a preferred future industrial water supply considering low yields from the fractured rock aquifer and the limited aerial extent (and likely sustainable yield) of the alluvial aquifer. The presence of readily available surface water and reticulated water alternatives make it possible but unlikely that groundwater would be used for industrial purposes. |
| Stock | No | Unlikely | No | Land use zoning in study area includes Rural which may include some limited agricultural activities, such as those associated with hobby farming. The presence of existing groundwater contamination (including PFAS) would likely preclude use for stock water. |
| Ecosystem protection | Yes | Yes | Yes | This value applies at the point of discharge to surface water receptors. Groundwater originating from the proposed converter site is likely to discharge to marine environment of Bass Strait. All marine and freshwater features in the study area require protection of the aquatic ecosystem. |
| Recreational use | Yes | Yes | Yes | Groundwater is likely to discharge to the estuarine and marine environment where recreational uses include swimming, boating and recreational fishing. |
| Indigenous cultural values | Yes | Yes | Yes | While not a legislated environmental value of groundwater, this environmental value is recognised due the connected nature of groundwater and surface water, including the marine and estuarine ecosystems which may have tangible and intangible cultural values to the First Peoples of the area. |

*Note: shaded rows denote Protected environmental values that may apply to groundwater*

### 7.2.1 Sensitivity assessment

Groundwater sensitivity has been assessed in relation to its suitability to support the identified environmental values, which have been summarised into the following categories:

- Consumptive or productive uses: including industrial water use, some cultural water uses, and to support water-based recreation such as swimming.
- Water dependent ecosystems: as baseflow contribution to the Blythe River estuary or the marine environment Bass Strait.
- Cultural or spiritual values: including aesthetic, historical, scientific, social or other significance to the present generation or past or future generations.

On the basis of the sensitivity criteria presented in Table 5-1, the sensitivity levels assigned to aquifers present beneath the study area are summarised in Table 7-3. Each aquifer has been assigned a low sensitivity based on the rounded mean ranking across the five sensitivity criteria, where:

- high sensitivity = 3
- moderate sensitivity = 2
- low sensitivity = 1
- very low sensitivity = 0

This assessment relates to the process of establishing the sensitivity of aquifers which is a requisite step of the groundwater impact assessment methodology established for the project and is consistent with the Tasmanian EIS guideline requirements (Section 2).

The potential impacts to environmental values as a result of the project construction and operation activities are discussed further in the following sections below as they relate to either impacts to groundwater quantity and levels or groundwater quality.

**Table 7-3 Sensitivity assignments for aquifers within the study area**

| Aquifer | Supported environmental values | Uniqueness and rarity | Resilience to change | Recovery potential | Replacement potential | Overall sensitivity |
|---|---|---|---|---|---|---|
| Quaternary sand | Moderate (2) | Low (1) | Low (1) | Moderate (2) | Not sensitive (0) | Low (1.2) |
| Bedrock | Moderate (2) | Low (1) | Low (1) | Moderate (2) | Not sensitive (0) | Low (1.2) |
| Justification | Groundwater supports slightly to moderately disturbed marine ecosystems.<br>Altered groundwater quality affecting some environmental values.<br>Predominantly construction and irrigation use. | Common aquifers at a regional scale with numerous alternatives.<br>Aquifer and connected features not listed or recognised by statutory registers | Highly conductive aquifers in high rainfall environments have resilience to change.<br>Connection with nearby hydraulic boundary features minimise change. | Recovery to quality changes (such as saline water intrusion) would be slow or only partly successful | There are numerous local water features that could provide alternative water sources to users. Groundwater would be an unlikely preferred resource in this setting | |

## 7.3 CONSTRUCTION

This section identifies the potential impacts of the project on groundwater during the construction phase on identified groundwater values.

### 7.3.1 Project dewatering assessment

This section provides an assessment of the potential impacts associated with groundwater dewatering during construction and has been completed to inform the assessment of impacts which are documented in the following section.

Often dewatering assessments adopt analytical assessment or numerical groundwater models to simulate the possible range of groundwater level drawdown that may propagate away from dewatered excavations or bores. In this case, the dewatering assessment has adopted a qualitative approach that considers the hydrogeological conceptual model, and specifically, the presence of major hydraulic boundaries in close proximity to the site. The site setting and proximity to major aquifer boundaries is likely to limit extensive groundwater level drawdown and allows a conservative, qualitative assessment to be adopted. This approach is suitable for predicting potential groundwater drawdown impacts so that appropriate mitigation measures can be established.

The site in underlain by a shallow water table that is likely to be encountered at depths of less than 1 m below the current ground surface. Limited information is available on the proposed excavations that may be required during construction; however, it is assumed that most excavations would potentially extend below the water table and might require temporary or permanent dewatering.

It is assumed that most excavations will extend into the Quaternary sand aquifer, which, in the absence of site-specific aquifer hydraulic conductivity data, is assumed to have high (greater than 10 m/day) hydraulic conductivity. Under these conditions, in a homogenous, infinite aquifer, dewatering rates would be high and groundwater drawdown would propagate quickly away from the excavation. However, the outcropping bedrock along the western, southern and parts of the eastern site boundary provides a low hydraulic conductivity barrier that will limit drawdown propagation in these directions. The steeply rising topography (including the underlying bedrock) away from the site and the presence of groundwater catchment boundaries to the west and south of the site will further limit drawdown offsite in these directions through the bedrock aquifer.

The presence of these low/no-flow barriers will result in an increased rate of groundwater drawdown towards the north where the Quaternary sand aquifer extends offsite and connects with Bass Strait coastline, approximately 120 m from the converter station site. The coastline represents a major recharge boundary that will halt or significantly slow the further propagation of drawdown once it is encountered.

For this reason, the radius of influence of construction dewatering is likely to be in the order of approximately 150 m (based on a conservative assumption of the distance between the southern site boundary and the coastline to the north). Drawdown is assessed as unlikely to extend offsite to the south, east or west due to the presence of outcropping, low permeability bedrock.

Refined analytical or numerical modelling approaches may be warranted during design when additional information on the project dewatering requirements is known and additional baseline hydrogeological investigations have been completed.

If construction dewatering is maintained at high discharge rates and for a sufficient period of time, it could result in the ingress of saline water to the freshwater aquifer.

### 7.3.2 Temporary dewatering impacts to groundwater users

There are no registered or known unregistered groundwater users located within the study area.

Considering both the absence of known groundwater users from the study area and the limited extent of groundwater level drawdown that can propagate away from the site, it is highly unlikely that any temporary construction dewatering activities would impact on groundwater users.

The environmental values of groundwater also consider potential future extractive groundwater users, specifically for industrial water use. Temporary groundwater level drawdown as a result of construction dewatering would rapidly recover in the highly conductive Quaternary sand aquifer. There would be unlikely to be a measurable effect to the long-term groundwater availability to future users.

#### Impact significance

Temporary dewatering is unlikely to have a measurable effect (negligible magnitude) on current or potential future industrial groundwater users. A corresponding very low impact is considered to apply.

#### Mitigation and management measures

No mitigation or management measures are proposed or required to address this potential impact.

#### Residual impacts

As the initial assessment of impacts to groundwater users was assessed as being very low, and no mitigation or management measures are proposed, the residual impact is consistent with the initial very low impact assessment.

### 7.3.3 Temporary dewatering impacts to GDEs

There are no suspected terrestrial GDEs within the study area. Groundwater drawdown has been assessed as unlikely to propagate offsite to the south and west where large areas of non-groundwater dependent native vegetation is present, further limiting unforeseen potential impacts. In the unlikely event that, unplanned drawdown occurred beneath unknown terrestrial GDEs, the proposed short-duration dewatering would be unlikely to have a measurable effect on vegetation health.

The Blythe River estuary is the primary aquatic GDE that exists within the study area. The drawdown assessment considered that southern and eastern drawdown was likely to be limited by the presence of outcropping bedrock along the site boundaries. However, planned earthworks along these boundaries may feasibly reduce the effectiveness of this hydraulic barrier and permit a degree of drawdown. This could temporarily reduce the freshwater input to the estuarine zone. The aquatic ecosystem of the estuary would be adapted to highly variable salinity and changes to the freshwater input over a short section of the total catchment would have a negligible effect on the aquatic ecosystem.

#### Impact significance

Temporary dewatering is unlikely to have a measurable effect (negligible magnitude) on terrestrial or aquatic GDEs. A corresponding very low impact is considered to apply.

#### Mitigation and management measures

No mitigation or management measures are proposed or required to address this potential impact.

## Residual impacts

As the initial impact assessment is assessed as being very low, and no mitigation or management measures are proposed, the residual impact is consistent with the initial impact assessment of very low.

# 7.3.4 Groundwater acidification

Where potential ASS is present and it is allowed to oxidise (either in-situ or in temporary stockpiles), it may result in the acidification of groundwater. In addition to increased acidity, which can have adverse ecological effects, lower pH groundwater commonly results in increased concentrations of dissolved metals. Acidic groundwater conditions might pose a risk to underground structures (such as building foundations) and/or the receiving marine ecosystem.

## Impact significance

The magnitude of a groundwater quality impact (if it occurred) would be a function of the duration that dewatering was required, and the time required for groundwater levels to recover.

If unmitigated and sustained, a degree of groundwater acidification may persist during construction as a result of localised groundwater drawdown. Acidic groundwater, if it were generated, would be relatively limited in extent, but would likely migrate over the short distance to Bass Strait coastline, discharging to the marine environment. It could potentially have major impacts to the aquatic ecosystem and affect various environmental values of the receiving environment, including human health.

A major magnitude of impact is conservatively assumed under this scenario, corresponding to a moderate impact.

Measures to comply with GWMM01 are proposed to further assess the potential for groundwater acidification from ASS that may be present at the site. Measures to comply with GWMM02 are proposed to prevent impacts from groundwater drawdown in ASS areas. In the case where dewatering is required in areas of likely ASS, a range of engineering approaches are available to meet GWMM02, such as installation of sheet pile walls or other barriers extending into the weathered bedrock to minimise groundwater drawdown in the Quaternary sediments during construction.

## Mitigation and management measures

The following mitigation and management measures are proposed to reduce the significance of the potential impacts:

**Table 7-4 Mitigation and management measures: groundwater acidification**

| Measure ID | Mitigation and management measures | Project stage |
|---|---|---|
| GWMM01 | Conduct a pre-construction hydrogeological assessment at the converter station site to inform appropriate detailed design and construction methods. | Design |
| GWMM02 | Minimise groundwater inflow into excavations, limit groundwater level drawdown, avoid mobilising contaminated or saline groundwater, and prevent groundwater acidification. | Design, Construction |
| GWMM05 | Develop and implement a construction groundwater monitoring plan to establish baseline and background groundwater conditions prior to construction and monitor potential Project impacts during construction. | Design, Construction |

### Residual impacts

When applying the stated measures, groundwater level drawdown and subsequent oxidation of ASS would be minimised to the extent practicable, which would result in an assumed minor residual magnitude of impact to the marine environment. Groundwater level and quality monitoring would likely be required to demonstrate that this mitigation measure is achieving the intended outcome during construction in areas where dewatering is proposed and ASS is potentially present (GWMM05).

## 7.3.5 Saline groundwater intrusion

Temporary dewatering may result in groundwater level drawdown propagating through the aquifer towards the coastline. Drawdown in coastal zones may alter the naturally occurring fresh/saline water interface within the aquifer that runs parallel with the coastline, causing salinisation of the fresh groundwater resource.

There would be limited direct impacts as a result of increased groundwater salinity due to the absence of existing local groundwater users and GDEs between the coastline and the site. Potential future industrial groundwater users would be adversely affected as it is possible that recovery from saline intrusion could take several years or decades.

The effluent outfall pipeline and associated tunnel may represent a preferential pathway for marine water or saline groundwater in the coastal zone to migrate inland, either as a result of long term climate change or during periods when construction dewatering is active. The pipeline and tunnel may have been partially decommissioned by historical remedial works and further decommissioning activities may be undertaken as a part of the project. Depending on the decommissioning method (such as decommission and retain in place or demolish and remove the pipelines) there is the potential that the trench backfill and/or the pipelines itself could provide continue to provide a preferential pathway for saline water to migrate onshore during dewatering.

The potential for saline intrusion via the HDD borehole and cable conduit is assessed in Section 7.3.9.

### Impact significance

Under the conditions described, it is feasible that relatively significant changes to groundwater salinity could occur; however, further work would be required to confirm this drawing on site-specific aquifer hydraulic properties which will support transient drawdown assessments. If unmitigated, a moderate magnitude of impact would be anticipated to potential future consumptive or productive groundwater users, corresponding to a low impact significance. It is recognised that a legislative requirement exists under the EMPCA (Section 23A – general environmental duty (GED)) to minimise environmental impacts to the extent practicable or reasonable which would warrant mitigations to prevent saline intrusion into the aquifer.

Measures to comply with GWMM01 should include further assessment in areas of proposed dewatering to verify the aquifer hydraulic properties and modelling to simulate groundwater level drawdown, and assess whether saline intrusion risk are generally consistent with those assessed by this impact assessment. To meet legislative requirements and minimise environmental impacts as far as reasonably practicable, measures to comply with GWMM02 are recommended to limit the volume and duration of dewatering that may be required at excavations, minimising groundwater level drawdown and potential for saline water intrusion to occur. Furthermore, GWMM02 and GWMM03 are designed to prevent preferential pathways for saline water intrusion along the HDD borehole annulus towards the inland aquifer and the decommissioned discharge pipelines.

### Mitigation and management measures

The following mitigation and management measures are proposed to reduce the significance of the potential impact:

**Table 7-5 Mitigation and management measures: saline water intrusion**

| Measure ID | Mitigation and management measures | Project stage |
|---|---|---|
| GWMM01 | Conduct a pre-construction hydrogeological assessment at the converter station site to inform appropriate detailed design and construction methods. | Design |
| GWMM02 | Minimise groundwater inflow into excavations, limit groundwater level drawdown, avoid mobilising contaminated or saline groundwater, and prevent groundwater acidification. | Design, Construction |
| GWMM03 | Develop specifications and implement methods for Horizontal Directional Drilling (HDD) and other drilling activities to prevent groundwater movement and contamination. | Construction |

### Residual impacts

Following the application of dewatering controls, groundwater level drawdown would be limited from propagating towards the coastline, and the magnitude of impact associated with saline groundwater intrusion would be significantly reduced, resulting in a minor magnitude impact. A residual impact of low significance is assumed.

## 7.3.6 Mobilisation of existing groundwater contamination

Historical and current land uses in the vicinity of the project may have caused groundwater contamination. A comprehensive review of land and groundwater contamination across converter station site has been reported separately in the Tasmanian contaminated land and acid sulphate soil impact assessment (Tetra Tech Coffey, 2023).

Whilst groundwater contamination has been detected beneath the site in both the shallow Quaternary sand aquifer and the deeper bedrock aquifer, there are no known discreet plumes of groundwater contamination present which might represent a source of impact to sensitive receptors should they be mobilised by the project's dewatering activities.

As described above, there are no existing groundwater users within the study area that would experience an increased risk posed by mobilising known or undetected groundwater contamination. There would be negligible magnitude risks to existing groundwater users. It is possible that uncontrolled mobilisation of existing contamination could limit use of previously uncontaminated sections of the groundwater resource by possible future users. This would have a minor impact due to the alternative water supply options that are readily available.

Similarly, there are no terrestrial or freshwater aquatic GDEs that are within the study area that would experience an increased risk of impact if groundwater flow paths were altered. The marine environment of Bass Strait is the current groundwater discharge point that is likely to be affected by existing groundwater contamination from the site. There are no foreseeable scenarios where dewatering might increase the risk posed by existing contamination to the marine discharge point.

As such, limited impact to environmental values of groundwater is anticipated and a negligible magnitude is adopted.

## Impact significance

The assessment has not identified any areas where dewatering might mobilise contaminated groundwater and result in an increased risk profile to the environmental values of groundwater. Negligible to minor magnitude impacts would be anticipated if it did occur.

It is recognised that a legislative requirement exists under the EMPCA (Section 23A – general environmental duty (GED)) to minimise environmental impacts to the extent practicable or reasonable, regardless of the significance of the potential impact assessed in this report. Measures to comply with GWMM01 is recommended to complete a hydrogeological investigation in areas of anticipated dewatering, which will provide further information on the existing groundwater quality and allow for measures to be developed that prevent mobilisation of contamination.

## Mitigation and management measures

The following mitigation and management measures are proposed to reduce the significance of the potential impact:

**Table 7-6 Mitigation and management measures: contaminant mobilisation**

| Measure ID | Mitigation and management measures | Project stage |
|---|---|---|
| GWMM01 | Conduct a pre-construction hydrogeological assessment at the converter station site to inform appropriate detailed design and construction methods. | Design |
| GWMM02 | Minimise groundwater inflow into excavations, limit groundwater level drawdown, avoid mobilising contaminated or saline groundwater, and prevent groundwater acidification. | Design, Construction |
| GWMM03 | Prevent groundwater movement and contamination as a result of HDD and other drilling activities. | Construction |
| GWMM05 | Develop and implement a construction groundwater monitoring plan to establish baseline and background groundwater conditions prior to construction and monitor potential Project impacts during construction. | Construction |

## Residual impacts

The implementation of measures to comply with GWMM01 and GWMM02 will limit the volume and duration of dewatering that may be required at excavations, minimising groundwater level drawdown and potential for existing groundwater contamination to be mobilised. The implementation of measures to comply with GWMM03, including the requirement to seal the borehole annulus of directionally drilled bores or otherwise prevent water movement, will minimise the potential for groundwater contamination to be mobilised along preferential flow paths. Measures to comply with GWMM05 will provide additional groundwater level and quality monitoring data in areas where potential groundwater interactions are planned. This additional data will inform construction managers and allow them to avoid existing contamination or implement measures to otherwise control or adequately assess the risk of mobilising groundwater contamination that might cause increased risk of harm to sensitive receptors. These measures maintain a low impact and supports compliance with the GED.

### 7.3.7 Release of contaminated groundwater to the environment

Limited information is available on groundwater quality in the Quaternary sand aquifer and the potential to encounter unexpected groundwater contamination exists. The available data indicates that, at a minimum, groundwater may be contaminated by metals and PFAS at concentrations that exceed marine ecosystem protection criteria.

Dewatering activities are likely to generate groundwater that may be contaminated by metals, PFAS and potentially other contaminants that may be unsuitable for discharge to the environment without prior treatment.

## Impact significance

Uncontrolled discharge of impacted groundwater may result in moderate magnitude impacts, corresponding with a low impact significance where discharge occurs back to the groundwater system. Higher impacts would be expected to surface water features such as the Blythe River estuary or Bass Strait if direct discharge of contaminated groundwater occurred. While the impact to groundwater would likely be low, there is a requirement to minimise potential adverse impacts to the extent practicable under the GED of the EMPCA. Management and appropriate disposal of extracted groundwater from dewatering activities will be required to minimise potential impacts to groundwater values.

## Mitigation and management measures

The following mitigation and management measures are proposed to reduce the significance of the potential impact:

**Table 7-7 Mitigation and management measures: contaminated groundwater management**

| Measure ID | Mitigation and management measures | Project stage |
|---|---|---|
| GWMM01 | Conduct a pre-construction hydrogeological assessment at the converter station site to inform appropriate detailed design and construction methods. | Design |
| GWMM02 | Minimise groundwater inflow into excavations, limit groundwater level drawdown, avoid mobilising contaminated or saline groundwater, and prevent groundwater acidification. | Design, Construction |
| GWMM04 | Develop and implement a groundwater management plan to manage, monitor, reuse, treat, and dispose of groundwater during construction dewatering. | Construction |
| GWMM05 | Develop and implement a construction groundwater monitoring plan to establish baseline and background groundwater conditions prior to construction and monitor potential Project impacts during construction. | Construction |

## Residual impacts

Compliance with GWMM01 and GWMM05 will require groundwater investigations in areas where dewatering is likely to be required to ensure adequate information on existing groundwater contamination is available prior to construction commencing. Measures to comply with GWMM04 are recommended to ensure that all groundwater generated is managed appropriately based on its quality and potential contamination status. This may require treatment and/or disposal via trade waste in some situations where contaminated groundwater is encountered. These requirements would be formalised in a groundwater management plan, as a sub plan to the CEMP and implemented during construction.

Measures to comply with GWMM02 are recommended to prevent groundwater acidification in areas where ASS may be present, which may contribute to the development of contaminated groundwater that may be released during construction.

Together, these mitigation and management measures would ensure that the residual magnitude of impact is reduced to minor, maintaining a low impact significance and supporting compliance with the GED.

### 7.3.8 Groundwater contamination from construction activities

#### 7.3.8.1 Groundwater contamination from drilling fluids

Prior to construction, geotechnical and hydrogeological investigation boreholes will be drilled at some locations where construction activities are planned. Construction activities will also include HDD deployed from the site beneath the coastline and to the offshore environment.

Drilling can require the use of relatively low volumes of drilling fluids in addition to potable water. These fluid assist with lubricating and cooling the drill bit, borehole stability, and the removal of drill cuttings from the borehole. In the case of groundwater monitoring wells, drillers are required to install wells in general accordance with the following guidance:

- National Uniform Drillers Licensing Committee 2020. Minimum construction requirements for water bores in Australia. Fourth Edition.

This guidance requires that, “Chemicals and other drilling fluid additives that could leave a residual toxicity should not be added to any drilling fluids or cement slurries (i.e., grouts) used to drill and complete any water bore”.

It is possible that drilling conducted for purposes other than groundwater investigation (such as HDD and geotechnical drilling) could use alternative drilling fluid additives that might cause contamination by low concentrations of toxic chemicals.

##### Impact significance

Considering the local scale of the site investigations and HDD activities, the magnitude of impact (if it occurred) might be conservatively considered to be moderate, particularly to future extractive groundwater users. This equates to a low impact significance.

##### Mitigation and management measures

The following mitigation and management measures are proposed to further reduce the magnitude of the impact as far as reasonably practicable:

**Table 7-8 Mitigation and management measures: groundwater movement and contamination from drilling**

| Measure ID | Mitigation and management measures | Project stage |
|---|---|---|
| GWMM03 | Prevent groundwater movement and contamination as a result of HDD and other drilling activities. | Construction |

##### Residual impacts

Geotechnical drilling and HDD construction activities will be completed without the use of toxic additives (GWMM03). The impact magnitude would be reduced to minor after implementing GWMM03, maintaining a low impact significance.

#### 7.3.8.2 Groundwater contamination from construction chemicals and fuels

Construction activities will require the use of light vehicles, drill rigs, excavators and other construction machinery for planned construction of the converter station and ancillary infrastructure. Hydrocarbon based fuels, lubricants and degreasing agents are likely to be required on site to power and maintain machinery.

These, and other raw materials may either be hazardous or pose a contamination risk to groundwater if not adequately stored, handled and used during the construction period. Spills and leaks during storage and use may infiltrate to groundwater and cause contamination.

The following is noted in relation to the planned use of chemicals and fuel during construction activities:

- Construction activities will be managed under a Construction Environment Management Plan (CEMP) that will include the following elements:
  - A hazardous materials register.
  - Minimum requirements for the handling, use and disposal of hazardous materials consistent with regulatory guidance and Australian Standards, including designated areas where hazardous materials should not be stored or used (such as near waterways and wetlands).
  - Spill response and incident management plans, including provision of spill kits, drains and booms and other equipment that may be identified as necessary by site-specific risk assessments.
- Light vehicles used by contractors and other project staff will be maintained and refuelled offsite at commercial service stations. Some construction equipment and earthworks machinery will be refuelled onsite during the construction period by a mobile diesel fuel tanker.
- All wastes, including controlled wastes (e.g., contaminated groundwater generated during construction), will be transported, stored, handled and disposed. Hydrocarbon contaminated material will be removed to an appropriate disposal site or treatment facility. Further discussion of impacts of controlled waste is provided in the Tasmanian Contaminated Land and Acid Sulphate Soil Impact Assessment (Tetra Tech Coffey 2023).

The proposed construction activities and the volumes and nature of chemicals and fuels that are likely to be use are not dissimilar to most common construction activities (such as road construction and commercial building projects).

These activities are commonly managed through a project specific CEMP that aligns with the minimum standards and regulatory guidance published in relation to these commonly occurring construction activities or broader industry guidance.

The following Tasmanian and Australian legislation, regulations and standards are noted as applicable to the planned construction activities:

- EMPCA
- Development Regulations 2014
- Tasmania Waste Management and Resource Recovery Regulations 2013
- AS/NZS ISO 14001:2016: Environmental management systems – Requirements with guidance for use (Australian Standards)

### Impact significance

The magnitude of impact associated with groundwater contamination resulting from the use of relatively small volume chemicals and mobile refuelling during construction of the converter station would be considered minor. This is based on the assessment that where impact occurred, it would be localised, of short duration and could be effectively mitigated through standard environmental management controls. The minor impact magnitude if groundwater contamination did occur in small volumes, would equate to a low impact significance.

### Mitigation and management measures

The following mitigation and management measures will further reduce potential groundwater impacts from construction chemicals and fuels to the extent practicable.

**Table 7-9 Mitigation and management measures: groundwater contamination from chemicals and fuels**

| Measure ID | Mitigation and management measures | Project stage |
|---|---|---|
| GWMM04 | Develop and implement a groundwater management plan to manage, monitor, reuse, treat, and dispose of groundwater during construction dewatering. | Design, Construction |
| GWMM05 | Develop and implement a construction groundwater monitoring plan to establish baseline and background groundwater conditions prior to construction and monitor potential Project impacts during construction. | Design, Construction |

### Residual impacts

Application of controls in GWMM04 and GWMM05 would reduce magnitude of impact associated with a minor release of chemicals or fuels during construction to minor, corresponding to a low residual impact significance.

## 7.3.9 Horizontal directional drilling

HDD can create preferential pathways for groundwater to travel along the borehole annulus and the installed cable conduit if not adequately sealed. This is commonly not of concern when drilling vertically within the same aquifer formation (such as for geotechnical investigation or groundwater monitoring) but can be problematic when drilling crosses confining layers or might connect previously isolated aquifers or water sources (such as the marine environment with inland freshwater aquifers).

HDD and the permanently installed cable conduit may result in the following potential impacts to groundwater, several of which have been considered in previous sections:

- Dewatering of the launch pit causing drawdown and temporary dewatering impacts to groundwater users (assessed in Section 7.3.2) and GDEs (assessed in Section 7.3.3), and acidification of groundwater (assessed in Section 7.3.4).
- Creating preferential pathways for saline marine water to enter freshwater aquifers (partly assessed in Section 7.3.5).
- Groundwater contamination from drilling fluids (assessed in Section 7.3.8.1).
- Drilling ‘frac out’ causing impacts to surface water features, buildings, roads, and other infrastructure.

The following sections expand on impacts relating to HDD and the cable shore crossing that are no addressed in previous sections.

### 7.3.9.1 Groundwater contamination via preferential pathways

The HDD borehole annulus and conduit, if not adequately sealed, can provide a pathway for contaminants from the surface (such as runoff from roads, or potential spills from the future converter station) to enter groundwater more rapidly and affect associated environmental values of groundwater.

The HDD borehole and conduit connect the marine zone with the converter station may provide a preferential pathway for saline marine water to move inland and impact freshwater groundwater resources. These may occur particularly in response to tidal fluctuations, storm surge, or temporary dewatering of excavations at the converter site drawing water along the pathway.

There would be limited direct impacts as a result of increased groundwater salinity beneath the converter station site due to the absence of existing local groundwater users or GDEs at the site. Potential future industrial groundwater users would be adversely affected as it is possible that recovery from saline intrusion could take several years or decades.

### Impact significance

It is feasible that significant changes to groundwater salinity could occur within the aquifer surrounding the alignment of the HDD borehole. If unmitigated, a moderate magnitude of impact would be anticipated to potential future consumptive or productive groundwater users, corresponding to a low impact significance. Negligible impacts would be expected at the identified GDEs at a distance from the converter station and shore crossing site.

It is recognised that a legislative requirement exists under the EMPCA (Section 23A –GED) to minimise environmental impacts to the extent practicable or reasonable which warrants mitigations to prevent saline intrusion into the aquifer.

### Mitigation and management measures

Measures to comply with GWMM01 should be undertaken to verify the aquifer hydraulic conditions and ensure that drawdown estimates are generally consistent with those assessed by this impact assessment. To meet legislative requirements and minimise environmental impacts as far as reasonably practicable, measures to comply with GWMM02 are recommended to limit the volume and duration of dewatering that may be required during earthworks and construction, minimising groundwater level drawdown and potential for saline water intrusion to occur along the HDD borehole and cable conduit. Furthermore, GWMM03 is designed to prevent preferential pathways for saline water intrusion along the HDD borehole annulus and conduit towards the inland aquifer.

**Table 7-10 Mitigation and management measures: groundwater contamination via preferential pathways**

| Measure ID | Mitigation and management measures | Project stage |
|---|---|---|
| GWMM01 | Conduct a pre-construction hydrogeological assessment at the converter station site to inform appropriate detailed design and construction methods. | Design |
| GWMM02 | Minimise groundwater inflow into excavations, limit groundwater level drawdown, avoid mobilising contaminated or saline groundwater, and prevent groundwater acidification. | Design, Construction |
| GWMM03 | Prevent groundwater movement and contamination as a result of HDD and other drilling activities. | Construction |

### Residual impacts

Following the application of mitigation measures GWMM01, GWMM02 and GWMM03, potential for saline water intrusion via the HDD borehole and cable conduit would be minimised as far as reasonably practicable, and the magnitude of impact associated with saline groundwater intrusion would be significantly reduced, resulting in a minor magnitude impact and a low residual impact significance.

### 7.3.9.2 HDD frac out

All HDD activities have potential for ‘frac out’ to occur during drilling. Frac-out is the unintentional return of drilling fluids to the surface, other than via the drilling entry and exit point, as a result of the pressure in the borehole exceeding the pressure of the surrounding ground. This could result in the loss of drilling fluids to the surface environment and the development of new hydraulic connections between aquifers, across confining layers or between surface water and groundwater.

Frac-out occurs most frequently near the borehole entry and exit points where the drilling depth is shallowest. Frac-out occurring near the entry and exit points would have lower potential for impact to groundwater and associated environmental values due to the shallow depth, greater distance from surface water features, and the localised disturbance by the main borehole that would already exist around the drilling activities and converter station site.

### Impact significance

In some scenarios, significant, uncontrolled frac-out events could impact existing infrastructure such as the Bass Highway, the adjacent railway line, or subsurface infrastructure that may be present. Groundwater impacts (which is the focus of this assessment) associated with frac-out would be relatively minor and limited to a local area that would be readily remediated. A low impact significance is assessed.

### Mitigation and management measures

Recognising the higher potential impact of a frac-out event to infrastructure and potential quality impacts to the marine environment, additional mitigation measures are listed in GWMM03.

GWMM03 includes requirements to develop an HDD frac out prevention and management plan that will minimise potential for frac-outs to occur. The plan will include completing a review of the geotechnical investigation data and a risk assessment with the drilling contractor, agreeing minimum monitoring and observation requirements during drilling to detect potential frac-outs (such as loss of fluid circulation), pressure relief methods, and other mitigations or contingencies.

**Table 7-11 Mitigation and management measures: HDD frac out**

| Measure ID | Mitigation and management measures | Project stage |
|---|---|---|
| GWMM03 | Prevent groundwater movement and contamination as a result of Horizontal Directional Drilling (HDD) and other drilling activities. | Construction |

### Residual impacts

With the implementation of GWMM03, a low impact significance is maintained, and the likelihood of a frac-out event will be minimised so far as is reasonably practicable.

## 7.4 OPERATION

This section identifies the potential impacts of the project on groundwater during the operation phase on identified groundwater values.

## 7.4.1 Groundwater contamination from operational activities

The ongoing operation of the Heybridge converter station will include the use of site features or ongoing maintenance activities that take have potential to cause groundwater contamination. They include:

- Accidental spills and leaks of transformer oil, the contents of lead acid batteries, and diesel fuel stored in above ground tanks.

- Discharge from the proposed septic tank system causing groundwater contamination from nutrients and pathogens.
- Herbicide application migrating to groundwater.

Contaminants potentially released during operation may migrate via groundwater towards Bass Strait coastline and the marine environment. There are no registered extractive use bores in the vicinity of the proposed converter station but contamination might reduce the quality of groundwater resources for future users or migrate towards GDEs and the marine environment.

### Impact significance

The design and operation of the septic tank and the application of herbicides will be consistent with regulatory requirements and manufacturer's guidance. Contaminants that might infiltrate to groundwater and cause quality impacts would be localised at the source and generally be of low volume. Furthermore, they would attenuate over distance if they were allowed to migrate towards the marine discharge point of Bass Strait. As minor releases, they would potentially have low magnitude impact to environmental values at the point of discharge. A corresponding low impact significance is assumed.

Larger volumes of transformer oils and fuels that may be handled at the converter station may pose a risk to groundwater values if accidental release occurred. While no extractive uses of groundwater are registered or known to exist in the local area around the proposed converter station, the aquatic ecosystem of Bass Strait may reasonably be impacted by a spill that was allowed to migrate via groundwater if it was not adequately remediated. The magnitude could be moderate depending on the volumes released and the response taken.

### Mitigation and management measures

The Contaminated Land and Acid Sulfate Soil Assessment proposed environmental performance requirement (EPR) CL03 that requires the operator develop and implement measures to avoid causing contamination during the operation of the project. EPR CL03 will minimise the significance of potential contamination impacts to groundwater. No further groundwater management measures are proposed.

### Residual impacts

When considering minimum industry requirements for storage of fuels, such as bunding and environmental reporting of incidents, commitments made to achieve EPR CL03, and the ability for contamination to be readily remediated via conventional remediation methods, a low residual impact magnitude is assumed. The residual impact of operational activities causing groundwater contamination is assessed as being low with the implementation of the identified mitigation and management measures.

## 7.5 CLIMATE CHANGE

The predicted effect of climate change in northern Tasmania and on the groundwater resources in the area are discussed in Section 6.2.2. The discussion draws on the climate change projections and assessment completed for the project (Katestone, 2023).

The effect of a changing climate on groundwater may be realised over the operation and decommissioning periods of the project and could result in groundwater levels that may be higher or lower than those assessed by this report (as a result of changing rainfall recharge rates and sea level rise), and/or groundwater that is more saline than currently observed (as a result of sea level rise and/or increase storm surge intensity).

These climate change effects on groundwater are not considered to be relevant to most potential project impacts which are associated with dewatering drawdown that may occur during the construction period. Construction activities will take place under the present-day climate.

Long term reduced or raised groundwater levels, or increased groundwater salinity would not alter the potential impacts of the project on the groundwater environment during operation and decommissioning, as these impacts relate primarily to project hazards that might affect groundwater quality (such as contamination from site activities. Therefore, the effects of climate change are not considered further.

## 7.6 SUMMARY OF POTENTIAL IMPACT MAGNITUDE ASSESSMENT

The potential impact magnitude assessment is summarised below (Table 7-12). This potential impact magnitude assessment does not account for implementation of the specified mitigation and management measures, which are considered in the residual impact summary (Section 7.7).

**Table 7-12 Summary of the potential impact magnitude assessment**

| Project phase | Potential impact | Affected groundwater values | Assigned magnitude | Justification |
|---|---|---|---|---|
| **Groundwater level and quantity** | | | | |
| **Construction** | Temporary dewatering of onshore cable trenches, cable joint pits, and HDD entry/exit pits during construction leading to groundwater level drawdown. | Consumptive or productive uses | Negligible | There are no registered or known unregistered groundwater users located within the study area. It is highly unlikely that any temporary construction dewatering activities would impact on groundwater users. |
| | | Potential future extractive groundwater users (industrial water use) | Negligible | Temporary groundwater level drawdown as a result of construction dewatering would rapidly recover in the highly conductive Quaternary sand aquifer. There would be unlikely to be a measurable effect to the long-term groundwater availability to future users. |
| | | Terrestrial GDEs | Negligible | There are no known terrestrial GDEs within the study area. In the unlikely event that unplanned drawdown occurred beneath unknown terrestrial GDEs, the proposed short-duration dewatering would be unlikely to have a measurable effect on vegetation health. |
| | | Aquatic GDEs – Blythe River estuary | Negligible | The Blythe River estuary is the primary aquatic GDE that exists within the study area. The drawdown assessment considered that southern and eastern drawdown was likely to be limited by the presence of outcropping bedrock along the site boundaries. However, planned earthworks along these boundaries may feasibly reduce the effectiveness of this hydraulic barrier and permit a degree of drawdown. This could temporarily reduce the freshwater input to the estuarine zone. The aquatic ecosystem of the estuary would be adapted to highly variable salinity and changes to the freshwater input over a short section of the total catchment would have a negligible effect on the aquatic ecosystem. |
| **Groundwater Quality** | | | | |
| **Construction** | Mobilisation of existing groundwater contamination towards the project due to temporary groundwater level drawdown | Consumptive or productive uses | Negligible | There are no existing groundwater users within the study area that would experience an increased risk posed by mobilising known or undetected groundwater contamination. |
| | | Terrestrial GDEs | Negligible | There are no terrestrial or freshwater aquatic GDEs that are within the study area that would experience an increased risk of impact if groundwater flow paths were altered. |
| | | Aquatic GDEs | Minor | The marine environment of Bass Strait is the current groundwater discharge point that is likely to be affected by existing groundwater contamination from the site. |
| **Construction** | Release of contaminated groundwater generated during dewatering to the environment | All | Moderate | Dewatering activities are likely to generate groundwater that may be contaminated by metals, PFAS and other contaminants that may be unsuitable for discharge to the environment without prior treatment.<br>Uncontrolled discharge of impacted groundwater may result in moderate magnitude impacts, corresponding with a low impact where discharge occurs back to the groundwater system. Higher impacts to surface water features such as the Blythe River estuary or Bass Strait if discharge occurred. |
| **Construction** | Groundwater contamination from drilling fluids | Consumptive or productive uses | Moderate | Drilling can require the use of relatively low volumes of drilling fluids in addition to potable water. These fluid assist with lubricating and cooling the drill bit, borehole stability, and the removal of drill cuttings from the borehole. It is possible that drilling conducted for purposes other than groundwater investigation (such as HDD and geotechnical drilling) could use alternative drilling fluid additives that might cause contamination by low concentrations of toxic chemicals. |
| | | Terrestrial GDEs | Moderate | |
| | | Aquatic GDEs | Moderate | |
| **Construction and Operation** | Groundwater contamination from construction chemicals and fuels | Consumptive or productive uses | Minor | Construction activities will require the use of light vehicles, drill rigs, earthworks and other construction machinery for planned construction of the converter station and ancillary infrastructure. Hydrocarbon based fuels, lubricants and degreasing agents are likely to be required on site to power and maintain machinery.<br>Low volumes of chemicals and fuels will be required, which will be stored, handled and used in line with the project CEMP and OEMP, legislative requirements, and regulatory guidance. |
| | | Terrestrial GDEs | Minor | |
| | | Aquatic GDEs | Minor | |
| **Construction** | Saline groundwater intrusion due to temporary groundwater level drawdown | Consumptive or productive uses | Negligible | There would be limited direct impacts as a result of increased groundwater salinity due to the absence of existing local groundwater users and GDEs between the coastline and the site. |
| | | Terrestrial GDEs | Negligible | |
| | | Aquatic GDEs | Negligible | |
| **Construction and Operation** | Groundwater acidification due to temporary groundwater level drawdown | Consumptive or productive uses | Moderate | If unmitigated, a degree of groundwater acidification may persist during operation as a result of localised groundwater drawdown. Acidic groundwater, if it were generated, would be relatively limited in extent, but would likely migrate towards Bass Strait coastline, discharging to the marine environment. |
| | | Terrestrial GDEs | Moderate | |

| Project phase | Potential impact | Affected groundwater values | Assigned magnitude | Justification |
|---|---|---|---|---|
| | | Aquatic GDEs | Moderate | |
| **Construction and Operation** | Accidental spills and leaks of transformer oil, the contents of lead acid batteries, and diesel fuel stored in above ground tanks | All | Moderate | Larger volumes of transformer oils and fuels that may be handled at either of the converter station may pose a risk to the environmental values of groundwater if accidental release occurred. While no extractive uses of groundwater are recorded in the local area around the proposed converter station, the aquatic ecosystem of Bass Strait may reasonably be impacted by a spill if it was not adequately remediated. |
| **Construction and Operation** | Discharge from the proposed septic tank system causing groundwater contamination from nutrients and pathogens | All | Minor | In the case of septic tank discharge, contaminants may migrate via groundwater towards Bass Strait coastline and the marine environment (being diluted along the path). There are no registered extractive use bores in the vicinity of the proposed converter station. |
| **Construction and Operation** | Herbicide application migrating to groundwater | All | Minor | In the case of herbicide use, contaminants may migrate via groundwater towards Bass Strait coastline and the marine environment (being diluted along the path). There are no registered extractive use bores in the vicinity of the proposed converter station. |

## 7.7 SUMMARY OF RESIDUAL IMPACTS

A summary of the outcomes of the groundwater impact assessment using the sensitivity and magnitude approach and considering implementation of mitigation and management measures is presented in Table 7-13.

**Table 7-13 Summary of residual impact assessment**

| Project phase | Potential impact | Affected value | Sensitivity | Initial impact assessment | | Recommended mitigation and management measures | Residual impact assessment | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Magnitude | Significance | | Magnitude | Justification | Significance |
| **Groundwater level and volume** | | | | | | | | | |
| **Construction** | Temporary dewatering of onshore excavations during construction leading to groundwater level drawdown. | Consumptive or productive uses | Low | Negligible | Very low | No measures are proposed or required for this potential impact. | Unchanged | N/A | Very low |
| | | Terrestrial GDEs | Low | Negligible | Very low | | Unchanged | N/A | Very low |
| | | Aquatic GDEs – Blythe River estuary | Low | Negligible | Very low | | Unchanged | N/A | Very low |
| **Groundwater Quality** | | | | | | | | | |
| **Design and Construction** | Mobilisation of existing groundwater contamination towards the project's dewatering activities. | Consumptive or productive uses | Low | Minor | Low | GWMM01– Conduct a pre-construction hydrogeological assessment at the converter station site to inform appropriate detailed design and construction methods.<br>GWMM02 – Minimise groundwater inflow into excavations, limit groundwater level drawdown, avoid mobilising contaminated or saline groundwater, and prevent groundwater acidification.<br>GWMM03 – Prevent groundwater movement and contamination as a result of HDD and other drilling activities.<br>GWMM05 – Develop and implement a construction groundwater monitoring plan to establish baseline and background groundwater conditions prior to construction and monitor potential Project impacts during construction. | Unchanged | Hydrological investigation (GWMM01) in areas of potential dewatering will provide further information on existing groundwater quality and allow contaminated groundwater to be avoided or managed appropriately.<br>Measures to minimise the potential of groundwater drawdown (GWMM02), including the installation of sheet pile walls or other barriers, to prevent the release of contaminated groundwater.<br>The use of non-toxic and/or biodegradable drilling additives (GWMM03), such as bentonite clay and xanthan gum for HDD and other drilling activities during construction, will remove a potential source of contamination.<br>Groundwater monitoring (GWMM05) will confirm the existing sources of groundwater contamination and verify the adequacy of the proposed design and construction methods. | Low |
| | | Terrestrial GDEs | Low | Negligible | Very low | | Unchanged | | Low |
| | | Aquatic GDEs – Bass Strait | Low | Negligible | Very low | | Unchanged | | Low |
| **Design and Construction** | Release of contaminated groundwater generated during dewatering to the environment | Aquatic GDEs – Bass Strait | Low | Moderate | Low | GWMM03 – Prevent groundwater movement and contamination as a result of Horizontal Directional Drilling (HDD) and other drilling activities.<br>GWMM04 – Develop and implement a groundwater management plan to manage, monitor, reuse, treat, and dispose of groundwater during construction dewatering.<br>GWMM05 – Develop and implement a construction groundwater monitoring plan to establish baseline and background groundwater conditions prior to construction and monitor potential Project impacts during construction. | Minor | The use of non-toxic and/or biodegradable drilling additives (GWMM03), such as bentonite clay and xanthan gum for HDD and other drilling activities during construction, will minimise the potential of groundwater contamination.<br>Management and disposal of extracted groundwater from dewatering activities (GWMM04) will be required to minimise potential impacts to environmental values.<br>Groundwater monitoring (GWMM05) will confirm the existing groundwater conditions and verify the adequacy of the proposed design and construction methods. | Low |
| **Design and Construction** | Saline groundwater intrusion due to temporary groundwater level drawdown | Consumptive or productive uses | Low | Moderate | Low | GWMM01– Conduct a pre-construction hydrogeological assessment at the converter station site to inform appropriate detailed design and construction methods.<br>GWMM02 – Minimise groundwater inflow into excavations, limit groundwater level drawdown, avoid mobilising contaminated or saline groundwater, and prevent groundwater acidification. | Minor | Hydrological investigation (GWMM01) in areas of potential dewatering will provide further information on existing groundwater quality and allow contaminated groundwater to be avoided or managed appropriately. | Low |
| | | Terrestrial GDEs | Low | Negligible | Very Low | | Unchanged | | Very low |
| | | Aquatic GDEs | Low | Moderate | Low | | Minor | | Low |

| Project phase | Potential impact | Affected value | Sensitivity | Initial impact assessment | | Recommended mitigation and management measures | Residual impact assessment | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Magnitude | Significance | | Magnitude | Justification | Significance |
| | | | | | | GWMM03 – Prevent groundwater movement and contamination as a result of Horizontal Directional Drilling (HDD) and other drilling activities.<br>GWMM05 – Develop and implement a construction groundwater monitoring plan to establish baseline and background groundwater conditions prior to construction and monitor potential Project impacts during construction. | | GWMM02 will limit the volume and duration of dewatering that may be required at excavations, minimising groundwater level drawdown and potential for saline water intrusion to occur.<br>Furthermore, GWMM03 will prevent preferential pathways for saline water intrusion along the HDD borehole annulus towards the inland aquifer.<br>Groundwater monitoring (GWMM05) will confirm the existing groundwater conditions and verify the adequacy of the proposed design and construction methods.<br>GWMM02 requires the onshore effluent pipeline to be decommissioned using construction methods that remove preferential flow pathways for saline water intrusion that connect the marine water to onshore groundwater aquifers, if this impact is likely to be realised. | |
| Design and Construction | Groundwater acidification due to temporary groundwater level drawdown | Consumptive or productive uses | Low | Minor | Low | GWMM01– Conduct a pre-construction hydrogeological assessment at the converter station site to inform appropriate detailed design and construction methods.<br>GWMM02 – Minimise groundwater inflow into excavations, limit groundwater level drawdown, avoid mobilising contaminated or saline groundwater, and prevent groundwater acidification.<br>GWMM03 – Prevent groundwater movement and contamination as a result of Horizontal Directional Drilling (HDD) and other drilling activities.<br>GWMM05 – Develop and implement a construction groundwater monitoring plan to establish baseline and background groundwater conditions prior to construction and monitor potential Project impacts during construction. | Unchanged | Hydrological investigation (GWMM01) in areas of potential dewatering will provide further information on existing groundwater quality and allow contaminated groundwater to be avoided or managed appropriately.<br>GWMM02 will limit the volume and duration of dewatering that may be required at excavations, minimising groundwater level drawdown and potential for saline water intrusion to occur.<br>Furthermore, GWMM03 will prevent preferential pathways for saline water intrusion along the HDD borehole annulus towards the inland aquifer.<br>Groundwater monitoring (GWMM05) will confirm the existing groundwater conditions and verify the adequacy of the proposed design and construction methods.<br>Measures, including sheet pile walls or other barriers, to prevent groundwater level drawdown, will prevent groundwater acidification within the zone of groundwater drawdown and in the coastal areas (GWMM02) | Low |
| | | Terrestrial GDEs | Low | Negligible | Very low | | Unchanged | | Very low |
| | | Aquatic GDEs | Low | Major | Moderate | | Minor | | Low |
| Construction | Groundwater contamination from drilling fluids | All | Low | Moderate | Low | GWMM03 – Prevent groundwater movement and contamination as a result of Horizontal Directional Drilling (HDD) and other drilling activities. | Minor | The use of non-toxic and/or biodegradable drilling additives (GWMM03), such as bentonite clay and xanthan gum for HDD and other drilling activities during construction, will remove a potential source of contamination. | Low |
| Construction | Groundwater contamination from construction chemicals and fuels | All | Low | Minor | Low | GWMM04 – Design and implement measures to manage and dispose of groundwater during construction to avoid (where possible) or minimise environmental impacts.<br>GWMM05 – Develop and implement a construction groundwater monitoring plan to establish baseline and background | Unchanged | Management and disposal of extracted groundwater from dewatering activities (GWMM04) will be required to minimise potential impacts to environmental values. | Low |

| Project phase | Potential impact | Affected value | Sensitivity | Initial impact assessment | | Recommended mitigation and management measures | Residual impact assessment | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Magnitude | Significance | | Magnitude | Justification | Significance |
| | | | | | | groundwater conditions prior to construction and monitor potential Project impacts during construction. | | Groundwater monitoring (GWMM05) will confirm the existing groundwater conditions and verify the adequacy of the proposed design and construction methods. | |
| Operation | Groundwater contamination from leaks of hazardous chemicals (e.g., transformer oil, lead acid batteries, and diesel fuel). | All | Low | Moderate | Low | EPR CL03 - Develop and implement measures to manage potential contamination impacts in operation.<br>GWMM06 – Develop and implement an operational groundwater management plan to detect and minimise potential contamination impacts during the project's operation. | Minor | EPR CL03 and GWMM06 would significantly reduce any potential volume of hazardous chemicals released and subsequent clean up would further mitigate any impact. | Low |
| Construction and Operation | Discharge from the proposed septic tank system causing groundwater contamination | All | Low | Minor | Low | | Unchanged | N/A | Low |
| Operation | Herbicide application migrating to groundwater | All | Low | Minor | Low | | Unchanged | N/A | Low |

## 7.8 CUMULATIVE IMPACTS

Proposed and reasonably foreseeable projects were identified based on their potential to credibly contribute to cumulative impacts due their temporal and spatial boundaries. Projects were identified based on publicly available information at the time of assessment. The projects considered for cumulative impact assessment across Tasmania are:

- Remaining NWTD
- Guilford Windfarm
- Robbins Island Renewable Energy Park
- Jim's Plain Renewable Energy Park
- Robbins Island Road to Hampshire Transmission Line
- Bass Highway upgrades between Deloraine and Devonport
- Bass Highway upgrades between Cooee and Wynard
- Hellyer Windfarm
- Table Cape Luxury Resort
- Youngmans Road Quarry
- Port Latta Windfarm
- Port of Burnie Shiploader Upgrade
- Quaylink – Devonport East Redevelopment.

All of the identified Tasmanian projects are located outside of the local groundwater catchment (defined in Section 6.6) and would not interact spatially with the groundwater effects from the proposed Heybridge converter station and shore crossing. Therefore, no cumulative impacts are expected to arise from these projects.

The exception could be the Remaining NWTD project, which includes the construction and operation of high voltage overhead transmission lines (OHTL) that will connect the Heybridge converter station with the Tasmanian power grid.

With respect to potential groundwater impacts, OHTL tower construction could require temporary dewatering of bored pile foundations during construction. This is unlikely to be the case for the closest towers that would be positioned south of the Heybridge converter site, where low hydraulic conductivity basement outcrops and topography rises to the surrounding hills. Deep bored piles are unlikely to be required at these locations where shallow competent rock is likely to be encountered. Even if bored piles were required, groundwater would be deeper along the elevate tower sites and temporary dewatering would be unlikely. Furthermore, if temporary dewatering was required, drawdown would not propagate through the low permeability basement rock to the Heybridge site over the short term construction period.

# 8. INSPECTION AND MONITORING

A range of groundwater inspection and monitoring activities are proposed to meet the recommended management and mitigation measures.

Most existing wells screen 2.5 to 10 m below the water table in the bedrock aquifer and are unlikely to accurately represent shallow groundwater contamination that may be present.

The pre-construction groundwater assessment (GWMM01) and construction groundwater monitoring plan (GWMM05) will require additional groundwater monitoring wells to be installed to measure groundwater levels and assess groundwater quality (including baseline and background conditions). Pre-construction monitoring will identify where existing contamination may exist and the quality condition in areas where construction dewatering may be required. Aquifer hydraulic tests may also be required to support detailed design (GWMM01) to ensure that groundwater drawdown effects can be predicted and adequately managed to meet the requirements of mitigation and management measure GWMM02.

The groundwater monitoring program will be designed, implemented, and used by project hydrogeologists and geotechnical engineers that form part of the design construction team, to ensure that relevant mitigation measures will be effective, should the project proceed (GWMM01 and GWMM02).

Groundwater monitoring requirements will be set out in the groundwater monitoring plans that are specific to the construction (GWMM05) and operational (GWMM06) phases. Details of the groundwater monitoring activities will be formalised in GMPs which will be developed as sub plans to the CEMP and OEMP, and implemented during construction and operation, respectively. The GMPs will be developed by project hydrogeologists engaged during the design and construction phase in consultation with EPA Tasmania. The plans should recognise the potential requirement for new wells to be installed that are suitable to detect groundwater contamination from project operational activities. They will include groundwater quality and level triggers and actions to be taken in response to a trigger exceedance to prevent impacts to groundwater values during construction and operation.

The GMP will ensure that the necessary environmental outcomes are achieved, and the environmental values of groundwater are maintained.

# 9. MANAGEMENT AND MITIGATION MEASURES

Management and mitigation measures that must be implemented during the design, construction, operation and decommissioning phases of the project are presented below and are discussed throughout Section 7. They have been developed with consideration of relevant legislation, guidelines, policies and industry standards.

Each measure is accompanied by directions that must be addressed when they are being developed and implemented. These directions ensure that the implemented measures achieve the level of risk reduction that has been assumed by the impact assessment in Section 7.

A decommissioning management plan will be prepared to outline how potential groundwater impacts associated with decommissioning activities of the project will be avoided, reduced or mitigated. The requirements for the decommissioning management plan are provided in the EIS.

**Table 9-1 Mitigation and management measures**

| Measure ID | Mitigation and management measures | Project Stage |
|---|---|---|
| GWMM01 | **Conduct a pre-construction hydrogeological assessment at the converter station site to inform appropriate detailed design and construction methods.** | Design |

The hydrogeological assessment must include installing additional groundwater monitoring wells, performing aquifer hydraulic testing, and monitoring groundwater levels and quality to address identified data gaps and be sufficient to support development of further mitigation measures for GWMM02, GWMM04, and GWMM05. It should include a preliminary groundwater dewatering and drawdown assessment for areas where dewatering is anticipated, based on the engineering design and anticipated earthworks available at the time, using a revised hydrogeological conceptual model. The assessment should be completed by a suitably qualified hydrogeologist, and it should review whether the predicted impacts of the project on groundwater may be greater than those originally assessed in Section 7. The assessment results should be documented in a hydrogeological interpretive report that is made available prior to detailed design and be suitable to support development of other management and mitigation measures. Relevant conclusions should be presented as part of the groundwater management plan, that will be prepared prior to, and implemented during construction.

| Measure ID | Mitigation and management measures | Project Stage |
|---|---|---|
| GWMM02 | **Minimise groundwater inflow into excavations, limit groundwater level drawdown, avoid mobilising contaminated or saline groundwater, and prevent groundwater acidification.** | Design, Construction |

GWMM02 must consider scheduling earthworks to reduce the duration of dewatering so far as reasonably practicable and assess the need for engineering controls such as sheet pile walls, aquifer injection, and decommissioning infrastructure, to ensure potential impacts to groundwater are avoided, and perform hydrogeological assessments to ensure the effectiveness of these controls. These measures must be informed by the ASS management plan (EPR CL02) and consider acidification risk in areas of predicted groundwater level drawdown defined by GWMM01. If identified by GWMM01 as a likely pathway for saline water intrusion during dewatering, decommission the disused onshore effluent pipeline and tunnel. These measures must be documented in a groundwater management plan that includes design specifications, monitoring requirements, and contingency plans.

| Measure ID | Mitigation and management measures | Project Stage |
|---|---|---|
| GWMM03 | **Prevent groundwater movement and contamination as a result of Horizontal Directional Drilling (HDD) and other drilling activities.** | Construction |

Develop specifications and methods that address seal the borehole annulus, prevent saline water movement along the cable conduit, use non-toxic drilling additives (where additives are necessary), and include drainage systems to prevent runoff entering boreholes. Prepare a frac-out prevention and management plan to be implemented during HDD. These specifications and methods should be informed by site specific geotechnical data, be consistent with relevant guidelines, and must be documented in the CEMP.

| Measure ID | Mitigation and management measures | Project Stage |
|---|---|---|
| GWMM04 | **Develop and implement a groundwater management plan to manage, monitor, reuse, treat, and dispose of groundwater during construction dewatering.** | Design, Construction |

The groundwater management plan developed for GWMM04 should prioritise groundwater reuse (such as for construction water supply, dust suppression, or reinjection for hydraulic control, where feasible), specify approved disposal options (e.g., discharge to surface water, sewer, or stormwater), and document agreed water quality discharge criteria and action trigger levels, and outline suitable treatment technologies that will be implemented or reserved as contingency measures should unforeseen contamination be encountered.

| Measure ID | Mitigation and management measures | Project Stage |
|---|---|---|
| GWMM05 | **Develop and implement a construction groundwater monitoring plan to establish baseline and background groundwater conditions prior to construction and monitor potential Project impacts during construction.** | Design, Construction, |

The construction groundwater monitoring plan developed under GWMM05 should include an initial review of the groundwater monitoring network developed for GWMM01 and assess its suitability to establish baseline and background conditions prior to construction. Adequate monitoring should be completed prior to construction commencing to characterise groundwater quality and levels, including seasonal changes. The plan should recognise the potential requirement for the monitoring network to change over time in response to the project's progress through design and construction. For construction impact monitoring, the plan should include groundwater quality and level triggers, and mitigation measures to be implemented in response to a trigger exceedance to prevent impacts to groundwater values during construction. The monitoring plan must be developed in consultation with EPA Tasmania and be documented in a groundwater management plan as part of the CEMP.

| Measure ID | Mitigation and management measures | Project Stage |
|---|---|---|
| GWMM06 | **Develop and implement an operational groundwater management plan to detect and minimise potential contamination impacts during the project's operation.** | Operation |

The operational groundwater monitoring plan developed under GWMM06 should include an initial review of the adequacy of the available groundwater monitoring network remaining at the end of construction to monitor and validate the effectiveness of mitigation measures to detect and respond to project-related groundwater contamination that may occur during operation. It should recognise the potential requirement new wells to be installed that are suitable to detect groundwater contamination from project operational activities. It should include groundwater quality and level triggers and actions to be taken in response to a trigger exceedance to prevent impacts to groundwater values during construction and operation. The plan should include ongoing groundwater monitoring requirements and verification of groundwater level (and quality if relevant) recovery post-construction. The operational groundwater monitoring plan must be developed in consultation with EPA Tasmania and be documented in a groundwater management plan as part of the OEMP.

# 10. DATA GAPS

All major construction projects progress through increasing levels of design certainty prior to construction commencing. It is common for data gaps or some uncertainty to exist at the time when an EIS is prepared so long as those gaps would not materially affect the conclusions of the assessment.

In many cases, mitigation and management measures are proposed to ensure that the design process resolves data gaps and continues to minimise uncertainty.

The following data gaps are recognised. They are not considered to be uncommon for a project of this type, they are commensurate with the level of risk posed by the project to the groundwater environment, and they are consistent with the level of information required to provide a robust EIS:

- Site specific groundwater investigations have residual data gaps and uncertainty relating to groundwater quality, levels, and aquifer hydraulic properties. Specifically, limited information is available on the shallow aquifer that may be encountered during construction.
- Limited information is available on construction dewatering requirements, including the duration and volumes of dewatering that may be required, and the effect that unmitigated dewatering would have on surrounding groundwater levels and quality within the aquifers.

Uncertainty has been addressed by adopting conservative assumptions (such as groundwater drawdown extending to the coastline) which minimises the effect of this uncertainty on the impact assessment. The assessment has been provided in the assumption that further hydrogeological investigations are required to address these data gaps prior to construction and to inform detailed design (GWMM01).

# 11. CONCLUSION

In Tasmania, a converter station is proposed to be located at Heybridge near Burnie. The converter station would facilitate the connection of the project to the Tasmanian transmission network. There will be two subsea cable landfalls at Heybridge with the cables extending from the converter station across Bass Strait to Waratah Bay in Victoria.

A desktop hydrogeological assessment has been completed drawing on publicly available spatial information on ground surface elevation, the inferred average water table elevation, surface geological conditions and groundwater quality. These inputs, together with information on GDEs and groundwater users has support and assessment of the potential impacts of the project's construction and operation on groundwater receptors. No potential impacts to groundwater were considered for the decommissioning phase as the project has not identified the need for subsurface work with the decommissioning approach assumed to be to leave subsurface infrastructure in place.

A significance assessment approach has been applied which identified mostly negligible and minor magnitude of potential impacts, equating to an overall low impact.

The following potential activities were assessed to have raised initial moderate to major magnitude of impacts, which corresponds to an overall moderate un-mitigated impacts on groundwater values and were considered further:

- Mobilisation of existing groundwater contamination towards the project's dewatering activities.
- Release of contaminated groundwater generated during dewatering to the environment.
- Saline groundwater intrusion due to temporary groundwater level drawdown.
- Groundwater acidification due to temporary groundwater level drawdown.
- Groundwater contamination from operational activities including leaks of hazardous chemicals (e.g., transformer oil, lead acid batteries, and diesel fuel).

Mitigation and management measures were developed to reduce the significance of all potential impacts to low and meet legislative requirements under the GED. With the implementation of mitigation and management measures, including the requirement to complete further site investigation to address identified data gaps, the overall residual impact to groundwater would be low during construction and operation of the project.

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# APPENDIX A : STATEMENT OF LIMITATIONS

# IMPORTANT INFORMATION ABOUT YOUR TETRA TECH COFFEY ENVIRONMENTAL REPORT

## Introduction

This report has been prepared by Tetra Tech Coffey for you, as Tetra Tech Coffey's client, in accordance with our agreed purpose, scope, schedule and budget.

The report has been prepared using accepted procedures and practices of the consulting profession at the time it was prepared, and the opinions, recommendations and conclusions set out in the report are made in accordance with generally accepted principles and practices of that profession.

The report is based on information gained from environmental conditions (including assessment of some or all of soil, groundwater, vapour and surface water) and supplemented by reported data of the local area and professional experience. Assessment has been scoped with consideration to industry standards, regulations, guidelines and your specific requirements, including budget and timing. The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry practice.

This interpretation is not a complete description of all material on or in the vicinity of the site, due to the inherent variation in spatial and temporal patterns of contaminant presence and impact in the natural environment. Tetra Tech Coffey may have also relied on data and other information provided by you and other qualified individuals in preparing this report. Tetra Tech Coffey has not verified the accuracy or completeness of such data or information except as otherwise stated in the report. For these reasons the report must be regarded as interpretative, in accordance with industry standards and practice, rather than being a definitive record.

## Your report has been written for a specific purpose

Your report has been developed for a specific purpose as agreed by us and applies only to the site or area investigated. Unless otherwise stated in the report, this report cannot be applied to an adjacent site or area, nor can it be used when the nature of the specific purpose changes from that which we agreed.

For each purpose, a tailored approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible quantify, risks that both recognised and potential contamination pose in the context of the agreed purpose. Such risks may be financial (for example, clean up costs or constraints on site use) and/or physical (for example, potential health risks to users of the site or the general public).

## Limitations of the Report

The work was conducted, and the report has been prepared, in response to an agreed purpose and scope, within time and budgetary constraints, and in reliance on certain data and information made available to Tetra Tech Coffey.

The analyses, evaluations, opinions and conclusions presented in this report are based on that purpose and scope, requirements, data or information, and they could change if such requirements or data are inaccurate or incomplete.

This report is valid as of the date of preparation. The condition of the site (including subsurface conditions) and extent or nature of contamination or other environmental hazards can change over time, as a result of either natural processes or human influence. Tetra Tech Coffey should be kept appraised of any such events and should be consulted for further investigations if any changes are noted, particularly during construction activities where excavations often reveal subsurface conditions.

In addition, advancements in professional practice regarding contaminated land and changes in applicable statues and/or guidelines may affect the validity of this report. Consequently, the currency of conclusions and recommendations in this report should be verified if you propose to use this report more than 6 months after its date of issue.

The report does not include the evaluation or assessment of potential geotechnical engineering constraints of the site.

## Interpretation of factual data

Environmental site assessments identify actual conditions only at those points where samples are taken and on the date collected. Data derived from indirect field measurements, and sometimes other reports on the site, are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions.

Variations in soil and groundwater conditions may occur between test or sample locations and actual conditions may differ from those inferred to exist. No environmental assessment program, no matter how comprehensive, can reveal all subsurface details and anomalies. Similarly, no professional, no matter how well qualified, can reveal what is hidden by earth, rock or changed through time.

The actual interface between different materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions.

For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of a suitably qualified and experienced environmental consultant through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other unrecognised features encountered on site. Tetra Tech Coffey would be pleased to assist with any investigation or advice in such circumstances.

## Recommendations in this report

This report assumes, in accordance with industry practice, that the site conditions recognised through discrete sampling are representative of actual conditions throughout the investigation area. Recommendations are based on the resulting interpretation.

Should further data be obtained that differs from the data on which the report recommendations are based (such as through excavation or other additional assessment), then the recommendations would need to be reviewed and may need to be revised.

## Report for benefit of client

Unless otherwise agreed between us, the report has been prepared for your benefit and no other party. Other parties should not rely upon the report or the accuracy or completeness of any recommendation and should make their own enquiries and obtain independent advice in relation to such matters.

Tetra Tech Coffey assumes no responsibility and will not be liable to any other person or organisation for, or in relation to, any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report.

To avoid misuse of the information presented in your report, we recommend that Tetra Tech Coffey be consulted before the report is provided to another party who may not be familiar with the background and the purpose of the report. In particular, an environmental disclosure report for a property vendor may not be suitable for satisfying the needs of that property’s purchaser. This report should not be applied for any purpose other than that stated in the report.

## Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, a suitably qualified and experienced environmental consultant should be retained to explain the implications of the report to other professionals referring to the report and then review plans and specifications produced to see how other professionals have incorporated the report findings.

Given Tetra Tech Coffey prepared the report and has familiarity with the site, Tetra Tech Coffey is well placed to provide such assistance. If another party is engaged to interpret the recommendations of the report, there is a risk that the contents of the report may be misinterpreted and Tetra Tech Coffey disowns any responsibility for such misinterpretation.

## Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists or engineers based on their interpretation of field logs, field testing and laboratory evaluation of samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

This report should be reproduced in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

## Responsibility

Environmental reporting relies on interpretation of factual information using professional judgement and opinion and has a level of uncertainty attached to it, which is much less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. As noted earlier, the recommendations and findings set out in this report should only be regarded as interpretive and should not be taken as accurate and complete information about all environmental media at all depths and locations across the site.

# Appendix G. Air Quality Impact Assessment

# Marinus Link – Tasmania Component: Air Quality Impact Assessment

Prepared for:

## Tetra Tech Coffey Pty Ltd

## November 2024

## FINAL


Prepared by:

**Katestone Environmental Pty Ltd**
ABN 92 097 270 276
Level 4, 154 Melbourne Street, South Brisbane
Queensland, 4101, Australia

**www.katestone.global**
admin@katestone.com.au
Ph +61 7 3369 3699

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| **Prepared by:** | PM |
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# Contents

## Tables



## Figures

# Glossary

| Term | Definition |
|---|---|
| µg | micrograms |
| µg/m$^3$ | micrograms per cubic metre |
| °C | degrees Celsius |
| ha | hectare |
| km | kilometre |
| kV | kilovolt |
| m | metre |
| m/s | metres per second |
| m$^2$ | square metres |
| m$^3$ | cubic metres |
| mm | millimetres |
| MW | Megawatt |
| t | tonne |
| **Nomenclature** | **Definition** |
| $PM_{10}$ | particulate matter with a diameter less than 10 micrometres |
| $PM_{2.5}$ | particulate matter with a diameter less than 2.5 micrometres |
| TSP | Total suspended particulates |
| **Abbreviations** | **Definition** |
| Acid sulfate soils | ASS |
| AHD | Australian Height Datum |
| Air NEPM | *National Environment Protection (Ambient Air Quality) Measure* |
| Air Quality EPP | *Environment Protection Policy (Air Quality) 2004* |
| AQA | Air quality assessment |
| AWS | Automatic weather station |
| BoM | Bureau of Meteorology |
| CDMP | Construction Dust Management Plan |
| EIS | Environmental Impact Statement |
| EPA Tasmania | Environment Protection Authority Tasmania |
| EPBC | *Environment Protection and Biodiversity Conservation Act 1999* |
| EMPC Act | *Environmental Management and Pollution Control Act 1994* |
| HDV | Heavy Duty Vehicle |
| HDD | Horizontal direction drilling |
| HVAC | High voltage alternating current |
| HVDC | High voltage direct current |
| IAQM | Institute of Air Quality Management (UK) |
| LUPA Act | *Land Use Planning and Approvals Act 1993* |
| NEM | National Electricity Market |
| NEPC | National Environment Protection Council |
| NPI | National Pollutant Inventory database |

# EXECUTIVE SUMMARY


Katestone Environmental Pty Ltd (Katestone) was commissioned by Tetra Tech Coffey Pty Ltd (Tetra Tech Coffey) to complete an air quality assessment (AQA) of the Tasmania component of the Marinus Link project (the project).

The project is a proposed 1500 megawatt (MW) high voltage direct current (HVDC) electricity interconnector between Heybridge in northwest Tasmania and the Latrobe Valley in Victoria. The project would provide a second link between the Tasmanian renewable energy resources and the Victorian electricity grids enabling efficient energy trade, transmission and distribution from a diverse range of generation sources to where it is most needed and will increase energy capacity and security across the National Electricity Market (NEM).

Once operational, the operation and maintenance activities associated with the project will not generate significant emissions to air. Decommissioning air quality impacts will be assessed prior to decommissioning in accordance with the regulations at the time and in agreement with landowners or land managers and Environment Protection Authority Tasmania (EPA Tasmania). Therefore, detailed assessment of impacts during operation and decommissioning has not been carried out.

The assessment has focused on the potential impacts of dust emissions during construction, including the dismantling of existing lines. A risk assessment approach has been used, based on the method detailed by the United Kingdom's Institute of Air Quality Management (IAQM).

The assessment has shown that, without mitigation, the preliminary risk of impacts (in terms of both health effects and nuisance) at nearby sensitive receptors associated with the construction of the proposed Heybridge converter station is low. Even with a low risk of impacts, dust mitigation measures should be applied during construction to minimise emissions and the potential for impact. With the implementation of standard mitigation measures the residual risk reduces to negligible.

Based on these findings it is concluded that the project will pose minimal risk for human health and, therefore, a quantitative assessment using dispersion modelling is not required to verify National Environment Protection (Ambient Air Quality) Measure (NEPM) compliance for $PM_{10}$, $PM_{2.5}$ and combustion gases.

The outcomes of the risk assessment have provided the basis for the application of the following Environmental Performance Requirements (EPR) for the project.

- EPR AQ01: Develop and implement a construction dust management plan.
- EPR AQ02: Develop and implement measures to manage emissions to air during operations.

Key mitigation measures presented should be incorporated in order to ensure that construction activities comply with the environmental performance requirements (EPRs).

# 1. INTRODUCTION

The proposed Marinus Link (the project) comprises a high voltage direct current (HVDC) electricity interconnector between Tasmania and Victoria, to allow for the continued trading and distribution of electricity within the National Electricity Market (NEM).

The project was referred to the Australian Minister for the Environment 5 October 2021. On 4 November 2021, a delegate of the Minister for the Environment determined that the proposed action is a controlled action as it has the potential to have a significant impact on the environment and requires assessment and approval under the Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) (EPBC Act) before it can proceed. The delegate determined that the appropriate level of assessment under the EPBC Act is an environmental impact statement (EIS).

In July 2022 a delegate of the Director of the Environment Protection Authority Tasmania determined that the project be subject to environmental impact assessment by the Board of the Environment Protection Authority (the Board) under the Environmental Management and Pollution Control Act 1994 (Tas) (EMPCA).

On 12 December 2021, the former Victorian Minister for Planning under the Environment Effects Act 1978 (Vic) (EE Act) determined that the project requires an environment effects statement (EES) under the EE Act, to describe the project's effects on the environment to inform statutory decision making.

As the project is proposed to be located within three jurisdictions, the Tasmanian Environment Protection Authority (Tasmanian EPA), Victorian Department of Transport and Planning (DTP), and Australian Department of Climate Change, Energy, Environment and Water (DCCEEW) have agreed to coordinate the administration and documentation of the three assessment processes. Two EISs are being prepared to address the Tasmanian EPA requirements for the Heybridge converter station and shore crossing. A separate EIS/EES is being prepared to address the requirements of DTP and DCCEEW.

This report has been prepared by Katestone Environmental Pty Ltd (Katestone) for the Tasmanian jurisdiction as part of the two EISs being prepared for the project.

## 1.1 Purpose of this report

Katestone was commissioned by Tetra Tech Coffey Pty Ltd (Tetra Tech Coffey) to conduct an air quality assessment (AQA) for the project. The AQA of the project has been separated into two reports to address the individual state components and legislative requirements.

The project's AQA comprise of the following components:

- Marinus Link Victorian component; and
- Marinus Link Tasmania component (the subject of this AQA).

The objectives of the AQA of the Tasmania component of the project are to:

- Compile an inventory of the material and vehicle movement associated with earthworks, construction and trackout expected to be generated from construction at Heybridge
- Determine the sensitivity of the environment surrounding the area of disturbance associated with construction
- Calculate and overall risk of the project based on the dust emissions magnitude and the sensitivity of the surrounding area
- Propose strategies manage and reduce the initial dust risk associated with construction of the project.

## 1.2 Project overview

The project is a proposed 1500 megawatt (MW) HVDC electricity interconnector between Heybridge in North West Tasmania and the Latrobe Valley in Victoria (Figure 1). The project is proposed to provide a second link between the Tasmanian renewable energy resources and the Victorian electricity grids enabling efficient energy trade, transmission and distribution from a diverse range of generation sources to where it is most needed, and will increase energy capacity and security across the NEM.

Marinus Link Pty Ltd (MLPL) is the proponent for the project and is a wholly owned subsidiary of Tasmanian Networks Pty Ltd (TasNetworks). TasNetworks is owned by the State of Tasmania and owns, operates and maintains the electricity transmission and distribution network in Tasmania.

Tasmania has significant renewable energy resource potential, particularly hydroelectric power and wind energy. The potential size of the resource exceeds both the Tasmanian demand and the capacity of the existing Basslink interconnector between Tasmania and Victoria. The growth in renewable energy generation in mainland states and territories participating in the NEM, coupled with the retiring of baseload coal-fired generators, is reducing the availability of dispatchable generation that is available on demand.

Tasmania's existing and potential renewable resources are a valuable source of dispatchable generation that could benefit electricity supply in the NEM. The project will allow for the continued trading, transmission and distribution of electricity within the NEM. It will also manage the risk to Tasmania of a single interconnector across Bass Strait and complement existing and future interconnectors on mainland Australia. The project is expected to facilitate the reduction in greenhouse gas emissions at a state and national level.

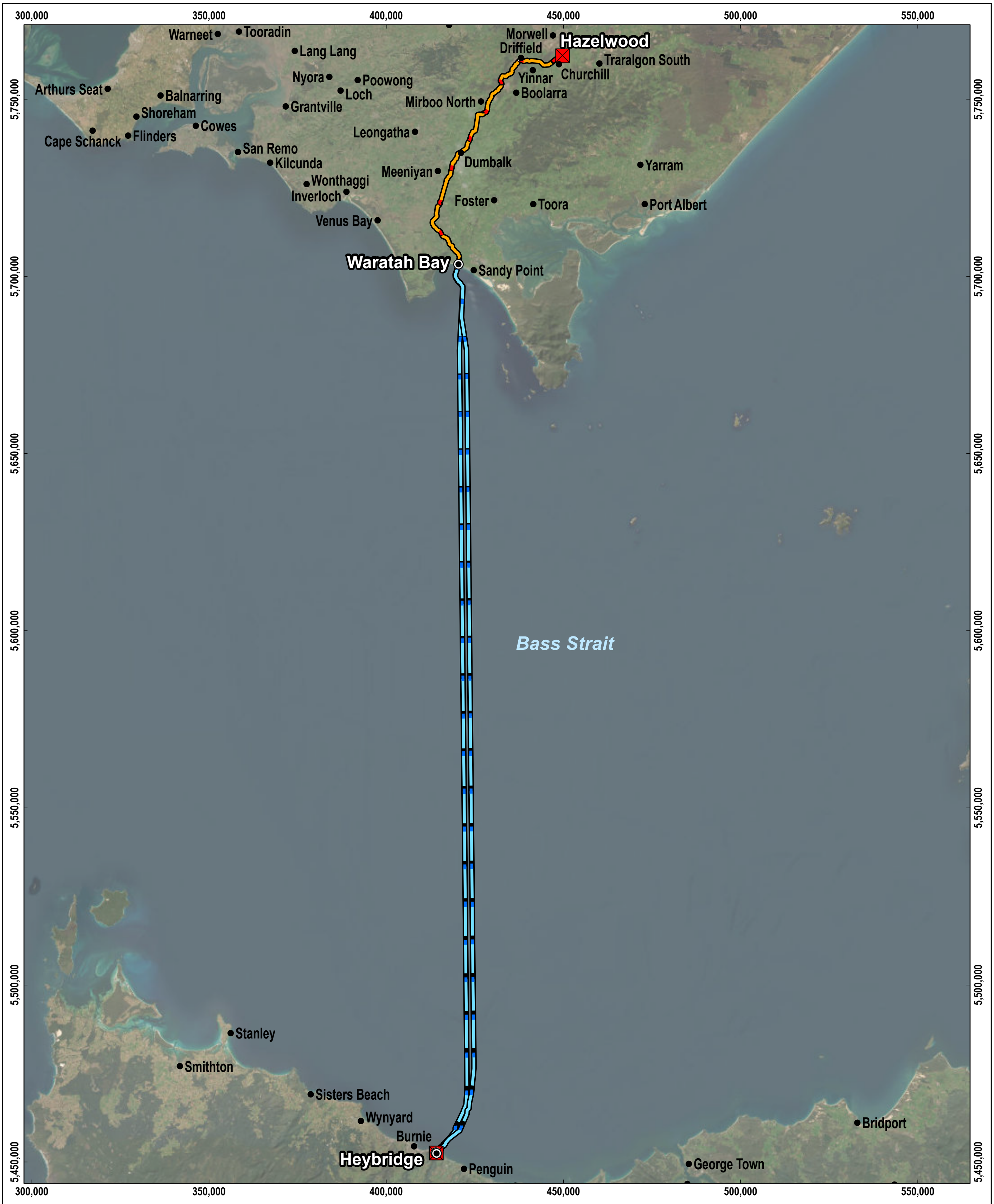
Interconnectors are a key feature of the future energy landscape. They allow power to flow between different regions to enable the efficient transfer of electricity from renewable energy zones to where the electricity is needed. Interconnectors can increase the resilience of the NEM and make energy more secure, affordable and sustainable for customers. Interconnectors are common around the world including in Australia. They play a critical role in supporting Australia's transition to a clean energy future.

## 1.3 Assessment context

Once operational, the operation and maintenance activities associated with the project will not generate significant emissions to air. During the construction phase of the project there will be potential for emissions to be released into the air. Diligent management will be important to ensure emissions are minimised. Thus, the focus of this report is upon the potential for emissions during the construction phase, presenting a construction dust risk assessment of the project. The potential for emissions during decommissioning has also been considered.

The report is structured as follows:

- Assessed guidelines are summarised in Section 2
- Legislative requirements are summarised in Section 3
- The project is described in Section 4
- Considerations for assessing air quality are detailed in Section 5
- The risk assessment methodology is described in Section 6
- Potential cumulative effects are discussed in Section 6.3
- The existing environment is characterised in Section 7
- Outcomes of the risk assessment, including preliminary risk, mitigation measures, and residual risk are detailed in Section 8
- Conclusions are specified in Section 8.4.




## LEGEND

- Landfall
- Converter station
- HVDC subsea cable
- Underground HVDC cable
- Cable option not progressing

MARINUS LINK

SCALE 1:1,500,000
PAGE SIZE: A4
PROJECTION: GDA2020 MGA Zone 55

0 15 30 km

N

SOURCE
Proposed route from Tetra Tech Coffey.
Imagery from ESRI Online.

MARINUS LINK PTY LTD

MARINUS LINK
EIS/EES

**FIGURE 1**

**Project Overview**

TETRA TECH COFFEY

DATE: 08.05.24 PROJECT: 754-MELEN215878ML FILE: 215878ML_R06_F01-01_GIS

SAVED BY: GEORGE.YOUNG 01.05.24 1:53 PM

DOC REFERENCE: \\TT.LOCAL\COF\S772\GIS\215878_MELEN_TASNETWORKS_PROJECTMARINUS\GIS\MXD_APRX\215878ML_R06_EIS_FINAL\215878ML_R06_VOLUME1_FIGS1_20.APRX LAYOUT:215878ML_R06_F01-01_GIS_1

# 2. ASSESSMENT GUIDELINES

This section outlines the assessment guidelines relevant to AQA and the linkages to other technical studies completed for the project. Two separate EISs are being prepared to address the EIS guidelines published by EPA Tasmania for the Heybridge converter station and shore crossing.

## 2.1 Tasmania

EPA Tasmania has published two sets of guidelines (September 2022) for the preparation of an EIS for the Marinus Link converter station and shore crossing. A separate set of guidelines have been prepared for each of these project components:

- *Environmental Impact Statement Guidelines Marinus Link Pty Ltd Converter Station for Marinus Link, September 2022,* Environment Protection Authority Tasmania (Tas converter station EIS guidelines)
- *Environmental Impact Statement Guidelines Marinus Link Pty Ltd Shore Crossing for Marinus Link, September 2022,* Environment Protection Authority Tasmania (Tas shore crossing EIS guidelines)

The sections relevant to the AQA assessment are outlined in Table 1.

**Table 1 Assessment guidelines**

| Guideline section | Assessment requirement | Relevant report section |
|---|---|---|
| **Tasmania** | | |
| EIS Guidelines<br><br>Heybridge shore crossing for Marinus Link<br>Section 6.7*<br><br>Converter Station for Marinus Link<br>Section 6.5* | Discuss potential impacts of the proposal on local air quality, particularly during construction, and provide evidence that the activity would not cause environmental nuisance or harm, including the following:<br>• Identify, describe and show on a site map all sensitive receptors that could potentially be affected by dust and particulate matter emissions.<br>• Identify and map all possible sources of air emissions including dust and particulate matter from the site, particularly that associated with the proposed construction. This includes emissions generated from:<br>  ○ Upgrading or building of roads;<br>  ○ On-site and off-site vehicle and vessel movements<br>  ○ Use of generators;<br>  ○ Site ground preparation, vegetation clearance, trenching, or general disturbance;<br>  ○ Infrastructure construction (e.g., HDD pad construction);<br>  ○ HDD of shore crossing cables from the Heybridge launch pad.<br>• Provide the details of equipment used on the site.<br>• Discuss potential impact of fugitive dust and particulate matter emissions from the proposed activity on the environment and the likelihood for the activity to cause environmental nuisance or harm. The discussion should consider: | Section 4<br>Section 5<br>Section 6<br>Section 8<br>Section 9 |

| Guideline section | Assessment requirement | Relevant report section |
|---|---|---|
| | ○ Land uses in the vicinity of the activity;<br>○ Terrain and local climatic conditions, especially the direction and strength of prevailing winds and rainfall;<br>○ Special consideration of the environmental impact of the activity during adverse meteorological conditions;<br>○ The potential for cumulative impact with the proposed converter station.<br>• Provide information about proposed management measures to be implemented to avoid or mitigate potential impact of emissions to air during various phases of the project including construction, commissioning, and operation, especially during adverse meteorological conditions. This may include but not be limited to watering or sealing of roads, covering of truck loads, reduced vehicle speed, road surfacing or maintenance details, enclosures, water sprays, windbreaks, and revegetation or stabilisation. Evidence of application of accepted modern technology for reduction of unavoidable emissions to the greatest extent practicable should be provided.<br><br>Legislative and policy requirements - *Environment Protection Policy (Air Quality) 2004* (Air EPP) Tasmania, specifically:<br>• Part 3 Environmental Values Clause 6<br>• Part 4 Managing point sources of air pollution Clause 9<br>• Part 5 Managing diffuse sources of air pollution Clause 16 | |

* The requirements are the same for the Heybridge shore crossing and Converter Station guidelines

## 2.2 Linkages to other reports

This report is informed by or informs the technical studies outlined in Table 2.

**Table 2 Relevant technical studies linkages**

| Technical studies | Relevance to this assessment |
|---|---|
| Climate change | Data from this report have informed the existing environment, meteorological and climate sections of this report. |
| Terrestrial ecology | The locations where state significant fauna have been recorded, inform the risk assessment of ecological receptors. |
| Contaminated land and acid sulfate soils | Data from this has informed the section regarding the management of odour in the AQA. |

# 3. REGULATORY FRAMEWORK AND POLICY CONTEXT

## 3.1 Legislation

The following legislation is relevant to air quality in Tasmania:

- *National Environment Protection (Ambient Air Quality) Measure* (National Environment Protection Council (NEPC), 2021) (Air NEPM)
- *Environment Protection Policy (Air Quality) 2004* (Air EPP)
- *EPA Board Statement – Update to Air Pollutant Design Criteria used in the Environmental Impact Assessment Process (January 2022)*
- *Director Determination – Design Criteria for Supplementary Air Pollutants (January 2022)*.

The National Environment Protection Council (NEPC) defines national ambient air quality standards and goals in consultation, and with agreement from all Australian state and territory governments. These were first published in 1998, in the Air NEPM. The Air NEPM sets national standards for the six key air pollutants to which most Australians are exposed: carbon monoxide, ozone, sulfur dioxide, nitrogen dioxide, lead, and particulates ($PM_{10}$ and $PM_{2.5}$). The Air NEPM air quality standards are health-based.

The Air Quality EPP defines environmental values to be protected, air quality standards and management requirements for sources of air contaminants. The Air Quality EPP adopts the Air NEPM standards for ambient air quality. In January 2022, the Air Quality EPP Design Criteria, Schedule 2 were updated and Design Criteria for supplementary air pollutants were listed. Where pollutant concentrations are below the designated standards, the environmental risk can be considered acceptable.

There are no assessment criteria provided for the protection of amenity impacts due to deposited dust in the Air NEPM or Air Quality EPP. However, in keeping with Clauses 9 and 16 of the Air Quality EPP, point and diffuse sources of air pollution, that have the potential to cause material or serious environmental harm or an environmental nuisance, should be managed in such a manner as not to prejudice the achievement of the environmental values in the Air Quality EPP.

The Air NEPM standards and Air Quality EPP design criteria for particulate matter are shown in Table 3.

**Table 3 NEPM air quality standards and Air Quality EPP design criteria**

| Pollutant | Averaging period | Value |
|---|---|---|
| $PM_{10}$ | 24-hour average | 50 µg/m³ |
| | Annual | 25 µg/m³ |
| $PM_{2.5}$ | 24-hour average | 25 µg/m³ |
| | Annual | 8 µg/m³ |

# 4. PROJECT DESCRIPTION

## 4.1 Overview

The project is proposed to be implemented as two 750 MW circuits to meet transmission network operation requirements in Tasmania and Victoria. Each 750 MW circuit will comprise two power cables and a fibre-optic communications cable bundled together in Bass Strait and laid in a horizontal arrangement on land. The two 750MW circuits will be installed in two stages with the western circuit being laid first as part of stage one, and the easter cable in stage two.

The key project components for each 750 MW circuit are, from south to north are:

- HVAC switching station and HVAC-HVDC converter station at Heybridge in Tasmania. This is where the project will connect to the North West Tasmania transmission network being augmented and upgraded by the North West Transmission Developments (NWTD).
- Shore crossing in Tasmania adjacent to the converter station
- Subsea cable across Bass Strait from Heybridge in Tasmania to Waratah Bay in Victoria.

In Tasmania, a converter station is proposed to be located at Heybridge near Burnie. The converter station would facilitate the connection of the project to the Tasmanian transmission network. There will be two subsea cable landfalls at Heybridge with the cables extending from the converter station across Bass Strait to Waratah Bay in Victoria. The preferred option for shore crossings is horizontal directional drilling (HDD) to about 10 m water depth where the cables would then be trenched, where geotechnical conditions permit.

Approximately 255 kilometres (km) of subsea HVDC cable would be laid across Bass Strait. The preferred technology for the project is two 750 megawatt (MW) symmetrical monopoles using ±320 kV, cross-linked polyethylene insulated cables and voltage source converter technology. Each symmetrical monopole is proposed to comprise two identical size power cables and a fibre-optic communications cable bundled together. The cable bundles for each circuit will transition from approximately 300m apart at the HDD (offshore) exit to 2km apart in offshore waters.

This assessment is focused on the Tasmanian terrestrial and shore crossing section of the project. This report will inform the two EISs being prepared to assess the project's potential environmental effects in accordance with the legislative requirements of the Tasmanian governments (Figure 2).

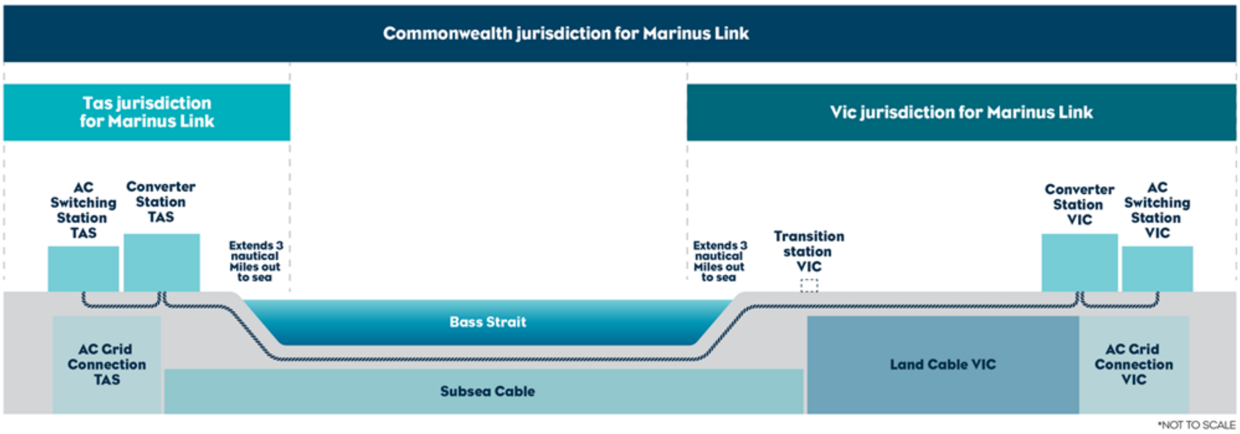



**Figure 2 Project components considered under applicable jurisdictions (Marinus Link Pty Ltd 2022, Consultation Plan).**

The project is proposed to be constructed in two stages over approximately five years following the award of works contracts to construct the project. On this basis, stage 1 of the project is expected to be operational by 2030, with Stage 2 to follow, with final timing to be determined by market demand. The project will be designed for an operational life of at least 40 years.

The construction of the Heybridge converter, switching station and shore crossing are the only components of the project within Tasmania. The site layout, consisting of the Heybridge converter and switching station, is provided in Figure 3. The construction activities associated with the Heybridge site will occur within the site boundary.

The key activities relevant to the impact assessment for the Tasmanian component include:

- Vegetation and topsoil or subsoil clearing and stockpiling (with associated wind erosion)
- Construction and upgrading of roads and access tracks and other temporary infrastructure
- Excavation and levelling, where required
- Construction of the switching and converter station
- Vegetation clearing for the shore crossing adjacent to the Heybridge converter station.

After construction and commissioning, temporary workplaces may be rehabilitated and revegetated depending on the wishes of landowners and the pre-construction level of vegetation.

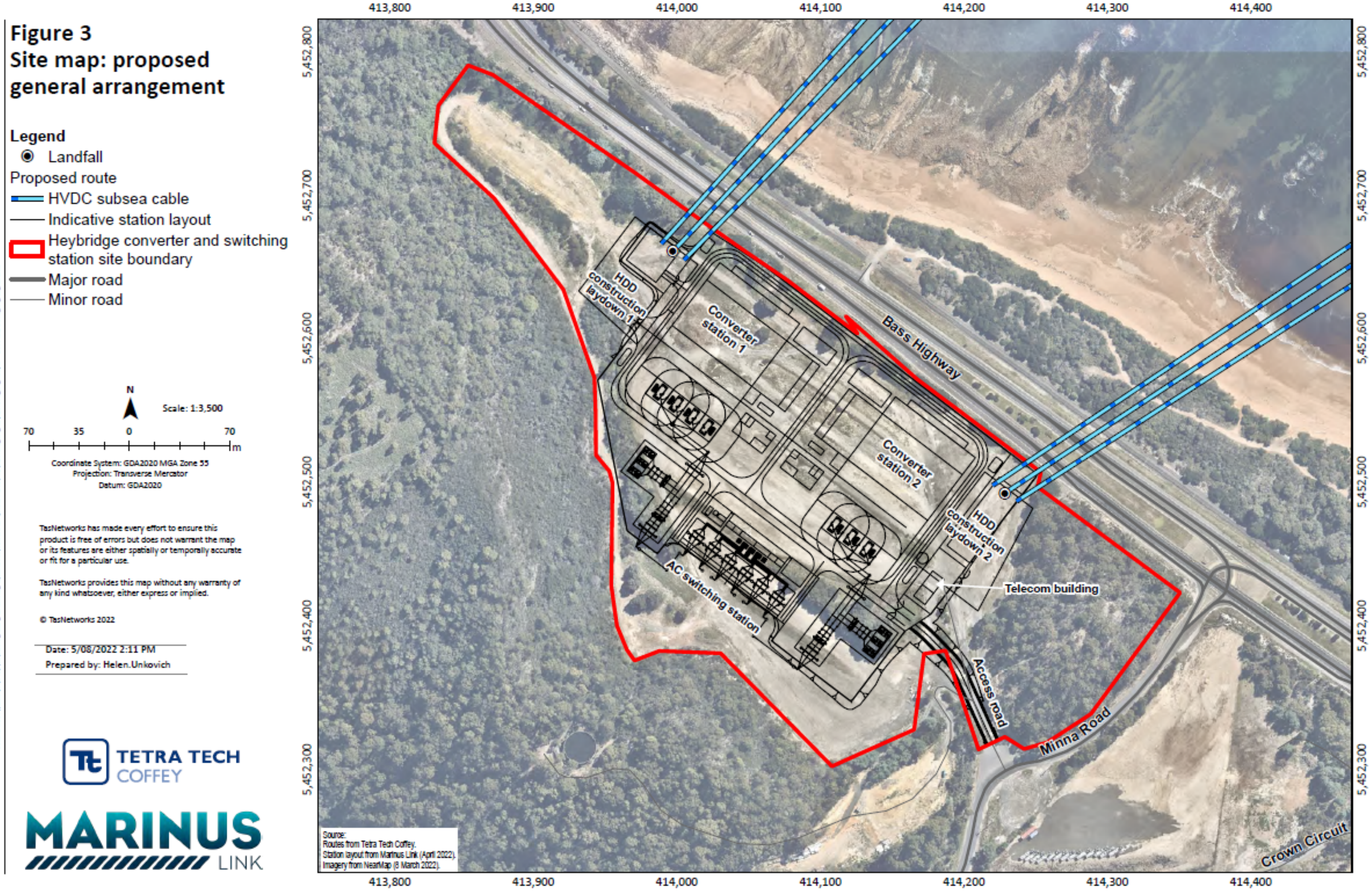



**Figure 3** **Heybridge site layout**

## 4.2 Construction

### 4.2.1 Process

Construction activities for the shore crossing will be continuous over 24 hours / 7 days a week to ensure borehole stability. Three bore holes will be drilled from each pad by HDD and only one can be completed at a time.

Work associated with access tracks, easement clearing, and earthworks associated with the trenching for the cable trench are likely to be the most significant in terms of emissions of dust to air. Subsequent stages, including construction of the proposed converter station at Heybridge are likely to involve predominantly non-dusty materials such as pre-mixed concrete and steel. Rehabilitation works may result in emissions of dust also, as this typically involves tasks such as the redistribution of stockpiled material and dozing.

Key activities during the construction phase that will generate emissions to air include:

- Land clearing for the construction work associated with the converter station
- HDD associated with the Heybridge shore crossing
- Earthworks and surface preparation required for the construction and upgrading of the access road to the Heybridge site.

The project will source construction material from international and local manufacturers.

After construction and commissioning, temporary workplaces may be rehabilitated and revegetated depending on the wishes of landowners and the pre-construction level of vegetation.

### 4.2.2 Construction equipment

Potential equipment required for construction activities are listed in Table 4.

**Table 4 List of potential equipment required for construction**

| Construction activity | Equipment |
|---|---|
| HDD pads | Drilling rig |
| Converter station and trenching | Medium and heavy rigid trucks |
| | Agitator trucks |
| | Light vehicles |
| Converter station | Wheeled and tracked excavators |
| | Piling rig |
| | Elevated work platforms |
| | Spider crane |
| | 1500 kVA diesel generators |

## 4.3 Operations

Operation and maintenance activities include:

- Occasional operation of two 1500 kVA backup diesel generators with above ground fuel storage of 5000 L.
- Routine inspections of the Heybridge converter station's equipment and infrastructure including scheduled minor and major outages for repairs and servicing, via light vehicles.
- Maintenance of access tracks using light vehicles.

## 4.4 Decommissioning

The operational lifespan of the project is a minimum 40 years. At this time the project will be either decommissioned or upgraded to extend its operational lifespan.

Decommissioning will be planned and carried out in accordance with regulatory requirements at the time. A decommissioning plan in accordance with approvals conditions will be prepared prior to planned end of service and decommissioning of the project.

Requirements at the time will determine the scope of decommissioning activities and impacts. The key objective of decommissioning is to leave a safe, stable and non-polluting environment.

In the event that the project is decommissioned, all above-ground infrastructure will be removed, the site rehabilitated.

Decommissioning activities required to meet the objective will include, as a minimum, removal of above ground buildings and structures. Remediation of any contamination and reinstatement and rehabilitation of the site will be undertaken to provide a self-supporting landform suitable for the end land use.

Decommissioning and demolition of project infrastructure will implement the waste management hierarchy principles being avoid, minimise, reuse, recycle and appropriately dispose. Waste management will accord with applicable legislation at the time.

Decommissioning activities may include recovery of land and subsea cables. The conduits and shore crossing ducts would be left in-situ as removal would cause significant environmental impact. Subsea cables be recovered by water jetting or removal of rock mattresses or armouring to free the cables from the seabed.

A decommissioning plan will be prepared to outline how activities would be undertaken and potential impacts managed.

# 5. CONSIDERATIONS FOR ASSESSING AIR QUALITY

## 5.1 Key air emissions

Construction activities with the potential for the generation of dust emissions include:

- Land clearing of the operational area for construction of the proposed converter station and switching station at Heybridge
- Excavation and stockpiling of topsoil associated with development of the converter station and switching station at Heybridge
- Earthmoving and surface preparation required for the construction and upgrading of roads and access tracks.

Dust emissions will occur due to the earthmoving activities involved in preparing these areas, including:

- Materials handling associated with excavation and dozing
- Wheel generated dust from material transport
- Wind erosion from stockpiled material and exposed ground.

The operation of the project will not result in significant emissions to air. The potential impacts of dust emissions during decommissioning will be assessed prior to decommissioning but are likely to be smaller in scale than construction. Therefore, emissions due to operations and decommissioning have not been assessed further. The key issue relating to air quality is emissions of dust due to construction activities.

In addition to the key pollutant of dust from the construction activities, the operation of vehicles, machinery, and stationary engines as part of the construction works will result in emissions of carbon monoxide, nitrogen oxides, hydrocarbons, volatile organic compounds and sulfur dioxide. The potential impacts associated with these combustion-generated pollutants are addressed in accordance with the IAQM guidance in section 6.1.

## 5.2 Odour

Odour may arise if the topsoil and subsoil removed during the construction phase of the project is contaminated. However, odour from contaminated soil is generally temporary in nature and dissipates after a few days. The Contaminated Land and Acid Sulfate Soils Impact Assessment (Tetra Tech Coffey, 2024) identifies potential sources of odour at the Heybridge site, and recommends that odours arising from contaminated soils and acid sulfate soils (ASS) can be managed through standard ASS management measures (e.g. neutralisation, odour suppressant application). Mitigation measures specific to odour are detailed in section 8.4. The assessment of impacts from the potential sources of odour are detailed in the Contaminated Land and Acid Sulfate Soils Impact Assessment (Tetra Tech Coffey, 2024). Therefore, odour has not been assessed further at this stage as part of the Heybridge Air Quality Impact Assessment.

## 5.3 Impacts of dust

The key potential emissions to air from the construction activities will be in the form of dust or particulate matter. Particulate matter is sub-divided into a number of metrics based on particle size. These metrics are total suspended particulates (TSP), $PM_{10}$, $PM_{2.5}$ and dust deposition rate:

- TSP refers to the total of all particles suspended in the air and is used as a metric of the potential for particulate matter to affect amenity

- $PM_{10}$ is a subset of TSP and refers to particles suspended in the air with an aerodynamic diameter less than 10 µm
- $PM_{2.5}$ is a subset of TSP and $PM_{10}$ and refers to particles suspended in the air with an aerodynamic diameter less than 2.5 µm
- Dust deposition refers to any dust that falls out of suspension in the atmosphere.

As described above, $PM_{10}$ and $PM_{2.5}$ are both potential components of TSP, but the relative proportion of each within TSP is dependent on the nature of the dust source (e.g., handling of fine powders compared with handling of dry topsoil during earthworks).

Elevated concentrations of dust have the potential to cause adverse impacts on the amenity and health of people. Dust can affect communities in various ways, depending upon the source and size of particles present. Dust typically emitted as a result of construction activities is assessed in terms of dust deposition, total suspended particulates (TSP) and $PM_{10}$.

Dust from construction activities consists primarily of larger particles generated through the handling of rock and soil, as well as through wind erosion of stockpiles and exposed ground. Larger particles (measured as dust deposition) are mostly associated with dust nuisance or amenity impacts in residential areas, through settling or deposition of the particles. Elevated dust deposition rates can reduce public amenity, through soiling of clothes (drying on clothes lines), vehicles, buildings, and other surfaces.

Smaller particles such as $PM_{10}$ can also be generated by the same construction activities. Elevated levels of $PM_{10}$ have the potential to affect human health as these particles can be trapped in the nose, mouth, throat, or be drawn into the lungs.

Very fine particles such as $PM_{2.5}$ are mostly generated through combustion processes, and so will be emitted by the vehicle fleet and other construction equipment. Combustion of fuel in the vehicle fleet will also produce oxides of nitrogen, oxides of sulfur and carbon monoxide.

Some ecological habitats may also be sensitive to dust. This may be due to sensitivity to the direct impacts of dust deposition to aquatic ecosystems or on vegetation (by reducing photosynthesis or other processes), or indirect impacts on fauna. The timeframe over which construction activities occur, and the frequency of rainfall events are relevant to assess the risk posed to ecological receptors by construction activities.

The potential key air quality risks associated with the construction phase of the project are:

- Reduced public amenity due to dust soiling
- Health impacts due to elevated levels of $PM_{10}$ and $PM_{2.5}$
- Harm to ecological receptors.

These risks are generally avoidable through the implementation of diligent dust management and controls.

# 6. ASSESSMENT METHOD

The potential impacts of dust emissions, during construction of the project, have been addressed using a risk-based methodology. This is appropriate due to the temporary nature of the proposed construction activities, and well-established mitigation measures that can be applied to minimise potential dust emissions. The Institute of Air Quality Management (IAQM) has published a risk assessment methodology, titled 'Guidance on the assessment of dust from demolition and construction' (Holman et al, 2016) (IAQM Methodology). Whilst it was drafted with the intention of application in the United Kingdom, the IAQM methodology is applicable and widely used in Australia. This IAQM methodology has been adopted to assess construction dust impacts and to inform the implementation of appropriate dust management measures.

The IAQM methodology considers the potential for impacts within 350 m of the boundary of construction works, or within 50 m of roads used by construction vehicles within 500 m of the site. The methodology follows a sequence of steps detailed in Section 6.1.

The construction dust risk assessment approach does not require a focus on individual specific receptors to be identified; instead, the numbers of different types of receptors within given distance bands of the construction works are counted.

The IAQM methodology explains that *"experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed"*. Those cases where quantitative assessment is required tend to be major construction projects in dense urban areas, such as large cities. Review of the IAQM and Katestone's professional judgement is that there is no risk of significant air quality impacts as a result of emissions from site machinery or traffic accessing the construction sites, thus these emissions are not considered further. Standard practice mitigation measures to reduce emissions from vehicles and machinery are, however, included in the site-specific mitigation recommended in section 8.1.3.

The potential for air quality impacts due to construction associated with the converter station and switching station at Heybridge within Tasmania has been assessed using the IAQM methodology, detailed below.

## 6.1 Detailed method

The risk assessment framework developed by the IAQM determines the level of risk based on the sensitivity of the area (i.e., the presence of sensitive receptors and the air quality in the area with respect to the air quality criteria) combined with the magnitude of change (i.e., the increase in predicated concentrations or deposition rates as a result of project activities).

Construction activities have been divided into four types by the IAQM to reflect their different potential impacts. These are:

- Demolition – any activities involved in the removal of an existing structure
- Earthworks – covers the processes of soil-stripping, ground levelling, excavation and landscaping
- Construction – any activities involving the provision of a new structure, its modification or refurbishment
- Trackout – the transport of dust and dirt from the construction site onto the public road network where it may be deposited and then re-suspended by vehicles using the road network.

The assessment method considers three separate dust impacts, which are considered to be the key impacts of construction activities:

- Annoyance due to dust soiling

- The risk of health effect due to an increase in exposure to $PM_{10}$
- Harm to ecological receptors.

The assessment is used to define appropriate mitigation measures to ensure that there will be no significant effect.

The methodology involves the following steps:

**STEP 1** is to screen the requirement for a more detailed assessment (with no further assessment required if there are no receptors within a certain distance of the works).

**STEP 2** is to assess the risk of dust impacts. This is done separately for each of the four activities (demolition; earthworks; construction; and trackout) and takes account of the following factors:

- **STEP 2A**: The scale and nature of the works, which determines the potential dust emission magnitude
- **STEP 2B**: The sensitivity of the area
- **STEP 2C**: Combine the factors from STEP 2A and STEP 2B to give the risk of dust impacts.

Risks are described in terms of there being a low, medium or high risk of dust impacts for each of the four separate potential activities. Where there are low, medium or high risks of an impact, then site-specific mitigation will be required, proportionate to the level of risk.

Based on the threshold criteria and professional judgement one or more of the groups of activities may be assigned a 'negligible' risk. Such cases could arise, for example, because the emissions magnitude is small and there are no receptors near the activities.

**STEP 3** is to determine the site-specific mitigation for each of the four potential activities in STEP 2. This will be based on the risk of dust impacts identified in STEP 2. Where a local authority has issued guidance on measures to be adopted at demolition or construction sites, these should also be considered.

**STEP 4** is to examine the residual effects and to determine whether these are significant.

**STEP 5** is to prepare the dust assessment report.

Each of the steps is described in more detail in the following sections:

### 6.1.1 Step 1: Screen the need for a detailed assessment

An assessment will normally be required where there is the following:

- A 'human receptor' within:
  - 350 m of the boundary of the site; or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).
- An 'ecological receptor' within:
  - 50 m of the boundary of the site; or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

### 6.1.2 Step 2: Assess the risk of dust impacts

#### 6.1.2.1 *Step 2A – Define the potential dust emission magnitude*

The dust emission magnitude is based on the scale of the anticipated works as defined in Table 5.

**Table 5 Magnitude of emissions by activity relevant to the project (IAQM, 2014)**

| Magnitude of emissions | Description |
|---|---|
| ***Demolition*** | |
| Large | Total building volume >50,000 m$^3$, potentially dusty construction material (e.g., concrete), on-site crushing and screening, demolition activities >20 m above ground level |
| Medium | Total building volume 20,000 m$^3$ – 50,000 m$^3$, potentially dusty construction material, demolition activities 10-20 m above ground level |
| Small | Total building volume <20,000 m$^3$, construction material with low potential for dust release (e.g., metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months |
| ***Earthworks*** | |
| Large | Total site area >10,000 m$^2$, potentially dusty soil type (e.g., clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes (t) |
| Medium | Total site area 2,500 m$^2$ – 10,000 m$^2$, moderately dusty soil type (e.g., silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 t – 100,000 t |
| Small | Total site area <2,500 m$^2$, soil type with large grain size (e.g., sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 t, earthworks during wetter months |
| ***Construction*** | |
| Large | Total building volume >100, 000 m$^3$, on site concrete batching, sandblasting |
| Medium | Total building volume 25,000 m$^3$ – 100,000 m$^3$, potentially dusty construction material (e.g., concrete), on site concrete batching |
| Small | Total building volume <25,000 m$^3$, construction material with low potential for dust release (e.g., metal cladding or timber). |
| ***Trackout*** | |
| Large | >50 HDV (>3.5 t) outward movements in any one day, potentially dusty surface material (e.g., high clay content), unpaved road length >100 m |
| Medium | 10-50 HDV (>3.5 t) outward movements in any one day, moderately dusty surface material (e.g., high clay content), unpaved road length 50 m – 100 m |
| Small | <10 HDV (>3.5 t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m. |
| Tables notes: HDV = Heavy Duty Vehicle | |

#### 6.1.2.2 *Step 2B – Define the sensitivity of the area*

The sensitivity of the area considers a number of factors:

- The specific sensitivities of receptors in the area (see Table 6)

- The proximity and number of those receptors
- The local background concentration of $PM_{10}$
- Site-specific factors, such as whether there are natural shelters (e.g., trees) to reduce the risk of wind-blown dust.

The sensitivity of receptors to the effects of dust due to soiling, human health and ecological receptors are each considered. Table 6 provides a description of the range of sensitivities for an individual receptor associated with each impact category.

**Table 6 Receptor sensitivity to dust effects (source)**

| Receptor sensitivity | Description |
|---|---|
| ***Dust Soiling Effects on People and Property*** | |
| High | • users can reasonably expect enjoyment of a high level of amenity; or<br>• the appearance, aesthetics or value of their property would be diminished by soiling; and<br>• the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. |
| Medium | • users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or<br>• the appearance, aesthetics or value of their property could be diminished by soiling; or<br>• the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. |
| Low | • the enjoyment of amenity would not reasonably be expected; or<br>• property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or<br>• there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. |
| ***Human health effects of $PM_{10}$*** | |
| High | • locations where members of the public are exposed over a time period relevant to the air quality criteria for $PM_{10}$ (in the case of the 24-hour criteria, a relevant location would be one where individuals may be exposed for eight hours or more in a day). |
| Medium | • locations where the people exposed are workers, and exposure is over a time period relevant to the air quality criteria for $PM_{10}$ (in the case of the 24-hour criteria, a relevant location would be one where individuals may be exposed for eight hours or more in a day). |
| Low | • locations where human exposure is transient. |
| ***Ecological effects*** | |
| High | • locations with an international or national designation and the designated features may be affected by dust soiling; or<br>• locations where there is a community of a particularly dust sensitive species. |
| Medium | • locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or<br>• locations with a national designation where the features may be affected by dust deposition. |
| Low | • locations with a local designation where the features may be affected by dust deposition. |

Table 7, Table 8 and Table 9 show how the sensitivity of the area is determined for dust soiling, human health and ecosystem impacts, respectively. These tables take account of a number of factors that may influence the sensitivity of the area. When using these tables, it should be noted that distances are measured from the dust source, and as such a different area (and therefore, different number of receptors) may be affected by trackout than by on-site works. The highest level of sensitivity from each table should be recorded.

**Table 7 Sensitivity of the area to dust soiling effects on people and property**

| Receptor Sensitivity | Number of Receptors | Distance from the Source (m) | | | |
|---|---|---|---|---|---|
| | | <20 | <50 | <100 | <350 |
| High | >100 | High | High | Medium | Low |
| | 10-100 | High | Medium | Low | Low |
| | 1-10 | Medium | Low | Low | Low |
| Medium | >1 | Medium | Low | Low | Low |
| Low | >1 | Low | Low | Low | Low |

**Table 8 Sensitivity of the area to human health impacts**

| Receptor Sensitivity | Annual Mean $PM_{10}$ concentration ($\mu g/m^3$) * | Number of Receptors | Distance from the Source (m) | | | | |
|---|---|---|---|---|---|---|---|
| | | | <20 | <50 | <100 | <200 | <350 |
| High | >20 | >100 | High | High | High | Medium | Low |
| | | 10-100 | High | High | Medium | Low | Low |
| | | 1-10 | High | Medium | Low | Low | Low |
| | 17.5 - 20 | >100 | High | High | Medium | Low | Low |
| | | 10-100 | High | Medium | Low | Low | Low |
| | | 1-10 | High | Medium | Low | Low | Low |
| | 15 – 17.5 | >100 | High | Medium | Low | Low | Low |
| | | 10-100 | High | Medium | Low | Low | Low |
| | | 1-10 | Medium | Low | Low | Low | Low |
| | <15 | >100 | Medium | Low | Low | Low | Low |
| | | 10-100 | Low | Low | Low | Low | Low |
| | | 1-10 | Low | Low | Low | Low | Low |
| Medium | >20 | >10 | High | Medium | Low | Low | Low |
| | | 1-10 | Medium | Low | Low | Low | Low |
| | 17.5 - 20 | >10 | Medium | Low | Low | Low | Low |
| | | 1-10 | Low | Low | Low | Low | Low |
| | 15 – 17.5 | >10 | Low | Low | Low | Low | Low |
| | | 1-10 | Low | Low | Low | Low | Low |
| | <15 | >10 | Low | Low | Low | Low | Low |
| | | 1-10 | Low | Low | Low | Low | Low |
| Low | - | ≥1 | Low | Low | Low | Low | Low |
| Table note: * IAQM criteria revised to reflect annual $PM_{10}$ criteria relevant in Tasmania | | | | | | | |

**Table 9 Sensitivity of the area to ecological impacts**

| Receptor Sensitivity | Distance from the Source (m) | |
|---|---|---|
| | <20 | <50 |
| **High** | High | Medium |
| **Medium** | Medium | Low |
| **Low** | Low | Low |

### 6.1.2.3 *Step 2C - Define the Risk of Impacts*

The dust emission magnitude determined at STEP 2A (Section 6.1.2.1) is combined with the sensitivity of the area determined at STEP 2B (Section 6.1.2.2) to determine the risk of impacts with no mitigation applied. The matrices in Table 10, Table 11 and Table 12 provide a method of assigning the level of risk for each activity. This is used to determine the level of mitigation that must be applied. Mitigation is discussed in STEP 3 (Section 8.1.3). For those cases where the risk category is 'negligible', no mitigation measures beyond those required by legislation are required.

**Table 10 Risk of dust impacts – earthworks**

| Sensitivity of Area | Dust Emission Magnitude | | |
|---|---|---|---|
| | Large | Medium | Small |
| **High** | High | Medium | Low |
| **Medium** | Medium | Medium | Low |
| **Low** | Low | Low | Negligible |

**Table 11 Risk of dust impacts – construction**

| Sensitivity of Area | Dust Emission Magnitude | | |
|---|---|---|---|
| | Large | Medium | Small |
| **High** | High | Medium | Low |
| **Medium** | Medium | Medium | Low |
| **Low** | Low | Low | Negligible |

**Table 12 Risk of dust impacts – trackout**

| Sensitivity of Area | Dust Emission Magnitude | | |
|---|---|---|---|
| | Large | Medium | Small |
| **High** | High | Medium | Low |
| **Medium** | Medium | Low | Negligible |
| **Low** | Low | Low | Negligible |

## 6.1.3 Step 3: Site-specific mitigation

The IAQM recommends that the dust risk categories for each of the four activities determined in STEP 2C be used to define the appropriate, site-specific, mitigation measures to be adopted.

For almost all construction activity, the IAQM guideline notes that the aim should be to prevent significant effects on receptors through the use of effective mitigation and experience shows that this is normally possible.

The IAQM guidelines include appropriate mitigation measures that could be adopted for construction activities that are determined to have low, medium and high preliminary risk of adverse air quality impacts.

### 6.1.4 Step 4: Determine significant effects

Once the risk of dust impacts has been determined in STEP 2C and the appropriate dust mitigation measures have been identified in STEP 3, the final step is to determine whether there are significant effects arising from the construction phase of a proposed development.

### 6.1.5 Step 5: Dust assessment report

The IAQM recommends that the dust assessment report summarises the dust emission magnitude, the sensitivity of the area and the risk of impacts without mitigation. In addition, the report is to describe the mechanism for ensuring that the appropriate level of mitigation would be implemented.

## 6.2 Cumulative impacts

The EIS guidelines and EES scoping requirements both include requirements for the assessment of cumulative impacts. Cumulative impacts result from incremental impacts caused by multiple projects occurring at similar times and within proximity to each other.

To identify possible projects that could result in cumulative impacts, the International Finance Corporation (IFC) guidelines on cumulative impacts have been adopted. The IFC guidelines (IFC, 2013) define cumulative impacts as those that ‘result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones.’

The approach for identifying projects for assessment of cumulative impacts considers:

- Temporal boundary: the timing of the relative construction, operation and decommissioning of other existing developments and/or approved developments that coincides (partially or entirely) with the project.
- Spatial boundary: the location, scale and nature of the other approved or committed projects are expected to occur in the same area of influence as the project. The area of influence is defined at the spatial extent of the impacts a project is expected to have.

Proposed and reasonably foreseeable projects were identified based on their potential to credibly contribute to cumulative impacts due their temporal and spatial boundaries. Projects were identified based on publicly available information at the time of assessment. The projects considered for cumulative impact assessment across Tasmania, Bass Strait and Victoria are:

- Delburn Windfarm
- Star of the South Offshore Windfarm
- Offshore wind development zone in Gippsland including Greater Gippsland Offshore Wind Project (BlueFloat Energy), Seadragon Project (Floatation Energy), Greater Eastern Offshore Wind (Corio Generation).
- Hazelwood Mine Rehabilitation Project
- Wooreen Energy Storage System
- North West Transmission Developments (NWTD)

- Guilford Windfarm
- Robbins Island Renewable Energy Park
- Jim's Plain Renewable Energy Park
- Robbins Island Road to Hampshire Transmission Line
- Bass Highway upgrades between Deloraine and Devonport
- Bass Highway upgrades between Cooee and Wynard
- Hellyer Windfarm
- Table Cape Luxury Resort
- Youngmans Road Quarry
- Port Latta Windfarm
- Port of Burnie Shiploader Upgrade
- Quaylink – Devonport East Redevelopment.

The projects relevant to this assessment have been determined based on there is potential for cumulative impacts to receptors. The North West Transmission Developments was assessed as relevant to this assessment due to their proximity to this project and its sensitive receptors. The cumulative assessment has considered the potential for activities associated with the projects to emit dust and the likelihood of cumulative impacts due to distance.

### 6.2.1 North West Transmission Developments

The NWTD project is a proposed development within the vicinity of the disturbance area associated with the construction of the Heybridge converter station. Construction is anticipated to commence in Q1 of 2025. The location of the NWTD project with relation to the converter station and the identified sensitive receptors is presented in Figure 4. The NWTD is a proposed overhead transmission line. Key site activities for dust include the construction of the facility and associated infrastructure and occasional vehicle operation along access tracks, with the greatest potential for dust impacts being attributable to the construction phase. Should construction of the NWTD project occur at the same time and dust emissions are not controlled, then there is the potential for cumulative impact. However, given that both projects propose to apply standard dust mitigation measures, cumulative impacts should not occur.

Where there are sites that could have a cumulative impact, the IAQM guidance recommends that the following additional mitigation measure is implemented:

*"Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes".*

Provided this liaison and coordination takes place, dust emission should be adequately managed such that there will be no significant cumulative impacts.

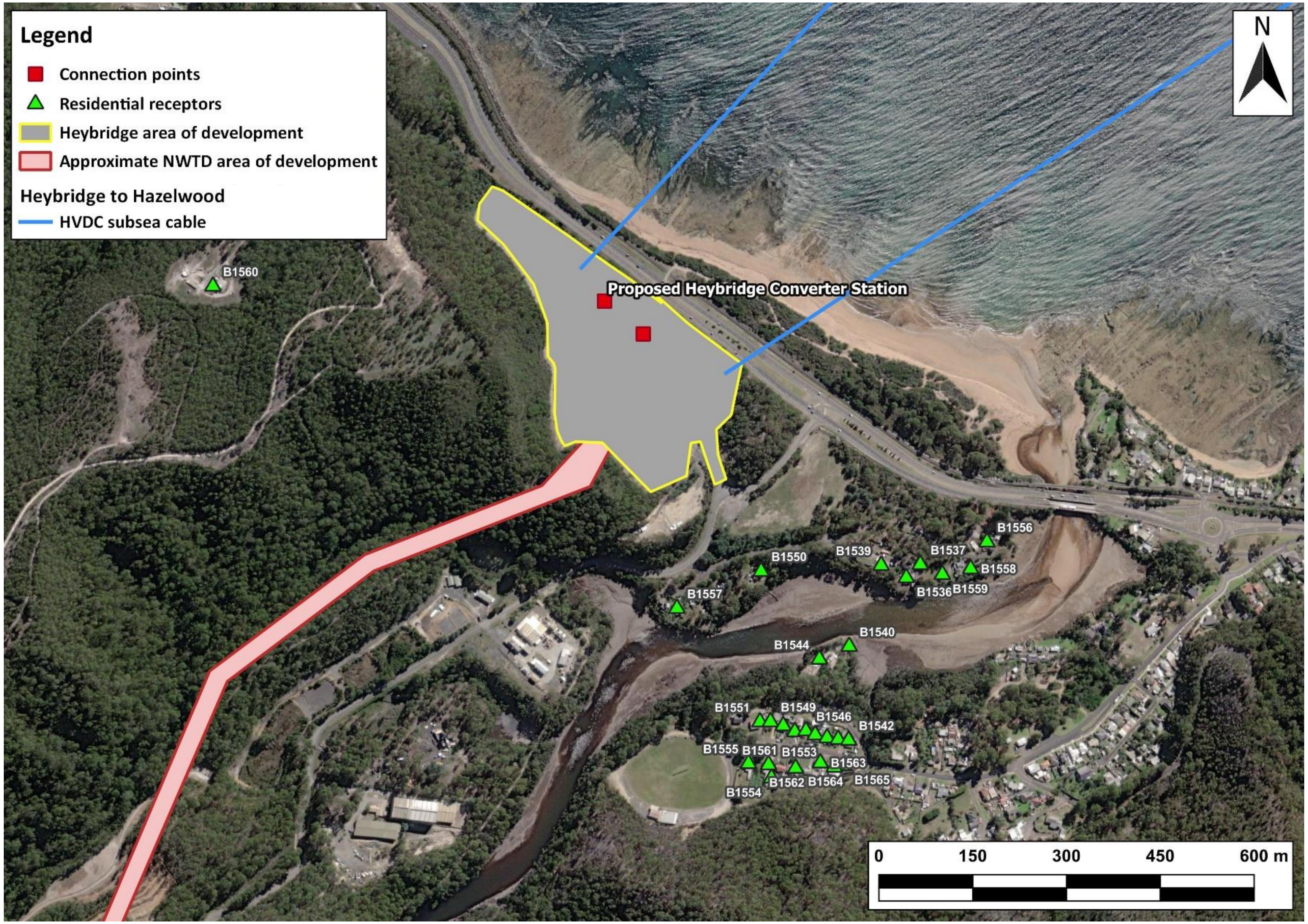



**Figure 4** Location of the NWTD project with relation to the project and residential receptors

# 7. EXISTING ENVIRONMENT

## 7.1 Terrain

The key issue relating to air quality will be emissions of dust during construction of the converter station and switching station at Heybridge. The elevation of the project development area for the Heybridge connection point is approximately 12 m Australian Height Datum (AHD) (Figure 5). The project development area is in the coastal town of Heybridge with the Bass Strait the key terrain feature likely to play a large role in the predominant wind directions and wind speeds across the project area.

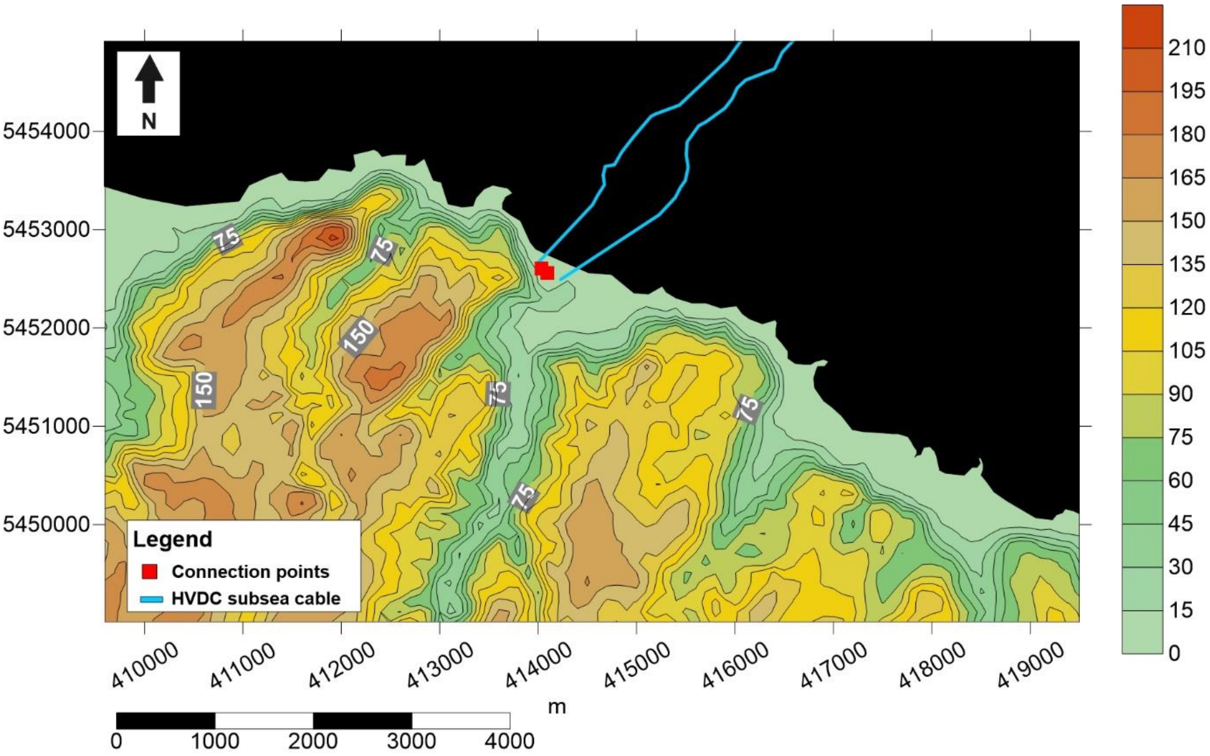



**Figure 5** **Terrain across the project area**

## 7.2 Land use

Figure 6 presents a detailed overlay of Tasmanian Government 2019 land use classification data. The predominant land uses in the vicinity of the project include, but are not limited to, residential and farm infrastructure, other minimal use, and managed resource protection.

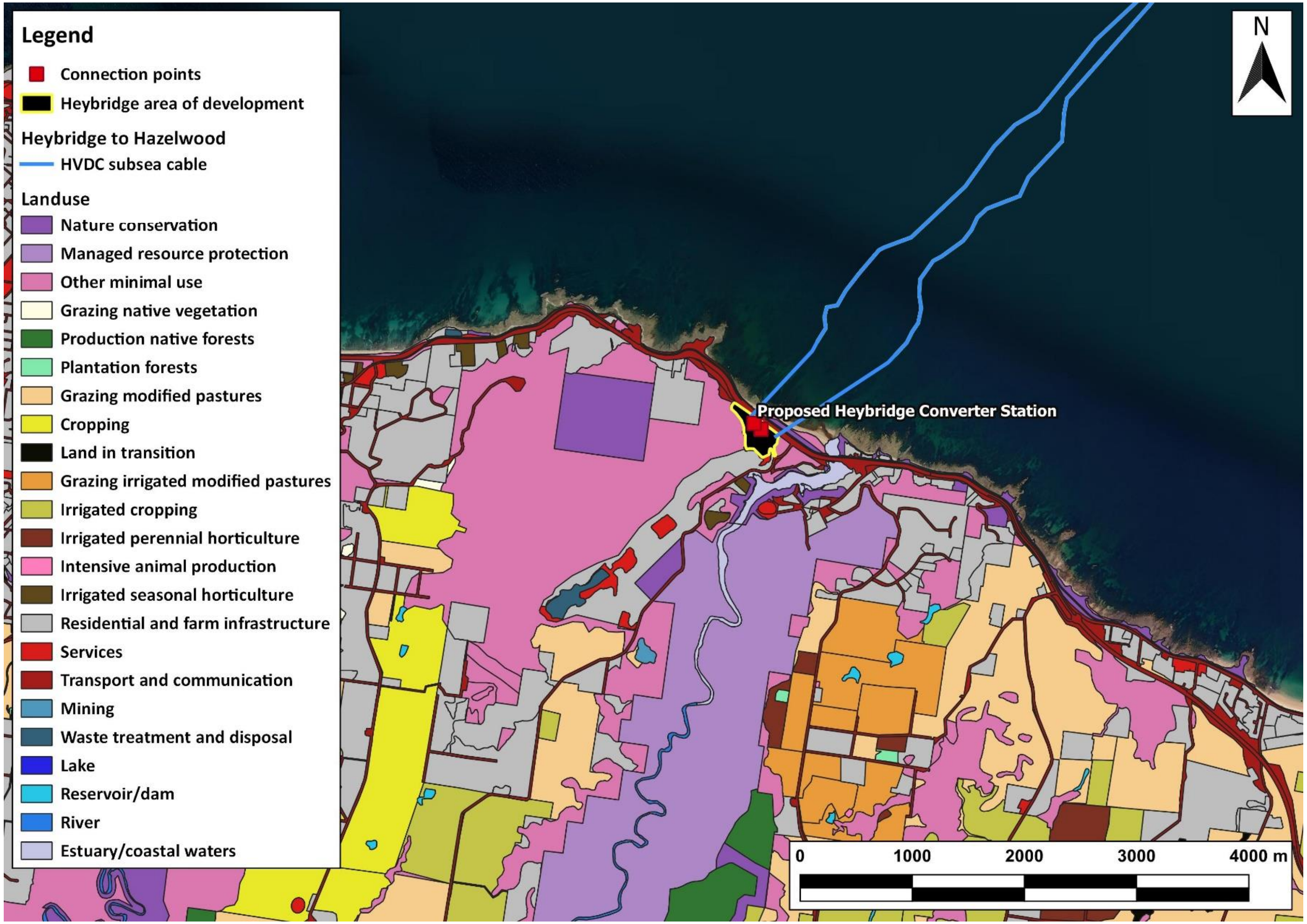



**Figure 6** Land use data in the vicinity of the project (Planning Scheme)

## 7.3 Meteorology and climate

The local meteorological conditions are important in understanding the potential air quality impacts associated with a project as they dictate the direction of transport of dust, and where and when the higher concentrations are likely to occur. In general, it is under hot, dry and windy conditions where dust emissions have the highest potential to adversely impact on air quality away from their point of release. The meteorological parameters that may lead to these conditions are summarised in the following sections.

A summary of each Bureau of Meteorology (BoM) site considered for the existing meteorology summary is provided in Table 13. BoM sites located at Burnie (National Tidal Centre) NTC (automatic weather station (AWS) (from 1992 onwards) and Burnie (Park Grove) (from 2009 onwards) have been selected to characterise the meteorology at the Heybridge disturbance area. Figure 7 shows the location of available monitoring sites in the vicinity of the project. These sites are expected to be representative of meteorological conditions at the project site, due to their similar elevation and geographic location.

**Table 13 BoM Monitoring Site summary**

| BOM Monitoring Site | State | Opened | Last Record | Distance from the project | Parameters | Climate Summary |
|---|---|---|---|---|---|---|
| Burnie NTC AWS | Tasmania | 1992 | Open | 5.6 km NW | Temperature and meteorological data | Coastal site, 0 m AHD |
| Burnie (Park Grove) | Tasmania | 2009 | Open | 8.4 km W | Rainfall | Coastal site, 99 m AHD |

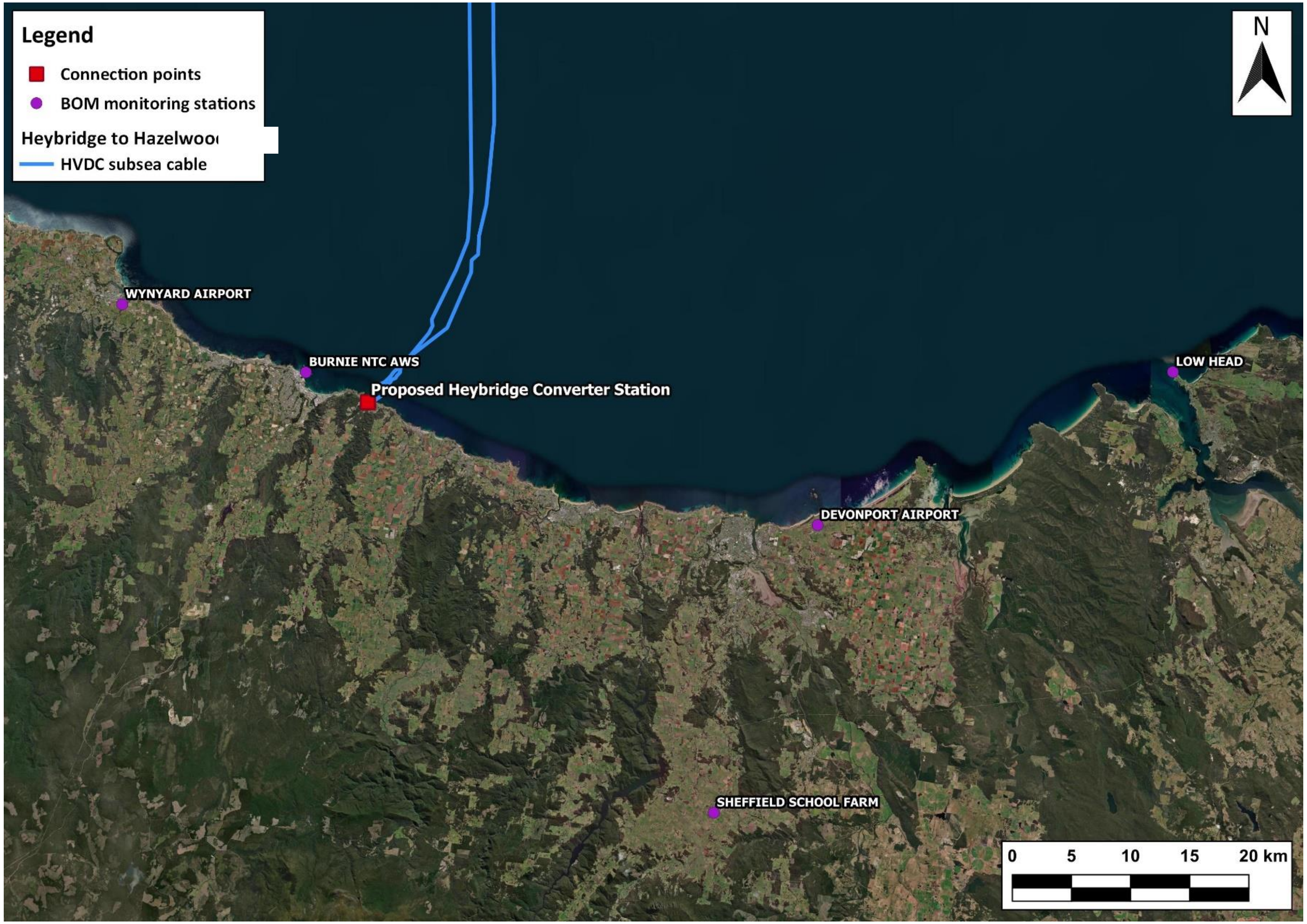



**Figure 7** BoM monitoring stations within the vicinity of the project

### 7.3.1 Wind speed and wind direction

Wind speed and wind direction are important parameters for the transport and dispersion of air pollutants including dust. BoM site Burnie NTC AWS (2009 to 2022) has been selected to characterise the wind speed at the project site, due to the similar elevation, geographic location and the availability of hourly wind speed and wind direction data from these automatic weather stations.

The surface wind climate is driven by the large-scale circulation pattern of the atmosphere. The project is in the Southern Slopes region which is at the northern edge of the 'Roaring Forties' belt of westerly circulation (Grose, M. *et al.,* 2015), and so receives predominantly westerly winds.

The annual, seasonal, and diurnal distribution of winds based on the Burnie NTC AWS site are presented in Figure 8, Figure 9 and Figure 10, respectively. The winds recorded at the Burnie NTC AWS site are generally moderate to strong with an average wind speed of 4.36 m/s. Approximately 67% of winds are from the southwest to northwest directions with approximately 22% of winds from the southeast. The BoM Burnie NTC AWS recorded 0.6% calms (wind speed of 0 m/s) over the recording period.

There is a variation in both wind direction and wind speed throughout the seasons of the year. Autumn and winter are characterised by slightly lighter winds and an increased southerly component compared to spring and summer. There is a variation in both wind direction and wind speed during the day and night, with wind speeds increasing throughout the day to be at their strongest during the afternoon (midday to 6pm) and lightest overnight (midnight to 6am). Predominant westerlies and southerlies persist across all hours, with an increase in southeast winds during the day (6am to 6pm) with westerlies increasing overnight (6pm to 6am).

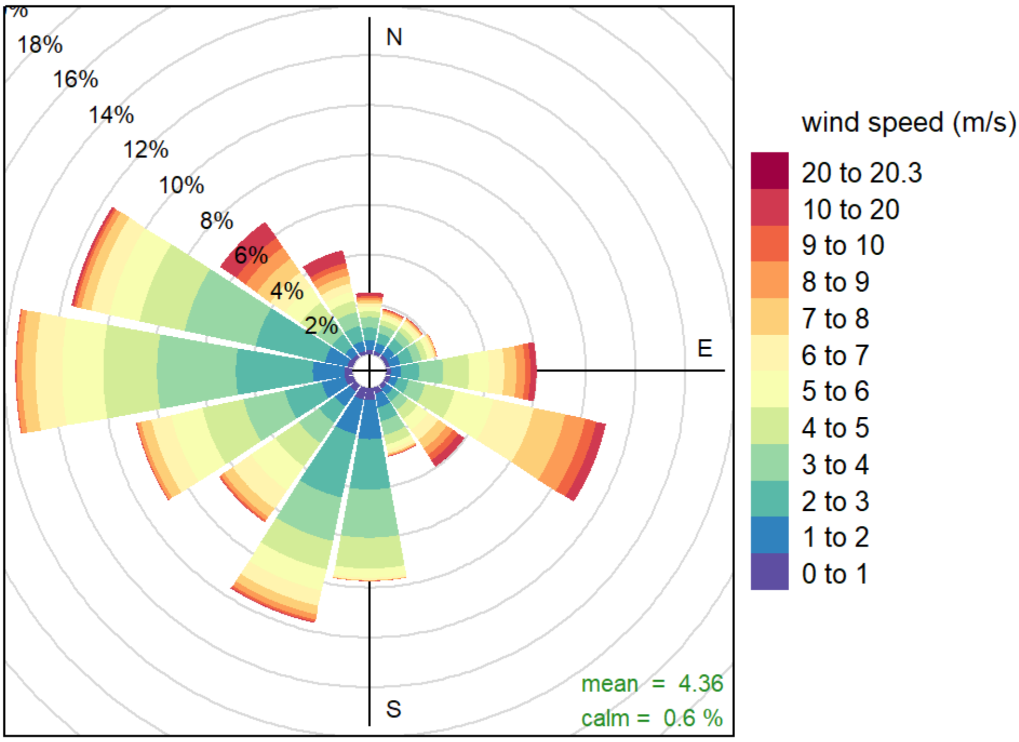



**Figure 8** **Annual distribution of wind speed and wind direction derived from BoM Burnie NTC AWS (2009-2022)**

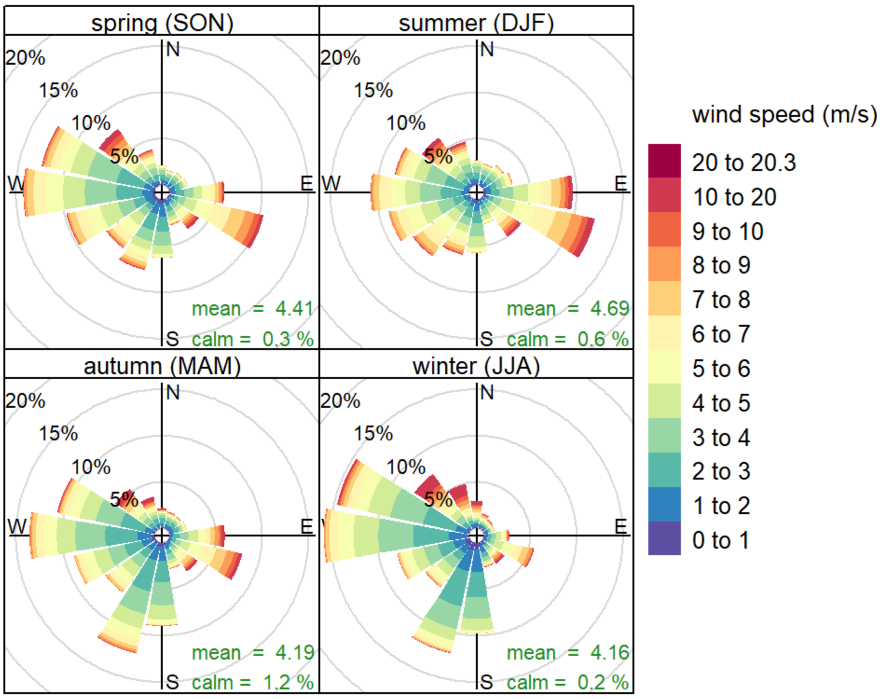



**Figure 9** **Seasonal distribution of wind speed and wind direction for BoM Burnie NTC AWS (2009-2022)**

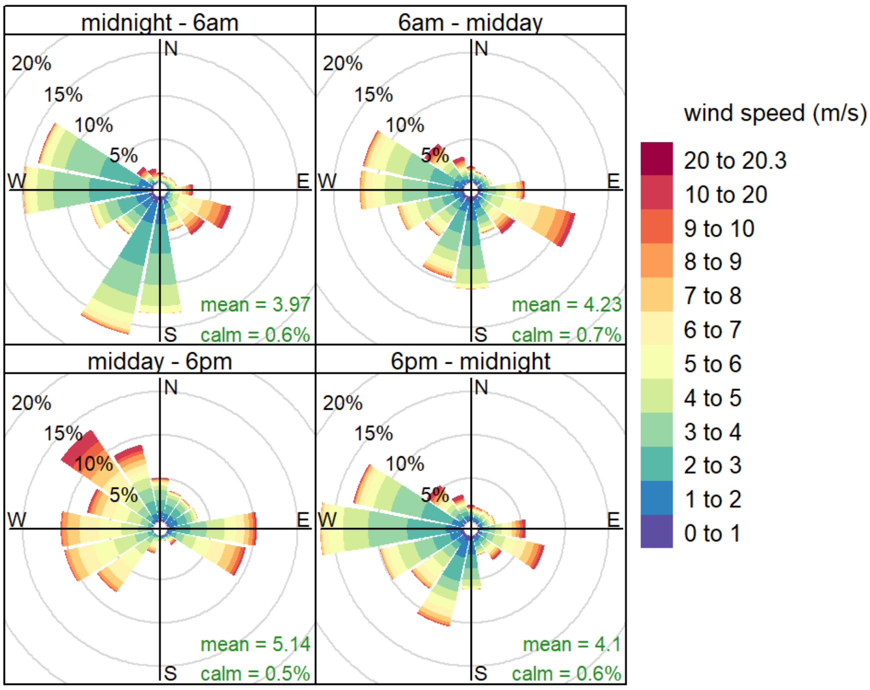



**Figure 10** **Diurnal distribution of wind speed and wind direction for BoM Burnie NTC AWS (2009-2022)**

### 7.3.2 Temperature

The temperature at the site of the facility influences the convective movement of air in the lower atmosphere and, therefore, the rate of dispersion of dust from the site. In addition, temperature variations provide an indication of times during which dust emissions may increase.

Table 14 shows the minimum and maximum seasonal temperatures for BoM Burnie NTC AWS site.

**Table 14 Maximum and minimum daily temperatures recorded at Burnie NTC AWS**

| Season | Maximum Temperature (°C)[1] | Minimum Temperature (°C)[1] |
|---|---|---|
| Autumn | 26.6 | 3.5 |
| Spring | 25.8 | 3 |
| Summer | 31.5 | 7.1 |
| Winter | 18.6 | 2.1 |

Table notes:
[1] Maximum and minimum daily temperature obtained from http://www.bom.gov.au/climate/data/stations/

### 7.3.3 Rainfall

Rainfall reduces emissions of dust from construction activities and exposed ground. Figure 11 and Figure 12, show the annual and seasonal distributions of rainfall at Burnie (Park Grove) for the available data periods.

The annual total is the sum of validated months of rainfall data for each year. The annual average rainfall at this site for the monitoring period (available data) is 876 mm, with a maximum annual total of 1,411 mm and a minimum annual total of 221 mm.

At the Burnie (Park Grove) site, the winter period accounts for 35% of the mean annual rainfall while summer only accounts for 17%. The shoulder seasons of spring and autumn at this site account for 22% and 26%, respectively.

The mean total rainfall peaks during the winter months and is at its lowest during summer. This seasonal rainfall is characteristic of the oceanic climate, with the absence of a dry season and the distribution of rainfall across the year.

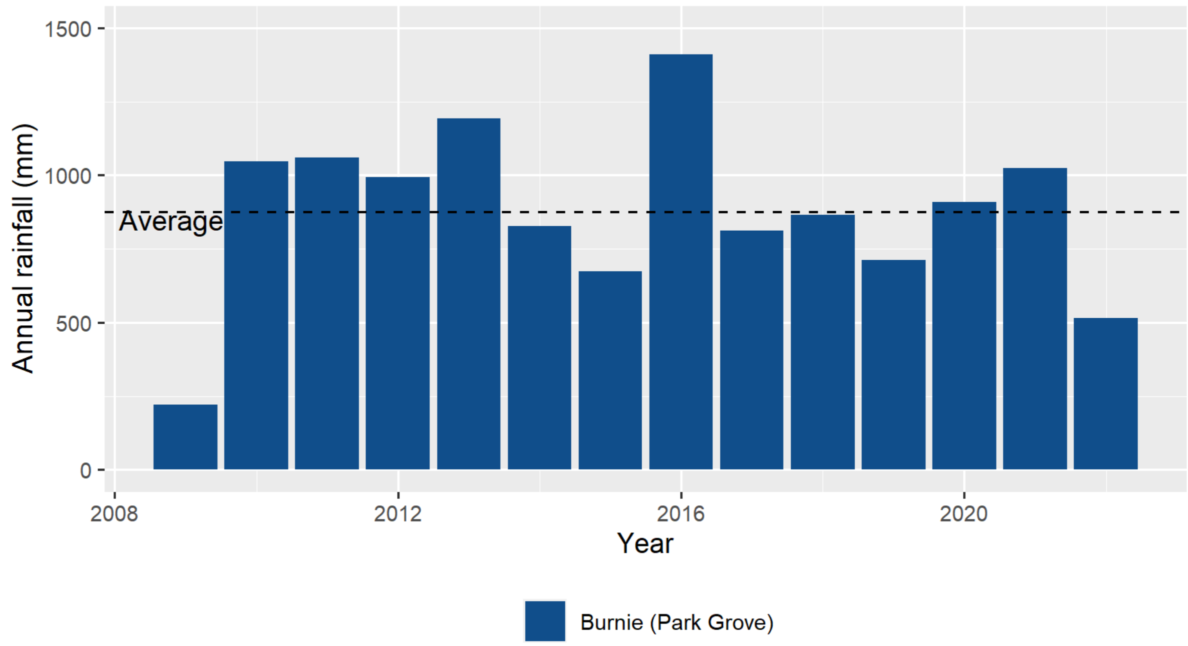



**Figure 11 Annual total rainfall at Bom Burnie (Park Grove) (2009 - 2022)**

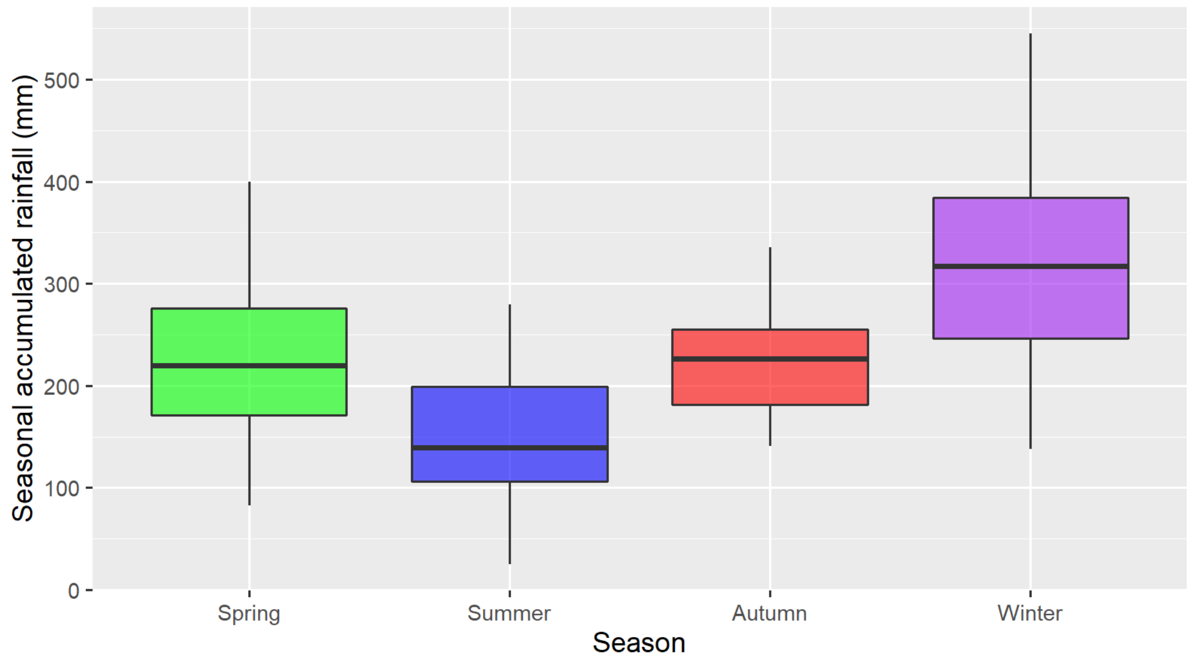



**Figure 12 Season rainfall at the BoM Burnie (Park Grove) monitoring station (2009 – 2022)**

## 7.4 Ambient air quality

### 7.4.1 Existing sources of dust and particulates

In Tasmania, smoke from burning wood in home heaters is the greatest source of particulates in the atmosphere. Other sources include dust blown by the wind from soil, vehicles driving over unsealed or dusty roads, dusts and fumes from chemical industrial processes, and smoke from planned burns (EPA Tasmania, 2013).

Existing waste treatment and disposal facilities near the proposal site include the Heybridge Asbestos Landfill, Heybridge East Waste Depot and the Heybridge Inert Waste Depot, all located between 1.9 and 2.2 km southwest of the proposal site, off from Minna Road and Devonshire Drive. There are no facilities within five km of the project that report particulate emissions to the National Pollutant Inventory. The nearest facility to the project is the Old Surrey Road Cheese Factory which is located approximately 5.6 km southwest. Given the distances between these facilities and the project, and the complex terrain, it is unlikely that they will significantly influence air quality in the vicinity of the project; their contributions will also largely be captured in the baseline air quality monitoring used in the assessment.

### 7.4.2 Existing ambient air quality

Existing ambient air quality has been quantified through a desktop assessment, based on EPA Tasmania-provided data. The location of the EPA Tasmania air monitoring stations with relevance to the project can be seen in Figure 13. A summary of the settings of these monitoring stations is provided in Table 15. These three sites monitor $PM_{10}$ and $PM_{2.5}$ levels.

The Tasmanian EPA carries out air quality monitoring to determine its compliance with the National Environment Protection (Ambient Air Quality) Measure. At the present time, the EPA operates reference level air monitoring stations in Hobart, Launceston and Devonport, using Tapered Element Oscillation Microbalances (TEOM) and Low Volume Samplers. These are Australian Standard instruments that provide high quality data. EPA Tasmania also operates the Base Line Air Network of EPA Tasmania (BLANkET). The BLANkET network offers real time, indicative (non-reference) particulate monitoring using DRX DustTrak instruments. The BLANkET network data is compared against the reference monitor at Hobart in an attempt to validate the data. The BLANkET indicative data cannot be used to determine if an air quality standard has been exceeded, but provides a good indication of particulate concentrations and how they change over time.

Review of the EPA Tasmania air monitoring stations within 50 km of the project has been performed to determine which site is most representative of the conditions experienced at the Heybridge disturbance area. Emu River is the closest to the project, approximately 8.6 km southwest, in an area with little in the way of emission sources. The ambient background levels at the project site are expected to be low as a result of minimal nearby emission sources, hence the similar setting and proximity of Emu River means that it should be reasonably representative of conditions in Heybridge. A conservative approach has been taken where the highest ambient concentrations measured at Emu River in any year have been used to characterise ambient background concentrations for the assessment. It should be noted that monitoring at the Emu River site is conducted using real time, indicative (non-reference) particle monitoring as part of the BLANkET network.

**Table 15 EPA Tasmania Monitoring Site summary**

| EPA Tasmania Monitoring Site | Distance from Project | Surrounding Environment |
|---|---|---|
| Emu River | 8.6 km SW | Located in a grassland paddock. Emu River is approximately 6 km south of Burnie town centre. |
| West Ulverstone | 16.8 km SE | Located near the Leven River approximately 2 km west of Ulverstone town centre. |
| Wynyard | 23.6 km NW | Located within Wynyard residential area. Approximately 2 km southwest from the North Coast of Tasmania. |
| Devonport | 34.1 km SE | The Devonport station is located approximately 1 km south of the residential centre of town. |
| Latrobe | 41.3 km SE | The Latrobe station is located approximately 700 m east of the town centre |
| Sheffield | 46 km SE | Located on agricultural land. Sheffield is approximately 1.5 km southeast of Sheffield town centre. |

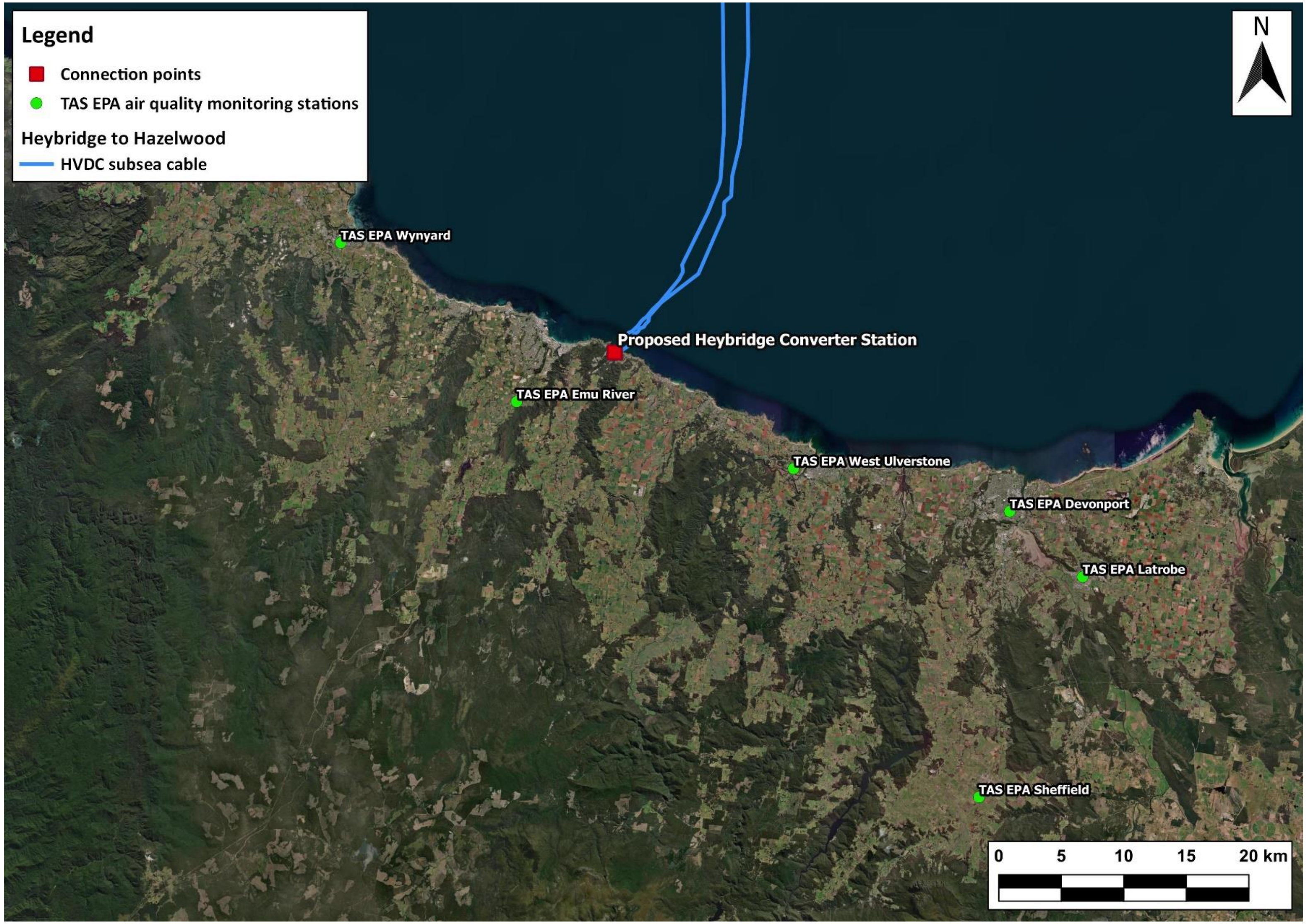



**Figure 13** **Location of EPA Tasmania dust monitoring station locations**

Data recorded over the past five years (January 2015 to October 2020) have been analysed to understand likely ambient background concentrations of particulates in the vicinity of the Heybridge construction. Relevant $PM_{10}$ statistics from data measured from January 2015 to October 2020 at the EPA Tasmania Emu River site are presented in Table 16, and relevant $PM_{2.5}$ statistics are presented in Table 17.

Advice from EPA Tasmania indicates that the elevated maximum 24-hour particulate levels in 2016 were due to bushfires, and hence these have been excluded from the summary of background particulate concentrations.

**Table 16 Concentrations of $PM_{10}$ at Emu River station from Jan 2015 to Oct 2020**

| Year | $PM_{10}$ (µg/m³) | | | |
|---|---|---|---|---|
| | 24-hour average (Maximum) | No. days above 50 µg/m³ | 24-hour average (70th percentile) | Annual average |
| 2015 | 36.3 | 0 | 8.3 | 7.0 |
| 2016 | 236.2 | 3 | 9.3 | 8.9 |
| 2017 | 38.0 | 0 | 9.5 | 7.8 |
| 2018 | 34.4 | 0 | 9.2 | 8.0 |
| 2019 | 36.4 | 0 | 6.8 | 5.8 |
| 2020 | 68.5 | 1 | 6.2 | 5.5 |
| **Criteria** | **50** | **-** | **-** | **25** |

**Table 17 Concentrations of $PM_{2.5}$ at Emu River station from Jan 2015 to Oct 2020**

| Year | $PM_{2.5}$ (µg/m³) | | | |
|---|---|---|---|---|
| | 24-hour average (Maximum) | No. days above 25 µg/m³ | 24-hour average (70th percentile) | Annual average |
| 2015 | 14.8 | 0 | 2.7 | 2.2 |
| 2016 | 206.4 | 3 | 2.5 | 3.1 |
| 2017 | 23.8 | 0 | 2.4 | 2.1 |
| 2018 | 18.6 | 0 | 2.3 | 2.1 |
| 2019 | 25.7 | 1 | 2.3 | 2.1 |
| 2020 | 62.0 | 4 | 2.4 | 2.7 |
| **Criteria** | **25** | **-** | **-** | **8** |

### 7.4.3 Summary of background particulate concentrations

Ambient levels of particulates used in the assessment are shown in Table 18. The ambient background concentrations selected to be representative of the project conditions highlight the low background levels in the vicinity of the project. The highest background concentration with relation to the criteria is annual average $PM_{2.5}$ which equates to 34% of the criteria. These ambient backgrounds are used to inform the human health impacts of additional dust.

**Table 18 Ambient background concentrations**

| Pollutant | Averaging Period | Criteria (µg/m³) | Estimated ambient background concentration (µg/m³) | Source |
|---|---|---|---|---|
| $PM_{10}$ | 24-hour | 50 | 9.5 | EPA Tasmania Emu River, highest 70th percentile |
| | Annual | 25 | 8.0 | EPA Tasmania Emu River, highest Annual Average |
| $PM_{2.5}$ | 24-hour | 25 | 2.7 | EPA Tasmania Emu River, highest 70th percentile |
| | Annual | 8 | 2.7 | EPA Tasmania Emu River, highest Annual Average |

## 7.5 Sensitive receptors

Tetra Tech Coffey has provided details of sensitive receptors within 1 km of the proposed Heybridge converter station and associated disturbance area at Heybridge for assessment purposes. Katestone has refined the list of sensitive receptors as per the specifics of the IAQM method, focussing on high sensitivity receptors within 500 m. As detailed in Table 19 and shown in Figure 14 there are 27 receptors centralised within the Heybridge township. The nearest property is approximately 157 m southeast of the nearest point of the project disturbance area.

No protected vegetation communities, flora or fauna species have been identified within 1 km of the proposed Heybridge disturbance area. Therefore, the potential for impacts upon ecological receptors is negligible.

Details of the identified receptors within 500m of the project indicate 26 receptors are located to the southeast of the project and one receptor is located to the northwest. The prevailing westerly winds determined from the Burnie NTC AWS analysis in 7.3.1, indicate the receptors to the southeast are downwind of the project for a greater proportion of time.

**Table 19 Summary of residential receptors within 500 m of the project disturbance**

| Receptor ID | Easting (m) | Northing (m) | Distance from project (m) |
|---|---|---|---|
| B1536 | 414,516 | 5,452,163 | 329 |
| B1537 | 414,538 | 5,452,184 | 339 |
| B1539 | 414,476 | 5,452,183 | 284 |
| B1540 | 414,425 | 5,452,053 | 332 |
| B1542 | 414,424 | 5,451,903 | 462 |
| B1543 | 414,407 | 5,451,905 | 453 |
| B1544 | 414,377 | 5,452,033 | 325 |
| B1545 | 414,370 | 5,451,912 | 431 |
| B1546 | 414,356 | 5,451,918 | 420 |
| B1547 | 414,338 | 5,451,917 | 416 |
| B1549 | 414,299 | 5,451,933 | 390 |
| B1550 | 414,284 | 5,452,173 | 158 |
| B1551 | 414,282 | 5,451,932 | 387 |
| B1552 | 414,319 | 5,451,926 | 401 |
| B1553 | 414,389 | 5,451,907 | 443 |
| B1554 | 414,301 | 5,451,843 | 478 |
| B1555 | 414,264 | 5,451,866 | 450 |
| B1556 | 414,645 | 5,452,220 | 429 |
| B1557 | 414,149 | 5,452,114 | 191 |
| B1558 | 414,619 | 5,452,177 | 416 |
| B1559 | 414,574 | 5,452,168 | 378 |
| B1560 | 413,407 | 5,452,630 | 436 |
| B1561 | 414,296 | 5,451,864 | 457 |
| B1562 | 414,339 | 5,451,858 | 472 |
| B1563 | 414,379 | 5,451,867 | 476 |
| B1564 | 414,401 | 5,451,860 | 491 |
| B1565 | 414,417 | 5,451,863 | 495 |

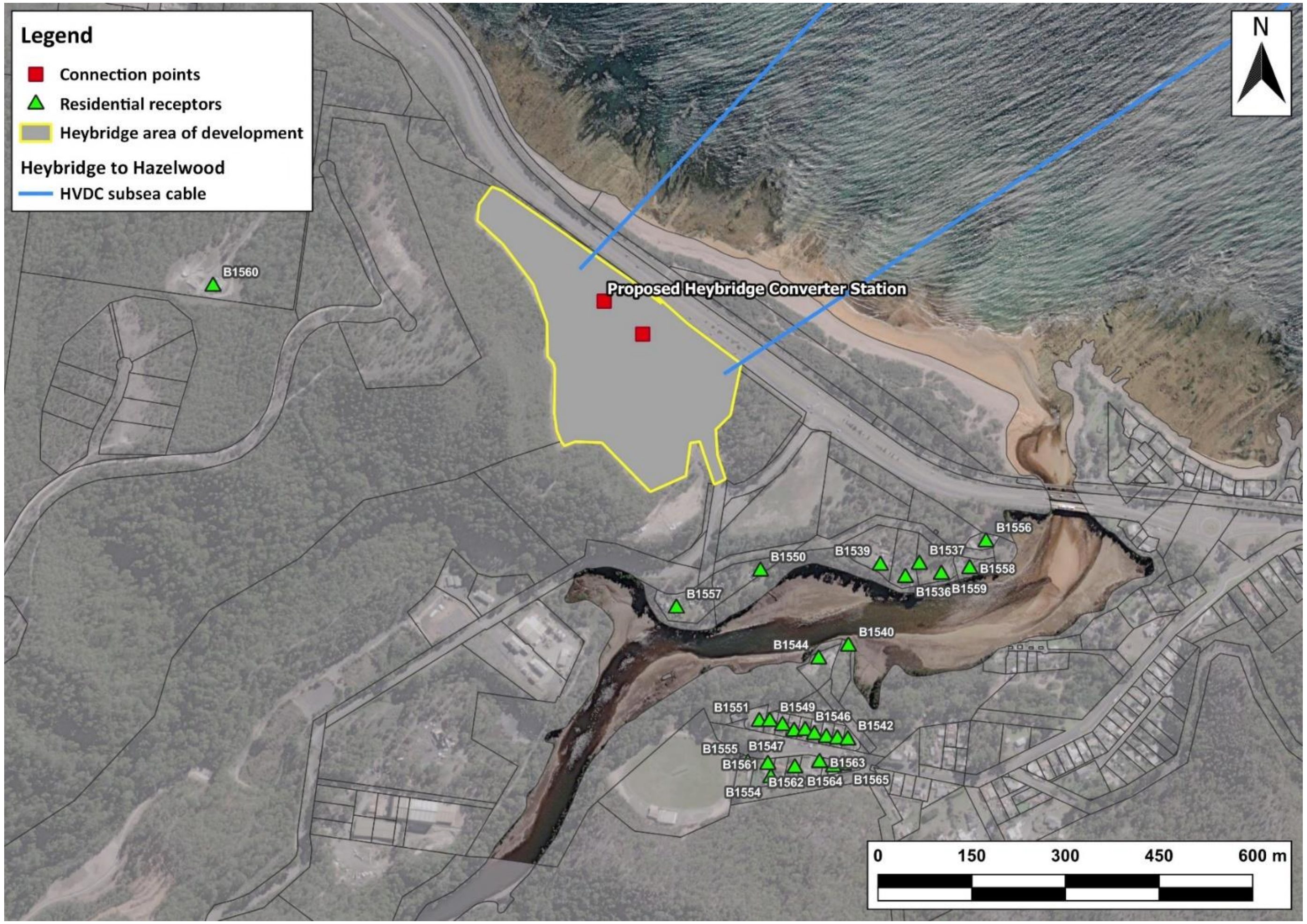



**Figure 14** **Residential receptors within 500 m of the Heybridge area of development**

# 8. AIR QUALITY ASSESSMENT

## 8.1 Construction risk assessment

### 8.1.1 Step 1: Screening assessment

There are seven residential properties within 350 m of the proposed Heybridge converter station. Therefore, a detailed risk assessment is required for the proposed Heybridge converter station.

The receptors surrounding the proposed Heybridge development areas are presented in Figure 15.

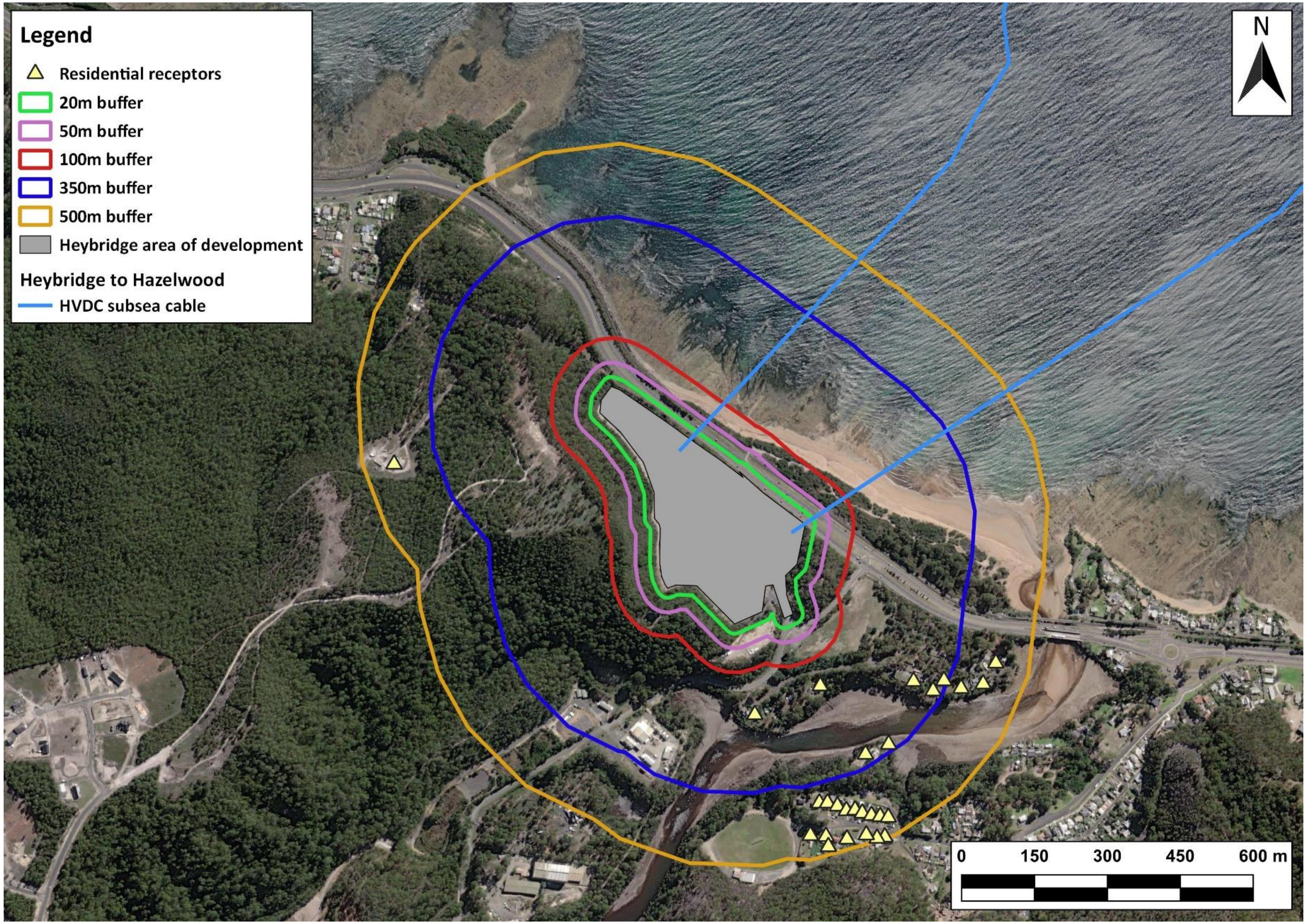



**Figure 15 Residential receptors near to the proposed Heybridge converter station construction**

### 8.1.2 Step 2: Risk of dust impacts

### 8.1.2.1 Proposed Heybridge converter station

#### 8.1.2.1.1 Emission magnitude

The magnitude of emissions associated with earthworks, construction and trackout during the construction of the proposed Heybridge converter station is presented in Table 20. No demolition works are required.

**Table 20 Magnitude of emissions by activity for the proposed Heybridge converter station**

| Magnitude of emissions | Key features of the project determining risk level |
|---|---|
| ***Earthworks*** | |
| Large | Total site area of approximately 57,930 $m^2$, with approximately 54,800 $m^3$ of aggregate moved for earthworks. Up to 13 heavy earth moving vehicles. |
| ***Construction*** | |
| Medium | Two converter station buildings with an approximate volume of 180,000 $m^3$ each and a portal frame switching station building with an approximate volume of 7,850 $m^3$. Buildings of standard sheet steel construction, with low potential for dust generation. |
| ***Trackout*** | |
| Medium | At most 13 heavy duty vehicles are expected per day. Access track around the switching station is approximately 200 m in length. |

#### 8.1.2.1.2 Sensitivity of the area

Table 21 presents the number of high sensitivity residential receptors within various distances of the Heybridge substation upgrade. Table 22 presents the sensitivity of the area based on the receptor counts, determined using the matrices in Table 7 and Table 8, taking the highest sensitivity rating based on any of the receptor counts. In this case, there are few receptors within any distance band of the works, thus the sensitivity of the area to dust deposition during earthworks, construction and trackout is low. For human health impacts, the sensitivity is low where the background annual mean $PM_{10}$ concentration is below 15 µg/$m^3$ (a background concentration of 8.0 µg/$m^3$ has been used in this assessment – see Table 18) and there are fewer than 100 receptors within 20 m of the works. No ecological receptors have been identified within 500 m of the Heybridge converter station area of disturbance, the impacts to ecological receptors will be assessed within the Terrestrial ecology report (Entura, 2024).

**Table 21 Proximity of receptors to the proposed Heybridge converter station**

| Proximity of receptors | Distance to the Heybridge converter station | | | | |
|---|---|---|---|---|---|
| | <20 m | <50 m | <100 m | <350 m | <500 m |
| Number of receptors | 0 | 0 | 0 | 7 | 27 |
| Number of ecological receptors | 0 | 0 | 0 | 0 | 0 |

**Table 22 Sensitivity of the area surrounding the proposed Heybridge converter station**

| Potential impact | Earthworks | Construction | Trackout |
|---|---|---|---|
| Dust soiling effects | Low | Low | Low |
| Human health impacts | Low | Low | Low |

#### 8.1.2.1.3 Risk of Impacts

Table 23 presents the preliminary risk due to construction of the proposed Heybridge converter station, which is 'low' for earthworks, construction and trackout principally due to the small number of receptors and the separation distance between the construction areas and surrounding residences.

**Table 23 Preliminary risk due to construction of the proposed Heybridge converter station**

| Potential impact | Earthworks | Construction | Trackout |
|---|---|---|---|
| Dust soiling effects | Low | Low | Low |
| Human health impacts | Low | Low | Low |

### 8.1.3 Dust mitigation

The key potential emissions to air from the construction works will be in the form of dust or particulate matter. Particulate matter is sub-divided into a number of metrics based on particle size. Standard management practices proposed for the project have identified measures that will assist in managing contaminated soils.

Emissions controls have been determined from the risk assessment, which follows the UK's IAQM Methodology on the assessment of dust from demolition and construction (2014). The emission controls in the IAQM methodology are considered best practice and will meet the principles of the Air EPP (2004). These emission controls cover communication, complaint management, site management, waste management and operations (Refer to Appendix A, Table A1).

It will be the responsibility of the contractor to prepare the CDMP. The contractor should have regard to these dust mitigation measures when preparing the CDMP. It is the responsibility of the principal contractor to determine what is ultimately reasonable and feasible. The mitigation measures outlined should be adopted into the CDMP by the principal contractor to achieve the EPRs listed in Section 8.4.

### 8.1.4 Residual risk

The IAQM guidance is clear that, with appropriate mitigation in place, the residual effects will normally be 'not significant'. The mitigation measures set out in Table A1 are based on the IAQM guidance. With these measures in place and effectively implemented the residual effects are judged to be 'not significant' and the overall residual risk as stated in Table 24.

The IAQM guidance does, however, recognise that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. During these events, short-term dust annoyance may occur, however, the scale of this will not normally be considered sufficient to change the conclusion that overall, the effects will be 'not significant'. The use of water and other mitigation measures may need to be increased during adverse weather conditions to minimise dust.

It is likely that dust emissions will be greater during the summer months, when temperatures are highest and there are fewer rainy days. The use of water and other mitigation measures during these months may need to be greater than during winter periods, particularly where construction activities are occurring near sensitive receptors.

**Table 24 Overall residual risk for the Heybridge converter site**

| Potential impact | Earthworks | Construction | Trackout |
|---|---|---|---|
| Dust soiling effects | Negligible | Negligible | Negligible |
| Human health impacts | Negligible | Negligible | Negligible |

## 8.2 Operations risk assessment

Assessment of the operational phase of the project identified three activities that could result in emissions to air.

- Occasional operation of two 1500 kVA backup diesel generators with above ground fuel storage of 5000 L.
- Routine inspections of the Heybridge converter station's equipment and infrastructure including scheduled minor and major outages for repairs and servicing, via light vehicles.
- Maintenance of access tracks using light vehicles.

The backup diesel generators will only operate in case of emergency and during routine testing and maintenance. With the nearest sensitive receptors being over 300 m away from the nearest generator, this occasional use of the generators and the associated emissions of combustion-related pollutants will not result in significant air quality impacts.

Routine inspections of the project alignment will occur quarterly, while planned outages will occur twice a year. The only relevant emissions to air from these activities will be from the small number of light vehicles accessing the converter station to carry out the maintenance works; tailpipe emissions and wheel generated dust from this small number of light vehicles will not result in significant air quality impacts.

Occasional maintenance of access tracks could generate some dust emissions, but these will be temporary in nature (hours or days) and will not result in significant dust impacts at nearby sensitive receptors.

Overall, it can be concluded that the operational phase of the project will not generate significant emissions to air and will not result in significant dust impacts at nearby sensitive receptors.

## 8.3 Decommissioning risk assessment

The operational lifespan of the project is a minimum 40 years. At this time the project will be either decommissioned or upgraded to extend its operational lifespan.

Decommissioning will be planned and carried out in accordance with regulatory and landowner or land manager requirements at the time. A decommissioning plan in accordance with approvals conditions will be prepared prior to planned end of service and decommissioning of the project.

Requirements at the time will determine the scope of decommissioning activities and impacts. The key objective of decommissioning is to leave a safe, stable and non-polluting environment, and minimise impacts during the removal of infrastructure.

In the event that the project is decommissioned, all above-ground infrastructure will be removed, and associated land returned to the previous land use or as agreed with the landowner or land manager.

Decommissioning activities required to meet the objective will include, as a minimum, removal of above ground buildings and structures. Remediation of any contamination and reinstatement and rehabilitation of the site will be undertaken to provide a self-supporting landform suitable for the end land use.

Decommissioning and demolition of project infrastructure will implement the waste management hierarchy principles being avoid, minimise, reuse, recycle and appropriately dispose. Waste management will accord with applicable legislation at the time.

Decommissioning activities may include recovery of land and subsea cables and removal of land cable joint pits. Recovery of land cables would involve opening the cable joint pits and pulling the land cables out of the conduits, spoiling them onto cable drums and transporting them to metal recyclers for recovery of component materials. The conduits and shore crossing ducts would be left in-situ as removal would cause significant environmental impact.

The concrete cable joint pits would be broken down to at least one metre below ground level and buried in-situ or excavated and removed. Subsea cables would be recovered by water jetting or removal of rock mattresses or armouring to free the cables from the seabed.

A decommissioning plan will be prepared to outline how activities will be undertaken and potential impacts managed.

## 8.4 Environmental performance requirements and mitigation measures

The following Environmental Performance Requirements (EPRs) and associated mitigation measures are proposed for the project to manage air quality risks and impacts (Table 25).

- AQ01: Develop and implement a construction dust management plan
- AQ02: Develop and implement measures to manage emissions to air during operations.

The singular site of construction for the Heybridge converter station, allows for effective implementation of mitigation measures when high dust generating activities like earthworks and access track construction occur. It is recommended that monitoring be focussed on the receptors to the east of the disturbance area, with at least three months of monitoring conducted prior to construction to establish baseline conditions.

A decommissioning plan will be prepared to outline how activities will be undertaken and potential impacts managed including due to dust and emissions addressing the items outlined in these air quality EPRs. The requirements for the decommissioning management plan are outlined in the EIS.

**Table 25 Air Quality Mitigation Measures**

| MM ID | Mitigation Measures | Project Stage |
| --- | --- | --- |
| **EPR AQ01: Develop and implement a construction dust management plan**<br>**Mitigation measures** | | Construction |
| MM AQ01 | Prior to commencement of project works, develop a construction dust management plan that documents measures to avoid, minimise and mitigate dust emissions including:<br>• Regular wetting down of exposed and disturbed areas including stockpiles, in dry and windy weather.<br>• Adjust the intensity of construction activities based on observed dust levels and weather forecasts (MM AQ02).<br>• Minimise the amount of materials stockpiled and position stockpiles away from proposal site boundary (where practicable).<br>• Regularly inspect dust emissions (MM AQ02) and apply additional controls as necessary. | |
| MM AQ02 | Conduct construction air quality monitoring in accordance with the requirements of the construction dust management plan (MM AQ01). This will include:<br>• Daily monitoring of wind/weather forecasts and temperature and humidity using data from nearby automatic weather station and/or BOM.<br>• Hourly monitoring of rainfall using data from nearby automatic weather station and/or BOM.<br>• Daily monitoring of odour when odour generating works are being carried out, or when a complaint is made.<br>• Daily visual surveillance to confirm effectiveness of dust control mitigation and that there are no visible dust emissions beyond the boundary of the proposal site.<br>• Investigations as required in response to a complaint. This may require review of monitoring data, frequency, and effectiveness of mitigation. | |
| MM AQ03 | Plant and equipment will be maintained in a proper and efficient manner. Visual inspections of emissions from plant will be carried out as part of pre-acceptance checks. | |
| MM AQ04 | The following best-practice odour management measures will be implemented during relevant construction works:<br>• The extent of opened and disturbed contaminated soil at any given time will be minimised.<br>• Temporary coverings or odour supressing agents will be applied to excavated areas where appropriate.<br>• Monitoring as outlined in AQ02. | |
| **EPR AQ02: Develop and implement measures to manage emissions to air during operations**<br>**Mitigation measures** | | |
| MM AQ03 | As part of the OEMP, develop measures to avoid or minimise air quality impacts including:<br>• Plant and equipment will be maintained in a proper and efficient manner. Visual inspections of emissions from plant will be carried out as part of pre-acceptance checks. | Operation |

# 9. CONCLUSIONS

Katestone was commissioned by Tetra Tech Coffey to complete an AQA of the Tasmania component of the project.

Once operational, the operation and maintenance activities associated with the project will not generate significant emissions to air. Decommissioning air quality impacts will be assessed prior to decommissioning in accordance with the regulations at the time and in agreement with landowners or land managers and EPA Tasmania. Therefore, detailed assessment of impacts during operation and decommissioning has not been carried out.

The assessment has focused on the potential impacts of dust emissions during construction. A risk assessment approach has been used, based on the method detailed by the United Kingdom's IAQM.

The assessment has shown that, without mitigation, the preliminary risk (in terms of health effects and potential nuisance) of impacts at nearby sensitive receptors associated with the construction of the Heybridge converter station is low. Even with a low risk of impacts, best practice dust mitigation measures should still be applied during construction. With the implementation of standard mitigation measures the residual risk reduces to negligible.

Based on these findings it is concluded that project will have a low risk for human health and, therefore, a quantitative assessment using dispersion modelling is not required to verify NEPM compliance for $PM_{10}$, $PM_{2.5}$ and combustion gases.

The outcomes of the risk assessment have provided the basis for the application of the following EPRs for the project.

- EPR AQ01: Develop and implement a construction dust management plan
- EPR AQ02: Develop and implement measures to manage emissions to air during operations.

Key mitigation measures presented should be incorporated in order to ensure that construction activities comply with the EPRs.

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# APPENDIX A – TYPICAL SITE-SPECIFIC MITIGATION

Typical site-specific mitigation measures identified in the IAQM methodology are presented in Table A1.

**Table A1 Recommended mitigation measures**

| |
|---|
| **Communications** |
| Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary or near active construction works. This may be the environment manager, engineer or site manager. |
| Display the head or regional office contact information. |
| Detail the mitigation measures to be applied, responsibilities for personnel on-site regarding dust management, and corrective procedures in the event of complaints or dust events. |
| **Site management** |
| Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken. |
| Make the complaints log available to the Local Authority when requested. |
| Record any exceptional incidents that cause dust or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book. |
| **Monitoring** |
| Undertake daily inspections to check for visible dust emissions and adjust controls if required to minimise dust emissions. Record results of inspection, corrective action, and residual emissions. |
| Carry out regular site inspections to monitor compliance with the CDMP. |
| Increase the frequency of site inspections when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. |
| Conduct dust deposition monitoring at selected sensitive receptors. |
| **Preparing and maintaining the site** |
| Plan site layout so that machinery and dust causing activities are located as far away from receptors as possible. |
| Remove materials, that have a potential to produce dust, from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below. |
| Storing materials susceptible to dust (e.g., aggregate) in a way that minimises dust to mobilise e.g., covering or spraying stockpiles and use of enclosed storage facilities |
| **Operating vehicles or machinery and sustainable travel** |
| Ensure all on-road vehicles comply with relevant vehicle emission standards, where applicable. |
| Turn off vehicles, plant and equipment when not in use or 'throttle down' when used intermittently. |
| Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable. |
| Impose and signpost a suitable maximum-speed-limit on unsurfaced haul roads and work areas. |
| Service vehicles, plant and equipment and operate in accordance with manufacturer's specifications to reduce emissions. |
| **Operations** |
| Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction (e.g., suitable local exhaust ventilation systems) when proximate to sensitive receptors. |
| Ensure an adequate water supply on site for effective dust and particulate matter suppression and the |

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| mitigation of its generation, using non-potable water where possible and appropriate. |
| Monitor severe weather, flood, damaging wind and storm warnings issued by Bureau of Meteorology and plan or defer activities, such as excavation works, to minimise risk of environmental harm, particularly dust, erosion, and sedimentation. |
| **Waste management** |
| No on-site burning of waste materials. |
| **Measures specific to earthworks** |
| Re-vegetate earthworks, including exposed areas and soil stockpiles to stabilise surfaces as soon as practicable. |
| Use hessian, mulches or tackifiers where it is not possible to re- vegetate or cover with topsoil, as soon as practicable. |
| Minimise the area where cover is removed or material disturbed, as much as practical. |
| Minimise the drop height when unloading material from haul trucks. |
| **Measures specific to construction** |
| Avoid scabbling (roughening of concrete surfaces) if possible. |
| Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place. |
| Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery. |
| Store bulk cement and other fine powder materials in enclosed silos or enclosed bunded areas to prevent windblown material and material washing offsite. Prevent overfilling during delivery to avoid spill. |
| **Measures specific to trackout** |
| Maintain access tracks to suitable standard |
| Where practical, ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. |
| Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.  Record all inspections. |
| Apply water to unsealed access tracks, particularly during dry periods and where construction works are within 100 m of sensitive receptors |

# Appendix H. EMF and EMI Impact Assessment

Jacobs

MARINUS LINK

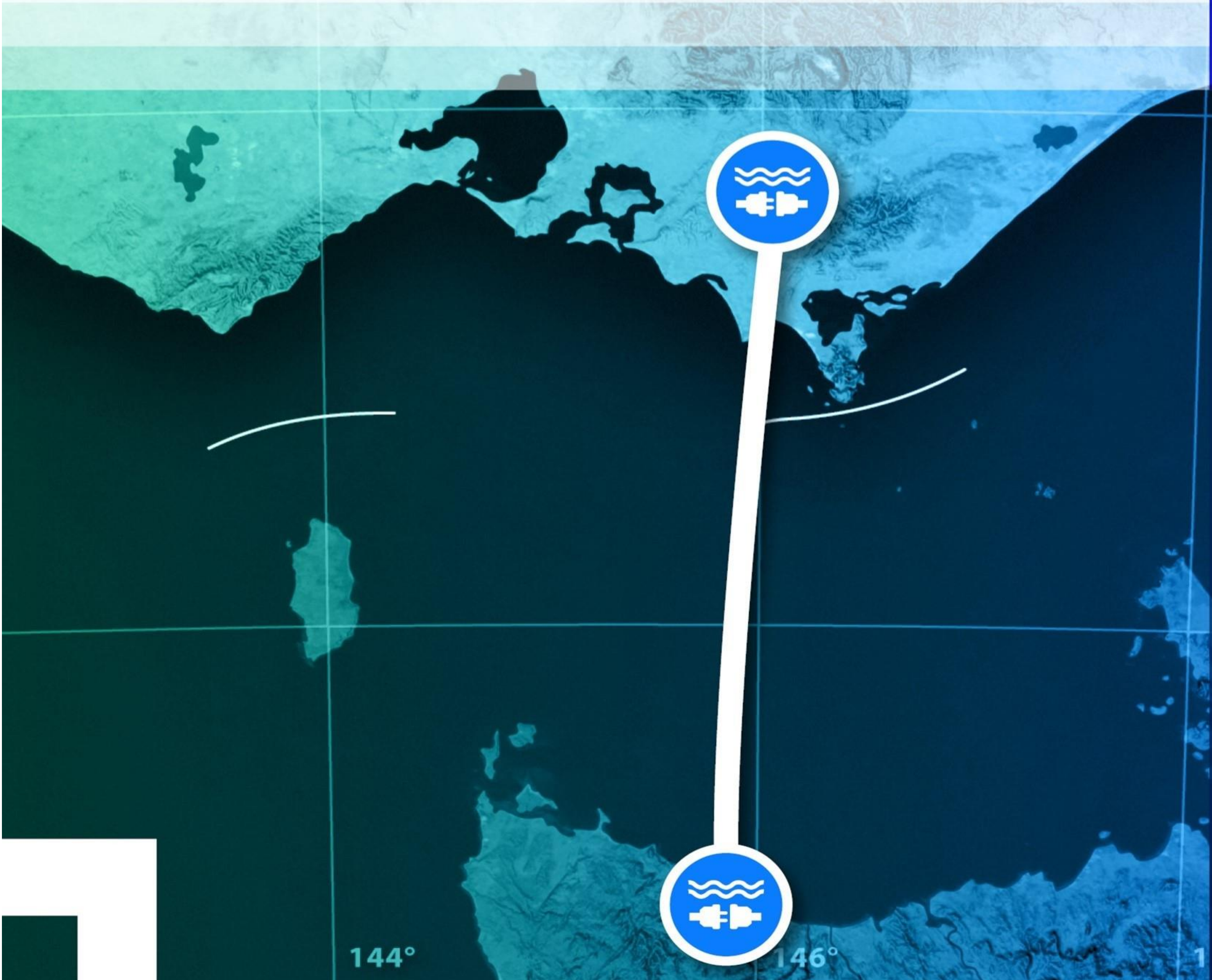
# Marinus Link

## Marinus Link EMF & EMI Impact Assessment

IS360328-SO28-EE-RPT-0002

May 2024

**Marinus Link Pty Ltd**



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Contents

# Executive Summary

## Overview

Marinus Link is a proposed 2 x 750 megawatt (MW) high voltage direct current (HVDC) electricity interconnector between Heybridge in northwest Tasmania and the Latrobe Valley in Victoria. Marinus Link will provide a second link between the Tasmanian renewable energy resources and the Victorian electricity grids enabling efficient energy trade, transmission and distribution from a diverse range of generation sources to where it is most needed and will increase energy capacity and security across the National Electricity Market (NEM).

The interconnector will comprise a 255 km long subsea cable link across the Bass Strait and a 90 km long land cable link through eastern Victoria, with converter stations at both ends. The proposed new HVDC link will initially operate at 750 MW capacity in Stage 1 and will be increased to 1,500 MW in Stage 2 with the addition of a second HVDC circuit.

The scope of works documented in this study report comprises desktop assessments of the Electric and Magnetic Fields (EMF) and Electromagnetic Interference (EMI) associated with the proposed new Marinus HVDC Link. The key components of the HVDC link are the ±320 kV subsea and land cable circuits, a 220 kV converter station at Heybridge (Tasmania) and a 500 kV converter station at either Driffield or Hazelwood (Victoria).

This report documents the impact assessments for people, livestock, wildlife and equipment within the Study area that may be sensitive to electric and magnetic fields and electromagnetic interference from the proposed electrical power infrastructure. It does not consider the impact of EMF and EMI on workers inside the converter stations as there are regulated compliance requirements defined in occupational health and safety standards for these exposure scenarios. Compliance with these requirements will be verified by the contractor during detailed design of the infrastructure.

## Existing Conditions

The only measurable sources of EMF and EMI within the subsea study area are the earth's geomagnetic fields. The cumulative impact of the proposed new electrical power infrastructure and the geomagnetic fields will only be measurable at the shore crossings of the subsea HVDC cables.

There are no measurable cumulative effects between any existing and proposed new HVDC cables within the subsea study area.

The only measurable sources of EMF and EMI within the mainland Tasmania and mainland Victoria study areas are the earth's geomagnetic fields and the AC electric and magnetic fields generated by operational high voltage power lines and substation equipment. There are existing 500 kV AC power lines that will parallel and cross-over the Marinus HVDC land cables. The physical and biological mechanisms by which DC and AC fields impact people, fauna, flora and equipment are distinct. As such, cumulative impact limits for DC and AC fields are not defined in the relevant standards and guidelines, and the cumulative impact of DC and AC fields on the environment within the study area are considered acceptable if they are below the respective limits and reference levels defined in the relevant standards and guidelines.

## Impact Assessment

Research and analysis of sensitive receivers that could potentially be impacted by the EMF and EMI generated by the proposed project's electrical power infrastructure have been undertaken. Limits and reference levels have been derived from applicable state, national and international standards and research reports/studies to evaluate the possible operational impact of the electrical power infrastructure on the local environment within the defined study area.

Besides the impact of electric and magnetic fields on people, plants and animals, generic household electrical and electronic equipment may also be impacted by AC magnetic fields that exceed 3.8 μT and radio frequency fields. DC magnetic field limits are not specified for generic equipment as the equipment is significantly more immune to DC fields, as compared to AC fields, in the general case. Specialised medical and scientific research equipment may however be sensitive to lower-level AC and also DC magnetic fields, which can interfere with the normal operation and functionality of the equipment.

#### Converter Stations and Surrounding Areas

Sensitive receivers that could be impacted by EMF and EMI associated with the proposed converter stations, and were considered in the impact assessment, include people, active implantable medical devices, generic electrical & electronic equipment, very sensitive medical and scientific research equipment, farm equipment, livestock and local flora and fauna.

The maximum calculated EMF at the Heybridge, Driffield and Hazelwood converter stations will be below the reference levels for people, livestock and wildlife at the property boundary for each site. The operating impacts of the converter stations on human health, livestock and wildlife will therefore be negligible. Mitigation and controls will not be required at the installations.

The maximum calculated EMI, specifically the AC magnetic field strength, will be below 3.8 μT (i.e. the generic equipment interference limit) in all areas outside the converter station properties. A desktop study of the area surrounding the three converter station sites was conducted and it was confirmed that there are no fixed sensitive electrical or electronic equipment or system installations that could be impacted by the EMI from the converter stations. The operating impacts of the converter stations on all nearby sensitive receivers will be negligible. Mitigation and controls will not be required at the installations.

#### Land HVDC Cables

Sensitive receivers that could be impacted by EMF and EMI associated with the proposed land HVDC cables, and were considered in the impact assessment, include people, active implantable medical devices, generic electrical & electronic equipment, very sensitive medical and scientific research equipment, farm equipment, livestock (dairy & beef cattle, sheep, horses, pigs, and poultry), honeybees, fruit trees, feeding grasses, vegetables, local flora and fauna (e.g. birds, reptiles, frogs, mammals).

The magnetic field distribution was calculated along the land HVDC project alignment. The maximum calculated EMF along the land HVDC cables will be below the reference levels for people throughout the study area. It was concluded from these calculations that the land cables will have no operating impacts on human health. Mitigation and controls will not be required at the installations.

Similarly, the land cables will not impact the general health of livestock, wildlife and the normal functioning of RFID tags or other farm equipment or machinery along the project alignment.

The HVDC land cables could have some impact on the behaviour of honeybees within 5 m of the cable trench. It is recommended that any apiaries located within 5 m of the trench be relocated outside the impact zone during the construction of the HVDC land cable. The impact of the HVDC cables will then be limited to temporary loss of direction sense for bees foraging within the very localised impact zone above the cable trench. Given the very limited extent of the impact zone and that the impact is momentary disorientation within the impact zone only, it is concluded that the HVDC cable will have negligible impact on bee colonies where the apiary has been relocated outside the impact zone.

A desktop study of the area along the land HVDC project alignment was carried out and it was confirmed that there will be no specialised medical and scientific research equipment near the land HVDC cables that could be impacted by the DC magnetic fields associated with the cables.

**Subsea HVDC Cables – Shore Crossings**

Sensitive receivers that could be impacted by EMF and EMI associated with the proposed subsea HVDC cables in the shore crossing areas, and were considered in the impact assessment, include fish, marine mammals, turtles, marine vessels (e.g. ships and boats), and other marine fauna and flora.

The potential effects of EMF exposure to Marine Flora and Fauna are addressed in the Marine Ecology and Resource Use (MERU) report (EIS/EES Appendix P). This report identifies applicable reference levels and potential effects of EMF exposure on Marine Flora and Fauna, including benthic species, epibenthic species, and those listed as threatened under the Threatened Species Protection Act 1995.

The highest DC magnetic field levels occur on the sea floor at the shore crossings. This is because the cables will be unbundled and spaced a few meters apart along these sections. The maximum calculated EMF along the shore crossing HVDC cables will be below the reference levels for people throughout the study area. It was concluded from the shore crossing cable impact assessment that the calculated field levels are below the applicable reference levels and there will be no operating impacts on human health. Mitigation and controls will not be required at the installations. Similarly, the shore crossing cables will not impact the normal functioning of marine vessels and systems in the study area.

**Subsea HVDC Cables - Bass Strait**

Sensitive receivers that could be impacted by EMF and EMI associated with the proposed subsea HVDC cables in the Bass Strait, and were considered in the impact assessment, include fish, marine mammals, turtles, marine vessels (e.g. ships and boats), and other marine fauna and flora.

The potential effects of EMF exposure to Marine Flora and Fauna are addressed in the Marine Ecology and Resource Use (MERU) report (EIS/EES Appendix P). This report identifies applicable reference levels and potential effects of EMF exposure on Marine Flora and Fauna, including benthic species, epibenthic species, and those listed as threatened under the Threatened Species Protection Act 1995.

The magnetic field distribution was calculated along the subsea HVDC project alignment across Bass Strait. The cables in each circuit will be bundled together within the Bass Strait trench section, which greatly reduces the external magnetic fields associated with the cables. The magnetic fields will be strongest directly above the cables and decrease quickly at increasing distance from the cables. Fluctuations in sea water conductivity were considered in the modelling but were found to have negligible impact on the intensity of the static magnetic fields. The static electric field produced by the cables in the conductive water will be negligible for all reasonable water salinities and ocean current velocities.

The maximum calculated EMF along the subsea HVDC cables will be below the reference levels for people throughout the study area. It was concluded from the subsea cable impact assessment that the calculated field levels are below the applicable reference levels and there will be no operating impacts on human health. Mitigation and controls will not be required at the installations. Similarly, the subsea cables will not impact the normal functioning of marine vessels and systems in the study area.

A desktop study of the area along the subsea HVDC project alignment within the Bass Strait was carried out and it was confirmed that there will be no specialised medical and scientific research equipment near the subsea cables that could be impacted by the DC magnetic fields associated with the cables.

**Cable Heating Assessment**

The heat generated by the subsea and land HVDC cables has been considered in the impact assessment. It is concluded from conservative soil heating calculations that it is unlikely that the operation the HVDC cables will impact plant life, specifically pasture grass, in the vicinity of the cable trench along any section of the cable. The cable system design will provide assurance that any impact on plant health is negligible.

Negligible heating of the seawater near the seabed is expected due to the operation of the subsea HVDC cables. The temperature rise at the seabed surface due to the subsea HVDC cables is indistinguishable from the ambient temperature.

## Monitoring and Review

It is recommended that post-construction and commissioning EMF and EMI tests be conducted near key locations within the project area to verify the calculations presented in this impact assessment and those that will be carried out during the detailed design stage.

## Environmental Performance Requirements

Two Environmental Performance Requirements (EPRs) are recommended as controls to ensure the EIS/EES evaluation objectives relevant to EMF and EMI are met. They are as follows:

| EPR ID | Environmental Performance Requirement | Project Stage |
|---|---|---|
| EPR EMF01 | **Design the project to reduce EMF/EMI emissions**<br>Design and construct the project to reduce electric and magnetic fields (EMF) and electromagnetic interference (EMI) for the project alignment onshore to below the reference levels or as low as reasonably practicable to avoid and minimise impacts. The applicable reference levels are defined in EIS/EES Technical Appendix A: Electromagnetic Fields Section 7 of the EMI impact assessment prepared for the EIS/EES. The design must be informed by a project wide EMF and EMI assessment for all the proposed infrastructure, identifying existing sensitive receptors and committed future developments within the study area. The assessment must be documented in a management plan that includes, but is not limited to:<br>• Outcomes of the project wide EMF and EMI assessment and details of the areas assessed.<br>• The location of all sensitive receptors including beehives within 5 m of the infrastructure. The location of beehives must also be documented in the property management plans (EPR A02).<br>• Where at-receiver mitigation works to sensitive equipment are required to avoid or minimise adverse impacts.<br>• A pre- and post-construction testing strategy to verify design calculations, impacts on sensitive equipment and the efficacy of any specified mitigation measures.<br>• Remedial action to be undertaken if EMF and EMI limits are not met during the construction, testing, and commissioning.<br>The EMF and EMI management plan must be prepared to inform the design and commissioning of the project.<br>EMF and EMI emissions of the subsea cable are addressed in EPR MERU 12. | Design<br>Construction<br>Commissioning |
| EPR EMF02 | **Investigate and resolve complaints regarding EMF and EMI during operation**<br>As part of the OEMP, develop a protocol for investigating and resolving complaints regarding EMF and EMI during operation. The protocol must outline requirements for working with landholders to assess impacts on sensitive equipment and implement reasonably practicable measures to address impacts. | Operation |

## Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to outline the methodology and present the results of an *EMF and EMI impact assessment of the Marinus Link* in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of, Jacobs' Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

# Glossary and Abbreviations

| Abbreviation | Definition |
|---|---|
| AC | Alternating Current |
| ACMA | Australian Communications and Media Authority |
| AIMD | Active Implantable Medical Device |
| AM | Amplitude Modulation |
| ARPANSA | Australian Radiation Protection and Nuclear Safety Agency |
| AS | Australian Standard |
| AS/NZS | Joint Australian New Zealand Standard |
| CDEGS | Current Distribution, Electromagnetic Fields. Grounding and Soil Structure Software |
| CYMCAP | Power Cable Installation Ampacity and Temperature Rise Calculation Software |
| DC | Direct Current |
| DGPS | Differential Global Positioning System |
| EES | Environmental Effects Statement |
| EIS | Environmental Impact Statement |
| ELF | Extremely Low Frequency |
| EMF | Electric and Magnetic Fields |
| EMI | Electromagnetic Interference |
| EN | European Normalised Standard |
| ENA | Energy Networks Australia |
| FM | Frequency Modulation |
| GPS | Global Positioning System |
| HDD | Horizontal Directional Drilling |
| HV | High Voltage |
| HVAC | High Voltage Alternating Current |
| HVDC | High Voltage Direct Current |
| IARC | International Agency for Research on Cancer |
| ICNIRP | International Commission on Non-Ionising Radiation Protection |
| ITU | International Telecommunication Union |
| MLPL | Marinus Link Pty Ltd |
| MNES | Matters of National Environmental Significance |
| MRI | Magnetic Resonance Imaging |
| NEM | National Electricity Market |

| Abbreviation | Definition |
|---|---|
| NHMRC | National Health and Medical Research Council |
| RFI | Radio Frequency Interference |
| RFID | Radio Frequency Identification |
| RHC | Radiation Health Committee |
| RHS | Radiation Health Series |
| RIV | Radio Influence Voltage |
| RMS | Root Mean Square |
| XLPE | Cross-linked Polyethylene |

# 1. Introduction

The proposed Marinus Link (the project) comprises a high voltage direct current (HVDC) electricity interconnector between Tasmania and Victoria, to allow for the continued trading and distribution of electricity within the National Electricity Market (NEM).

The project was referred to the Australian Minister for the Environment 5 October 2021. On 4 November 2021, a delegate of the Minister for the Environment determined that the proposed action is a controlled action as it has the potential to have a significant impact on the environment and requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) before it can proceed. The delegate determined that the appropriate level of assessment under the EPBC Act is an environmental impact statement (EIS).

On 12 December 2021, the former Victorian Minister for Planning under the *Environment Effects Act 1978* (Vic) (EE Act) determined that the project requires an environment effects statement (EES) under the EE Act, to describe the project's effects on the environment to inform statutory decision making.

In July 2022 a delegate of the Director of the Environment Protection Authority Tasmania determined that the project be subject to environmental impact assessment by the Board of the Environment Protection Authority (the Board) under the *Environmental Management and Pollution Control Act 1994* (Tas) (EMPCA).

As the project is proposed to be located within three jurisdictions, the Victorian Department of Transport and Planning (DTP), Tasmanian Environment Protection Authority (Tasmanian EPA) and Australian Department of Climate Change, Energy, Environment and Water (DCCEEW) have agreed to coordinate the administration and documentation of the three assessment processes. One EIS/EES is being prepared to address the requirements of DTP and DCCEEW. Two EISs are being prepared to address the Tasmanian EPA requirements for the Heybridge converter station and shore crossing.

This report has been prepared by Jacobs to address all jurisdictions as part of the EIS/EES being prepared for the whole project.

## 1.1 Purpose of this Report

The objective of Electric and Magnetic Field (EMF) and Electromagnetic Interference (EMI) studies for the project is to identify potential EMF and EMI effects to sensitive receivers and assess the impact caused by the construction and operation of the Marinus Link. The impact of EMF and EMI on workers inside the converter stations are not considered in the studies as there are regulated compliance requirements defined in occupational health and safety standards for these exposure scenarios. Compliance with these requirements will be verified by the contractor during detailed design.

An integrated approach is used to assess the EMF and EMI impacts that could occur as a result of the project. Receivers identified in either the other technical studies or a desktop audit of the proposed alignment were grouped by sensitivity to EMF and EMI, immunity limits were derived for each group from published standards or research papers and finally these assessment criteria were used to assess calculated EMF and EMI that will be generated by the construction and operation of the project.

## 1.2 Project Overview

The project is a proposed 1500 megawatt (MW) HVDC electricity interconnector between Heybridge in northwest Tasmania and the Latrobe Valley in Victoria (Figure 1-1). Marinus Link is proposed to provide a second link between the Tasmanian renewable energy resources and the Victorian electricity grids enabling efficient energy trade, transmission and distribution from a diverse range of generation sources to where it is most needed, and will increase energy capacity and security across the National Electricity Market (NEM).

Marinus Link Pty Ltd (MLPL) is the proponent for the project and is a wholly owned subsidiary of Tasmanian Networks Pty Ltd (TasNetworks). TasNetworks is owned by the State of Tasmania and owns, operates and maintains the electricity transmission and distribution network in Tasmania.

Tasmania has significant renewable energy resource potential, particularly hydroelectric power and wind energy. The potential size of the resource exceeds both the Tasmanian demand and the capacity of the existing Basslink interconnector between Tasmania and Victoria. The growth in renewable energy generation in mainland states and territories participating in the NEM, coupled with the retiring of baseload coal-fired generators, is reducing the availability of dispatchable generation that is available on demand.

Tasmania's existing and potential renewable resources are a valuable source of dispatchable generation that could benefit electricity supply in the NEM. Marinus Link will allow for the continued trading, transmission and distribution of electricity within the NEM. It will also manage the risk to Tasmania of a single interconnector across Bass Strait and complement existing and future interconnectors on mainland Australia. Marinus Link is expected to facilitate the reduction in greenhouse gas emissions at a state and national level.

Interconnectors are a key feature of the future energy landscape. They allow power to flow between different regions to enable the efficient transfer of electricity from renewable energy zones to where the electricity is needed. Interconnectors can increase the resilience of the NEM and make energy more secure, affordable and sustainable for customers. Interconnectors are common around the world including in Australia. They play a critical role in supporting Australia's transition to a clean energy future.

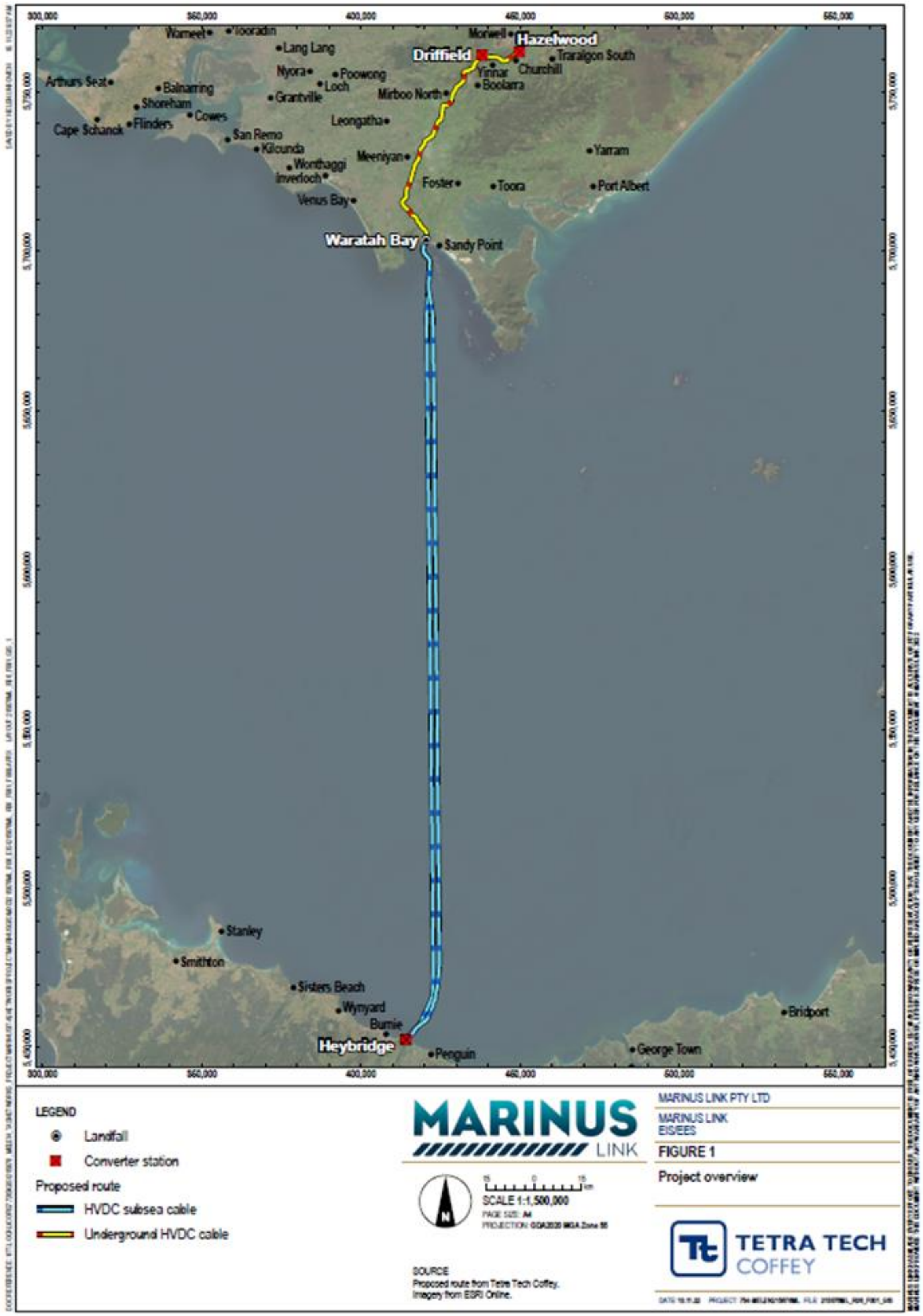


*Figure 1-1: Project Overview*

## 1.3 Assessment Context

Electric and magnetic fields (EMF) are invisible, physical fields that surround electrical charges and exert forces on all charged particles and objects in the field. All electrical and electronic equipment and appliances therefore generate EMF. The magnitude of the EMF generated by equipment is proportional to the magnitude of the voltage and current used to power the equipment and inversely proportional to the distance between the equipment and the sensitive receiver.

The project infrastructure utilises high voltages and currents and will therefore generate significant EMF. Furthermore, a wide range of sensitive receivers will be exposed to these EMFs along the extensive alignment and will come into close proximity to the insulated cables (i.e. within a few metres of the buried cables).

The EMF is also characterised by the frequency at which the fields oscillate between positive and negative peaks, described in cycles per seconds in units of Hertz (Hz). Extremely low frequency fields, such as those generated by the 0 Hz DC equipment and 50 Hz power infrastructure, are not radiated from the power cables and equipment and reduce to very low levels further away from the project infrastructure. At higher frequencies, the cables and equipment radiate electromagnetic fields that only reduce in magnitude with very large distances from the power infrastructure.

Some electrical and electronic equipment is very sensitive to extremely low frequency fields and radiated high frequency fields, which can interfere with the normal operation and functionality of the equipment. These interfering fields are called electromagnetic interference (EMI).

The assessment of EMF and EMI impacts on the large number of sensitive receivers forms an important part of a single consolidated EIS/EES that is being prepared to address the requirements of the Commonwealth and Victorian jurisdictions (including the requirement for an EES) given the large extent of the proposed alignment and the significant amount of electrical power that will be transmitted over the link. Potential sensitive receivers include, but are not limited to: humans, marine life, fauna, wildlife, crops, vegetation, communications equipment, and very sensitive medical and scientific research equipment.

# 2. Assessment Guidelines

The EMF and EMI assessment associated with the project spans all jurisdictions. It considers impacts on sensitive receivers from the converter stations in Tasmania and Victoria, and the subsea and land HVDC cables in between the converter stations. The Commonwealth, Tasmanian, and Victorian scoping requirements and guidelines are therefore applicable. The subsections below (2.1, 2.2, and 2.3) detail the EMF and EMI requirements applicable to the project for each jurisdiction. Moreover, the relevant section of the report which addresses each requirement is also identified in the summary.

## 2.1 Commonwealth

*Table 2-1: Commonwealth EIS Guidelines*

| Section | Definition | Report Section |
|---|---|---|
| 5 Relevant Impacts | Any technical data and other information used or needed to make a detailed assessment of the relevant impacts, including but not limited to:<br>• modelling (or other scientifically sound method for making predictions) of electromagnetic disturbance during the construction and operation stages of the action. Modelling should be relevant to the project area, installation methods and noise sources, | 5 & 7.5 |
| 5.3 Underwater disturbance (noise, heat, vibrations, and electromagnetic fields) impacts | The EIS must include an assessment of the potential direct and indirect impacts to listed marine, migratory, and threatened species and communities, and including impacts to prey species arising from electromagnetic fields generated during the construction, commissioning, operation, and decommissioning of the subsea cable. The following will be required:<br>• details of the electromagnetic fields to be generated during all stages of the action including:<br>○ The intensity and frequency of any underwater disturbance generated from all relevant activities associated with the proposed action;<br>○ the expected geographic extent of disturbance, and the length of the disturbance period;<br>• details of the heat generation from the operation of the subsea cable, on the surface of the cable and to the surrounding ambient environment of the water;<br>• the impacts of electromagnetic fields associated with the construction and ongoing operations of the action on all MNES, including:<br>○ an assessment of short-term, long-term and cumulative impacts, compared with baseline environmental conditions;<br>○ the consequences for the disruption of migration, resting, breeding (including calving and nursing), or foraging behaviours of listed species, as a result of underwater disturbance including consideration of requirements in relevant statutory documents; and<br>○ the potential for the activity to impede the recovery of a listed species.<br>○ the potential for impacts to commercially important species of the Commonwealth Marine Area | 7.4 & 7.5 |

## 2.2 Tasmania

### 2.2.1 Heybridge Shore Crossing & Coastal Waters

*Table 2-2: EPA EIS Guidelines applicable to the Heybridge shore crossing and coastal waters*

| Scoping Section | Definition | Report Section |
|---|---|---|
| 10.3 Marine Natural Values | In discussion of impacts on flora and fauna, including consideration of:<br>• Heat and electromagnetic radiation, including whether it will have any potential impacts on benthic ecosystems, fish or mammals, and their migratory behaviors, e.g., through impact on movement of seawater, magnetic characteristics of marine sediments or other potential impacts. | 7.2 |
| 10.4 Marine Water Quality | Discuss potential impacts of construction and operation of the proposal on marine water quality, including:<br>• As available, other relevant information for assessing potential impacts such as electromagnetic data,<br>Consideration of operational impacts on water quality, including electromagnetic fields (noting that electromagnetic radiation is within the definition of 'pollutant' under the EMPC). | 7.2.12 |

### 2.2.2 Heybridge Converter Station

*Table 2-3: EPA EIS Guidelines applicable to the Heybridge Converter Station*

| Scoping Section | Definition | Report Section |
|---|---|---|
| 6.8 Electric and magnetic fields | Discuss the potential risks or impacts of electromagnetic fields associated with the proposal, including:<br>• A desktop study of the Electromagnetic Fields (EMF) associated with the new converter station, including calculations of the EMF levels likely to be generated at the edge of the site,<br>• A comparison against levels recommended by the Australian Radiation Protection and Nuclear Safety Agency and the human exposure guideline limits recommended by the International Commission on Non-Ionizing Radiation Protection, | 7.4 & 7.5 |

## 2.3 Victoria

The EES Scoping Requirements issued by the Minister for Planning (February 2023) outline the specific matters to be assessed across a number of environmental and social disciplines relevant to the project, and to be documented in the EES for the project.

The EES Scoping Requirements inform the scope of the EES technical studies and define the EES evaluation objectives. The EES evaluation objectives identify the desired outcomes to be achieved and provide a framework for an integrated assessment of the environmental effects of a proposed project.

### 2.3.1 EES Evaluation Objective – Biodiversity and Ecological Values

"Avoid, and where avoidance is not possible, minimise adverse effects on terrestrial, aquatic and marine biodiversity and ecology, including native vegetation, listed threatened species and ecological communities, other protected species and habitat for these species, and to address offset requirements consistent with state policies."

### 2.3.2 EES Evaluation Objective – Amenity, Health, Safety and Transport

"Avoid and, where avoidance is not possible, minimise adverse effects on community amenity, health and safety, with regard to noise, vibration, air quality including dust, the transport network, greenhouse gas emissions, fire risk and electromagnetic fields."

### 2.3.3 EES Scoping Requirements

*Table 2-4: DEECA EES Scoping Requirements*

| Section | Definition | Report Section |
|---|---|---|
| 3.2<br>Content and Style | Conclusions on the significance of impacts on local, regional and state matters | 7.5 |
| 3.7<br>Environmental Management Framework | The Environmental Management Framework should describe proposed objectives, indicators and monitoring requirements, where relevant, for electromagnetic fields | 7.7, 7.8, & 7.9 |
| 4.1<br>Biodiversity and ecological values | Key Issues<br>• Potential for indirect effects on biodiversity values including those effects associated with changes in coastal processes, noise, vibration, electromagnetic fields, heat, vessel movements and water quality.<br>Likely Effects<br>• Potential for indirect effects on biodiversity values including those effects associated with changes in coastal processes, noise, vibration, electromagnetic fields, heat, vessel movements and water quality.<br>• Assess the direct and indirect effects of the project during construction and operation on biodiversity values, including disturbance through noise, vibration, electromagnetic fields and heat. | 7.2 & 7.5 |
| 4.5<br>Amenity, safety and transport | Key Issues<br>• Potential for adverse effects resulting from project-related electromagnetic fields at sensitive receivers during construction and operation.<br>Existing Environment<br>• Identify sensitive receivers that could be affected by electromagnetic fields<br>Likely Effects<br>• Identify potential effects of electromagnetic fields from the project on sensitive receivers<br>Mitigation<br>• Describe and assess potential measures for avoiding, mitigating or managing impacts of electromagnetic fields, including on human health | 7.2, 7.5 & 7.7 |

## 2.4 Linkages to Other Reports

This report is informed by, or informs, the technical studies identified in Table 2-5.

*Table 2-5: Linkages to other reports*

| Technical Study | Relevance to this Assessment |
|---|---|
| Agriculture | • Description of the farms and animals present along the project alignment that are potentially exposed to EMF and EMI from the project |
| Marine ecology and resource use | • Identification of marine species and environment exposed to EMF and EMI from the subsea cables<br>• The potential effects of EMF exposure to Marine Flora and Fauna are to be addressed in the Marine Ecology and Resource Use (MERU) report (EIS/EES Appendix P). This report will document potential effects of EMF exposure, and applicable reference levels that relate to Marine Flora and Fauna including benthic species, epibenthic species, and those listed as threatened under the Threatened Species Protection Act 1995. References to the MERU report are made in this report where applicable. |
| Social impact assessment | • People will be exposed to EMF generated by the subsea cables, land cables, and converter stations. Moreover, the general environmental impacts of EMF and EMI will have social implications |

# 3. Legislation, Policy and Guidelines

The scope of works covered in the study comprises desktop assessments of the EMF and EMI associated with the proposed new Marinus HVDC Link. The key components of the HVDC link will be the ±320 kV subsea and land cable circuits, a 220 kV converter station at Heybridge (Tasmania) and a 500 kV converter station at Driffield or Hazelwood (Victoria).

The proposed HVDC link will be arranged as a symmetric monopole with no earth return. The specifications for the indoor HVDC power equipment located within the converter station (e.g. rectifiers, filters, transformers, etc) will be confirmed during the subsequent stages of the project. The EMF and EMI from this equipment is therefore not modelled in the study but the appropriate requirements will be identified in this study and will inform the procurement of the equipment and requirement of the detailed design.

The EMF calculations documented in this report were carried out in the HIFREQ module of CDEGS, Ver. 17. The cable heating calculations documented in this report were carried out using CYMCAP Ver. 7.3. The EMF and EMI assessments documented in this report have been carried out in accordance with the Australian and international standards and industry guidelines specified Table 3-1.

*Table 3-1: Standards and guidelines referenced in the EMF and EMI study*

| Number | Revision | Title |
|---|---|---|
| ICNIRP | 2010 | International Commission on Non-Ionising Radiation Protection – Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz-100 kHz) |
| ICNIRP | 2014 | International Commission on Non-Ionising Radiation Protection – Guidelines for limiting exposure to electric fields induced by movement of the human body in a static magnetic field and by time-varying magnetic fields below 1 Hz |
| EN 45502-2-1 | 2003 | Active implantable medical devices – Particular requirements for active implantable medical devices intended to treat bradyarrhythmia (cardiac pacemakers) |
| EN 45502-2 | 2008 | Active implantable medical devices – Particular requirements for active implantable medical devices intended to treat tachyarrhythmia (includes implantable defibrillators) |
| EN 50527-1 | 2016 | Procedure for the assessment of the exposure to electromagnetic fields of workers bearing active implantable medical devices |
| AS/NZS 61000.6.1 | 2006 | Electromagnetic compatibility (EMC) - Generic standards - Immunity for residential, commercial and light-industrial environments |
| AS 2344 | 2016 | Limits of electromagnetic interference from overhead a.c. powerlines and high voltage equipment installation in the frequency range 0.15 MHz to 3000 MHz |
| ENA | 2016 | EMF Management Handbook |

# 4. Project Description

## 4.1 Overview

Marinus Link is proposed to be implemented as two 750 MW circuits to meet transmission network operation requirements in Tasmania and Victoria. Each 750 MW circuit will comprise two power cables and a fibre-optic communications cable bundled together in Bass Strait and laid in a horizontal arrangement on land. The two 750 MW circuits will be installed in two stages with the western circuit being laid first as part of stage one, and the easter cable in stage two.

The key project components for each 750 MW circuit, from south to north, are:

- HVAC switching station and HVAC-HVDC converter station at Heybridge in Tasmania. This is where the project will connect to the North West Tasmania transmission network being augmented and upgraded by the North West Transmission Developments (NWTD).
- Shore crossing in Tasmania adjacent to the converter station.
- Subsea cable across Bass Strait from Heybridge in Tasmania to Waratah Bay in Victoria.
- Shore crossing at Waratah Bay approximately 3 km west of Sandy Point.
- Land-sea cable joint where the subsea cables will connect to the land cables in Victoria.
- Land cables in Victoria from the land-sea joint to the converter station site in the Driffield or Hazelwood areas.
- HVAC switching station and HVAC-HVDC converter station at Driffield or at Hazelwood, where the project will connect to the existing Victorian transmission network.

A Transition Station at Waratah Bay may also be required if there are different cable manufactures or substantially different cable technologies adopted for the land and subsea cables. The location of the transition station will also house the fibre optic transition station in Victoria. However, regardless of whether a transition station is needed, a fibre optic terminal station will still be required in the same location.

Approximately 255 km of subsea HVDC cable will be laid across Bass Strait. The preferred technology for Marinus Link is two 750 MW symmetrical monopoles using ±320 kV, cross-linked polyethylene insulated cables and voltage source converter technology. Each symmetrical monopole is proposed to comprise two identical size power cables and a fibre-optic communications cable bundled together. The cable bundles for each circuit will transition from approximately 300m apart at the HDD (offshore) exit to 2 km apart in offshore waters.

In Victoria, the shore crossing is proposed to be located at Waratah Bay with the route crossing at the Waratah Bay–Shallow Inlet Coastal Reserve. From the land-sea joint located behind the coastal dunes, the land cable will extend underground for approximately 90 km to the converter station. From Waratah Bay the cable will run northwest to the Tarwin River Valley and then travel to the north to the Strzelecki Ranges. The route crosses the ranges between Dumbalk and Mirboo North before descending to the Latrobe Valley where it turns northeast to Hazelwood. The Victorian converter station will be at either a site south of Driffield or Hazelwood adjacent to the existing terminal station.

The land cables will be directly laid in trenches or installed in conduits in the trenches. A construction area of 20 to 36 m wide will be required for laying the land cables and construction of joint bays. Temporary roads for accessing the construction area and temporary laydown areas will also be required to support construction. Where possible, existing roads and tracks will be used for access, for example, farm access tracks or plantation forestry tracks.

Land cables will be installed in ducts under major roads, railways, major watercourses and substantial patches of native vegetation using trenchless construction methods (e.g., HDD, where geotechnical conditions permit. A larger area than the 36m construction area will be required for the HDD crossings.

The assessment is focused on the Victorian / Tasmanian / marine section of the project. The EMF and EMI assessment covers the Victorian / Tasmanian / marine sections of the project. This report will inform the EIS/EES being prepared to assess the project's potential environmental effects in its entirety across each jurisdiction in accordance with the legislative requirements of the Commonwealth, Tasmanian and Victorian governments (see Figure 4-1).

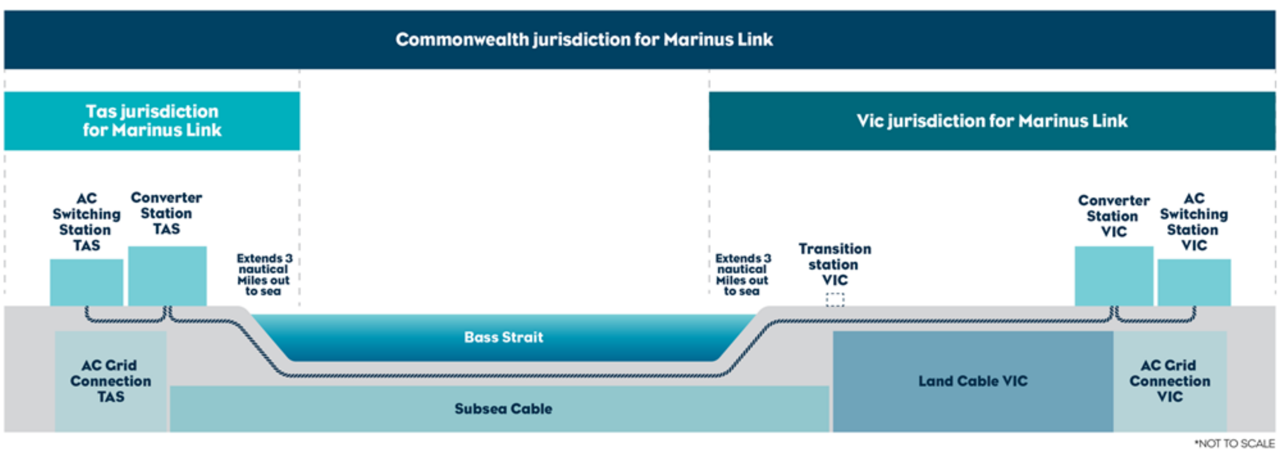


*Figure 4-1: Project components considered under applicable jurisdictions (Marinus Link Pty Ltd 2022, Consultation Plan).*

Marinus Link is proposed to be constructed in two stages over approximately five years following the award of works contracts to construct the project. On this basis, Stage 1 of the project is expected to be operational by 2030, with Stage 2 to follow, with final timing to be determined by market demand. The project will be designed for an operational life of at least 40 years.

## 4.2 Construction, Operation, and Decommissioning

The EMF and EMI assessment of the project is focussed on the operational phase of the project, as this phase will generate the only significant levels. EMF and EMI generated by construction, commissioning and decommissioning activities are discussed but will not be significant.

# 5. Assessment Methodology

The EMF and EMI assessment considers the impact of power and radio frequency electric and magnetic fields and electromagnetic interference on people, animals, plants and electrical and electronic equipment and systems, which are collectively referred to as sensitive receivers in the context of varying degrees of susceptibility to health or functional effects caused by exposure to EMF and EMI. Some specialised medical and scientific research equipment is susceptible to EMI at levels that are much lower than the level typically generated by power infrastructure. This equipment is referred to in the assessment as very sensitive receivers and special consideration must be given to citing power infrastructure near existing equipment that is classified as very sensitive.

An integrated approach is used to assess the potential EMF and EMI impacts that could occur as a result of the project. This involves the following steps:

- A desktop survey of the study area is first conducted to identify sensitive receivers that could be impacted by EMF and EMI associated with the proposed power infrastructure. The survey comprises an audit of online aerial imagery of the study area, followed by an online search for public information regarding the likely residential, commercial or industrial use of identified buildings and installations, and electrical and electronic equipment that may be installed at those locations.
- The basic mechanisms by which EMF and EMI can impact sensitive receivers are then introduced and cause-effect relationships established for the various receivers identified within the study area.
- Limits and reference levels are then confirmed for the identified impacts, based on state, national and international standards, guidelines and published research.
- The power infrastructure is then modelled in an appropriate software package and typical and worst-case EMF and EMI levels are calculated at the sensitive receiver locations for comparison with the impact assessment criteria.
- Finally, mitigations and management methods are assessed, and the residual risk established for the identified impacts.

## 5.1 Study Area

In general, sensitive receivers more than 500 m from the proposed power cables and equipment will not be impacted by EMF and EMI. This is because at a distance of 500 m from the proposed power cables and equipment, the generated EMF and EMI will most likely be indistinguishable from the background ambient levels. This is evidenced in the graphical plots presented in the Operation Impact Assessment (Section 7.5) of this document.

Some very sensitive receivers can however be impacted at greater distances and these will be identified by receiver type, in addition to a general source for sensitive receivers within a 500 m study area around the electrical power installations. In general, very sensitive receivers are receivers that can be affected by magnetic field levels in the nanotesla range. This is as opposed to sensitive receivers which in general, can be affected by magnetic fields in the microtesla range. No very sensitive receivers have been identified near the study area that will be impacted by the project.

## 5.2 Electrical Power Infrastructure

The Marinus Link Reference Design information was used as inputs for the EMF and EMI modelling for the impact assessment. As built data was provided by AusNet for the existing Hazelwood Terminal Station installations. These are discussed in this section along with all other critical input parameters used for the system modelling.

The Marinus HVDC link will comprise two converter stations and interconnecting cables. The two converter stations will be located at Heybridge (Tasmania) and Driffield or Hazelwood (Victoria). Heybridge is a 220 kV converter station, the supply to Heybridge will be via two double circuit transmission lines that utilise twin Sulphur phase conductors. The existing HWTS-CBTS and HWTS-ROTS 500 kV lines will be deviated into the Driffield converter station.

### 5.2.1 HVDC System

The HVDC link is proposed to operate as a symmetrical monopole arrangement with each circuit capable of transferring 750 MW across the Bass Strait. Only one circuit will operate initially during Stage 1 operation, followed by operation of the second circuit during Stage 2 operation. The general arrangement of each circuit is illustrated in Figure 5-1. The nominal voltage is proposed to be ± 320 kV with a maximum continuous rated current of 1,250 A. The maximum overload rated current is 1,480 A. The bundle for each circuit will comprise a positive (sending), negative (return) and a fibre optic cable. The cable sheaths will either be earthed at one or both converter stations, to be confirmed during detailed design.

Both cable arrangements were modelled in the study. Both Stage 1 and Stage 2 operation were also modelled in the study. Only the worst case field levels for all operating stages and arrangements are reported in the impact assessment.

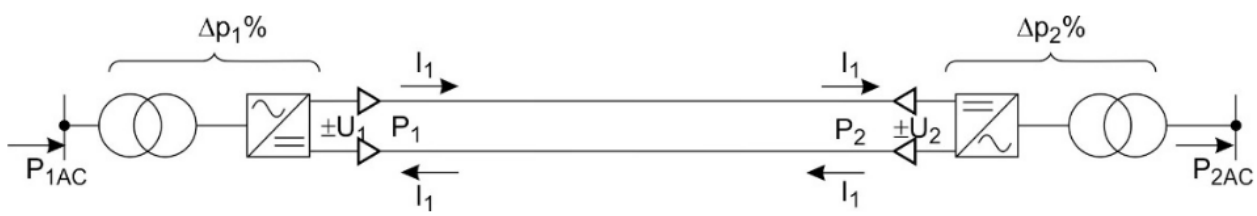


*Figure 5-1: Symmetrical monopole arrangement*

The bundle geometry through the Bass Strait is yet to be confirmed but will either be a horizontal flat or vertical stacked geometry. Both geometries were considered in the study. For the purposes of calculating the worst case magnetic flux density levels, it was assumed that for the three cables per circuit, the top and bottom cables will be the current carrying cables, and the middle cable is the fibre optic cable; providing the smallest degree of magnetic field cancellation.

The geometry of the cable will be sparse and non-uniform where the cable traverses the shore at both the Tasmanian and Victorian ends, as illustrated in Figure 5-2.

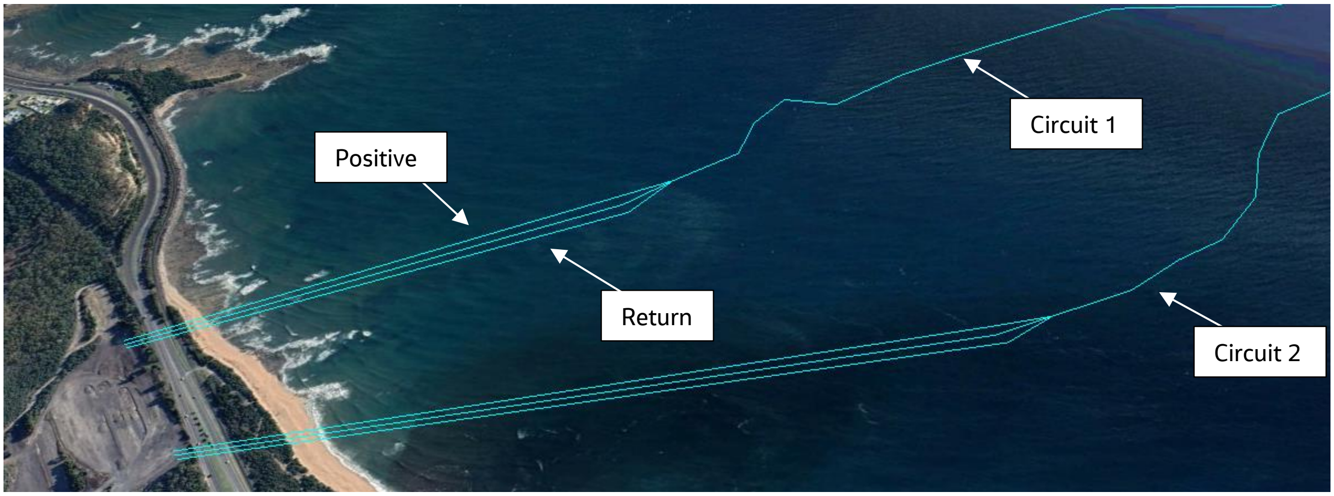


*Figure 5-2: Non-uniformity of cables at the Tasmanian shoreline*

The HVDC subsea cables have been modelled as 1,000 MW-rated submarine cables, comprising a 2,500 $mm^2$ stranded copper core with an extruded lead alloy metallic sheath and an overall nominal diameter of 135 mm. Where the cables transition from the Bass Strait to the land cable to Driffield/Hazelwood, the cables transition to 1,000 MW-rated underground cables; the key differences being the stranded copper wire screen and an overall nominal diameter of 117 mm.

## 5.2.2 Cable Modelling – Subsea Cable

The areas of the project alignment where the cables are spread out and their separation in non-uniform (i.e. the shore crossings at both the Tasmanian and Victorian ends) will produce the largest EMF levels. The two cable transitions between land and sea are shown in Figure 5-3. These sections are:

1. Cable transition from the Heybridge converter station to the Bass Strait (approximately 20 km)
2. Cable transition from the Bass Strait to the land cable (approximately 25 km)

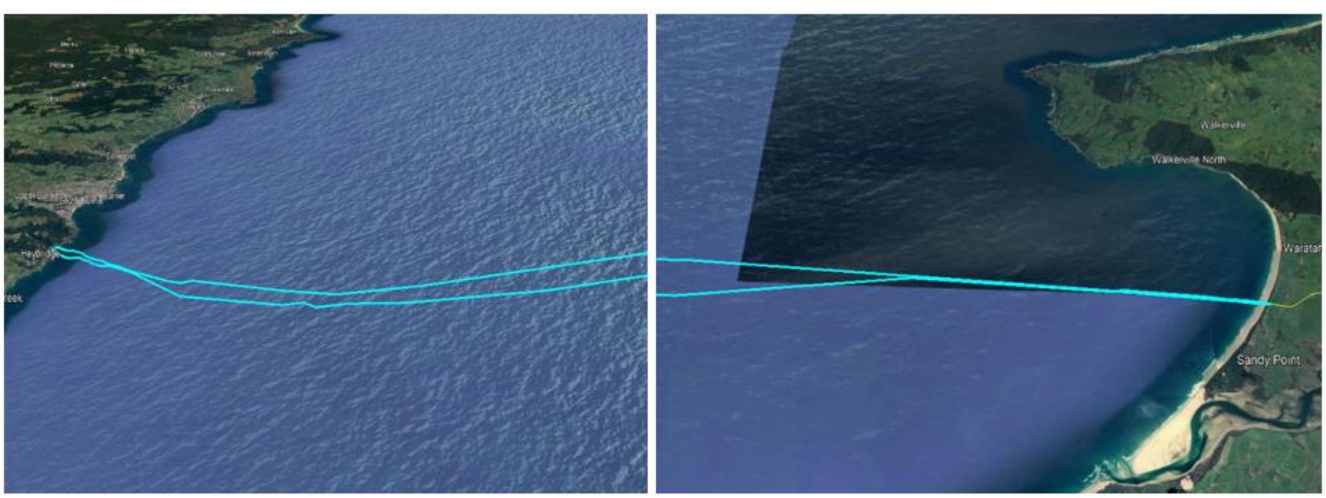


*Figure 5-3: Cable transitions between land and sea*

The preferred cable installation type for shore crossings is horizontal directional drilling (HDD) to about 10 m water depth, at which point they will be trenched where geotechnical conditions permit. The HDD sections comprise ducted cables separated by up to 50 m (see Figure 5-4). The largest EMF will be produced in the areas where the positive and negative cables have the largest separation from each other. This is because the magnetic fields produced by both cables don't cancel each other out to the same degree as in the trench where they will be separated by maximum 50 mm. The magnetic fields will also be reinforced at sharp bends in the cable. The detailed EMF and EMI modelling conducted for the study takes into account these magnetic field cancellation and reinforcement effects.

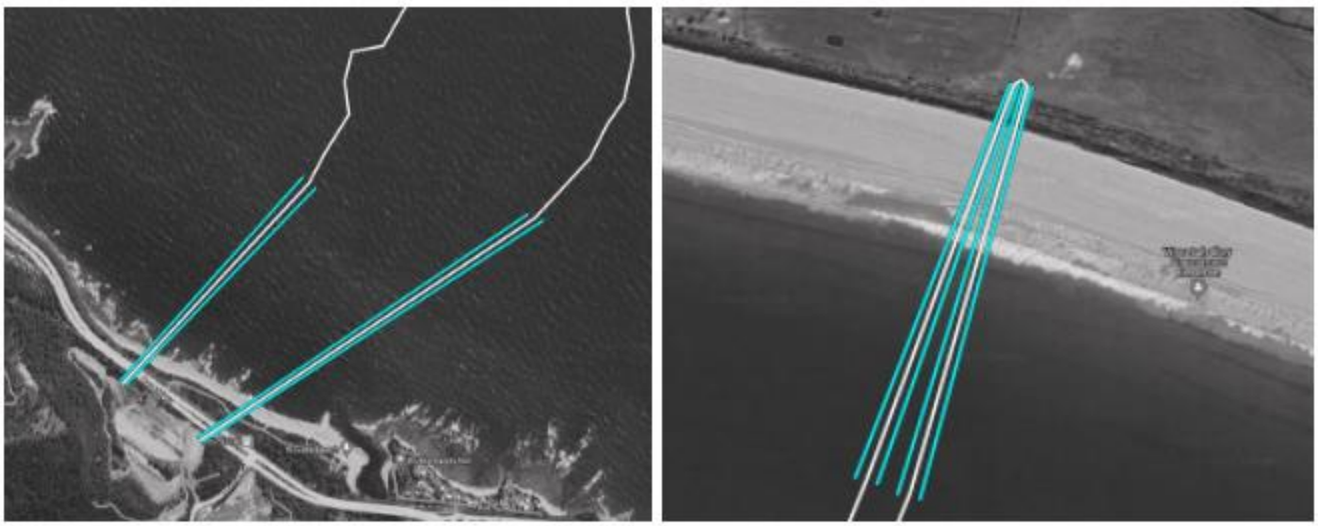

*Figure 5-4: Cable transitions between land and sea – HDD cable ducts*

The final geometry of the positive and return cables will only be confirmed during detailed design. For either horizontal of vertical final arrangements, the modelling conducted in this study has considered a flat arrangement with maximum 50 mm separation as this will produce the largest magnetic field levels for the trenched sections of the cable. The calculated magnetic field levels presented in this study are therefore conservative and allow for variations in final design arrangements. The average separation between the two HVDC circuits is 2 km along the Bass Strait. It is assumed that the cables will be buried a minimum of 1 m beneath the sea floor.

### 5.2.3 Cable Modelling – Land Cable

The proposed route of the land cable is shown in Figure 5-5. It has been assumed that the separation between circuits (cable trenches) will be 8.5 m, the cables will be trenched in a horizontal flat formation with nominal 0.5 m separation, at a minimum buried depth of 1.2 m below ground level.

There will be areas where the inter-cable spacing for the land cables is required to increase from 0.5 m for HDD road and river crossings. At these locations, the EMF modelling presented in this study has consider a maximum cable spacing of 4 m.

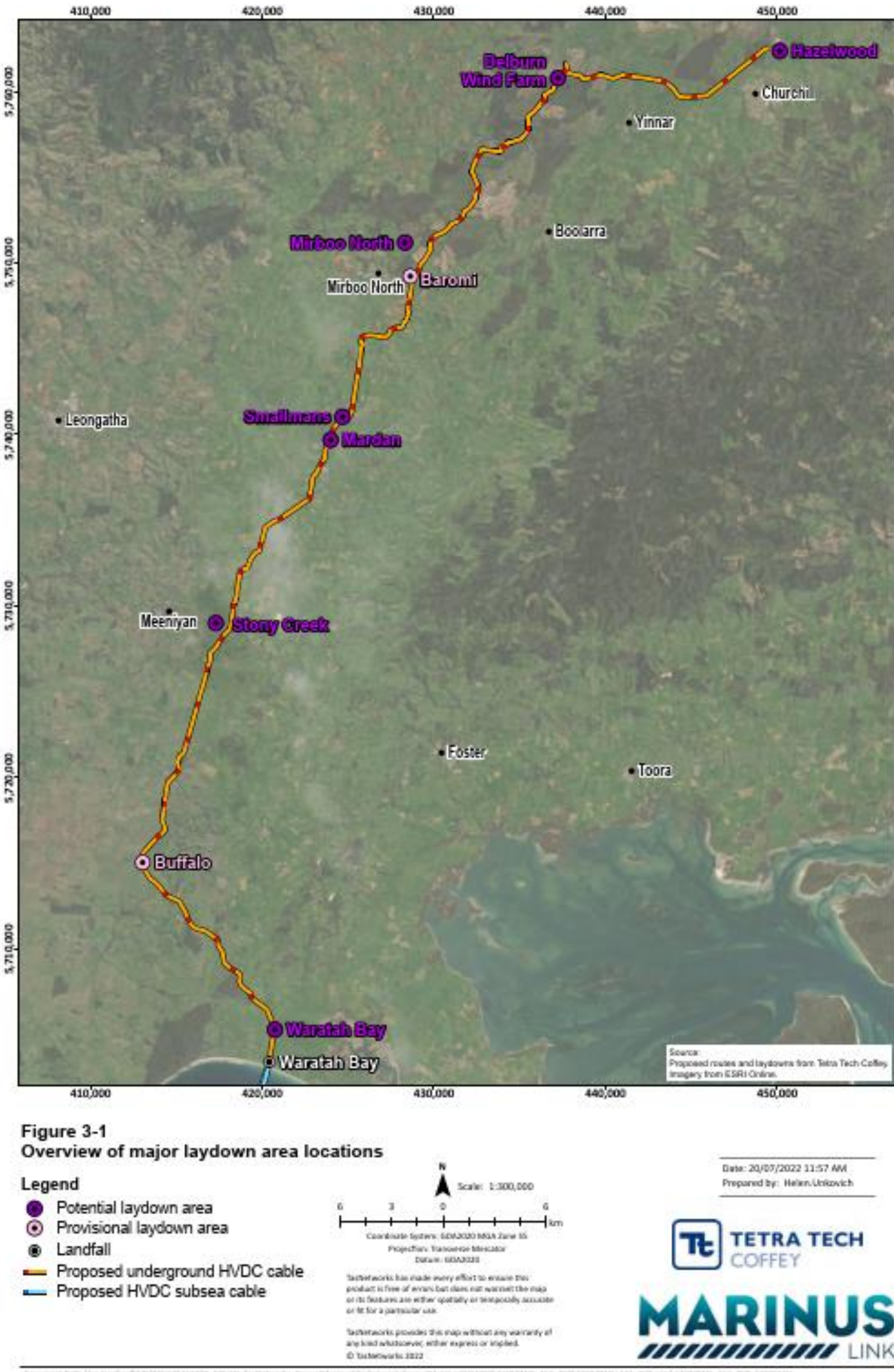


*Figure 5-5: Proposed land project alignment*

### 5.2.4 Converter Station Modelling

The electrical power is converted between AC and DC at converter station either side of the link. The primary AC flexible and rigid conductors within the converter station have been modelled to determine the extremely low frequency (ELF) EMF levels at the boundary of the converter stations, including the landing spans of the incoming/outgoing transmission lines.

Details of large power quality filters and power transformers will only be confirmed at the detailed design stage. Requirements have however been placed on the detailed design to comply with all relevant EMF and EMI environmental and human health standards (refer to EPR EMF01, which is described in Section 7.9). The DC equipment is also proposed to be located indoors, away from the converter station boundary. The building enclosure will shield the outside environment from electric fields generated by the indoor power equipment and the position of the indoor equipment with respect to the boundary will minimise the impact of magnetic fields on nearby sensitive receivers. Furthermore, the highest levels of EMF and EMI generated by DC equipment at the fenceline of the converter stations will be directly above the incoming HVDC cables. The modelling of the EMF/EMI generated by the HVDC cables is performed separately to the converter stations. The conclusions of the HVDC cable EMF/EMI modelling are however applicable to the HVDC cables entering/leaving the converter stations and constitute the worst-case EMF/EMI levels around the boundary of the converter station.

The 220 kV Heybridge site has been modelled based on the Reference Design layout and standard values of minimum ground clearance. Similarly, the 500 kV Driffield and Hazelwood sites have been modelled using the Reference Design layout and standard values of minimum ground clearance.

The Hazelwood converter station will form an extension of the existing Hazelwood terminal station. The extent of the modelling undertaken in this assessment with respect to the Hazelwood site is the modelling of the converter station air insulated switchgear (i.e. the existing terminal station equipment is not modelled). This is because the EMF/EMI levels generated by the existing equipment at the Hazelwood terminal station will have a negligible impact on calculated EMF levels at the fence line of the converter station. The EMF/EMI levels generated by the converter station equipment and connections will be the dominant contributor of EMF/EMI levels at the converter station fence line. Not modelling the existing Hazelwood terminal station equipment will not materially impact the EMF/EMI levels at the converter station site.

All converter station modelling considers only the Air Insulated Switchgear (AIS). Whilst the Heybridge converter station is proposed to include Gas Insulated Switchgear (GIS) inside the building, this equipment is located further away from the boundary fence and will produce lower EMF/EMI levels. As such, the additional GIS equipment will not have a material impact on the reported EMF/EMI levels.

The detailed design of the Heybridge, Driffield and Hazelwood converter stations will include an earthing assessment and mitigation design for safety impacts of earth potential rise on nearby sensitive receivers during HVAC and HVDC earth fault scenarios in accordance with AS/NZS 7000:2016 and AS 2067:2016.

### 5.2.5 Basslink

The Basslink HVDC submarine cable was laid in 2005, forming an electrical connection between Tasmania and Victoria across the Bass Strait. The subsea asymmetric monopole cable link comprises a high voltage cable, a low voltage metallic current return cable and fibre optic cable, which are bundled together. The continuous rated capacity of the link is 500 MW at either +400 kV or -400 kV, depending on the direction of power flow, and a dynamic rating of 630 MW. The nominal rated current of the link is therefore 1,250 A per cable.

A report was published in 2016 by the Journal of Ocean Engineering and Science [1]. It describes the observed impact of the Basslink subsea cable on the Bass Strait environment. The study concluded:

- Over 95% of the cable was directly laid into a wet-jetted trench
- Magnetic field measurements indicate that the intensity of the earth's geomagnetic field in the Bass Strait is 61.6 μT along the ocean bed.
- Sections of the cable were monitored over a 3.5-year period using remote towed video surveys and diver-based survey methods
- Magnetic field measurements were taken when the cable was transferring between 121 MW and 237 MW
- Observations of epibiota near the Victorian shore, at the first dive site, indicated no sedentary epibiota on the sandy seabed. At the dive site, swimming anemones were attached to rock associated with the cable trench
- In the deeper waters of the Bass Strait the following biological effects were noted:
    - Habitat modification where a trench was still detectable
    - Accumulation of drift biological material within the shallow depression where the presence of the cable trench was still detectable
    - Growth of some epibenthic species on the biological material accumulating in the trench
- Levels of biota comprising the seaweeds, bryozoans, ascidians, small sponges and sea urchins that covered the cable conduit shell or occupied the seabed beneath the shell at the Tasmanian end of the cable by 2009 were similar to those of the surrounding area

The study concluded that the ecological effects of the cable installation on epibiota have been minor and transient in nature for soft sediments along the sea floor. Moreover, the armoured half-shell substrate installed at the Tasmanian end of the cable has become a new habitat for reef species and is colonisable. The impact of the electric and magnetic fields generated by the cable do not affect this process.

## 5.3 Impact Assessment

The EMF and EMI impact assessment is performed using an industry specific methodology. Appropriate exposure and immunity limits and reference levels are identified in standards, guidelines and research publications. These are adopted as the assessment criteria in the study. If the calculated EMF and EMI levels are below the applicable criteria, the impact on sensitive receivers is considered acceptable but Environmental Performance Requirements are identified Section 7.9 to manage the impact of any residual effects. For instances where the calculated levels exceed the limits or reference levels, a risk assessment is carried out and mitigation options are considered.

Standard design practices and the additional mitigation and control measures described throughout the study will reduce the significance of the impacts of EMF and EMI from the project construction and operation activities to negligible under most circumstances. Residual impacts that are not negligible will be highlighted in the study.

The aforementioned mitigation measures can be broken down into two categories: at-source and at-receiver mitigations. Generally, at-source mitigations are inherent in standard design practices to reduce the magnitude of electric and magnetic fields produced by high voltage electrical equipment. These at-source mitigations include reduced spacing between adjacent phase conductors in an AC system, and reduced spacings between positive and negative poles in a DC system. At-receiver mitigations can include relocation of the sensitive equipment away from the source, passive shielding, or active shielding. The at-source mitigations have potentially limited efficacy, given the performance requirements of the link. The selection of at-receiver mitigation options depends on the magnitude of the source fields, the immunity of the limit of the sensitive receiver and the associated cost for each option.

### 5.3.1 Cumulative Impact Assessment

The EIS guidelines and EES scoping requirements both include requirements for the assessment of cumulative impacts. Cumulative impacts result from incremental impacts caused by multiple projects occurring at similar times and within proximity to each other.

To identify possible projects that could result in cumulative impacts, the International Finance Corporation (IFC) guidelines on cumulative impacts have been adopted. The IFC guidelines (IFC, 2013) define cumulative impacts as those that 'result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones.'

The approach for identifying projects for assessment of cumulative impacts considers:

- Temporal boundary: the timing of the relative construction, operation and decommissioning of other existing developments and/or approved developments that coincides (partially or entirely) with Marinus Link.

- Spatial boundary: the location, scale and nature of the other approved or committed projects expected to occur in the same area of influence as Marinus Link. The area of influence is defined at the spatial extent of the impacts a project is expected to have.

Proposed and reasonably foreseeable projects were identified based on their potential to credibly contribute to cumulative impacts due to their temporal and spatial boundaries. Projects were identified based on publicly available information at the time of assessment. The projects considered for cumulative impact assessment in Tasmania /Bass Strait / Victoria are:

- Delburn Windfarm

- Star of the South Offshore Windfarm
- Offshore wind development zone in Gippsland including Greater Gippsland Offshore Wind Project (BlueFloat Energy), Seadragon Project (Floatation Energy), Greater Eastern Offshore Wind (Corio Generation).
- Remaining North West Transmission Developments

The projects relevant to this assessment have been determined based on the potential for cumulative impacts to EMF/EMI values. Projects assessed as relevant to this assessment are:

- Delburn Windfarm
- Star of the South Offshore Windfarm
- Offshore wind development zone in Gippsland including Greater Gippsland Offshore Wind Project (BlueFloat Energy), Seadragon Project (Floatation Energy), Greater Eastern Offshore Wind (Corio Generation).
- Remaining North West Transmission Developments

Each of these projects contain high voltage electrical equipment that carry electrical current. The voltage and currents associated with the high voltage equipment generate electric and magnetic fields that will have the potential to constructively or destructively summate with the electric and magnetic fields that will be generated by the Marinus Link infrastructure.

Other projects that are not included in the list above have been omitted because either they do not contain high voltage electric equipment and therefore will not generate significant electric and magnetic fields, or the projects are located a significant distance away so that any potentially generated electric and magnetic fields will be indistinguishable from background levels.

Cumulative EMF and EMI impacts have been considered for the proposed electrical power infrastructure and describe the total or net EMF & EMI impacts that will be generated by the project's cables and other sources of potential EMF and EMI (i.e. the summation of EMF and EMI levels from multiple sources). These impacts include the cumulative effects of the proposed project infrastructure on the ambient geomagnetic field and also on the magnetic fields generated by the operational Basslink cables and other high voltage electrical projects and infrastructure.

The Delburn Windfarm project is the closest windfarm to the proposed Marinus Link infrastructure. Therefore, the cumulative impacts from this project are analysed first in detail. This is because if cumulative impacts from this windfarm project are deemed to be negligible, it stands to reason that the cumulative impacts from other windfarm projects, located further away, will also be negligible.

## 5.4 Assumptions and Limitations

The screened HVDC cables and indoor HVDC power equipment will not produce significant electric fields in the surrounding environment.

The subsea and land cable arrangements will only be confirmed during the detailed design process. Conservative assumptions have been described in Section 5.2. These are conservative and will result in worst-case EMF and EMI levels.

The modelling and results presented in Section 7.5 consider the nominal rating of the link (i.e. 1,500 MW). However, the impact of the overload rating for the proposed cables has also been considered in the impact assessment.

The overload rating is a temporary scenario and it has been assumed, for the purposes of this assessment, to apply to both Stage One and Stage Two cables simultaneously. The overload scenario and emergency current rating is assumed to be 150 MW per stage (i.e. Stage One overload rating is 900 MW and Stage Two overload rating is also 900 MW).

# 6. Existing Conditions

## 6.1 Geomagnetic Field Characterisation

There is a background geomagnetic field at the surface of the earth and in the oceans that is generated by four main natural sources. The EMF and EMI study will consider the cumulative effect of the DC magnetic field generated by the subsea and land cables and the ambient geomagnetic field that fluctuates geographically and also with time.

The primary source of the ambient geomagnetic field is the core field, which varies between 20 μT and 70 μT at the earth's surface. A map of the distribution of typical core field strengths across the globe is illustrated in Figure 6-1. The core field is generated by the flow of a hydrodynamic dynamo operating in the earth's fluid outer core. Convection of molten iron in the outer liquid core and the Coriolis effect caused by the earth's rotation causes the flow of charges across an existing magnetic field, inducing electric currents, which creates another magnetic field that reinforces the existing field (i.e. a dynamo that sustains itself). As is noted that the core field is relatively intense in the Bass Strait region, which is near the earth's magnetic south pole. The core field varies geographically but only varies very slowly with time (i.e. over the course of years, rather than days).

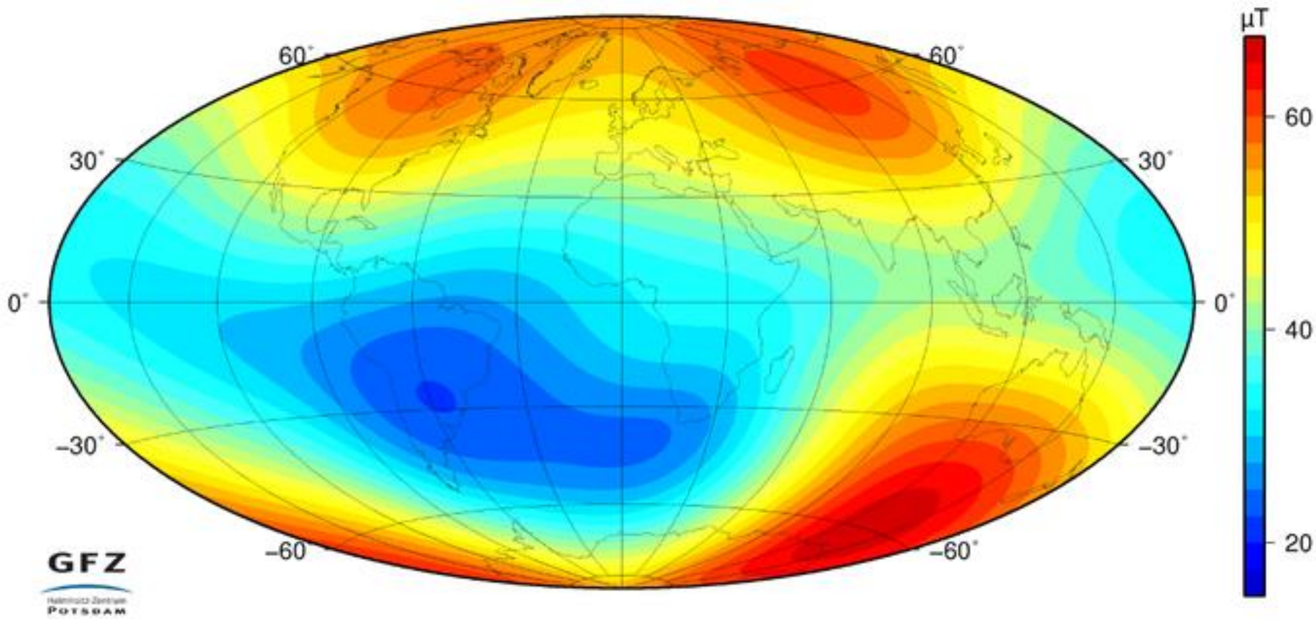


*Figure 6-1: Intensity of the core magnetic field at the earth's surface [GFZ Modell[1]]*

The second contribution to the ambient geomagnetic field at a location within the study area is due to the lithospheric field, which is caused by close proximity to magnetised rocks. The magnetic field strength associated with this contribution gives rise to localised variations in the total geomagnetic field at the earth's surface in the order of 0.1 μT. The lithospheric field anomalies within the study area

[1] Source: GFZ Helmholtz Zentrum Potsdam (https://www.gfz-potsdam.de/en/section/geomagnetism/topics/sources-of-the-earths-magnetic-field/core-field/)

will vary with geographic position due to changes in geology but only varies slowly with time in response to changes in the core field. The iron-rich, volcanic rock that makes up the ocean floor within the Bass Strait contains significant concentrations of magnetite that results in higher field levels near the ocean floor. Relatively large magnetic anomalies are therefore expected along the subsea cable.

The third contribution to the geomagnetic field is from disturbances above the earth's surface. Induced electric currents in the magnetosphere and ionosphere, created by solar radiation and thermospheric winds, cause localised variations in the magnetic field at the earth's surface. During periods of low induced current activity, the strength of these fields is typically in the order of 0.02 μT but can increase very quickly to values as high as 2 μT (e.g. during solar flares). The atmospheric field fluctuations vary geographically and also over relatively short time periods (i.e. is a transient field).

The fourth contribution is a result of the ocean's tidal dynamo but typically has a very low magnitude. Ocean currents cause the steady flow of conductive water and thereby generate magnetic fields through motional induction. The intensity of these magnetic fields is only in the order of 0.001 μT at the earth's surface. These contributions are typically defined in nanotesla (0.001 μT = 1 nT). The map of the oceanic tidal field intensity in Figure 6-2 indicates only a small variation in the geomagnetic field in the Bass Strait due to currents in the Tasman Sea and will have negligible impact on the magnetic anomalies within the study area.

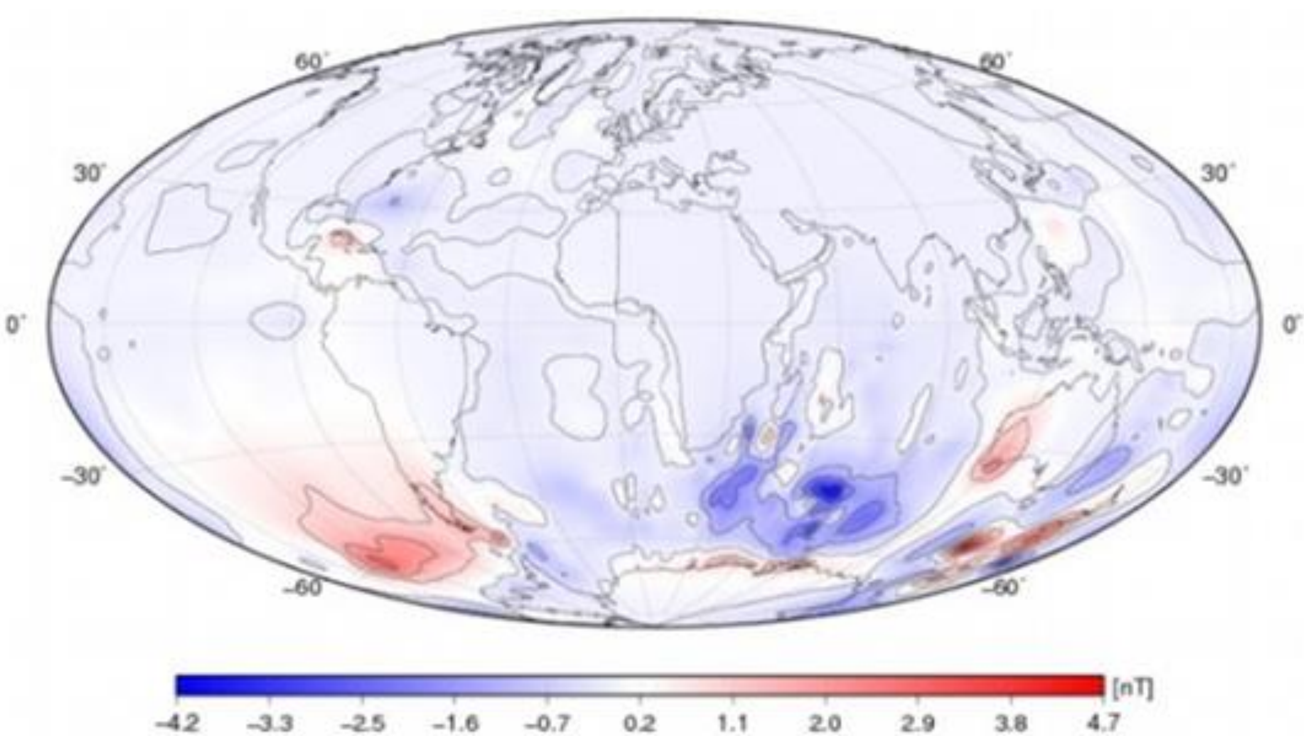


*Figure 6-2: Intensity of the oceanic tidal magnetic field at the earth's surface [GFZ Potsdam[2]]*

[2] Source: GFZ Helmholtz Zentrum Potsdam (https://www.gfz-potsdam.de/en/section/geomagnetism/topics/sources-of-the-earths-magnetic-field/core-field/)

A magnetic anomaly map of the Bass Strait is included in Figure 6-3, with the project's proposed subsea project alignment indicated in the black, dotted polygon. The map describes the average variation in the ambient geomagnetic field at a moment in time due to variations in the core and lithospheric fields. The magnetic anomaly map is derived from measurements taken by aircraft and describes anomalies above and below a nominal, ambient geomagnetic field.

It is concluded from Figure 6-1 and Figure 6-3 that the steady-state geomagnetic field along the subsea project alignment is approximately 60 +1.8/-0.9 μT. Atmospheric geomagnetic storms can also cause transient fluctuations of up to ± 2 μT in the ambient magnetic field in the study area.

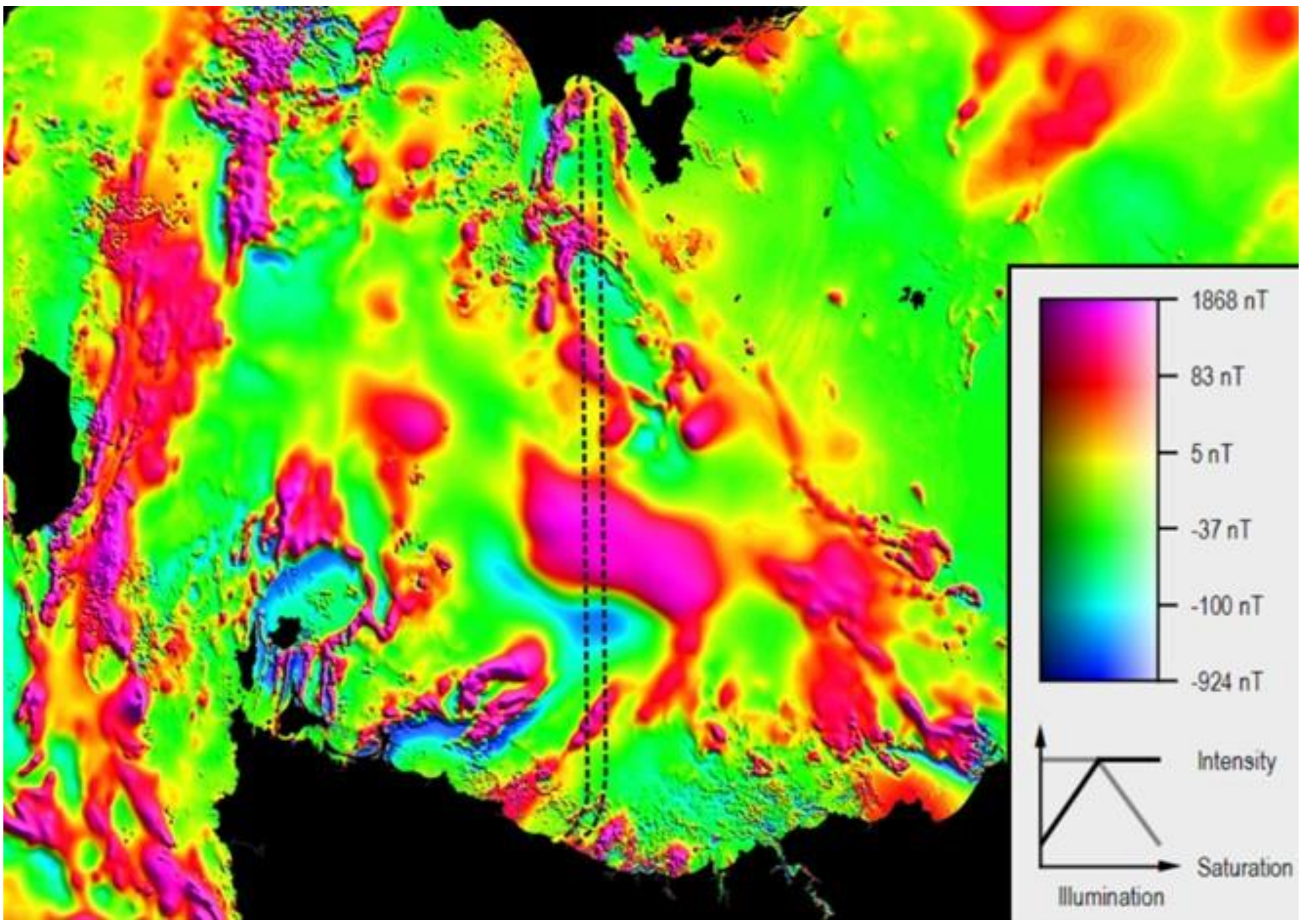


*Figure 6-3: Magnetic anomaly map of Bass Strait (subsea project alignment) [2]*

A similar magnetic anomaly map is included in Figure 6-4 for the land project alignment. The route exhibits a greater degree of geomagnetic field uniformity than the subsea project alignment. The steady-state geomagnetic field along the land project alignment is approximately 60 +1.8/-0.1 μT. Atmospheric geomagnetic storms can also cause transient fluctuations of up to ± 2 μT in the ambient magnetic field in the study area.

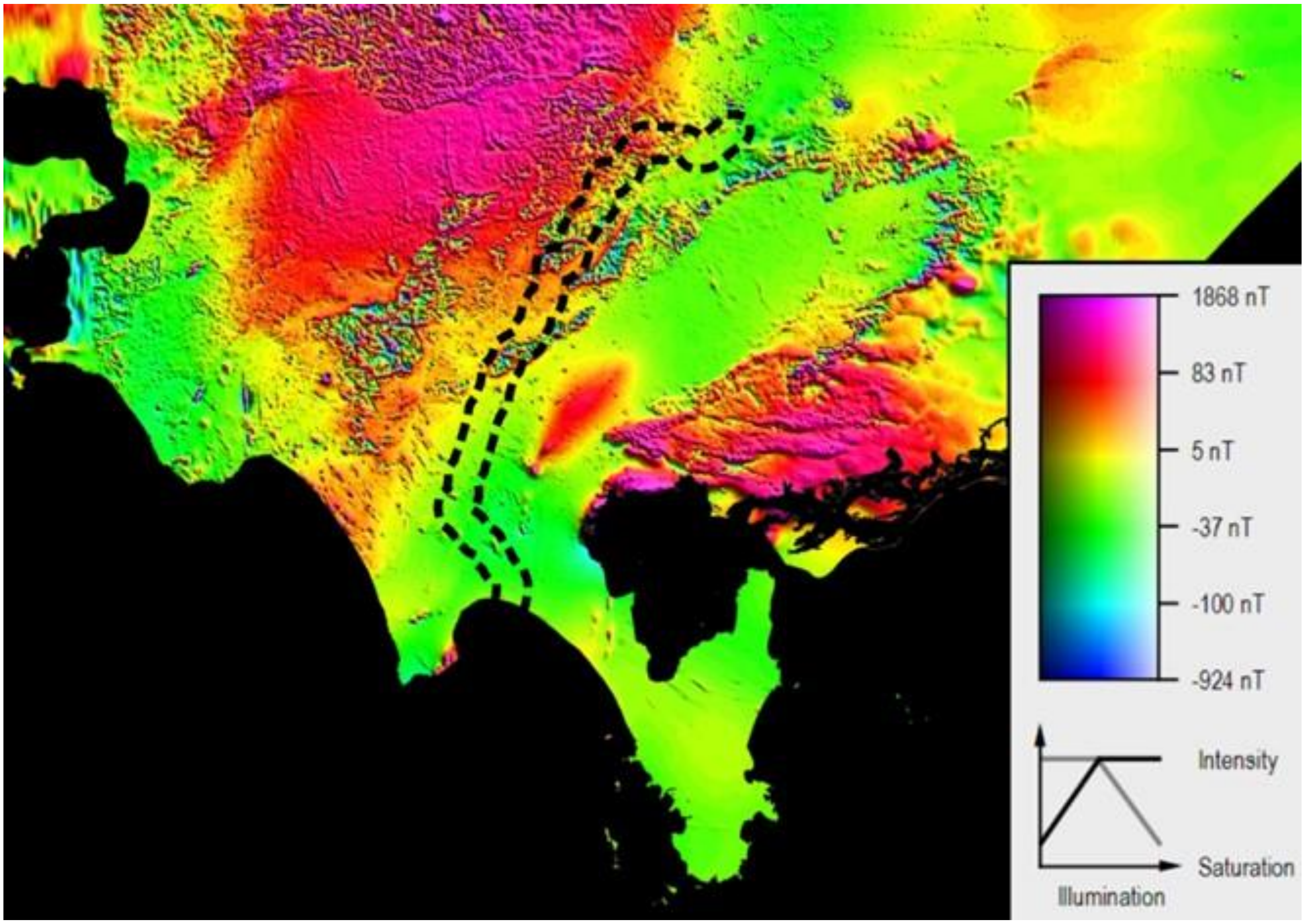


*Figure 6-4: Magnetic anomaly map of south-east Victoria (land project alignment) [2]*

## 6.2 Thermal Characterisation

EMF and EMI cause heating of body tissue and conductive objects by induction. For the DC magnetic fields associated with the proposed subsea and land HVDC cables, the only significant source of heating will be due to ohmic losses in the core of each cable, which will conduct through the cable insulation and screens to the outside environment. The EMF & EMI assessment has therefore also considered the impact of this form of heating on the local environment during normal operation of the cables. As part of this assessment, the thermal characteristics of the local environment are defined in this section.

Materials are characterised by their thermal resistivity, which is a measure of how easily they conduct heat. The thermal resistivity of the seabed and ground in which the subsea and land HVDC cables are buried respectively, has a significant impact on the temperature of the cable and the surrounding soil. Electrical power cables are generally installed in engineered backfill that facilitates the dissipation of heat into the surrounding soil, thereby protecting the cables from thermal damage.

The maximum measured ambient temperatures along key sections of the HVDC project alignment are summarised in Table 6-1 and the measured thermal resistivity of the soil and rock that will surround the HVDC cables in these areas are summarised in Table 6-2. This information has been sourced from the Marinus Link Cable Technical Specification document and has been used in the study to calculate the thermal conduction to the surrounding environment.

*Table 6-1: Measured ambient sea and soil temperatures along key sections of the proposed project alignment*

| Location | Temperature ($^oC$) |
|---|---|
| Heybridge (soil temperature at 1 m depth) | 25 |
| Hazelwood (soil temperature at 1 m depth) | 25 |
| Bass Strait (sea water temperature above seabed) | 18 |

*Table 6-2: Measured thermal resistivity of the material surrounding the HVDC cables along key areas of the project alignment*

| Thermal Resistivity Medium | Location | Thermal Resistivity ($^oK$ m/W) |
|---|---|---|
| Natural Soil | Heybridge | 1.2 |
| Natural Soil | Mainland Victoria<br>Waratah Bay - Smallmans Rd | 1.2 |
| Natural Soil | Mainland Victoria<br>Smallmans Rd - Darlimurla Rd | 3.0 |
| Natural Soil | Mainland Victoria<br>Darlimurla Rd - Strzelecki Hwy | 1.2 |
| Natural Soil | Mainland Victoria<br>Strzelecki Hwy - Hazelwood | 2.0 |
| Seabed | Submarine section – Bass Strait | 1.0 |
| Thermally stable backfilling material | Mainland Victoria<br>Installed in cable trench along route | 1.0 |

# 7. Impact Assessment

## 7.1 Technical Background

Electric and magnetic fields (EMF) are invisible, physical fields that surround electrical charges and exert forces on all charged particles and objects in the field. All electrical and electronic equipment and appliances therefore generate electric and magnetic fields. The electrical charge that provides power to the equipment and appliances produces EMF and some equipment and appliances also intentionally and unintentionally generate electromagnetic emissions as part of their normal functioning (e.g. the radio wave emissions from a CB radio transmitter and the microwaves that heats food in a microwave oven). Most generated fields fluctuate between minimum and maximum peaks at a fixed rate per second, called the frequency, with units of Hertz (Hz). Examples of everyday sources of EMF are illustrated in Figure 7-1. The EMF from these sources is characterised by the magnitude and frequency of the generated electric and magnetic fields.

The ELF electric and magnetic fields under a transmission line, above a cable or near a power equipment connection are non-ionising in that they do not have enough energy to ionize atoms or molecules (i.e., completely remove a charge from an atom or molecule). The fields are strongest near the conductors and decrease exponentially with increasing distance from the conductors.

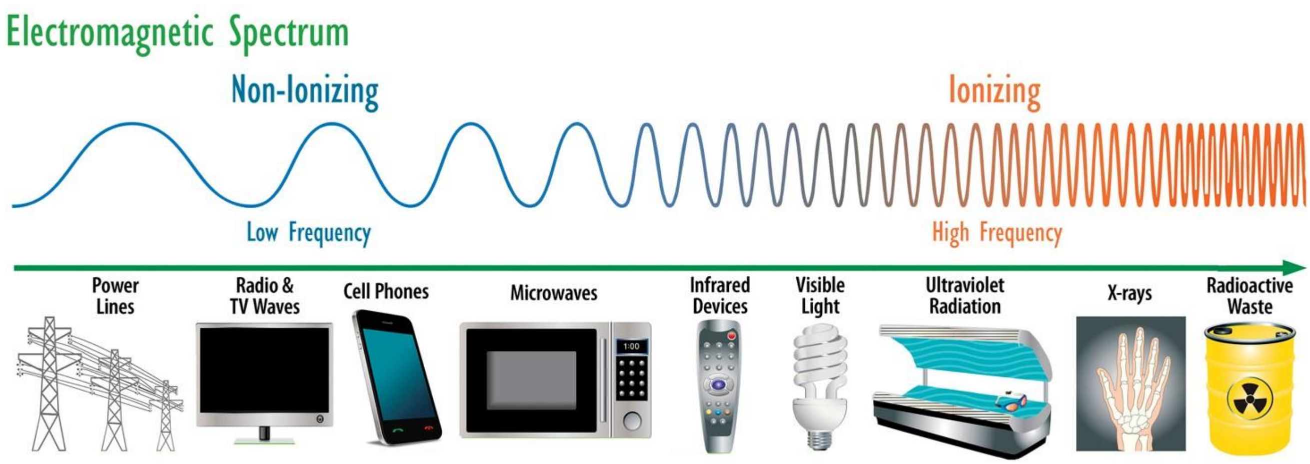


*Figure 7-1: Everyday sources of EMF and EMI[3]*

Electric Field Strength (EFS) is measured in volts per metre (V/m). The large fields associated with high voltage electrical infrastructure are typically expressed in kilovolts per metre (kV/m), with 1 kV/m = 1,000 V/m. Magnetic fields are normally measured in either gauss (G) or Tesla (T) and are commonly expressed in units of milligauss (mG) or microtesla (μT), with 10 mG equal to 1 μT. For the purposes of this EMF and EMI study, electric field strengths will be expressed in kilovolts per metre and magnetic fields will be expressed in units of microtesla. Typical, measured electric and magnetic field levels associated with everyday electrical and electronic equipment are summarised in Table 7-1:

[3] Source: National Institute of Environmental Health Sciences (https://www.niehs.nih.gov/health/topics/agents/emf/index.cfm)

*Table 7-1: Measured EMF levels associated with everyday electrical and electronic equipment and appliances*

| EMF Source | Typical Range of Magnetic Field Strength (μT)[4] | Typical Range of Electric Field Strength (kV/m)[5] |
|---|---|---|
| Electric stove | 0.2 to 3 | 0.07 to 0.1 |
| Refrigerator | 0.2 to 0.5 | Not reported |
| Electric kettle | 0.2 to 1 | Not reported |
| Toaster | 0.02 to 0.2 | Not reported |
| Television | 0.02 to 0.2 | Not reported |
| Personal computer | 0.2 to 2 | Not reported |
| Electric blanket | 0.5 to 3 | 0.058 to 0.6 |
| Hair dryer | 1 to 7 | 0.3 to 0.8 |
| Pedestal fan | 0.02 to 0.2 | Not reported |
| Substation fence | 0.1 to 0.8 | Not reported |
| Distribution line – under the line | 0.2 to 3 | 0.06 to 0.01 |
| Distribution line – 10 m from line | 0.05 to 1 | Not reported |
| Transmission line – under the line | 1 to 20 | 0.003 to 4.1 |
| Transmission line – edge of easement | 0.2 to 5 | Not reported |

The electrical charges in aerial transmission line conductors and underground cables generate both electric and magnetic fields. The voltages that are applied to the aerial conductors define the magnitude and distribution of the electric fields in the air gaps between the conductors and the ground. In underground cables, the metal screen that surrounds the cable's core contains the electric field within the cable, shielding all areas surrounding the cables from the electric field. The electrical currents that flow in the aerial line conductors and underground cable cores define the magnitude and distribution of the magnetic fields near the conductors. The metallic cable screens in underground cables do not however significantly shield the magnetic fields.

Both the voltages and currents associated with converter stations in this study oscillate between minimum and maximum values at an "extremely low frequency" (ELF) of 50 cycles per second (i.e., 50 Hz) and are referred to collectively as Alternating Current (AC). The voltages and currents associated with the land and subsea cables do not oscillate at a set frequency and only vary very slowly in magnitude due to fluctuating electrical loads and are referred to collectively as Direct Current (DC). The instantaneous magnitudes of the DC voltages and currents and the Root Mean Square (RMS) of the AC voltages and currents are used to quantify the amount of electrical power that is transferred along the link.

[4] Source: Australian Radiation Protection and Nuclear Safety Agency: https://www.arpansa.gov.au/understanding-radiation/radiation-sources/more-radiation-sources/measuring-magnetic-fields
[5] Source: Transpower New Zealand Ltd: https://www.transpower.co.nz/resources/factsheet-3-electric-and-magnetic-field-strengths

Some electrical and electronic appliances and equipment are susceptible to ELF magnetic field exposure from electrical power sources. They are referred to as sensitive receivers. Exposure to magnetic fields exceeding the immunity limits specified by the manufacturer may cause reduced functionality or malfunction of the equipment. This is referred to as electromagnetic interference (EMI).

The electric field levels between transmission line conductors and the ground are much larger near the surface of the conductors, as compared to the electric field level to which people are exposed at ground level. These very large conductor surface electric fields are able to ionise the air immediately surrounding the conductors, creating corona discharges that radiate high frequency electromagnetic fields away from the conductors and can cause interference to the reception of radio, television and mobile communication signals.

Water droplets that form on the surface of the conductors during rain increase the electric field strength near the surface of the conductors due to their shape and thereby increasing the radiated electromagnetic interference levels from the transmission lines under wet conductor conditions.

High electric fields around the sharp edges of converter station fittings can also cause corona discharges and electromagnetic interference under both wet and dry conditions. However, the fittings are Radio Interference Voltage (RIV) tested as part of the type of approval process for installation on to the electrical supply network to ensure that the electromagnetic interference from the fittings is below the applicable limits.

Electromagnetic interference from corona discharges on transmission lines and terminals stations is therefore limited to discharges on the conductors during wet weather by design.

The source of electromagnetic interference on transmission lines that is responsible for the majority of reported interference issues are gap (micro-spark) discharges. They are complete electrical discharges between electrodes across two dissimilar dielectrics, floating components and loose or damaged fittings. An example of this is the air gap that forms between a metal bolt and a timber distribution line pole due to a loose fitting. This creates very large electric field gradients across the air gaps, which results in the total, momentary breakdown of the dielectric air insulation. This form of electromagnetic interference source is found on lines of every voltage classification but tend to be most prevalent on distribution line wood pole where hardware has a greater probability of becoming loose as the wooden poles and crossarms dry out.

Dry band arcing along contaminated insulator surfaces generally produces the highest electromagnetic interference levels. This occurs on polluted insulators during fog or dew conditions, or after the cessation of light rain that does not clean the pollution off the insulators. The leakage current across the wet, polluted insulator surface heats the surface and creates small dry bands due to the evaporation of the water along the surface. The voltage across the dry bands results in very high surface voltage gradients and sparking. This can be very severe for heavily polluted insulators. Dry-band arcing is primarily a problem on ceramic and glass insulators and not polymer insulators, which have a hydrophobic surface that mitigates the formation of continuous moisture films along the insulator surface and also facilitate natural cleaning of pollution from the insulator surface during rain.

Transmission line towers and wires also have the potential to interfere with radio communication signal paths, thereby degrading radio reception in the vicinity of the line. The radiated fields and the field scattering effects that interfere with the functionality of sensitive receivers and reception of radio, television and mobile communication signals are collectively referred to as electromagnetic interference (EMI).

## 7.2 Sensitive Receiver Impacts

### 7.2.1 Limits and Reference Levels

Limits for EMF and EMI exposure are defined for some scenarios where a clear cause-effect has been identified and a value of exposure derived from experiments that confirm an acceptable level of confidence for mitigating the unwanted effect.

For exposure scenarios where the cause-effect is not definitive, experimental data is limited or where the verification of compliance with the limits is too complex, conservative, measurable field levels that ensure compliance with the limits are defined.

Limits and/or reference levels are defined in the proceeding sections for all sensitive receivers that may be impacted by EMF and EMI in the study area.

### 7.2.2 Human Biological Impacts

The potential sensitive receivers identified in this subsection are humans. In particular, the assessment considers biological impacts on people exposed to DC and power frequency AC electric and magnetic fields. The exposure scenarios involve DC magnetic fields from HVDC cables and AC electric and magnetic fields from converter stations.

Extremely low frequency electric and magnetic fields induce internal electric fields and currents in the body. The World Health Organisation states that at high field levels (well above 100 μT), it can cause "nerve and muscle stimulation and changes in nerve cell excitability in the central nervous system" [6]. Established biological effects caused by acute exposure to high field strengths include magneto-phosphene effect and micro-shocks:

- Magneto-phosphene effect - the sensation of flashes of light caused by induced electric currents stimulating the retina.
- Micro-shock - a sensation caused by a small electric spark discharge or arc when a person touches an earthed metallic object. Provisions such as proper earthing methods or working procedures are made for activities within the easement to minimise the impacts of micro shocks.

The ENA EMF Management Handbook defines mitigation measures for these biological effects.

Extensive scientific research examining health risks associated with exposure to extremely low frequency electric and magnetic fields have been undertaken since the 1970's. The Australian

[6] Source: World Health Organisation (https://www.who.int/health-topics/electromagnetic-fields#tab=tab_1)

Radiation Protection and Nuclear Safety Agency (ARPANSA) has advised that: "Most of this research indicates that the ELF EMF exposure normally encountered in the environment, including in the vicinity of transmission lines, does not pose a risk to human health" [7].

ARPANSA is the Australian Government's agency responsible for regulating Commonwealth Government radiation protection practices. The Victorian Department of Health and Tasmanian Department of Health are the state regulatory agencies tasked with protecting people and the environment from the harmful effects of ionising and non-ionising radiation.

There are some epidemiological (population) studies that have reported a statistical association between increased rates of childhood leukaemia and prolonged exposure to extremely low frequency magnetic fields at levels below the exposure limits but higher than what is typically encountered. A statistical association does not necessarily indicate a cause-effect relationship and ARPANSA has concluded, on the balance of the published research, that the statistical association reported in some research is not supported by laboratory or animal studies and no credible theoretical mechanism has been proposed to support the statistical association.

Based largely on the limited evidence, the International Agency for Research on Cancer (IARC) published a monograph that prudently classifies ELF magnetic fields as a "possibly carcinogenic to humans"[8] – Group 2B[9] and ELF electric fields as a "not classifiable as to carcinogenicity" – Group 3.

Extensive studies have also been carried out into other possible health effects of magnetic field exposure, including cancers in adults, depression and suicide. The World Health Organization concluded that there's little scientific evidence supporting an association between extremely low frequency magnetic field exposure and other adverse health effects[10].

Static and slowly varying magnetic field induce much lower electric fields and currents in the human body. The biological effects described previously for extremely low frequency EMF only occur at much higher DC field exposure levels. It's only at slowly varying magnetic field intensities greater than 2,000,000 μT that nausea, magneto-phosphenes and other biological effects are perceivable [3].

Blood electrolysis and spin chemistry changes (i.e. changes to an electron's momentum and spin about a reference axis) can impact chemical reactions within the body when subjected to a static magnetic field but these effects are not considered to have a significant health effect for magnetic field intensities below 7,000,000 μT. Exposure to static and slowly varying magnetic fields of such a large

[7] Source: Australian Radiation Protection and Nuclear Safety Agency: (https://www.arpansa.gov.au/understanding-radiation/radiation-sources/more-radiation-sources/electricity)
[8] List of classifications by the IARC monographs can be found in: https://monographs.iarc.who.int/list-of-classifications
[9] IARC publishes independent assessment by international experts of the carcinogenic risks posed to humans by a variety of agents, mixtures and exposures. These agents, mixtures and exposures are categorised into 4 groups, namely:

- Group 1 – the agent is carcinogenic to humans – 121 agents are included in the group, including asbestos, tobacco and UV radiation
- Group 2A – the agent is probably carcinogenic – 89 agents are included in the group, including lead compounds and creosotes
- Group 2B – the agent is possibly carcinogenic to humans – 319 agents are included in the group, including gasoline and dry cleaning
- Group 3 – the agent is not classifiable as to carcinogenicity – 500 agents are included in this group, including caffeine and tea

[10] Source: World Health Organisation (https://www.who.int/health-topics/electromagnetic-fields#tab=tab_1)

magnitude are generally only associated with medical treatment/diagnosis areas involving magnetic resonance imaging (MRI) [4].

### 7.2.3 Active Implantable Medical Devices

The potential sensitive receivers identified in this subsection are people with active implantable medical devices fitted. The exposure scenarios involve DC magnetic fields from HVDC cables and AC electric and magnetic fields from converter stations.

Static, slowly varying and extremely low frequency magnetic fields can interfere with Active Implantable Medical Devices (AIMD). However, according to the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines, EU Directive 2013/35/EU and various European Normalised standards and guidelines, exposure to static magnetic fields intensities below 1,000 μT can be regarded as safe in terms of interference to AIMDs. A conservative 500 μT limit is recommended by ICNIRP for the general exposure case.

It is further noted that devices such as cardiac pacemakers are generally designed to be able to withstand static magnetic fields up to 10,000 μT. As a precautionary measure, magnetic fields over magnitudes of 1,000 μT should be avoided by people with pacemakers since electromagnetic fields beyond this limit pose the risk of initiating an asynchronous pacing mode in the AIMD. The potential impact of static and slowly varying magnetic fields on AIMDS, as defined in the EU Directive, is summarised in Table 7-2.

For ELF magnetic fields (e.g. 50 Hz), the EN 45502-2 standard requires manufacturers of AIMDs to immunise such their products from exposure to 50 Hz EMF up to the general public reference levels indicated in the ICNIRP 2010 guidelines. EN 50527-1 provides a procedure for assessing the risk to workers with AIMDs fitted from exposure to EMF in the workplace, where EMF levels approaching the occupational limits indicated in the ICNIRP guidelines are expected. Precautions may need to be taken in such areas to alert or exclude workers with AIMDs.

*Table 7-2: Effects of magnetic fields on Active Implantable Medical Devices defined in the EU Directive 2013/35/EU*

| Static and Slowly Varying Magnetic Field (μT) | Biological Effects | Impact on Pacemakers |
|---|---|---|
| 0 to 500 | None | Generally safe. |
| 500 to 1,000 | None | Relatively safe, subject to formal assessment in accordance with the recommendations of EU Directive 2013/35/EU or other appropriate standards or guidelines. |
| 1,000 to 10,000 | None | Not recommended. May initiate asynchronous pacing modes, albeit not a life-threatening event. |
| > 10,000 | None | Pacemaker may be damaged causing life-threatening event. |

### 7.2.4 Electrical and Electronic Equipment

The potential sensitive receivers identified in this subsection are electrical and electronic equipment installed in residential, commercial, industrial, medical and scientific research environments. The exposure scenarios involve DC magnetic fields from HVDC cables and AC electric and magnetic fields, and electromagnetic interference from converter stations.

The magnetic field immunity limits for sensitive equipment are specified in generic immunity standards. For very sensitive equipment, the manufacturer defines the immunity limits. The immunity limits specified in Table 7-3 are derived from EMI standards for generic equipment and typical manufacturer specifications for very sensitive medical and scientific research equipment.

All forms of radio communication equipment are sensitive to electromagnetic interference and are considered to be sensitive receivers for the purposes of this impact assessment.

For sensitive receivers that form part of critical safety systems during adverse weather conditions (e.g., aeronautical VHF radio communications), the EMI assessment shall consider the most onerous operating and maintenance scenarios (e.g., heavy rain and damaged insulator EMI levels).

*Table 7-3: Typical EMI immunity levels for different equipment and appliances*

| Equipment | Magnetic Field Limit (µT) | | Standard/Specification |
|---|---|---|---|
| | Static/slowly varying | Extremely low frequency | |
| Electrical & electronic equipment in a residential, commercial or light industrial environment | Not defined | 3.8 | AS/NZS 61000-6-1 |
| Electrical & electronic equipment in an industrial environment | Not defined | 38 | AS/NZS 61000-6-2 |
| Electron microscopes | 0.03 to 0.3 | | Typical specification |
| Atomic force microscope | 0.03 to 0.3 | | Typical specification |
| Nuclear magnetic resonance | 0.2 to 0.5 | | Typical specification |
| Computed Tomography | 100 | 1 | Typical specification |
| Positron Emission Tomography | 100 | 3.8 | Typical specification |
| X-ray | Not defined | 3.8 | Typical specification |
| Mass Spectrometer | Not defined | 38 | Typical specification |
| Magnetic Resonance Imaging | 1.2 | | Typical specification |

### 7.2.5 Livestock

The potential sensitive receivers identified in this subsection are livestock. In particular, dairy and beef cattle, sheep, horses, pigs and poultry. The exposure scenarios involve DC magnetic fields from HVDC cables and AC electric and magnetic fields from converter stations.

Considerable research has been conducted on the possible effects of EMF on livestock from HVAC transmission lines ( [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16]) and HVDC transmission lines ( [17] [18] [19] [20]) since the 1970's. These studies have investigated the possible impact of DC and ELF EMFs on the general health, productivity, fertility, reproduction and behaviour of livestock. The studies included exposure of livestock to EMFs under operational transmission lines and also exposure to acute EMF levels in carefully controlled environments.

Collectively, these studies indicate that electric and magnetic fields from transmission lines and cables do not pose a significant risk of adverse health effects or negative impacts on production in livestock. Hydro Quebec, which operates both AC and DC transmission lines in Canada, and conducted an extensive review of the available literature concluded: "At this time, every indication is that no biological disorder can be attributed to the exposure of livestock to EMFs generated by high-voltage lines. Analysis of data collected to date has not made it possible to identify any harmful effect on the health, productivity, fertility, reproduction or behaviour of livestock exposed to EMFs" [21].

Radio-frequency identification (RFID) tags are increasingly used to uniquely identify and store information about an animal or farm object. Passive RFID tags receive radio signals, which also power the transponder device, and transmit the applicable data to a nearby receiver via radio signals. They operate in the kHz frequency range. Active RFID tags are powered and transmit information in wider bandwidths in the MHz frequency range, over larger distances. Passive RFID tags that operate in the kHz frequency range are typically used for cattle and other farm animals.

A study conducted on human patients wearing passive RFID tags with an operating frequency of 13.56 MHz, involved exposure to static and transient magnetic fields associated with the operation of 1,500,000 µT and 3,000,000 µT MRIs [22]. The study concluded that no data loss or corruption occurred in the RFID tags.

### 7.2.6 Apiaries

The potential sensitive receivers identified in this subsection are honeybees. The exposure scenarios involve DC magnetic fields from HVDC cables and AC electric and magnetic fields from converter stations.

A number of factors may cause the bee population of a hive to dwindle or cease to exist, such as sickness, weather conditions, pesticides or intruders. However, the term known as evaporation (Aikin, 1897), was given to describe the phenomenon where evidence of typical reasons for bee population reduction were not present, including: absence of sick or dead bees, non-existence of an egg-laying queen, a lack of fit and young adults, and where the condition does not appear to be contagious [23].

The Gibbs report [24] concluded that honeybees in hives under or near to transmission lines are adversely affected by shocks created by currents induced by HVAC lines, but that the effect can be mitigated by shielding.

The finding in the report was supported by published research conducted by Greenberg et al. [25], which focused on the different biological effects on honeybee colonies under a 765 kV AC transmission line. The observed effects included increased motor activity with transient increase in hive temperature, abnormal propolization, impaired hive weight gain, queen loss and abnormal production of queen cells, decreased sealed brood and poor winter survival.

The study stated, "When colonies were exposed at 5 different electric fields (7, 5.5, 4.1, 1.8, and 0.65-0.85 kV/m) at incremental distances from the line, different thresholds for biologic effects were obtained. Hive net weights showed significant dose-related lags at the following exposures: 7kV/m, one week; 5.5 kV/m, two weeks; and 4.1 kV/m, 11 weeks. The two lowest exposure groups had normal weight after 25 weeks. Abnormal propolization of hive entrances did not occur below 4.1 kV/m. Queen loss occurred in 6 of 7 colonies at 7 kV/m and 1 of 7 at 5.5 kV/m, but not below. Foraging rates were significantly lower only at 7 and 5.5 kV/m."

It is noted that the above-described impact is related only to AC electric fields. The static magnetic fields associated with land HVDC cables will not induce significant currents in a hive and therefore do not pose a risk to the health of a honeybee colony from the described impact.

Behavioural scientists have accumulated decades of experimental evidence regarding honeybees' ability to perceive and utilise the earth's static magnetic field as a form of navigation, this ability is often referred to as magnetoreception [26]. This area of research gives rise to the possibility that if a honeybee uses the earth's magnetic field as a form a navigation, then disruptions and disturbances in this ambient field in a honeybee's environment may affect their ability to locate food sources and their colony. The results of the study described in [23] indicate that exposure of honeybees to static magnetic fields of ≥ 2 μT may inhibit their ability to return to their hives.

It was concluded in Section 6 that the steady-state geomagnetic field along the land project alignment is approximately 60 +1.8/-0.1 μT and that atmospheric geomagnetic storms can also cause transient fluctuations of up to ± 2 μT in the ambient magnetic field in the study area. The impact threshold for DC magnetic fields that is proposed by the research therefore appears to correspond to the limit of the naturally occurring fluctuations in the ambient geomagnetic field.

Prolonged exposure (i.e. > 1 minute) to ELF magnetic fields has a negative impact on a bee's proboscis extension response (i.e. its ability to learn), increases their wingbeat frequency, and decreases their ability to successfully feed, all of which are shown to increase as the intensity level of the ELF AC magnetic field increases [27]. Moreover, honeybees have also exhibited a larger aggression score, by means of a sting extension response, towards bees introduced to their hives after exposure to ELF AC magnetic fields at levels greater than 100 μT, compared to bees that had not been exposed to such fields [28].

Based on the reviewed research, it is concluded that where exposure to static magnetic fields that exceed 2 μT, but do not exceed 100 μT, is very localised and remote from the hive (i.e. not prolonged), the impact on individual bees will be momentary disorientation and will have negligible impact on the colony as a whole.

### 7.2.7 Crops and Orchards

The potential sensitive receivers identified in this subsection are fruit trees, feeding grasses, vegetables and local flora. The exposure scenarios involve DC magnetic fields from HVDC cables and AC electric and magnetic fields from converter stations.

There are many reasons as to why crop and orchard yields and plant health may suffer, including environmental conditions, soil health, pesticides and adverse weather conditions. Research into the effects of EMF on plant health may therefore be inconclusive due to the numerous possible causes for the observed effects.

A report to the New South Wales Minister for Minerals and Energy dated 28 February 1991, commonly known as the "The Gibbs Report", references research into the effects of AC EMF to animals and plants and concludes [24]:

- Crops may suffer leaf damage when located close enough to overhead transmission lines, such that corona discharges are produced on the sharp tips and edges of the tree's leaves and branches. Damage cause by corona discharges may reduce the height and growth of the tree, but not affect the growth of low-growing vegetation or crops
- There was inconclusive evidence to suggest that exposure to a 5 kV/m electric field reduced the rate of germination of sunflower seeds
- Corn grown under 500 kV lines showed lower yields than those not exposed to the EMF. Other crops (cotton, soy beans and clover) and trees showed no effects. The data from the corn yields was deemed inconclusive
- Field studies in Indiana and Oregon, under 765 kV AC and 1200 kV AC (prototype) lines found no evidence of any long-term effects on the growth or germination of a variety of plants, except those affected by the aforementioned corona discharge issue
- Pasture grass beneath HV lines was unaffected

Certain types of trees that have sharp, pointed leaves and branch buds can be impacted by the electric field if they approach too close to the power line conductors. Research indicates that high electric field levels may negatively impact the growth in these tree types (e.g. pine trees). This is due to ionisation of the air, in the form of corona discharges, at the sharp points. These corona discharges damages leaf and branch cells. Corona damage is mainly caused by positive corona, whose inception occurs at space potentials greater than 30 to 40 kV. The research indicates that broadleaf trees don't suffer this form of damage and all trees are not significantly impacted by lower-level electric fields.

The AC EMF levels adjacent to the proposed converter stations will be lower than the levels under AC lines considered in the above research. It is therefore not expected that the EMF from the converter stations will have any effect on plant health. Furthermore, it is noted that the only possible effects identified in the Gibbs Report, albeit inconclusive evidence, was associated with electric field effects on plants and trees, not magnetic field effects. The EMF associated with the project's land HVDC cables will comprise DC magnetic fields only. The underground cables will not generate measurable electric fields.

While the root structure of the plants and trees remain stationary, the movement of the above-ground structure, primarily under the influence of air movement, in a DC magnetic field will induce electric currents in the plant. This is the only mechanism by which the DC magnetic field could cause behavioural responses in plants. Direct, adverse effects of DC magnetic fields on plant health have however not been identified in the available research [29]. It is therefore not expected that the DC magnetic fields from the HVDC cables will have any effect on plant health, or yields associated with orchards or crops.

The underground land HVDC cables will also cause heating of the soil surrounding the cables and this could dry out the soil surrounding the cables. The soil drying effect will impact plant health in the immediate vicinity of the cable trench. A temperature increase of more than 3°C at 0.1 m beneath ground level can cause drying of pasture grass immediately above buried HV cables (i.e. in the root zone). The root zone of plants is the area of soil and oxygen surrounding the roots of a plant. Cable heating calculations are presented in Section 7.5.6, along with an assessment of the potential impact on pasture grass in the vicinity of the HVDC cables.

Exposure of fruit and vegetables to high electric field potentials via the application of pulsed electric fields, is commonly used in food preservation as a preferred method over traditional thermal treatments as it does not alter the physical and sensory properties of the foods [30]. The use of electric fields to kill microorganisms associated with fruit and vegetables and research into the effect of magnetic field exposure of plants to a greater intensity than the geomagnetic field [31], suggest that EMF exposure could have positive effects on germination, root & leaf yields, regeneration, and preservation.

The Australian Government's National Standard for Organic and Bio-Dynamic Produce (Edition 3.7, 2016) does not specifically mention transmission lines or electric and magnetic fields. However, Section 1.25.2 of the Standard states that "Bio-dynamic Preparations are to be stored in a suitable container away from fumes, electricity, contamination sources." There are no Bio-dynamic Preparations storage facilities in the vicinity of the proposed power infrastructure and therefore no impact on certification of produce from land adjacent to the proposed infrastructure.

### 7.2.8 Farm Equipment

The potential sensitive receivers identified in this subsection are electrical and electronic equipment used for farming. The exposure scenarios involve DC magnetic fields from HVDC cables and AC electric and magnetic fields, and electromagnetic interference from converter stations.

Modern mobile agricultural equipment may utilise Global Positioning System (GPS) and/or Differential Global Positioning System (DGPS) communications for autonomous operations.

All GPS and DGPS systems utilise communication signals in the L-band, between 1 GHz and 2 GHz. A study conducted by J.M. Silva and R.G. Olsen [32] on the use of GPS receivers under power-line conductors found that no degradation in receiver performance were attributed to electromagnetic emissions from transmission lines under normal or foul weather. There is however a residual risk that damaged transmission line insulators or fittings may cause some interference to GPS systems in close proximity to the electrical power installations.

The DGPS systems used in Australia for land navigation broadcast correction signals in a commercial FM radio band. Converter stations that comply with the Radio Interference limits specified in AS 2344 under all weather conditions will not interfere with a correctly installed DGPS system. This may require higher transmitted DGPS signal strength or repositioning of the reference stations to avoid interference during heavy rain conditions.

### 7.2.9 Wildlife

The potential sensitive receivers identified in this subsection are birds, frogs, mammals and local fauna. In particular, albatrosses, petrels and reptiles are considered. Further, identified threatened wildlife species present in both Tasmania and Victoria, in the vicinity of the project's HV infrastructure have been identified for the purpose of this assessment.

The land-based threatened wildlife that may be present within 5 km of the proposed Heybridge converter station include the Black-browed albatross, Eastern barred bandicoot, Eastern Quoll, Fairy Tern, Grey Goshawk, Little Tern, Shy Albatross, Southern Fairy Prion, Spotted-tailed Quoll, Swift Parrot, Tasmanian Azure Kingfisher, Tasmanian Devil, Wedge-tailed Eagle, and White-bellied Sea-Eagle.

The land-based threatened fauna in Victoria that may be present along the land HVDC project alignment and around the proposed Driffield or Hazelwood converter station include the Baw Baw Frog, Brush-tailed, Rock-wallaby, Eastern Barred Bandicoot, Greater Glider, Helmeted Honeyeater, Hooded Plover, Leadbeater's Possum, Macquarie Perch, Mountain Pygmy-possum, Orange-bellied Parrot, Plains-wanderer, and Regent Honeyeater.

The exposure scenarios involve DC magnetic fields from HVDC cables and AC electric and magnetic fields from converter stations.

The degree to which different species of wildlife will be exposed to static and ELF EMFs depends on the animal species and the type of installation (i.e. converter station outdoor equipment versus underground cable). Ground dwelling fauna may be exposed to higher magnetic fields if traversing across or burrowing near a buried cable. The Gibbs report [24] found that the fields generated by transmission lines do not have a harmful effect on the health or behaviour of local fauna.

Manitoba Hydro issued a report in 2010 after investigating the effect of transmission lines on wildlife, concluding "Research has not shown a relationship between EMF and the health or behaviour of animals" [33]. Moreover, research on the effect of static and ELF EMF on biological effects such as genetic effects, cell growth, and reproduction and development, from multiple studies, have not indicated adverse effects [34].

For wildlife in general, EMF impacts can be classified as follows:

- Animals that have electroreceptors for predation/foraging (primary) and navigation (secondary);
- Animals that have magnetoreceptors for navigation;
- Animals that have neither electro- nor magnetoreceptors.

Animals that have electroreceptors are the smallest group. They are primarily aquatic as the insulating properties of air doesn't facilitate electric current flow that the ampullae of Lorenzini (the electric field receptor organ) requires for detection. The group mostly comprises fish, amphibians and monotremes (platypus and echidna). Some dolphins have hairless "whisker" cells on their beak that sense electric fields and bees can also sense the electric charge on flowers using specialized hairs on their body. Interference to these receptors directly impacts the health of these animals, as it impacts predation and foraging success, and EMF effects can be significant.

There are many animals that can sense low-level static magnetic fields using many different mechanisms. In birds, there are two main mechanisms for sensing magnetic fields. Migratory birds use cryptochrome protein in the eye to perceive magnetic fields (quantum radical pair mechanism). Some birds have iron-containing materials in their upper beaks and can sense magnetic fields using the trigeminal nerve.

There are no experimental or epidemiological field studies that have concluded that the low-level, localised 50 Hz magnetic fields from power lines could have an impact on magneto-sensitive animals. As birds only use magnetic field sensing for navigation, the low-level, localised magnetic fields from power lines and cables that are below the ambient geomagnetic field and transient fluctuations in this field, are very unlikely to have any effect on the behaviour of birds in the area, including birds nesting on the ground near the land cables. Furthermore, the quantum radical pair mechanism that most birds use for sensing magnetic fields is more sensitive to interference from radio frequency fields than slowly varying or ELF fields.

### 7.2.10 Marine Animals

The potential effects of EMF exposure to Marine Flora and Fauna are to be addressed in the Marine Ecology and Resource Use (MERU) report (EIS/EES Appendix P). This report will document potential effects of EMF exposure, and applicable reference levels that relate to Marine Flora and Fauna including benthic species, epibenthic species, and those listed as threatened under the Threatened Species Protection Act 1995.

### 7.2.11 Marine Vessels

The potential sensitive receivers identified in this subsection are electrical and electronic equipment installed on all forms of marine vessels. The exposure scenarios involve DC magnetic fields from subsea HVDC cables.

Ships and boats not equipped with GPS may rely on compass readings for navigation. Localised disturbances in the geomagnetic field can disrupt the accuracy of the compass reading. However, the compass will need to be located very close (within 10 m) to the source of the disturbance to have any significant impact [35]. Therefore, the impact to ships and boats relying on compass-based navigation in the Bass Strait will be negligible as the vessels will not be close enough to the generated fields from the cables to be impacted. Moreover, only small vessels (e.g. recreational crafts) will be impacted near shore crossings in very shallow water. Any impact to the compass reading on these vessels near the shoreline will not impact navigation or safety as visual navigation will assist. The magnetic fields generated by the proposed Marinus HVDC subsea cables will not impact GPS or gyrocompass navigation.

### 7.2.12 Water Quality

The average water temperature in the Bass Strait ranges from 13.7°C (winter) and 18°C (summer) [11]. The salinity in the Bass Strait ranges from 35-36 ppt with the higher salinity regions located in the northern parts of the Bass Strait[12].

The project's cables will generate heat near the outer surfaces of the cables due to resistive losses in the cable centre conductors. For the trenched cables, the majority of the heating will be limited to the rock and sand immediately surrounding the cables. The thermally insulating ducts will also limit the transfer of heat to the rock and sand. The impact of this heating on the marine fauna and flora will therefore depend on the buried depth of the cables and the thermal resistivity of the sand and sea water.

For cables buried on the seabed and surrounded by sea water, the heating of the water above the ambient is generally limited to water within a few centimetres of the cable [36]. Ocean currents are expected to dissipate the heat and negate any such water heating effects, such that it is only the outer surface of the cable that will be at a temperature above the ambient [37]. The cable heating assessment calculations presented in Section 7.5.6 discuss this in further detail.

The electrical conductivity of seawater and the sand immediately surrounding the cable is a function of temperature and salinity. An increase in electrical conductivity of seawater in the presence of a magnetic field will increase the electric field present in the water. This may impact marine animals. Increases in the salinity and temperature of the seawater will increase the conductivity of the water. The salinity through the Bass Strait does not vary by more than 1 parts per thousand (ppt)[13] on average and this variance will not result in a significant impact on marine life near the Marinus HVDC subsea cables where the magnetic field is strongest. It is therefore only an increase in the temperature of the seawater near the subsea cables that may impact the water quality and thereby the marine life. Only the outer surface of the cable that will be at a temperature above the ambient resulting in a small region of increased conductivity around the cables that is readily dispersed by the strong sea currents in the Bass Strait. The effect of a water temperature rise due to the Marinus HVDC subsea cables on the surrounding environment will therefore be negligible.

[11] Source: https://seatemperature.info/bass-strait-water-temperature.html

[12] http://www.cmar.csiro.au/datacentre/cmar_public/ocean_2004/maps/CARS/sal_0.pdf

[13] http://www.cmar.csiro.au/datacentre/cmar_public/ocean_2004/maps/CARS/sal_0.pdf

The study of the existing Basslink cable indicated that the ecological effects of the cable installation on epibiota have been minor and transient in nature for soft sediments along the sea floor, Epibenthic specie growth had occurred on the biological material accumulating in the cable trench and the armoured half-shell substrate installed at the Tasmanian end of the cable has become a new habitat for reef species and is colonisable. The impact of cable heating does not affect this process. Similarly heat generated by the Marinus subsea cables will not have a significant impact on benthic ecosystems, fish or mammals.

## 7.3 Assessment Criteria

### 7.3.1 Human Health

The World Health Organization recognises two international ELF EMF exposure guidelines:

- The Guidelines for Limiting Exposure to Time-varying Electric and Magnetic Fields (1Hz to 100kHz) produced by the International Commission on Non-Ionising Radiation Protection
- IEEE Standard C95.1- Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0Hz to 300GHz produced by Institute of Electrical and Electronics Engineers

These guidelines apply to people in all areas (i.e., not above underground cables) and no distinction is made in the guidelines for the duration of exposure (i.e., the limits and reference levels are specified as maximum instantaneous levels).

There are currently no national guidelines or regulations in Australia for extremely low frequency EMF. The Australian Radiation Laboratory, on behalf of the National Health and Medical Research Council (NHMRC), published the “Interim Guidelines on Limits of Exposure to 50/60 Hz Electric and Magnetic Fields” in December 1989 as part of its Radiation Health Series, No. 30 (RHS30).

ARPANSA’s Radiation Health Committee (RHC) agreed at its 24 June 2015 meeting that it will withdraw the existing NHMRC RHS30 guidance on extremely low frequency electric and magnetic fields exposure and recognised that the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz -100 kHz) are consistent with ARPANSA’s and the RHC's understanding of the scientific basis for the protection of people from exposure to ELF electric and magnetic field[14].

The basic restrictions for ELF electric and magnetic fields are exposure limits for internal electric fields in different body tissues. Relating these internal field levels within body tissues to measurable external field levels above a buried cable or under a transmission line is a complex undertaking requiring detailed dosimetry analysis. ICNIRP has therefore also defined reference levels, which are the external, measurable field levels that equate to internal field levels within body tissues that are below the basic restrictions. The ICNIRP reference levels are defined for uniform fields over the body whose exposure is being assessed.

[14] https://www.arpansa.gov.au/regulation-and-licensing/regulatory-publications/radiation-health-series

It is noted that a conservative reduction factor is used in deriving reference levels from the basic restrictions to account for uncertainties in the available dosimetry as well as the influence of body parameters on the derived values. It is further noted that a safety factor is applied to occupational exposure limits to derive the general public exposure limits that account for exceptionally sensitive individuals, uncertainties concerning threshold effects due to pathological conditions or drug treatment, uncertainties in reaction thresholds and uncertainties in induction models.

The basic restrictions are therefore the exposure thresholds that must be complied with, and the reference levels are conservative, measurable field levels that ensure compliance with the basic restrictions for generic electric and magnetic field exposure scenarios. The ICNIRP reference levels for general public exposure to 50 Hz electric and magnetic fields are summarised in Table 7-4.

*Table 7-4: ICNIRP EMF reference levels and AIMD limits*

| **Exposure Scenario** | **Electric Field Strength Reference Level (kV/m)** | | **Magnetic Field Strength Reference Level (μT)** | |
|---|---|---|---|---|
| | **Static/ slowly varying** | **ELF** | **Static/ slowly varying** | **ELF** |
| People – all areas | 5 | 5 | 400,000 | 200 |
| Active implantable medical devices | 5 | 5 | 500 | 200 |

The reference levels specified in the ICNIRP guidelines are defined as spatially averaged values within the volume occupied by a person's body. As such, the reference levels are compared to measured levels at 1 m above the normal standing surface of a person under or near the line.

The ICNIRP guidelines note that compliance with the reference level will ensure compliance with the relevant basic restriction but that if the measured or calculated value exceeds the reference level, it does not necessarily follow that the basic restriction will be exceeded. However, whenever a reference level is exceeded it is necessary to test compliance with the relevant basic restriction and to determine whether additional protective measures are necessary.

Given that adverse health effects from long-term exposure to EMF have not been established but also cannot be ruled out, Sir Harry Gibbs [24], the former Chief Justice of the High Court of Australia, and Professor Hedley Peach [38], University of Melbourne, recommended a policy of prudent avoidance in their reviews of the potential health effects.

Prudent avoidance is a precautionary approach to managing the potential risk which involves implementing no cost and very low-cost measures that reduce exposure (i.e., reasonable efforts to minimise the potential risks are taken when the actual magnitude of the risks is unknown). Under this approach, power utilities must design their assets to reduce the fields generated and locate the assets so as to minimise the long-term exposure of people to these fields, especially children.

### 7.3.2 Fauna and Flora

Reference levels for land fauna and flora impacts are summarised in Table 7-5 and have been derived from the research summarised in Section 7.2.10.

*Table 7-5: Land fauna and flora EMF reference levels considered in the study*

| Exposure Scenario | Electric Field Strength Reference Level (kV/m) | | Magnetic Field Strength Reference Level (μT) | |
|---|---|---|---|---|
| | Static/ slowly varying | ELF | Static/ slowly varying | ELF |
| RFID tags | n/a | n/a | 3,000,000 | 3,000,000 |
| Livestock | 5* | 5* | 400,000* | 200* |
| Apiaries | n/a | 4.1 | 2 | 100 |
| Wildlife | 5* | 5* | 400,000* | 200* |

* Conservative assumed value

### 7.3.3 Electrical and Electronic Equipment

The typical immunity limits for electrical and electronic equipment that are summarised in Table 7-3 have been adopted for the EMI impact assessment in this study.

Conductor corona and other electrostatic effects generate interference over a wide frequency range. The limits for electromagnetic interference from a converter station outdoor switchyard are established in Australian Standard AS 2344. A satisfactory level of radio reception, as defined by the International Telecommunication Union (ITU), can be expected for broadcast, navigation, safety-of-life and other radio communication services in areas where the radio frequency emissions from the line are below these limits. These limits are generally applied at the boundary of the transmission line easement.

Victoria and Tasmania fall into ITU region 3, zone C. The applicable emission limits for this zone are summarised in Table 7-6. Magnetic field strength and electric field strengths associated with emission limits are commonly measured on a decibel scale in microamperes per metre (dBμA/m) for frequencies below 30 MHz and in microvolts per metre (dBμV/m) for frequencies above 30 MHz. The specified limits are defined in the standard as the fields measured at μmetres above ground.

*Table 7-6: Radio and television interference limits as defined in Australian Standard 2344*

| Frequency (MHz) | Magnetic Field Strength (dBμA/m) | | Electric Field Strength (dBμV/m) |
|---|---|---|---|
| | Urban Areas[1] | All Other Areas | |
| 0.15 to 0.30 | -1.5 | -1.5 | - |
| 0.30 to 0.50 | -15.5 | -15.5 | - |
| 0.50 to 1.70 | -1.5 | -15.5 | - |
| 1.70 to 3.00 | -15.5 | -15.5 | - |
| 3.00 to 30.0[2] | -15.5 to -28.5 | -15.5 to -28.5 | - |

| Frequency (MHz) | Magnetic Field Strength (dBµA/m) | | Electric Field Strength (dBµV/m) |
|---|---|---|---|
| | Urban Areas[1] | All Other Areas | |
| 30.0 to 230 | - | - | 30 |
| 230 to 1,000 | - | - | 37 |
| 1,000 to 3,000 | - | - | 60 |

[1] Applicable to areas having a population of greater than 2000 people that are serviced by local broadcast stations
[2] The limit decreases linearly with the logarithm of the frequency from 3 MHz to 30 MHz

## 7.4 Construction Impact Assessment

### 7.4.1 Key Issues

Potential impacts for electric and magnetic fields and electromagnetic interference in relation to the construction activities of the project are summarised in Table 7-7. An overview of the significance of construction impacts is described in the following section.

*Table 7-7: Radio and television interference limits as defined in Australian Standard 2344*

| Project component | Project activity | Potential for impact to electric and magnetic fields and electromagnetic interference and associated consequence | Standard controls |
|---|---|---|---|
| Project-wide | All activities related to construction of the HVDC cables and converter stations. | Radiocommunication equipment used for construction activities (e.g., mobile telephones and Citizens Band radios) will generate radio frequency emissions during construction. There is therefore a potential to create radio frequency interference to nearby sensitive receivers. | The radiocommunication equipment used during construction must have appropriate Regulatory Compliance Mark labelling. |

### 7.4.2 Significance of impacts

Construction of the project infrastructure involves commercial plant and electrical equipment that will have appropriate EMC certification. This provides assurance that EMF and EMI from the construction site will be below the limits specified in applicable Australian Communications and Media Authority (ACMA) and product safety standards for a construction environment. When discussing the significance of impacts, this therefore implies post-mitigation or residual impacts.

Construction workers may need to work at closer distances to live transmission line conductors than the general public are permitted. They will therefore be exposed to higher EMF levels. Public access to work sites will be restricted with appropriate fencing and occupational exposure to EMF and EMI will be managed as part of safe work method planning in accordance with occupational health and safety requirements (e.g. access controls and/or appropriate warning signages).

## 7.5 Operation Impact Assessment

### 7.5.1 Heybridge Converter Station

The HIFREQ model of the AC Air Insulated Switchgear (AIS) equipment and associated structural components at Heybridge converter station, including the landing span, is shown below in Figure 7-2. The electric and magnetic fields around the fence line are plotted in Figure 7-3 and Figure 7-4. The results are summarized in Table 7-8 and Table 7-9. The AC equipment has been modelled as air-insulated equipment. The calculated electric and magnetic field intensities are below the permissible limits for people and other sensitive receivers at the fence line.

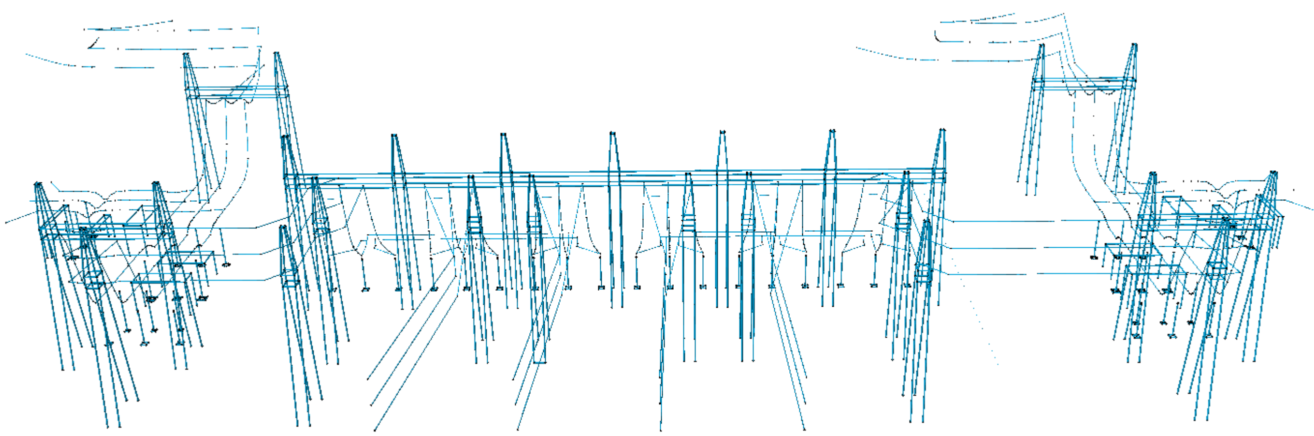

*Figure 7-2: HIFREQ model - AC equipment and supporting structures at the Heybridge Converter Station*

*Table 7-8: Human health impact assessment for the Heybridge converter station*

| EMF | General Public Reference Level | Maximum Calculated Value |
|---|---|---|
| Electric Field Strength (kV/m) | 5 | 3.5 |
| Magnetic Flux Density (μT) | 200 | 14.2 |

*Table 7-9: Farming and wildlife impact assessment for the Heybridge converter station*

| Exposure Scenario | Electric Field Strength (kV/m) | | Magnetic Field Strength (μT) | |
|---|---|---|---|---|
| | Reference Level | Maximum Calculated Value | Reference Level | Maximum Calculated Value |
| Livestock | 5* | 3.5 | 200* | 14.2 |
| Apiaries | 4.1 | 3.5 | 100 | 14.2 |
| Wildlife | 5* | 3.5 | 200* | 14.2 |

* Conservative assumed value

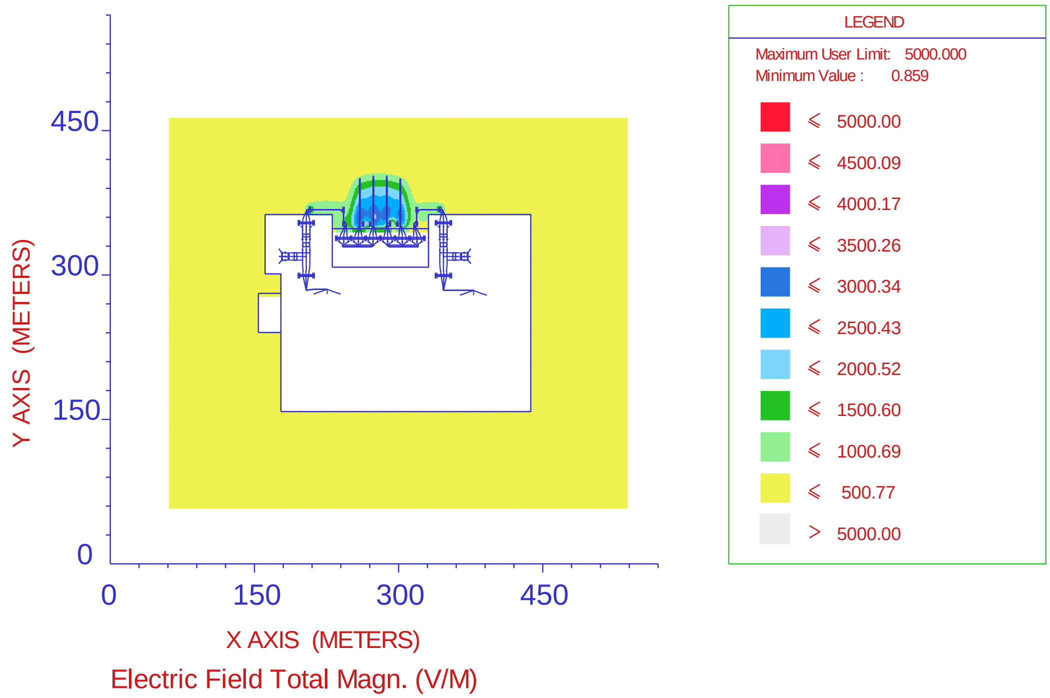


*Figure 7-3: Calculated electric field strength around the fence line of Heybridge Converter Station*

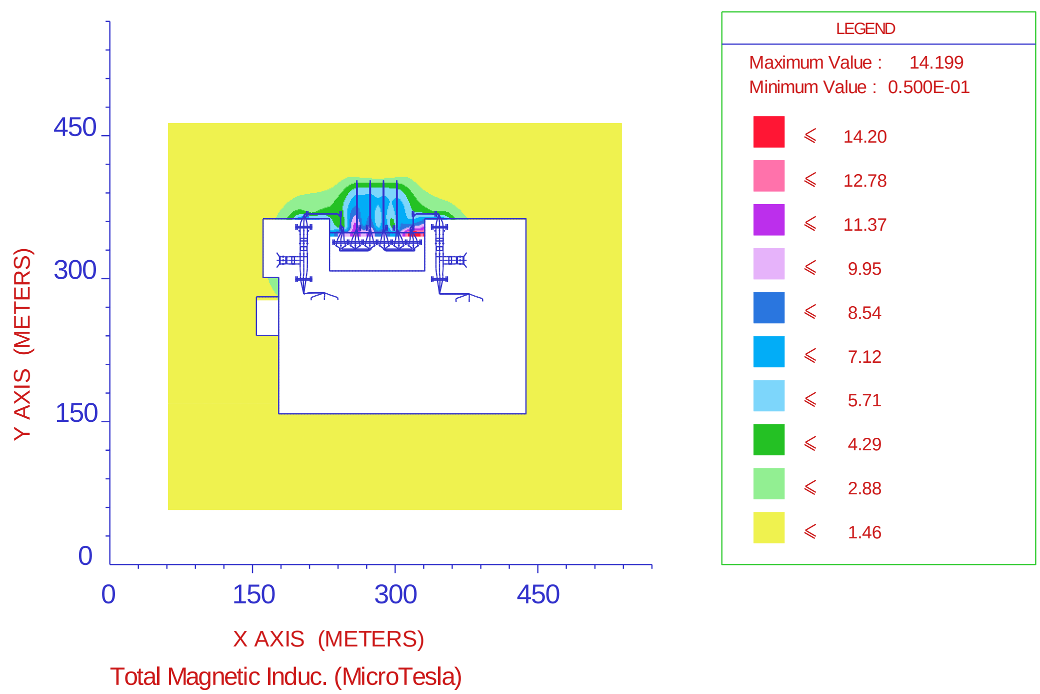


*Figure 7-4: Calculated magnetic flux density around the fence line of Heybridge Converter Station*

A desktop study of the area surrounding the Heybridge converter station was carried out and it was confirmed that there are no sensitive electrical or electronic equipment or systems that could be impacted by the EMI from the converter station. Furthermore, the maximum calculated magnetic field strength was below the 3.8 μT limit for generic household electrical and electronic equipment in all areas outside the converter station property.

The surface voltage gradient on the flexible connections and rigid bus sections within the Heybridge converter station were calculated using the HIFREQ model. The maximum calculated surface voltage gradient within the converter station is less than 16 kV/cm, as is evidenced in Figure 7-5. This is the benchmark value specified in AS/NZS 7000 for acceptable transmission line corona performance. All fittings, insulators and equipment bushings will be RIV tested as part of the type approval process and will therefore produce RFI levels under below the acceptable EMI limits for the converter station environment.

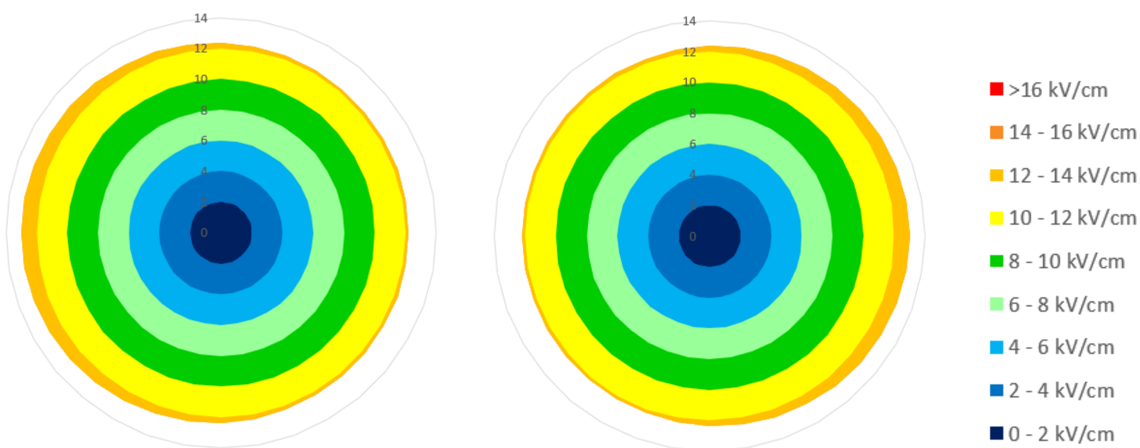


*Figure 7-5: Calculated surface voltage gradient on flexible connections at the Heybridge Converter station*

### 7.5.2 Driffield Converter Station

The HIFREQ model of the AC Air Insulated Switchgear (AIS) equipment and associated structural components at Driffield converter station, including the landing spans for both the incoming and outgoing circuits, is shown below in Figure 7-6. The calculated electric and magnetic fields around the fence line are plotted in Figure 7-7 and Figure 7-8. The results are summarized in Table 7-10 and Table 7-11. The calculated electric and magnetic field intensities are below the permissible limits for people and other sensitive receivers at the fence line.

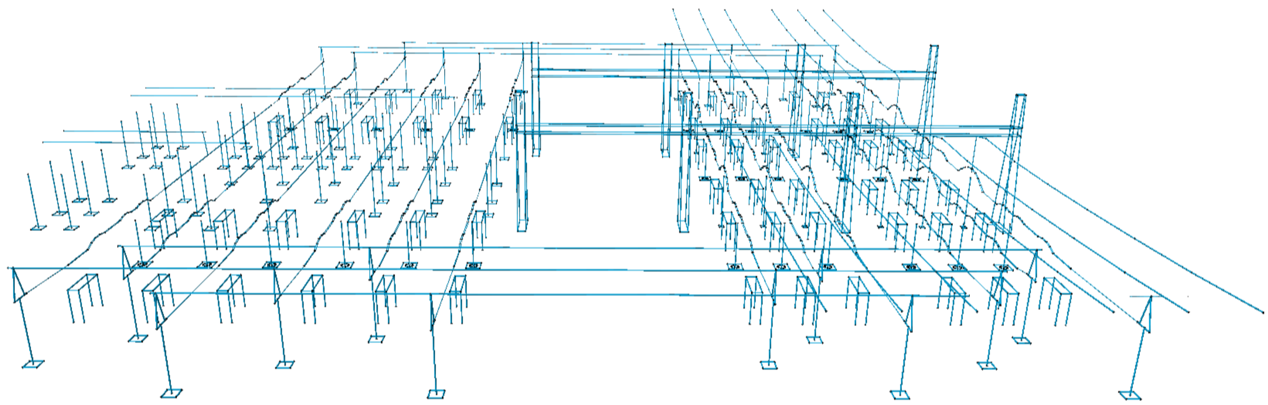

*Figure 7-6: HIFREQ model - AC equipment and supporting structures at the Driffield Converter Station*

*Table 7-10: Human health impact assessment for the Driffield converter station*

| EMF | General Public Reference Level | Maximum Calculated Value |
|---|---|---|
| Electric Field Strength (kV/m) | 5 | 1.8 |
| Magnetic Flux Density (μT) | 200 | 3.4 |

*Table 7-11: Farming and wildlife impact assessment for the Driffield converter station*

| Exposure Scenario | Electric Field Strength (kV/m) | | Magnetic Field Strength (μT) | |
|---|---|---|---|---|
| | Reference Level | Maximum Calculated Value | Reference Level | Maximum Calculated Value |
| Livestock | 5* | 1.8 | 200* | 3.4 |
| Apiaries | 4.1 | 1.8 | 100 | 3.4 |
| Wildlife | 5* | 1.8 | 200* | 3.4 |

* Conservative assumed value

A desktop study of the area surrounding the Driffield converter station was carried out and it was confirmed that there are no sensitive electrical or electronic equipment or systems that could be impacted by the EMI from the converter station. Furthermore, the maximum calculated magnetic field strength was below the 3.8 μT limit for generic household electrical and electronic equipment in all areas outside the converter station property.

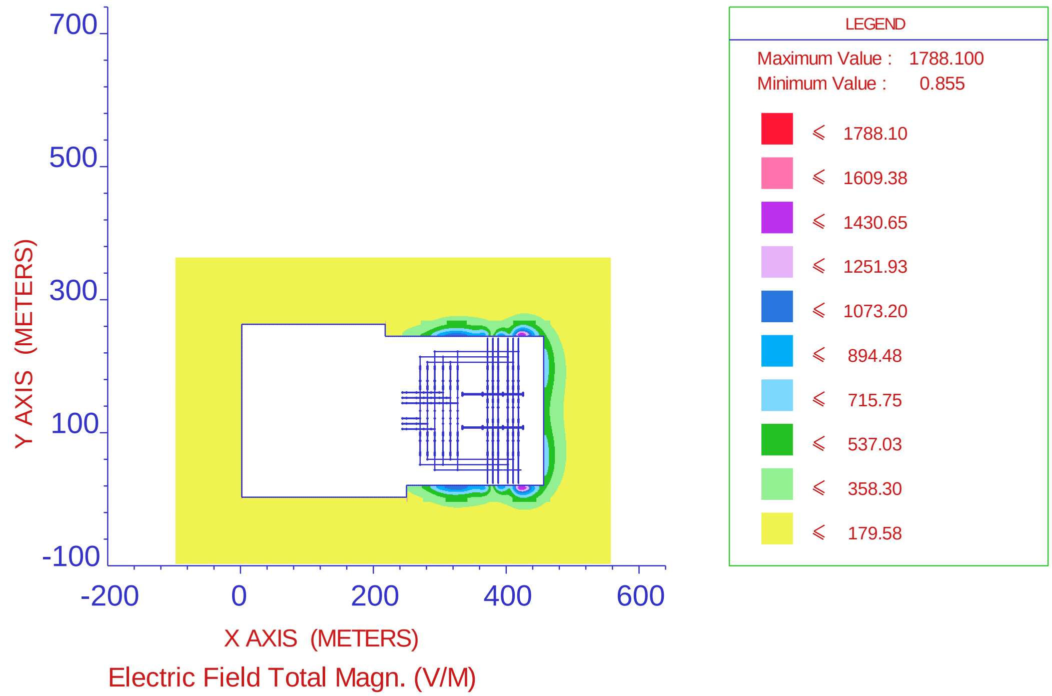


*Figure 7-7: Calculated electric field strength around the fence line of the Driffield Converter Station*

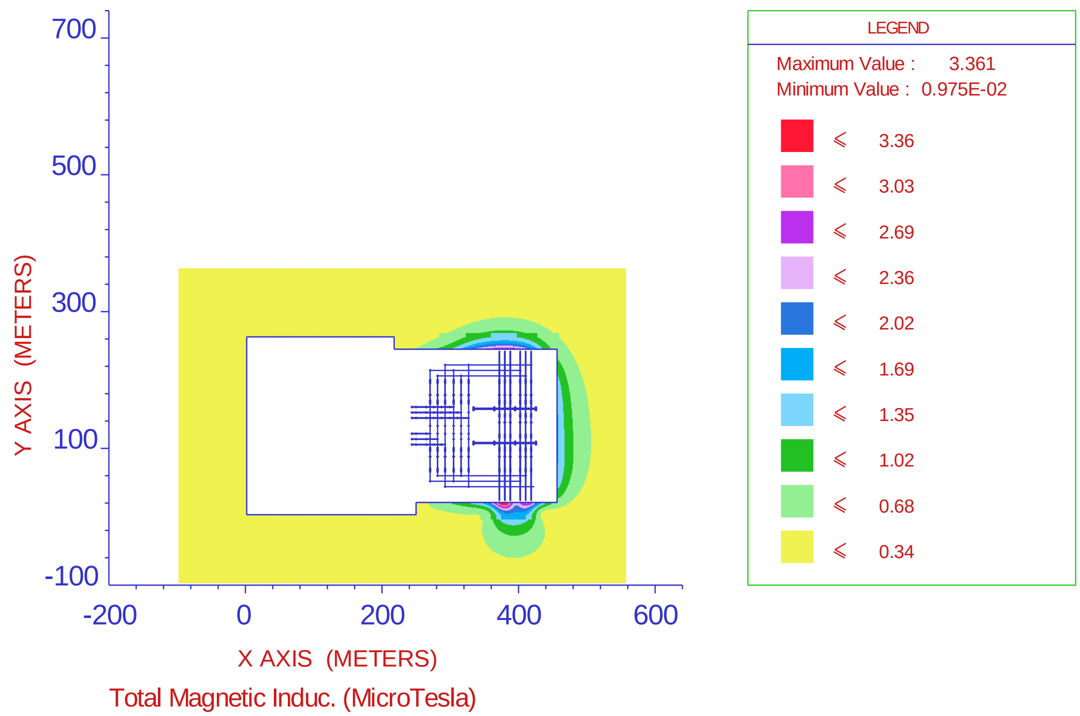


*Figure 7-8: Calculated magnetic flux density around the fence line of the Driffield Converter Station*

The surface voltage gradient on the flexible connections and rigid bus sections within the Driffield converter station were also calculated. The maximum calculated surface voltage gradient within the converter station is 16 kV/cm on the landing span at maximum possible voltage, as evidenced in Figure 7-9 and Figure 7-10. At normal operating voltages it will be below the 16 kV/cm benchmark value specified in AS/NZS 7000 for acceptable transmission line corona performance. All fittings, insulators and equipment bushings will be RIV tested as part of the type approval process and will therefore produce RFI levels under below the acceptable EMI limits for the applicable environment.

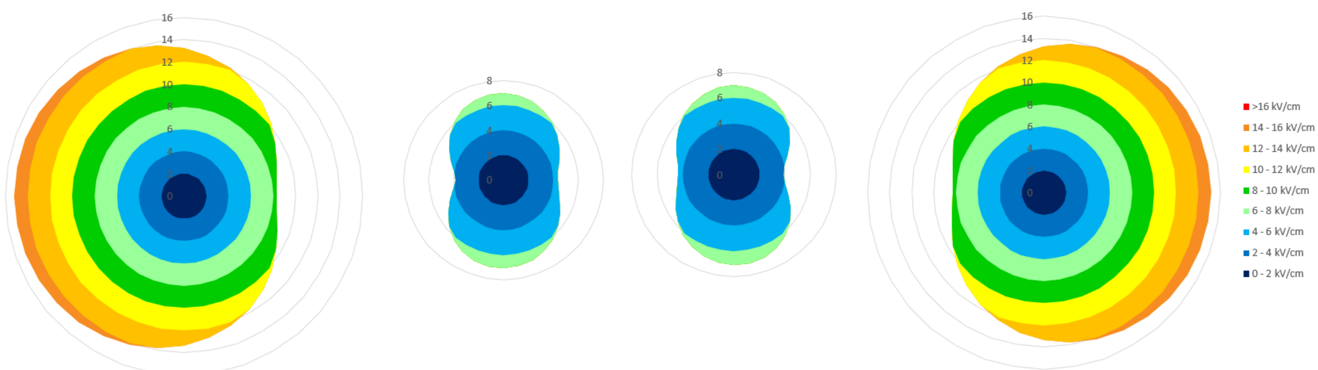


*Figure 7-9: Calculated surface voltage gradient on the flat-arranged flexible connections at the Driffield Converter station*

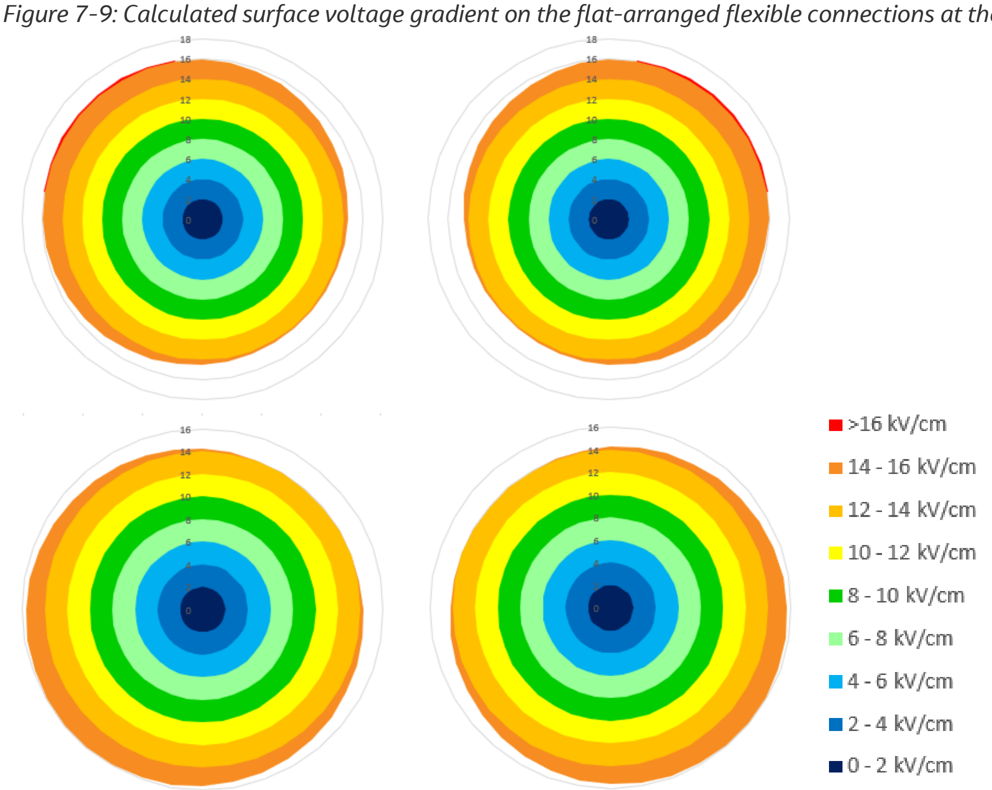


*Figure 7-10: Calculated surface voltage gradient on the square -type flexible connections at the Driffield Converter station*

### 7.5.3 Hazelwood Converter Station

The HIFREQ model of the AC Air Insulated Switchgear (AIS) equipment and associated structural components at Hazelwood converter station, including the landing spans for both the incoming and outgoing circuits, is shown below in Figure 7-11. The calculated electric and magnetic fields around the fence line are plotted in Figure 7-12 and Figure 7-13. The results are summarized in Table 7-12 and Table 7-13. The calculated electric and magnetic field intensities are below the permissible limits for people and other sensitive receivers at the fence line.

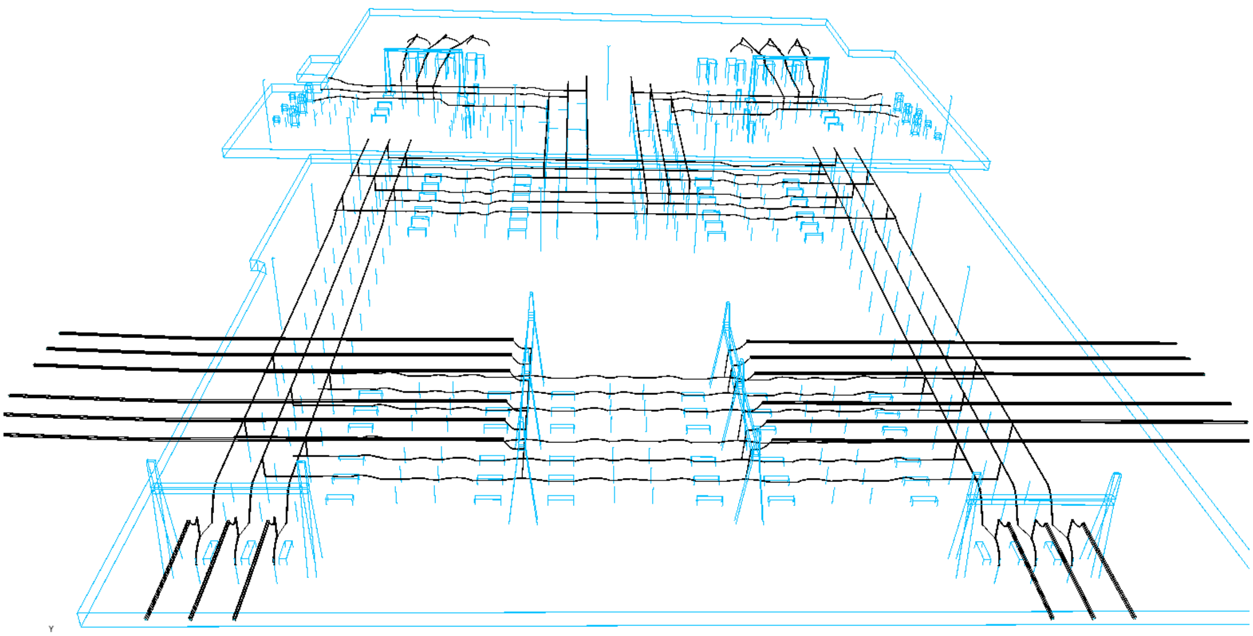

*Figure 7-11: HIFREQ model - AC equipment and supporting structures at the Hazelwood Converter Station*

*Table 7-12: Human health impact assessment for the Hazelwood converter station*

| EMF | General Public Reference Level | Maximum Calculated Value |
|---|---|---|
| Electric Field Strength (kV/m) | 5 | 3.2 |
| Magnetic Flux Density (μT) | 200 | 10.7 |

*Table 7-13: Farming and wildlife impact assessment for the Hazelwood converter station*

| Exposure Scenario | Electric Field Strength (kV/m) | | Magnetic Field Strength (μT) | |
|---|---|---|---|---|
| | Reference Level | Maximum Calculated Value | Reference Level | Maximum Calculated Value |
| Livestock | 5* | 3.2 | 200* | 10.7 |
| Apiaries | 4.1 | 3.2 | 100 | 10.7 |
| Wildlife | 5* | 3.2 | 200* | 10.7 |

* Conservative assumed value

A desktop study of the area surrounding the Hazelwood converter station was carried out and it was confirmed that there are no sensitive electrical or electronic equipment or systems that could be impacted by the EMI from the new equipment at the converter station. Furthermore, the maximum calculated magnetic field strength was below the 3.8 μT limit for generic household electrical and electronic equipment in all areas outside the converter station property.

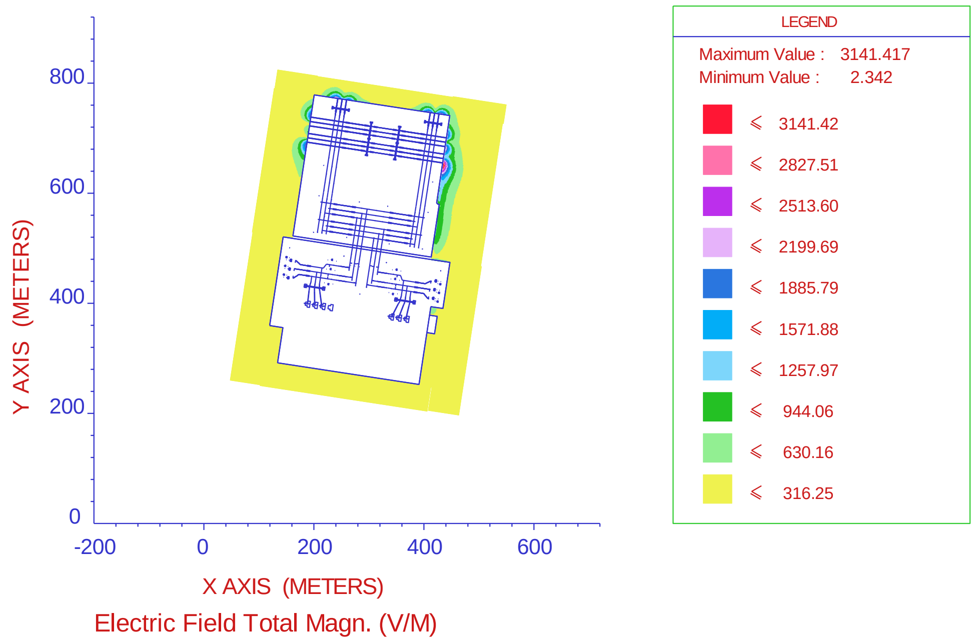


*Figure 7-12: Calculated electric field strength around the fence line of the Hazelwood Converter Station*

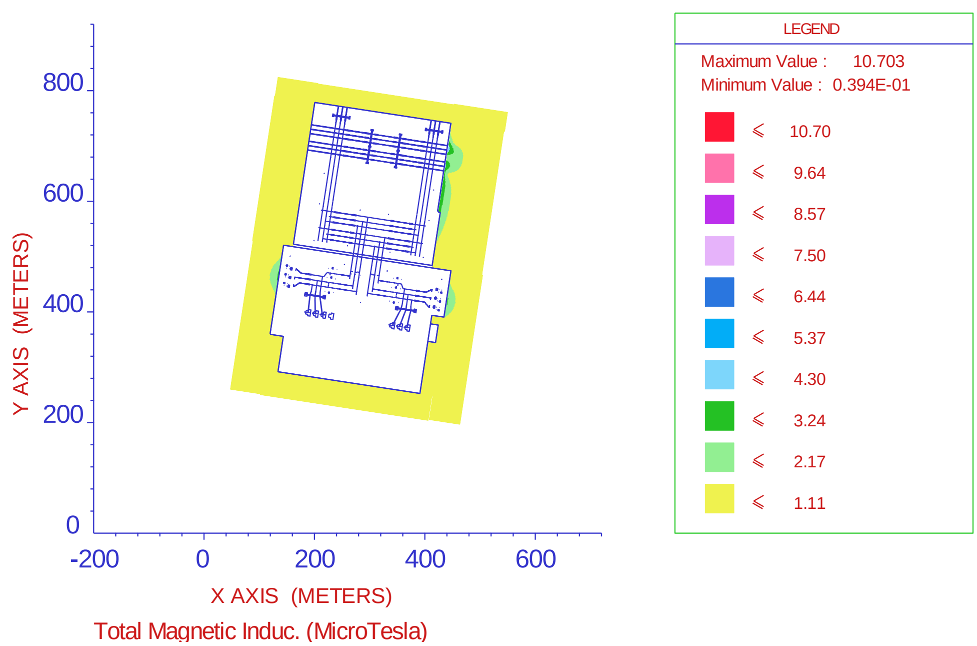


*Figure 7-13: Calculated magnetic flux density around the fence line of the Hazelwood Converter Station*

The surface voltage gradient on the flexible connections and rigid bus sections within the Hazelwood converter station were also calculated. The maximum calculated surface voltage gradient within the converter station is 16 kV/cm on the landing span at maximum possible voltage, as evidenced in Figure 7-14 and Figure 7-15. At normal operating voltages it will be below the 16 kV/cm benchmark value specified in AS/NZS 7000 for acceptable transmission line corona performance. All fittings, insulators and equipment bushings will be RIV tested as part of the type approval process and will therefore produce RFI levels under below the acceptable EMI limits for the applicable environment.

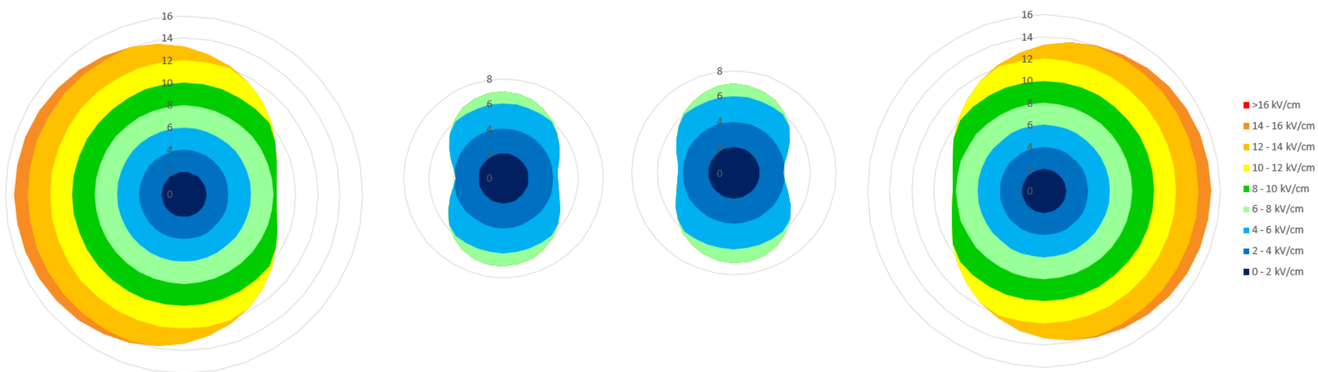


*Figure 7-14: Calculated surface voltage gradient on the flat-arranged flexible connections at the Hazelwood Converter station*

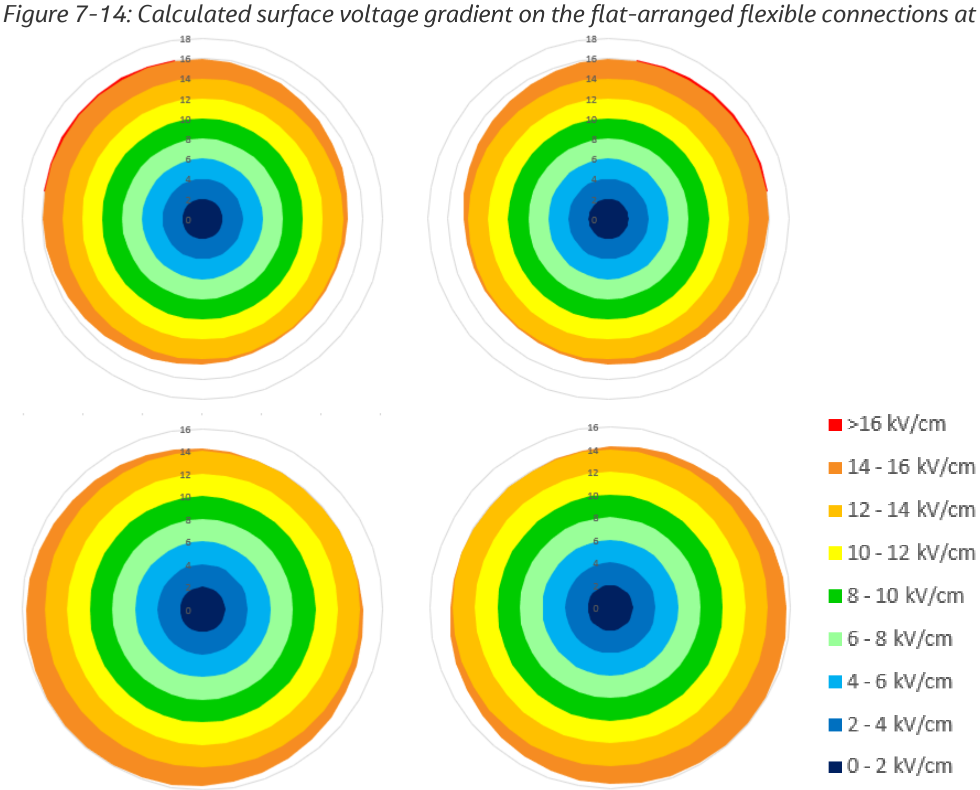


*Figure 7-15: Calculated surface voltage gradient on the square -type flexible connections at the Hazelwood Converter station*

### 7.5.4 Subsea HVDC Cables

The magnetic field levels were calculated in different areas along the subsea HVDC cables to verify the worst-case impact on the marine environment. The results are plotted in Figure 7-16 to Figure 7-27. The highest magnetic field levels occur at ground level as the cables transition from the Heybridge converter station to the Bass Strait (i.e. the Heybridge shore crossing) and at the Waratah Bay shore crossing. The cables will be unbundled and spaced a few metres apart in these HDD sections.

The cables in each circuit will be bundled together within the Bass Strait trench section, which greatly reduces the magnetic fields. The magnetic fields will be strongest directly above the cables and decrease quickly at increasing distance from the cable. Both vertically and horizontally arranged cables have been considered.

Fluctuations in sea water conductivity were considered in the modelling but were found to have negligible impact on the intensity of the static fields, which is consistent with Figure 6-2. The static electric field produced by the cable in the conductive water is negligible for all reasonable water salinities and ocean current velocities.

The largest generated magnetic field strength is 194 μT at the shore crossings (Figure 7-16 to Figure 7-23). The separation between adjacent circuits in these areas range from 20 m to 600 m. The magnetic field strength drops to below 5 μT at a distance of 50 m from the closest cable along the shore crossings.

If there will be locations where the cable cannot be buried at the modelled depth, the magnetic flux density at the seabed level will change. At the 1 m minimum value of the proposed burial depth range, the maximum magnetic flux density at seabed level will increase by up to 150%.

During the worst case possible overload scenario (considered to be where both Stage One and Stage Two are overloaded at the same time) the maximum magnetic flux density at seabed level will increase by up to 12.5%.

The two HVDC circuits will be separated by a nominal distance of 2 km along the majority of the Bass Strait crossing. Both a horizontal and vertical separation between positive and negative cables per circuit have been considered along this section. The EMF produced by vertically separated cables are plotted in Figure 7-24 and Figure 7-25. The EMF produced by horizontally separated cables are plotted in Figure 7-26 and Figure 7-27. The largest magnetic field strength is 24 μT for the horizontally arranged cables. This reduces to 21 μT for the vertically arranged cables. It is however noted that the magnetic field associated with the horizontally arranged cables drops off more quickly with horizontal distance from the cables along the seabed. The calculated magnetic field strength reduces to less than 5 μT at a distance of 3 m from the centre of each cable trench, irrespective of the cable bundle geometry.

The worst case calculated magnetic field strengths are compared to the derived reference levels for human health impacts in Table 7-14.

A desktop study of the area surrounding the subsea cables was carried out and it was confirmed that there are no sensitive electrical or electronic equipment or systems near the HVDC cables.

Furthermore, the XLPE insulated cables will be not subject to corona discharges and will therefore not emit radio frequency interference.

*Table 7-14: Human health impact assessment along the HVDC subsea project alignment*

| Exposure Scenario | Cable Area | Magnetic Field Strength (μT) | |
|---|---|---|---|
| | | Reference Level | Calculated Level |
| People – All areas | Heybridge shore crossing | 400,000 | 193 |
| | Bass Strait – Vertical | 400,000 | 21 |
| | Bass Strait – Horizontal | 400,000 | 24 |
| | Waratah Bay shore crossing | 400,000 | 194 |
| Active implantable medical devices | Heybridge shore crossing | 500 | 193 |
| | Bass Strait – Vertical | 500 | 21 |
| | Bass Strait – Horizontal | 500 | 24 |
| | Waratah Bay shore crossing | 500 | 194 |

It is evident from the impact assessments above that the calculated field levels are below the applicable reference levels and there will be no operating impacts on human health for people near the cables and mitigation is not required.

The potential effects of EMF exposure to Marine Flora and Fauna are to be addressed in the Marine Ecology and Resource Use (MERU) report (EIS/EES Appendix P). This report will document potential effects of EMF exposure, and applicable reference levels that relate to Marine Flora and Fauna including benthic species, epibenthic species, and those listed as threatened under the Threatened Species Protection Act 1995.

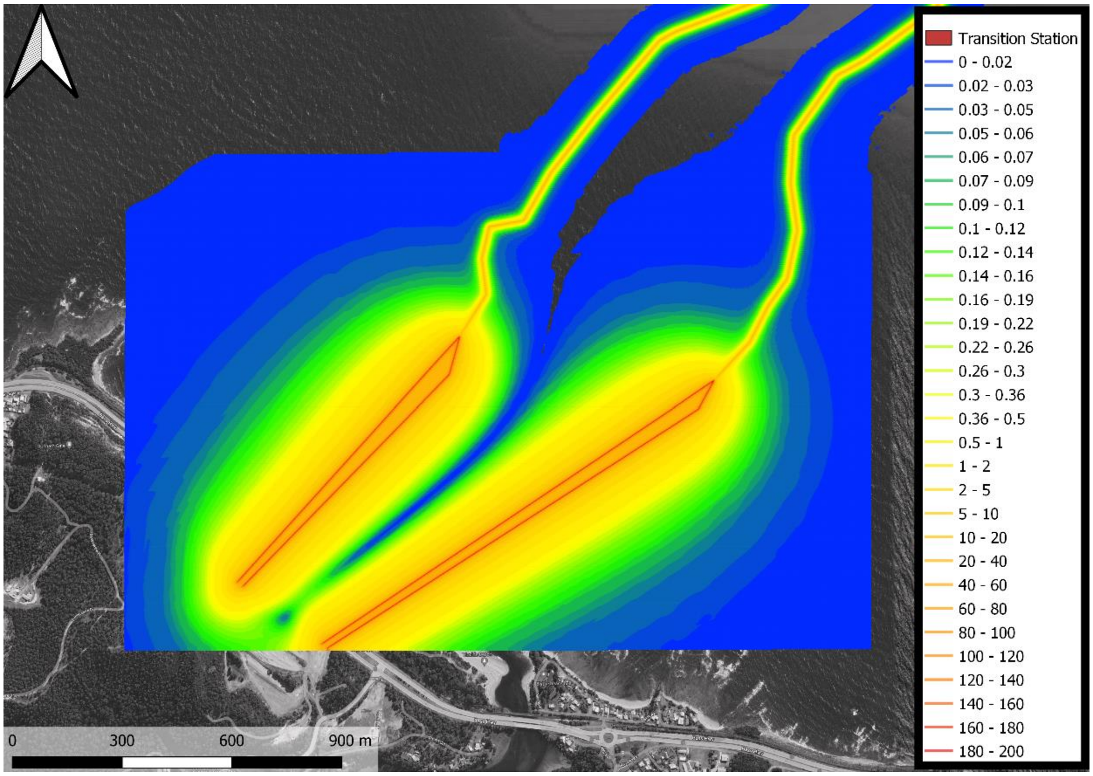


*Figure 7-16: Calculated magnetic field distribution on the seabed at the Heybridge shore crossing (μT)*

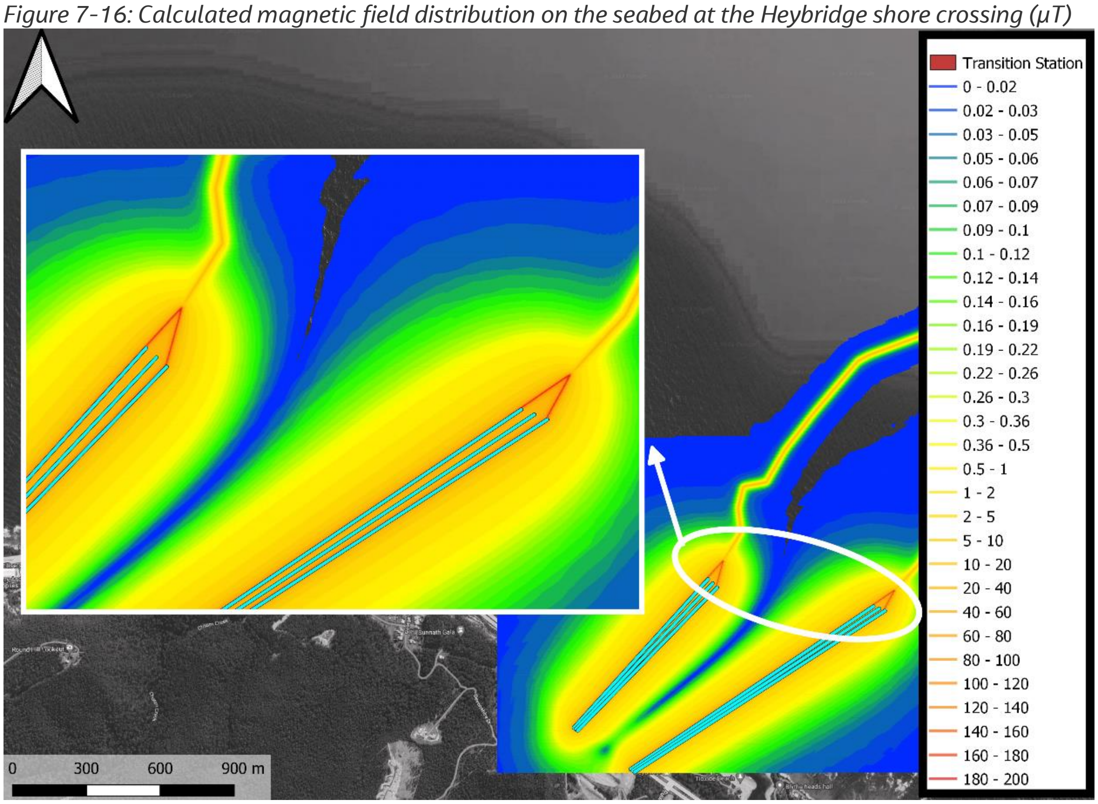


*Figure 7-17: Calculated magnetic field distribution on the seabed at the Heybridge shore crossing (μT)*

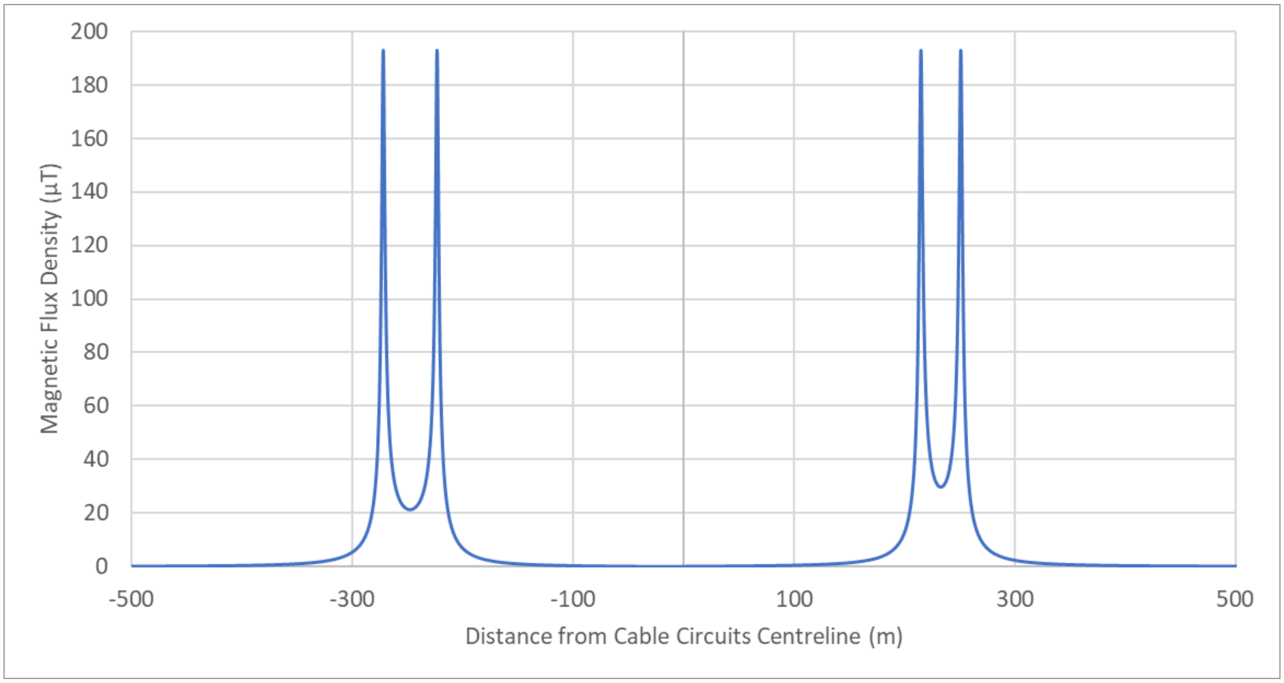


*Figure 7-18: Calculated magnetic field profile across the Heybridge shore crossing cable ducts (both circuits)*

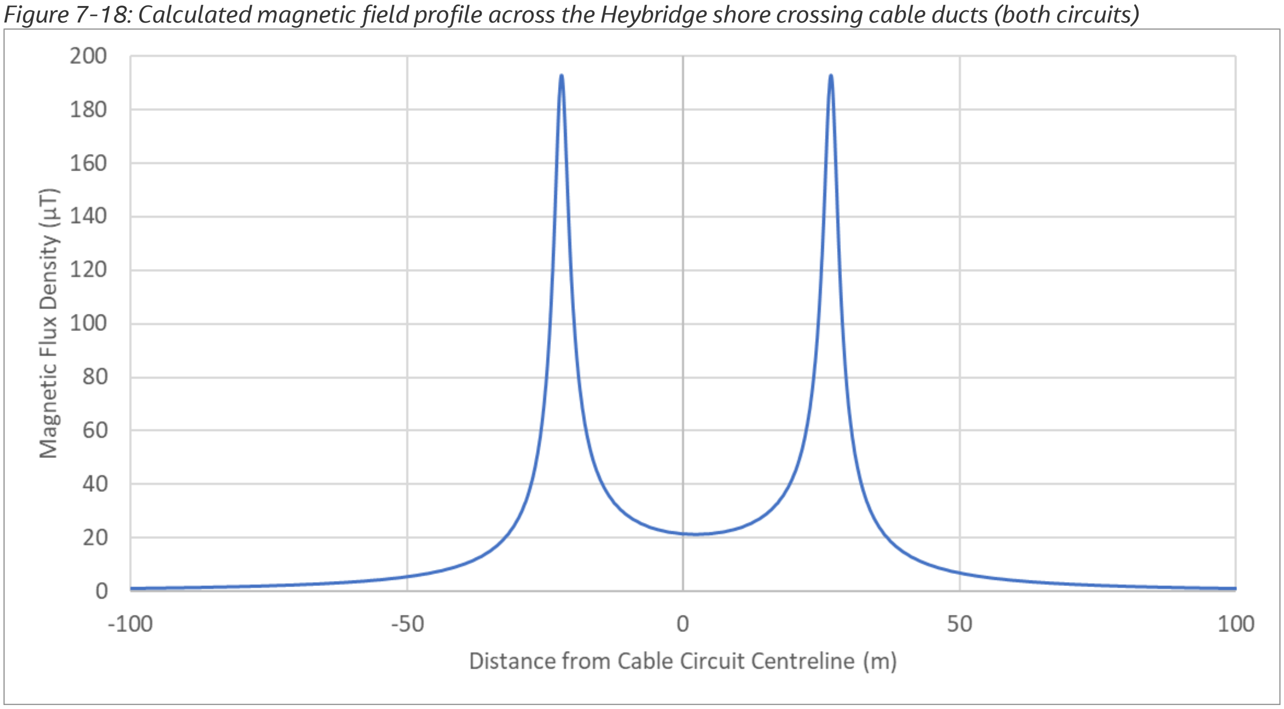


*Figure 7-19: Calculated magnetic field profile across the Heybridge shore crossing cable ducts (one circuit)*

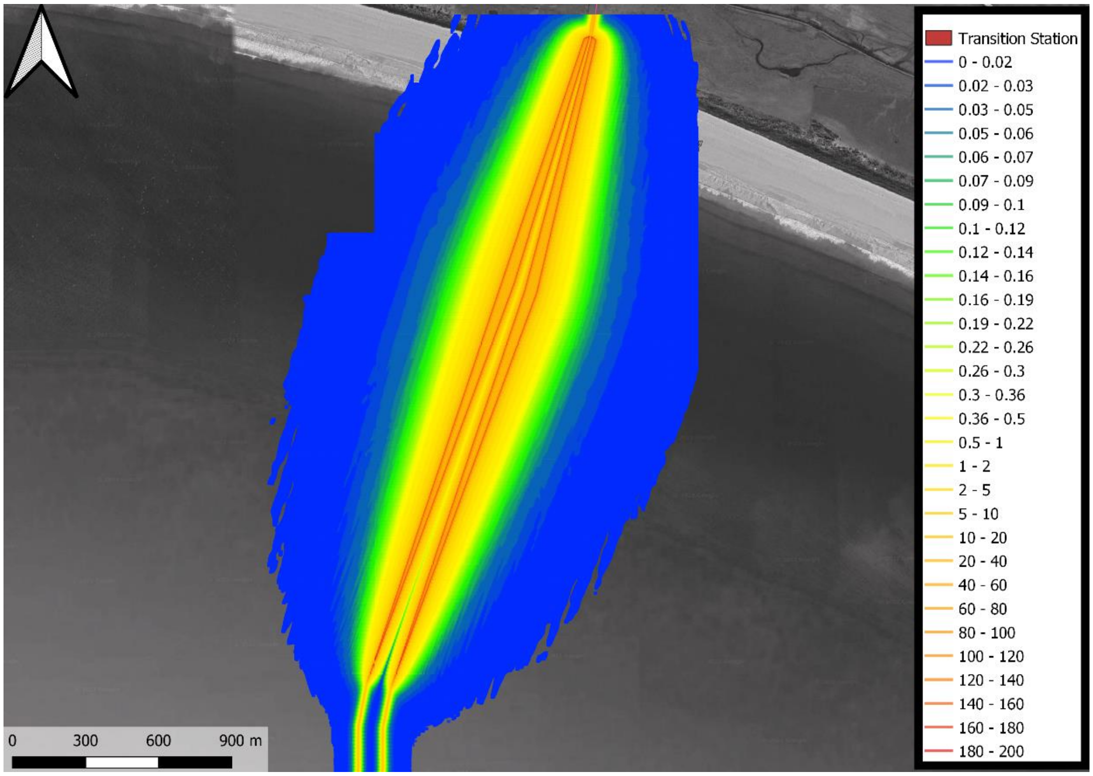


*Figure 7-20: Calculated magnetic field distribution on the seabed at the Waratah Bay shore crossing (μT)*

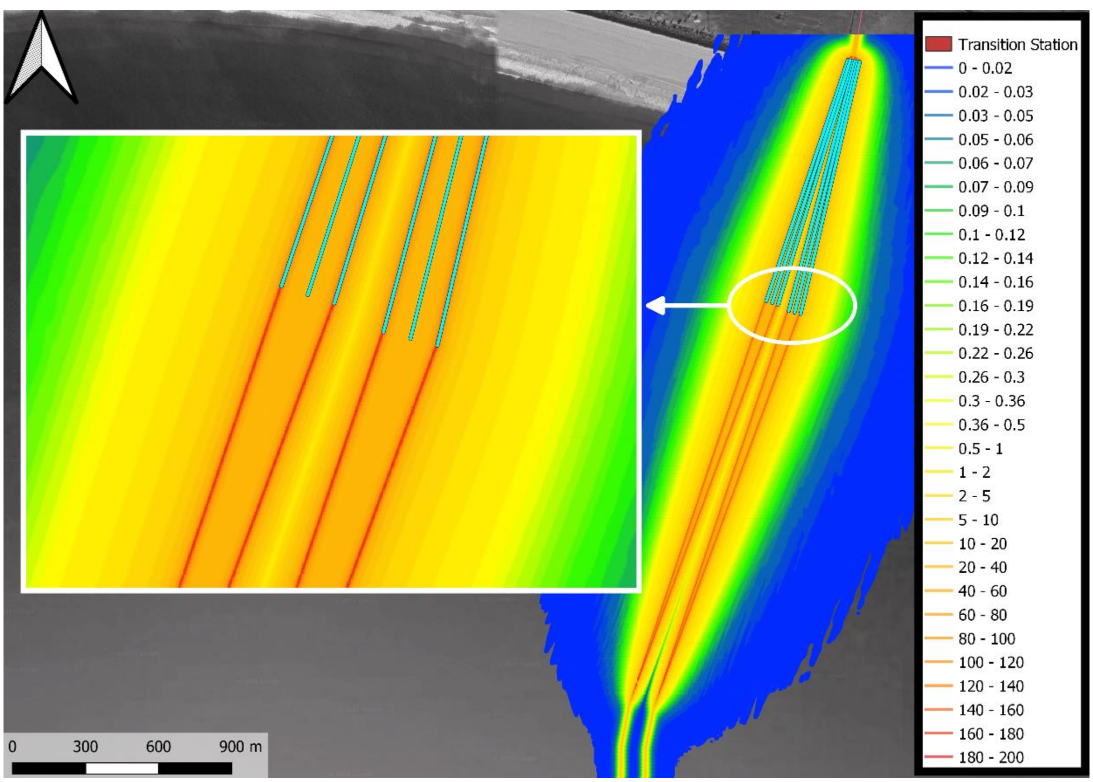


*Figure 7-21: Calculated magnetic field distribution on the seabed at the Waratah Bay shore crossing (μT)*

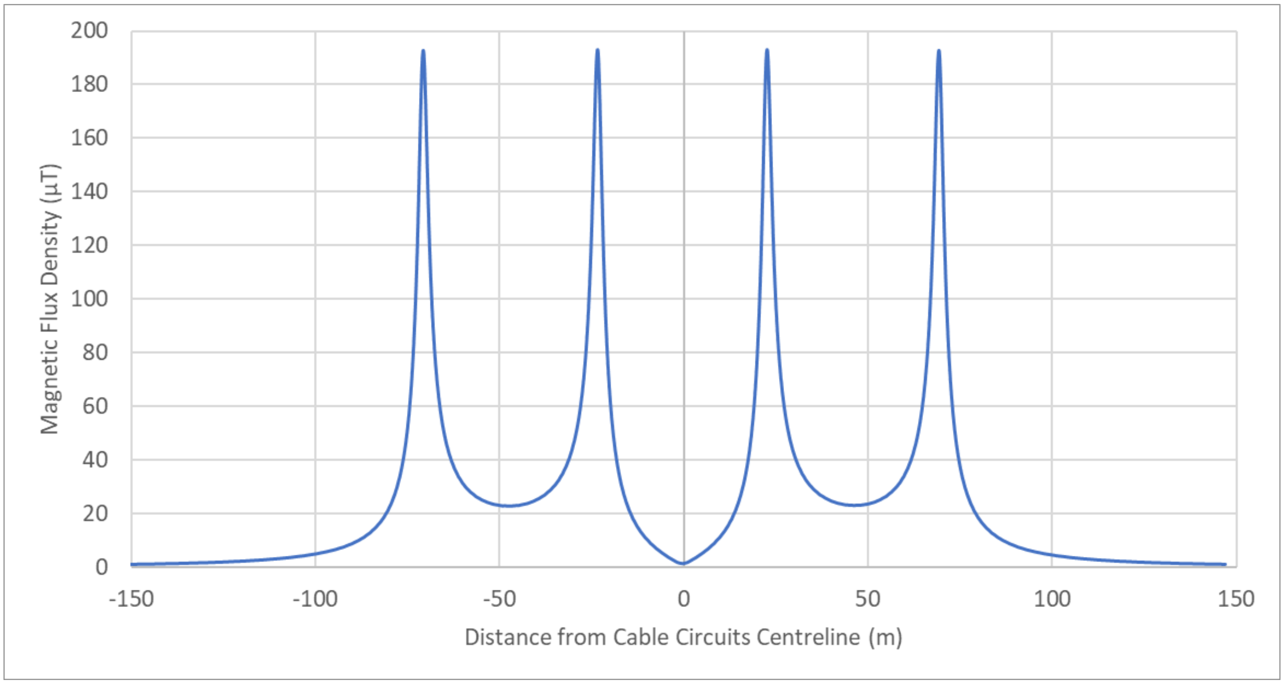


*Figure 7-22: Calculated magnetic field profile across the Waratah Bay shore crossing cable ducts (both circuits)*

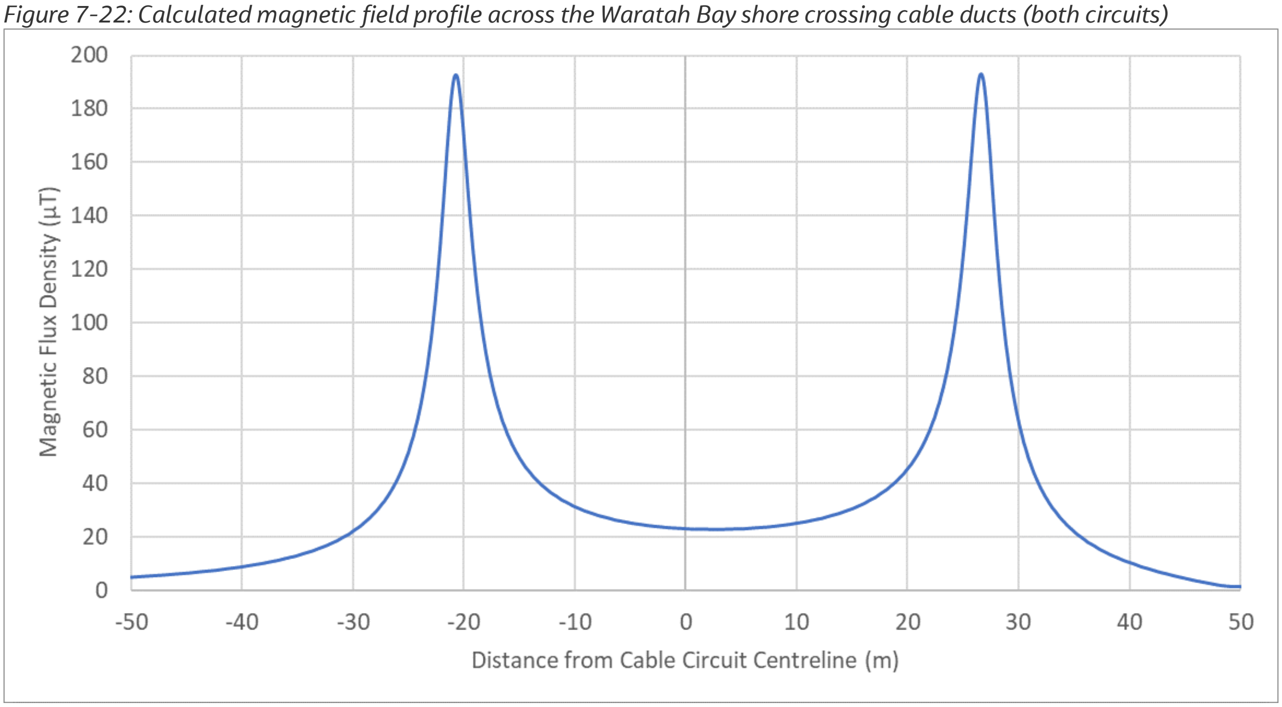


*Figure 7-23: Calculated magnetic field profile across the Waratah Bay shore crossing cable ducts (one circuit)*

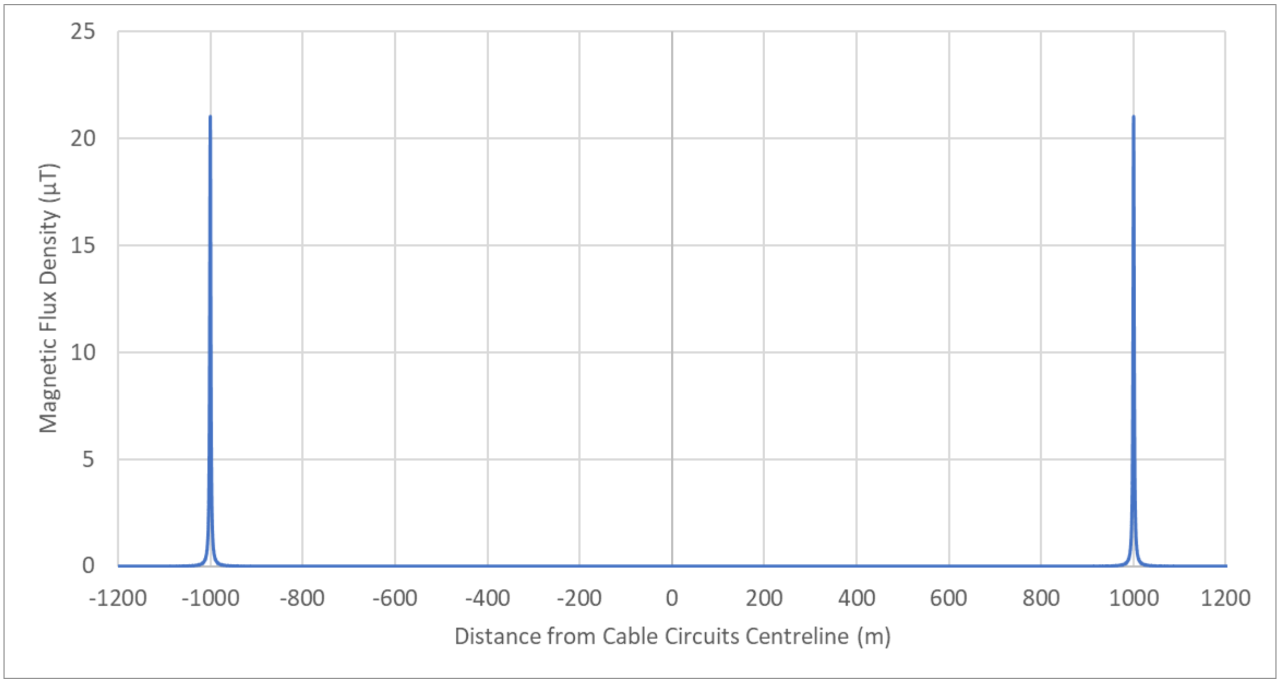


*Figure 7-24: Calculated magnetic field profile across the Bass Strait cables at sea floor level (both circuits) - Vertical*

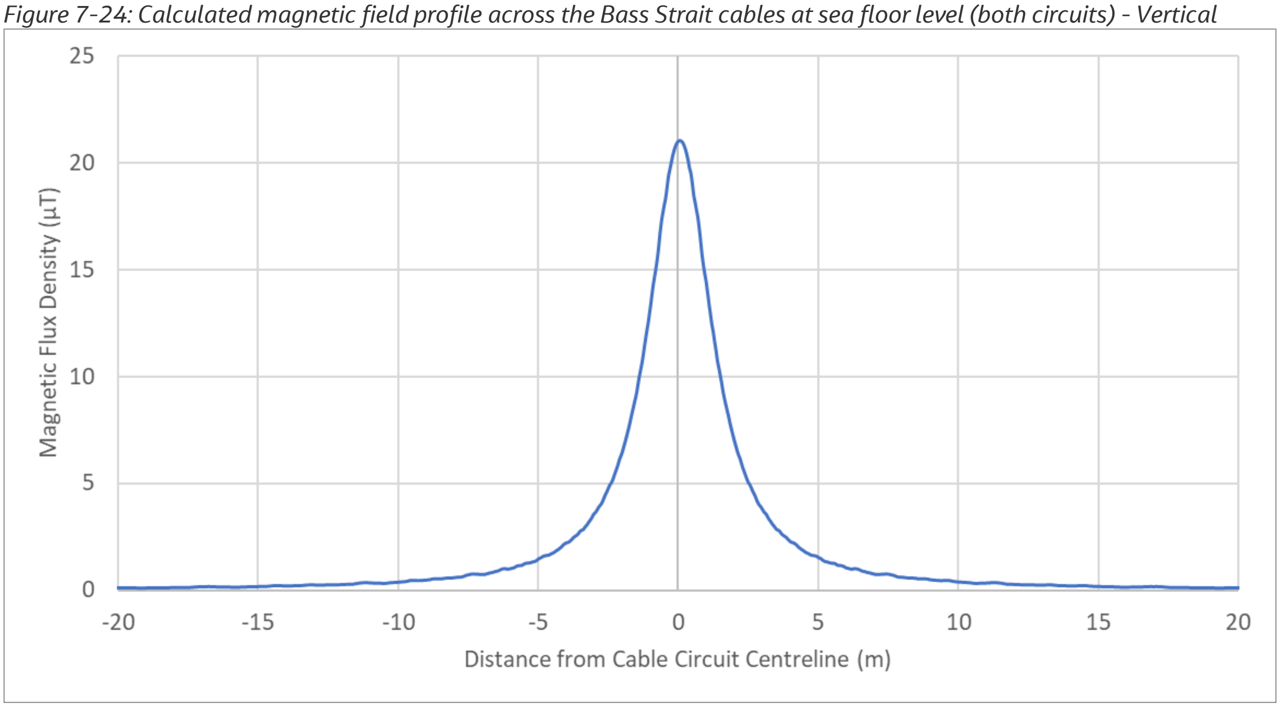


*Figure 7-25: Calculated magnetic field profile across the Bass Strait cables at sea floor level (one circuit) - Vertical*

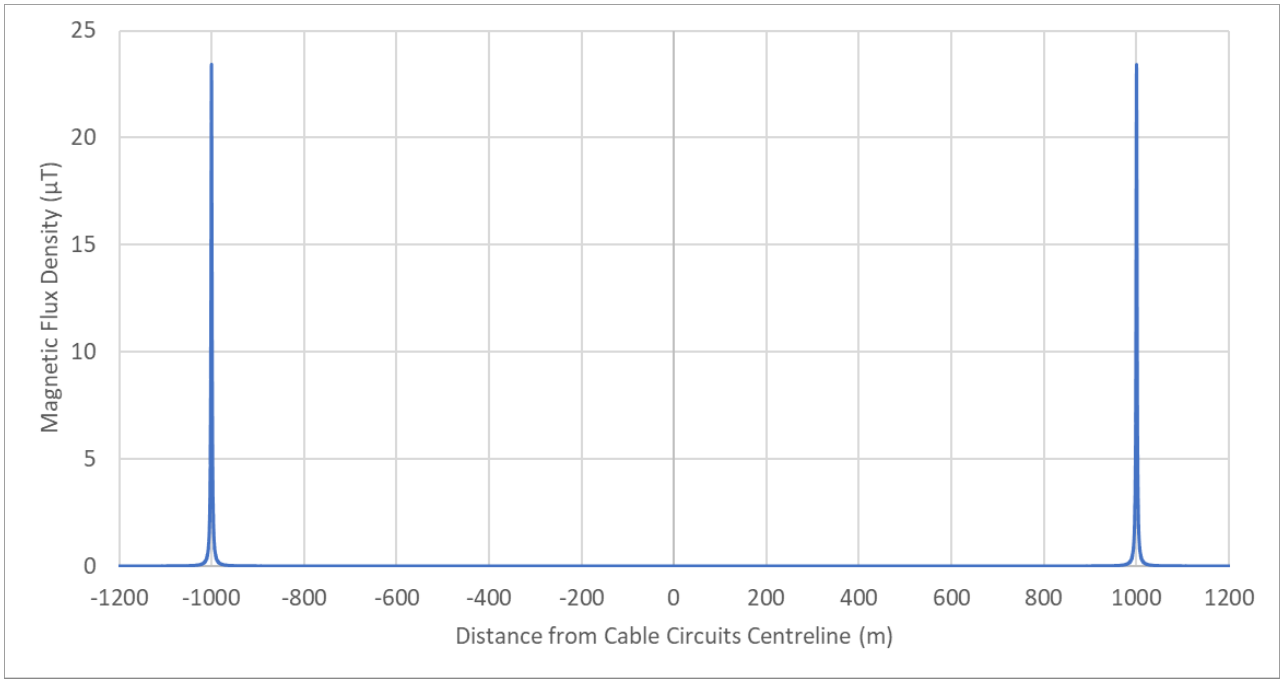


*Figure 7-26: Calculated magnetic field profile across the Bass Strait cables at sea floor level (both circuits) - Horizontal*

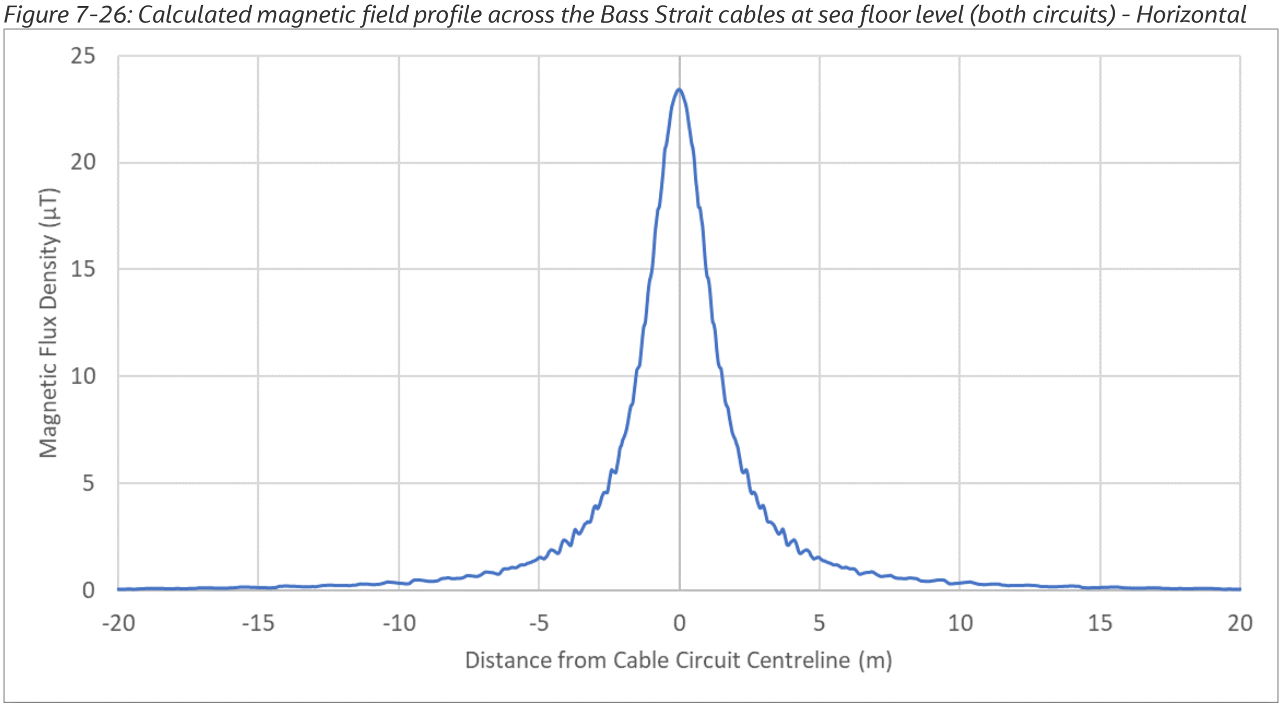


*Figure 7-27: Calculated magnetic field profile across the Bass Strait cables at sea floor level (one circuit) - Horizontal*

### 7.5.5 Land HVDC Cables

The magnetic field distribution was calculated along the HVDC land project alignment. The results indicated that the worst-case magnetic field levels at 1 m above ground level will be present within the first 3 km of land cable after the Waratah Bay shore crossing section.

The nominal horizontal spacing between the trenched positive and negative cables in each circuit will be 0.5 m, with an 8.5 m nominal separation between adjacent circuits, but could increase to 4 m for HDD installations at road and river crossings.

The calculated magnetic field distribution and profile along this land cable section are plotted in Figure 7-28 - Figure 7-35 for different cable spacings between 0.5 m and 4 m. The calculated magnetic field profiles above the HVDC land cable with different cable spacings are compared with each other in Figure 7-36. It is clear from this comparison that the cable spacing has a significant impact on the magnitude of the magnetic field near the HVDC land cables.

The worst case calculated magnetic field strengths are compared to the derived reference levels for human health, sensitive electrical and electronic equipment, fauna and flora impacts in Table 7-15 and Table 7-16 respectively.

During the worst case possible overload scenario (considered to be where both Stage One and Stage Two can be overloaded at the same time) the maximum magnetic flux density will increase by up to 12.5%.

A desktop study of the area surrounding the land cables was carried out and it was confirmed that there will be no sensitive electrical or electronic equipment or systems near the HVDC cables. Furthermore, the XLPE insulated cables will be not subject to corona discharges and will therefore not emit radio frequency interference.

*Table 7-15: Human health impact assessment along the HVDC land project alignment*

| Exposure Scenario | Inter-cable Spacing (m) | Magnetic Field Strength (μT) | |
|---|---|---|---|
| | | Reference Level | Calculated Level |
| People | 0.5 | 400,000 | 25 |
| | 1 | 400,000 | 49 |
| | 2 | 400,000 | 86 |
| | 4 | 400,000 | 124 |
| Active implantable medical devices | 0.5 | 500 | 25 |
| | 1 | 500 | 49 |
| | 2 | 500 | 86 |
| | 4 | 500 | 124 |

*Table 7-16: Sensitive receiver impact assessment along the HVDC land project alignment*

| Exposure Scenario | Inter-cable Spacing (m) | Magnetic Field Strength (µT) | |
|---|---|---|---|
| | | Reference Level | Calculated Level |
| RFID tags | 0.5 | 3,000,000 | 25 |
| | 1 | 3,000,000 | 49 |
| | 2 | 3,000,000 | 86 |
| | 4 | 3,000,000 | 124 |
| Livestock | 0.5 | 400,000* | 25 |
| | 1 | 400,000* | 49 |
| | 2 | 400,000* | 86 |
| | 4 | 400,000* | 124 |
| Apiaries | 0.5 | 2 | 25 |
| | 1 | 2 | 49 |
| | 2 | 2 | 86 |
| | 4 | 2 | 124 |
| Wildlife | 0.5 | 400,000* | 25 |
| | 1 | 400,000* | 49 |
| | 2 | 400,000* | 86 |
| | 4 | 400,000* | 124 |

* Conservative assumed value

It is evident from the impact assessments above that the calculated field levels are below the applicable reference levels and there will be no operating impacts on human health along the land cable. Similarly, the land cables will not impact the general health, foraging behaviour, or habitat of livestock, wildlife and the normal functioning of RFID tags or other farm equipment or machinery along the project alignment. Mitigation will not be required.

The HVDC land cables could have some impact on the behaviour of honeybees within 5 m of the cable trench. This is because directly above the buried cables, and within 5 m of the cable trench, the calculated field levels are above 2 µT. It is recommended that any apiaries located within 5 m of the trench be relocated outside the cable easement during the construction of the HVDC land cable. Publicly available information indicates that there are currently no existing apiaries within 5 m of the proposed land project alignment.

If different cable types will be selected for the subsea and land cables, a transition station could be required. It may also be required for the fibre optic cable termination. The site of the possible transition station is proposed to be 1 km inland from the Waratah Bay shore crossing. The indoor, gas-insulated installation will generate no significant electric fields or radio interference. The magnetic fields generated by the site will be comparable with that of the land cable.


*Figure 7-28: Calculated magnetic field distribution in the vicinity of the HVDC land cable – 0.5 m inter-cable spacing*

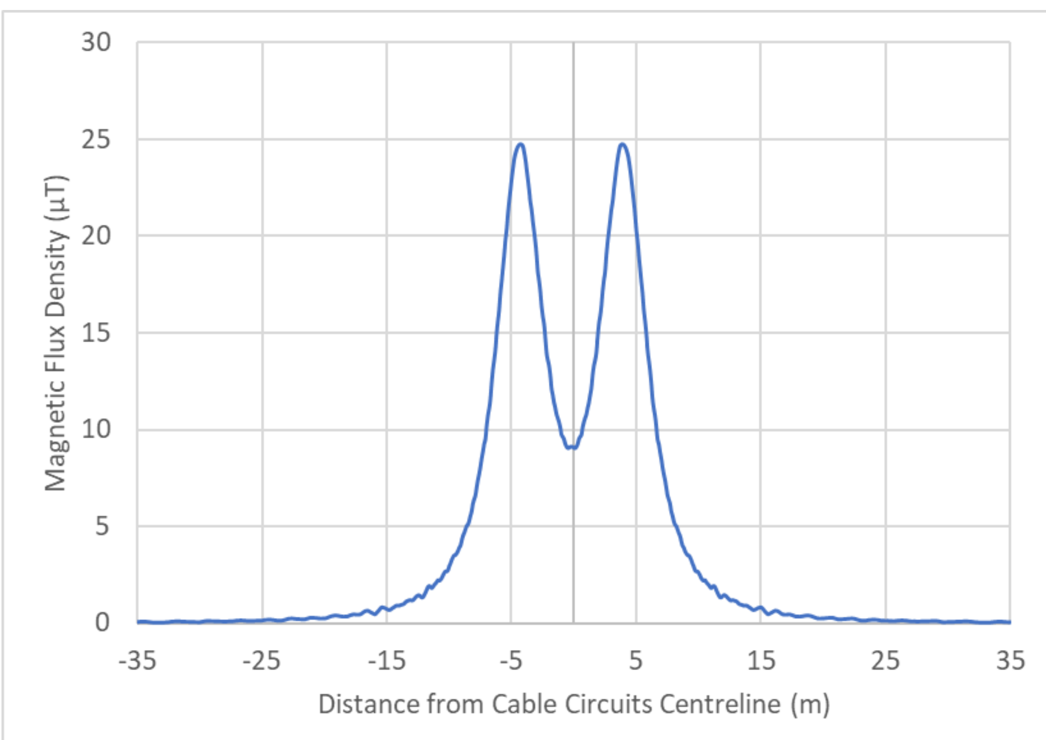


*Figure 7-29: Calculated magnetic field profile above the HVDC land cable – 0.5 m inter-cable spacing*

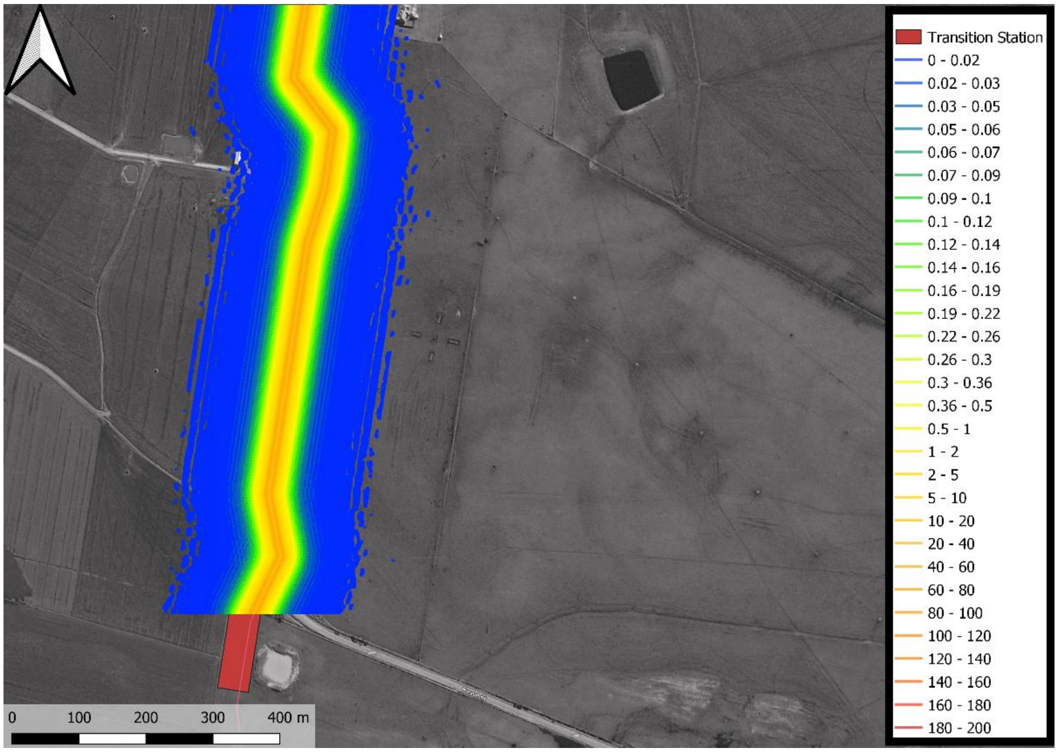


*Figure 7-30: Calculated magnetic field distribution in the vicinity of the HVDC land cable – 1 m inter-cable spacing*

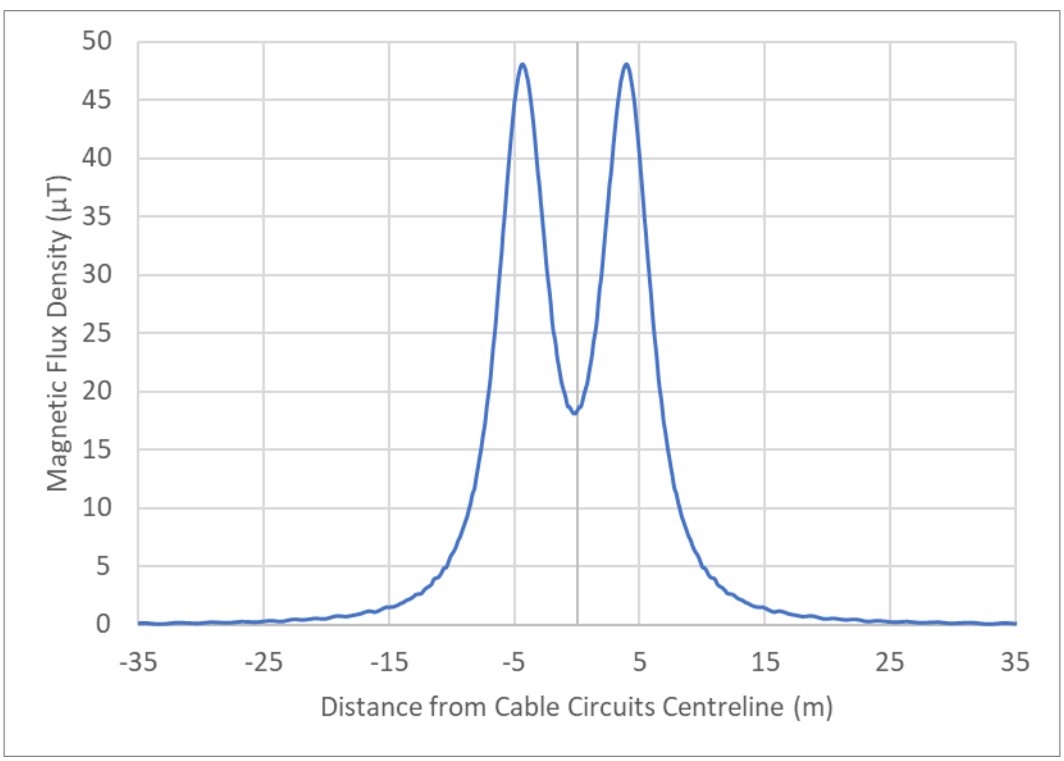


*Figure 7-31: Calculated magnetic field profile above the HVDC land cable – 1 m inter-cable spacing*

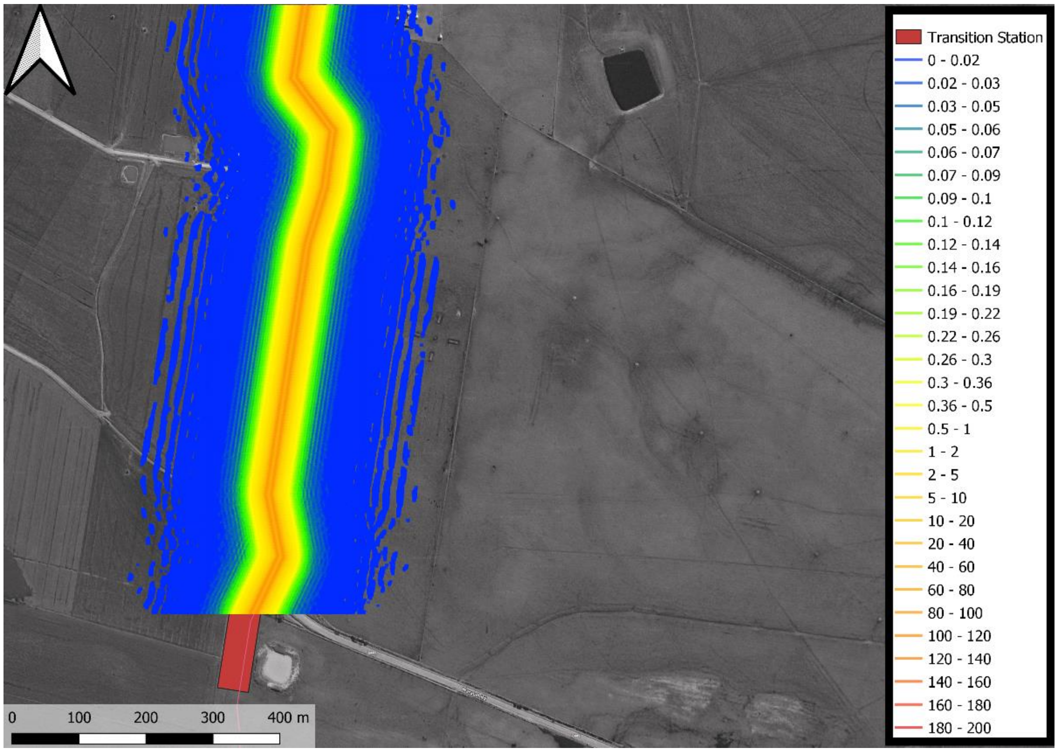


*Figure 7-32: Calculated magnetic field distribution in the vicinity of the HVDC land cable – 2 m inter-cable spacing*

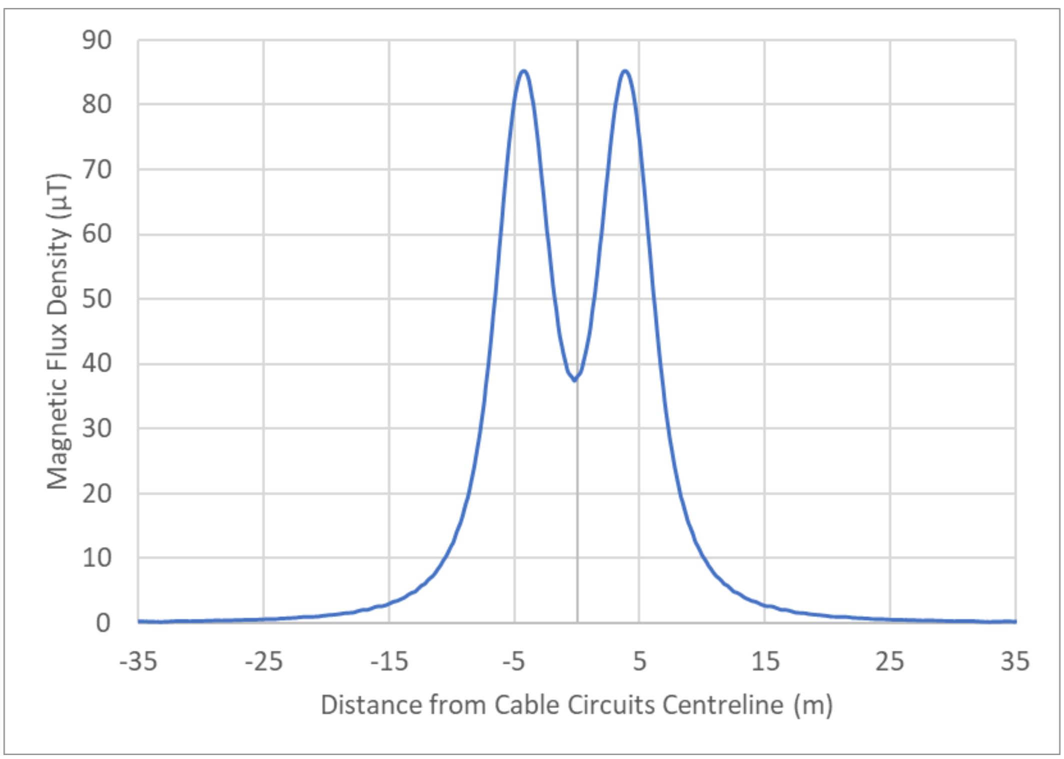


*Figure 7-33: Calculated magnetic field profile above the HVDC land cable – 2 m inter-cable spacing*

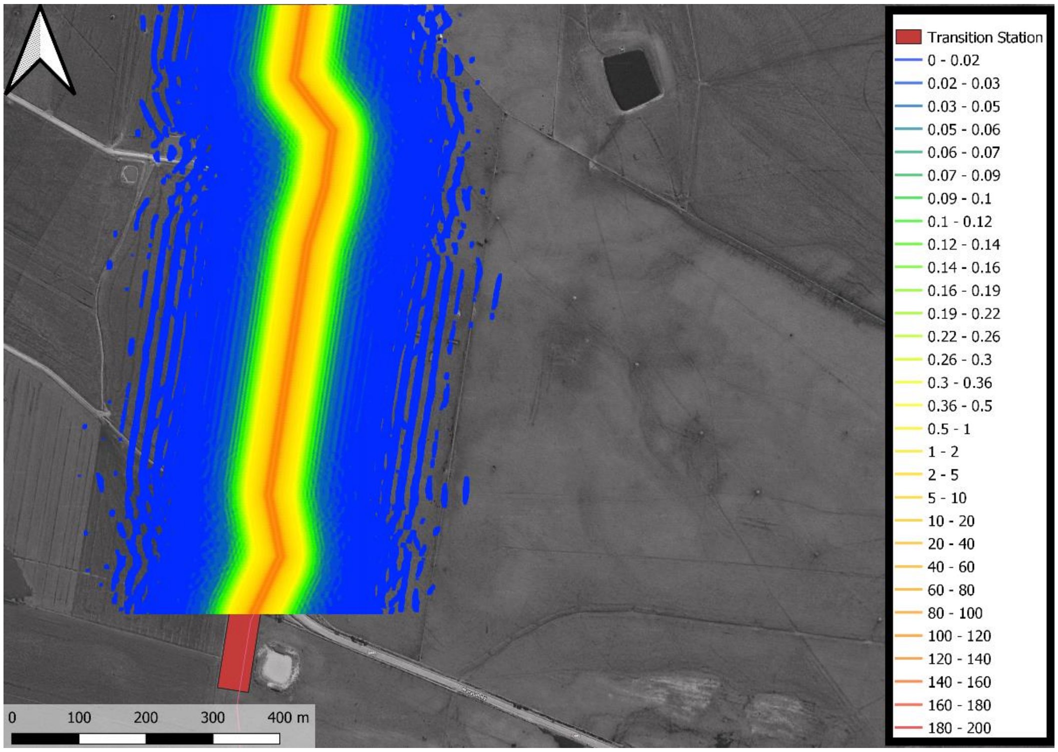


*Figure 7-34: Calculated magnetic field distribution in the vicinity of the HVDC land cable – 4 m inter-cable spacing*

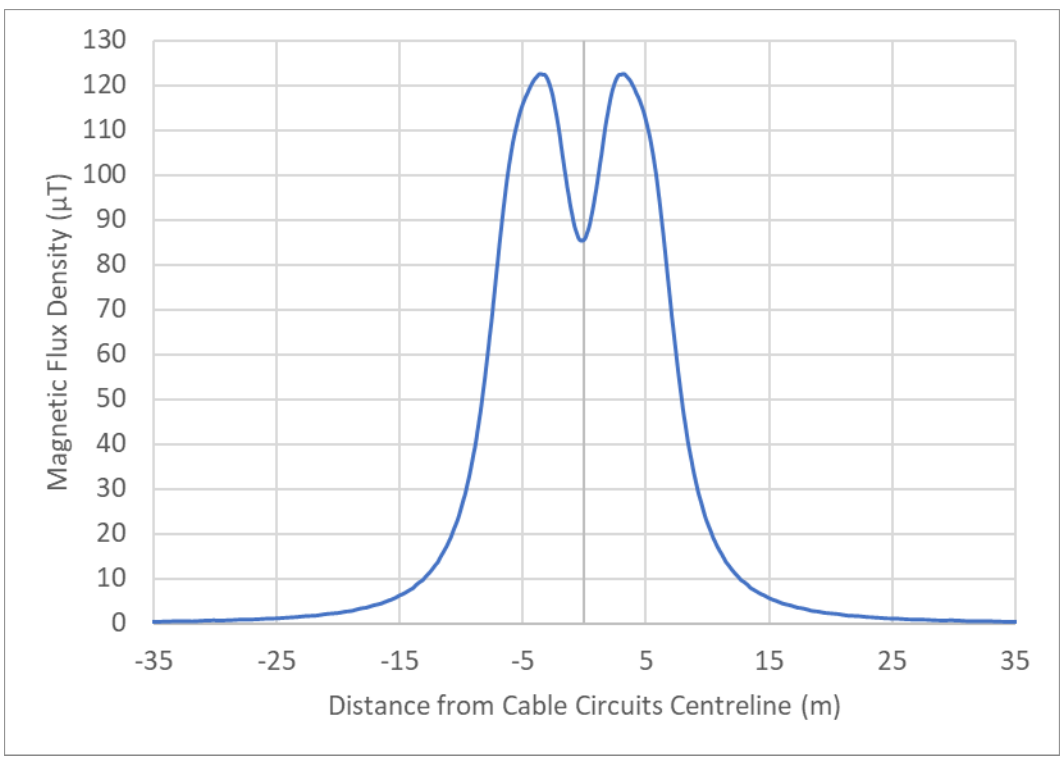


*Figure 7-35: Calculated magnetic field profile above the HVDC land cable – 4 m inter-cable spacing*

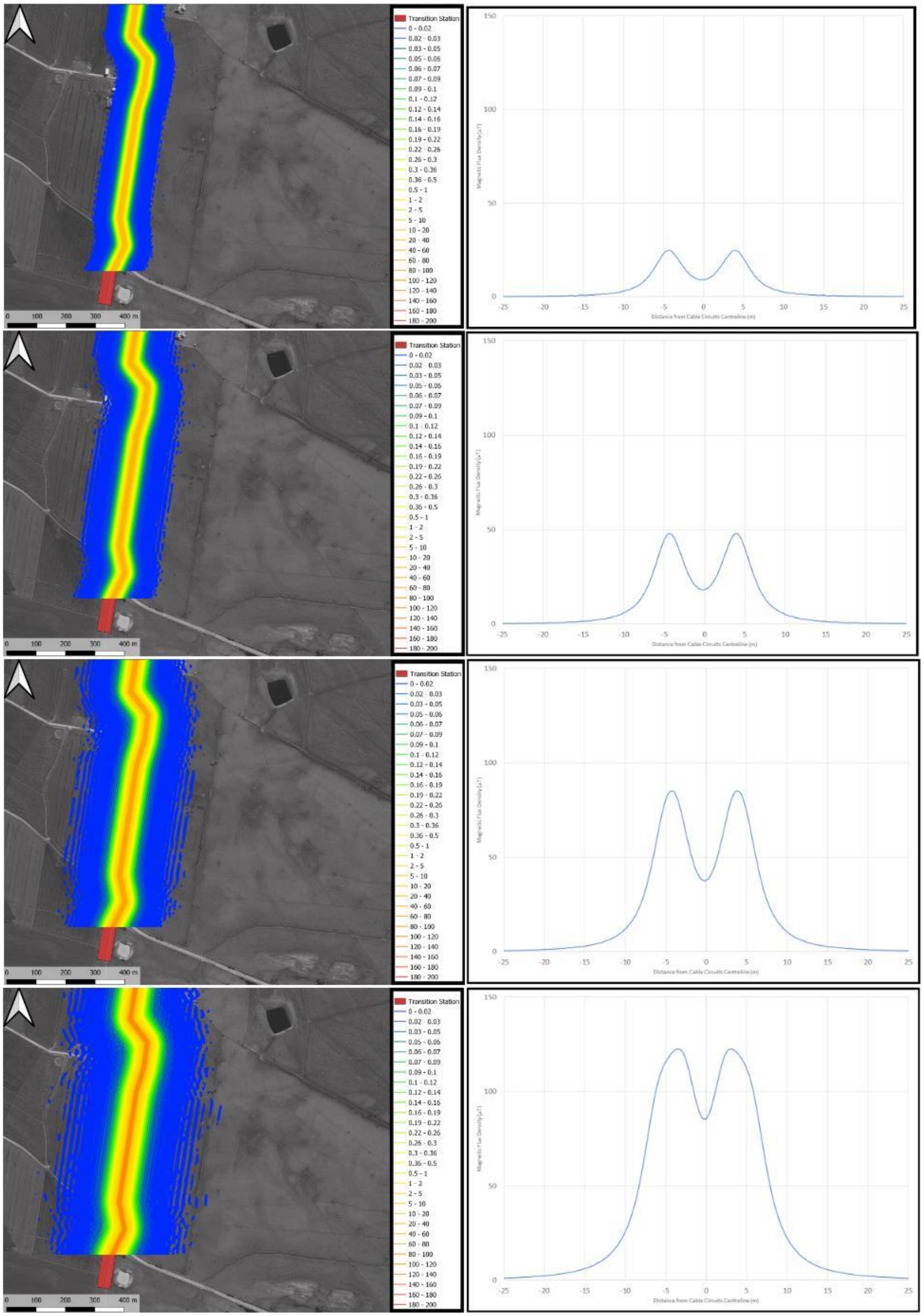


*Figure 7-36: Comparison of calculated magnetic fields for different HVDC land cable separations (0.5 m, 1 m, 2 m, and 4 m)*

### 7.5.6 Cable Heating Assessment

Soil temperature rise contours have been calculated for various operating scenarios for the subsea and land HVDC cables in different areas along the proposed project alignment as part of the impact assessment.

The assumed cable geometry used for the EMF and EMI assessment detailed previously in this section has also been used for the cable heating assessment. Only the horizontal flat cable formation has been considered for the subsea cable heating assessment.

Several CYMCAP models were created to analyse the different sections of the project alignment. Each model contained the relevant ambient temperature and thermal resistivity of the soil and backfill, where applicable. A typical CYMCAP simulation plot is presented in Figure 7-37. The plot presents a cross-sectional view of the modelled buried cables, with horizontal and vertical axis dimensions in meters, and the calculated temperature rise contours in the surrounding soil, colour coded in degrees Celsius.

The land HVDC cables have been modelled in PVC ducts, whilst the subsea cables have been modelled as direct buried. It is assumed that the land HVDC cables will be buried in Thermally Stable Backfilling Material (TSBM) with nominal cross-sectional dimensions of 1 m wide by 0.4 m deep.

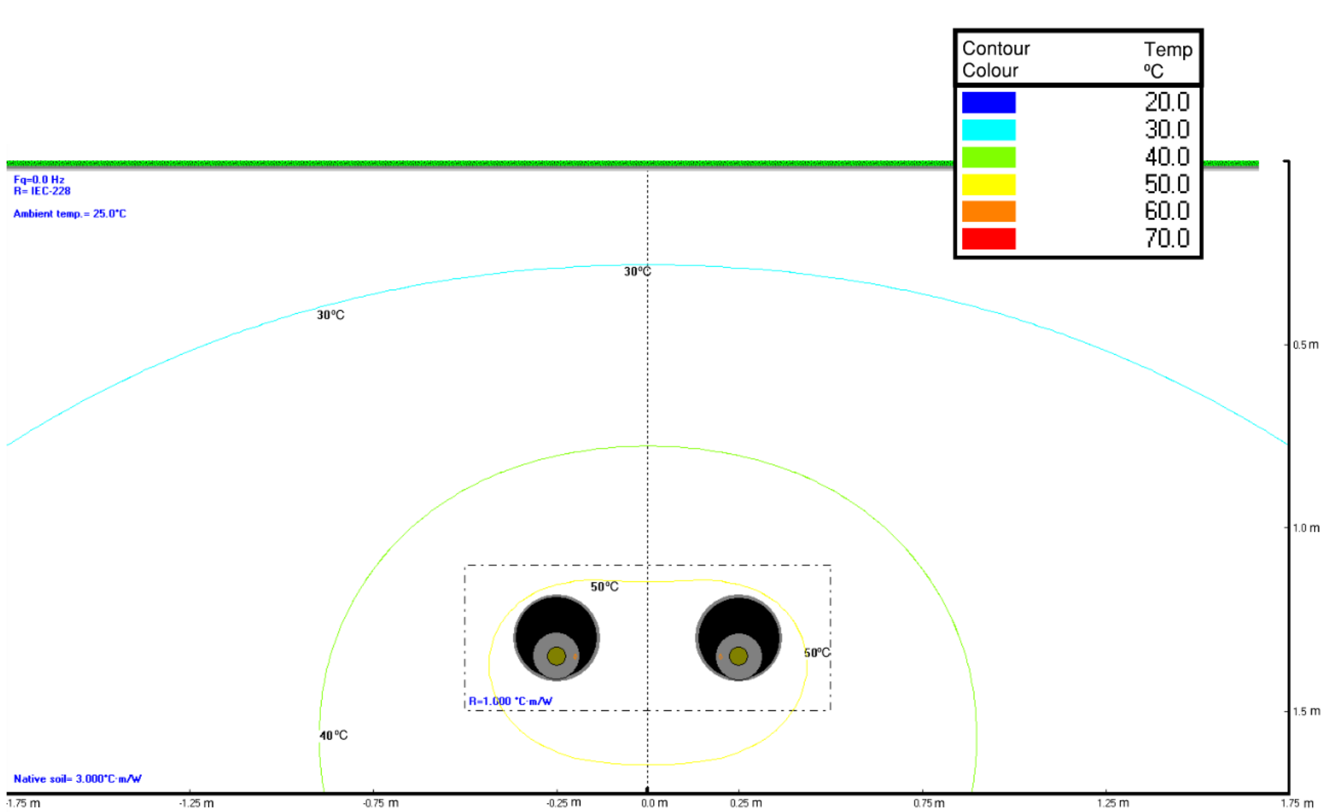


*Figure 7-37: Typical CYMCAP calculation plot*

Cable and soil heating calculations were performed for the following three operating scenarios:

1. The cables operating at the proposed steady-state current
2. The cables operating at a temperature of 70°C
3. The cables operating at a temperature of 90°C

The scenarios where the cables are operating at 70°C and 90°C correspond to the maximum operating temperatures for typical cables. The results of the cable and soil heating calculations are summarised in Table 7-17 at depths of 0.1 m, 0.5 m and 1 m below the surface of the ground or seabed.

The nominal ambient temperature of the soil surrounding the buried HVDC cables is 25°C. If the temperature rise of this soil will exceed 50°C (i.e. an increase of 25°C above the ambient temperature), the soil will lose significant moisture and its thermal resistivity will increase, resulting in possible thermal damage to the cables. The project cable specification document therefore requires that the volume of native soil within the calculated 50°C contour be replaced with Thermally Stable Backfilling Material (TSBM). This is an engineered material that does not dry out at temperatures exceeding 50°C and thereby protects the HVDC cables from thermal damage during maximum loading scenarios.

A temperature increase of more than 3°C above the ambient 25°C at a depth of 0.1 m or less below the surface of the ground, can impact the health of pasture grass. This volume of soil is called the root zone and contains the roots and aerated soil that facilitates healthy growth of the plants. Any drying out of the soil in the root zone will impact the health of the plants.

The calculated soil temperature rise values at the nominal depth of the HVDC cables (i.e. at 1 m depth) and at the maximum depth of the root zone (i.e. at 0.1 m depth) are summarised in Table 7-17. These are the values of temperature rise above the nominal 25°C ambient soil temperature. For all values exceeding 25°C along the proposed land project alignment in Table 7-17, additional thermal backfill was included in the CYMCAP model.

The temperature rise in the root zone only exceeds the 3°C limit along the Smallmans Rd – Darlimurla Rd section. With additional thermal backfill applied, the temperature rise in the root zone can be limited to less than 3°C as is evidenced in the calculation results summarised in Table 7-17.

In the HVDC cable sections where the soil temperature rise at 1 m depth exceeds 25°C, additional excavation and backfill may be required. The environmental impact is therefore limited to the construction phase only and is not considered significant. However, along sections where the soil temperature rise at 0.1 m depth exceeds 3°C, mitigation will be required to address the operational impact on the health of the pasture grass above the HVDC cables. This will be in the form of additional Thermally Stable Backfilling Material (TSBM) in the cable system design. The soil temperature rise calculations presented in this section do however indicate that the worst case soil temperature rise at 0.1 m depth does not exceed 3°C. It is therefore unlikely that the operation of the HVDC cables will impact the health of the pasture grasses in the vicinity of the cables and additional mitigation measures will not be required.

*Table 7-17: Cable heating assessment results with thermal backfill mitigation applied, where required*

| Operating Condition | Increase in Soil Temperature above Ambient for various cable sections | | | | | |
|---|---|---|---|---|---|---|
| | Heybridge Converter Station | Submarine Section | Waratah Bay - Smallmans Rd | Smallmans Rd - Darlimurla Rd[15] | Darlimurla Rd - Strzelecki Hwy | Strzelecki Hwy - Hazelwood |
| Steady state current 1.0 m depth | +8°C | +7°C | +8°C | +20°C | +8°C | +14°C |
| Conductor temp 70°C 1.0 m depth | +11°C | +22°C | +11°C | +25°C | +11°C | +17°C |
| Conductor temp 90°C 1.0 m depth | +15°C | +30°C | +15°C | +35°C | +15°C | +25°C |
| Steady state current 0.5 m depth | +3°C | +2°C | +3°C | +9°C | +3°C | +6°C |
| Conductor temp 70°C 0.5 m depth | +5°C | +9°C | +5°C | +12°C | +5°C | +8°C |
| Conductor temp 90°C 0.5 m depth | +6.5°C | +12°C | +6.5°C | +16°C | +6.5°C | +11°C |
| Steady state current 0.1 m depth | +0°C | +0°C | +0°C | +1°C | +0°C | +1°C |
| Conductor temp 70°C 0.1 m depth | +1°C | +0°C | +1°C | +2°C | +1°C | +1.5°C |
| Conductor temp 90°C 0.1 m depth | +1.5°C | +1°C | +1.5°C | <3°C | +1.5°C | +2°C |

It is noted that the CYMCAP modelling does not take into account the thermal mass of the water and the strong ocean currents in the Bass Strait. These factors will attenuate the thermal contours and result in negligible heating of the seawater near the seabed. It is evident from the values presented in Table 7-17 for the submarine section that the temperature rise of the seabed surface due to the subsea HVDC cables is indistinguishable from the ambient temperature.

## 7.6 Cumulative Impacts

Cumulative EMF and EMI impacts have been considered for the proposed electrical power infrastructure. Cumulative EMF and EMI impacts describe the total or net EMF & EMI impacts that will be generated by the project's cables and other sources of potential EMF and EMI (i.e. the summation of EMF and EMI levels from multiple sources).

These impacts include the cumulative effects of the proposed project infrastructure on the ambient geomagnetic field and also on the magnetic fields generated by the operational Basslink cables and other high voltage electrical projects and infrastructure.

[15] Modelled with additional thermal backfill to encapsulate the 50°C contour

The ambient geomagnetic field is vertically polarised near the surface of the earth (i.e. the field strength in the vertical direction away from the earth's surface is much larger than the field strength in the horizontal direction along the earth's surface). The calculated magnetic fields that will be generated by the new infrastructure will be almost entirely horizontally polarised above the cables, where the fields are largest (i.e. the field strength in the horizontal direction along the earth's surface is much larger than the field strength in the vertical direction away from the earth's surface). Sensitive receivers will experience the resultant magnetic field, which is the vector summation of the ambient and generated fields. Given the difference in field orientation near the cables, the cumulative effect is not significant other than at the shore crossings where the fields generated by the cables are much larger than the ambient geomagnetic field, as summarised in Table 7-18.

The magnetic field generated by the shore crossing cables reduce exponentially with increased horizontal distance away from the cable alignment. The significant magnetic field anomalies in an area of the shore crossings due to the fields generated by the HVDC cables will extend only up to about 5 m horizontal distance from the HDD cable sections. Beyond that distance, the cumulative impact of the proposed infrastructure will not be significant. The identified magnetic field anomaly within 5 m horizontal distance of the shore crossing cables will impact compass readings in very shallow waters, as described in Section 7.2.11. This is not considered a significant impact on maritime safety as the extent of the impact zone is limited to very shallow waters at the shore crossing only. Cumulative impacts on other sensitive electrical and electronic equipment, human health, livestock and wildlife will not be significant.

*Table 7-18: Cumulative impacts of the background geomagnetic field and the subsea HVDC cable magnetic fields*

| Subsea Location | Average Geomagnetic Field Intensity (µT) | Maximum Magnetic Field Generated by the subsea HVDC cables (µT) | Cumulative Effect of Geomagnetic and Subsea Cable Fields (µT) |
|---|---|---|---|
| Waratah Bay Shore Crossing (Victoria) | 60.35 | 194 | 203.4 |
| Off-shore | 60.87 | 24 | 65.5 |
| Heybridge Shore Crossing (Tasmania) | 61.39 | 193 | 202.8 |

Based on the worst-case calculated distribution of magnetic field levels near the shore crossing cables for the proposed Marinus project, it is concluded that the cumulative effect of other subsea HVDC cables in the vicinity of the proposed Marinus project will not be significant at a distance greater than 50 m from the Marinus subsea project alignment.

The proposed project subsea project alignment is located a minimum distance of 63 km from the Basslink cable. The magnetic field that will be generated by the project's cables at this distance will not be detectable above the magnetic field generated by the Basslink cables and the ambient geomagnetic fields and will not impact the local marine environment. Accordingly, the magnetic field generated by the Basslink cables will have negligible cumulative effect on the proposed Marinus cables marine environment. Furthermore, any impact on magneto-sensing will be transitory, present only for the duration in which the animals are within the impact zone near the cables, with no remnant effects when they move out of the impact zone. There is therefore no cumulative impact of the proposed project's cables and the existing Basslink cable due to sequential movement of sealife from the Marinus Link impact zone to the Basslink impact zone, and vice versa.

Offshore windfarms have been proposed in the Bass Strait. These wind farms will have subsea power export cables in the Bass Strait to transfer the generated power to the onshore electrical grid. The only proposed Bass Strait offshore wind farms near the Marinus project alignment are the Bass Offshore Wind Energy (BOWE) project and Great Southern Offshore Wind project. The BOWE project will be located 20-30 km off the coast of north-eastern Tasmania. The cumulative effects on Marinus Link from BOWE will be negligible. The cumulative effects on Marinus Link from the Great Southern Offshore Wind project will be negligible. It is further noted that neither of the proposed offshore wind farm projects have been referred and as such are excluded from the scope of the cumulative impact assessment due to lack of information.

Based on the worst-case calculated distribution of magnetic field levels near the land cables for the proposed Marinus project, it is concluded that the cumulative effect of other HVDC land cables in the vicinity of the proposed Marinus cables will not be significant at a distance greater than 10 m from the Marinus land project alignment. However, other projects are most likely to install HVAC cables. The effects of simultaneous exposure to DC and AC magnetic fields are not cumulative as regards interference to active implantable medical devices. Furthermore, humans and animals are far more immune to DC fields than AC fields. The cumulative effects of AC and DC magnetic fields are negligible and exposure to each can be assessed separately.

The proposed Marinus HVDC land project alignment between the transition station and Driffield/Hazelwood converter station runs along the Strzelecki Highway (B460) north-east of Delburn and south-west of Driffield. The proposed Delburn Wind Farm is to be located in this area and comprises 33 wind turbines in the HVP plantation that straddles the Strzelecki Highway. It is evident in Figure 7-38 that the proposed Marinus HVDC land cables will be located in close proximity to a number of proposed wind turbines. The power cables associated with the wind turbines and wind farm power collection system will be HVAC cables. There will therefore be negligible cumulative effects in the area.

There are also existing 500 kV AC power lines that will parallel and cross-over the Marinus HVDC land cables in the vicinity of the proposed windfarm. It is also indicated on Figure 7-38.

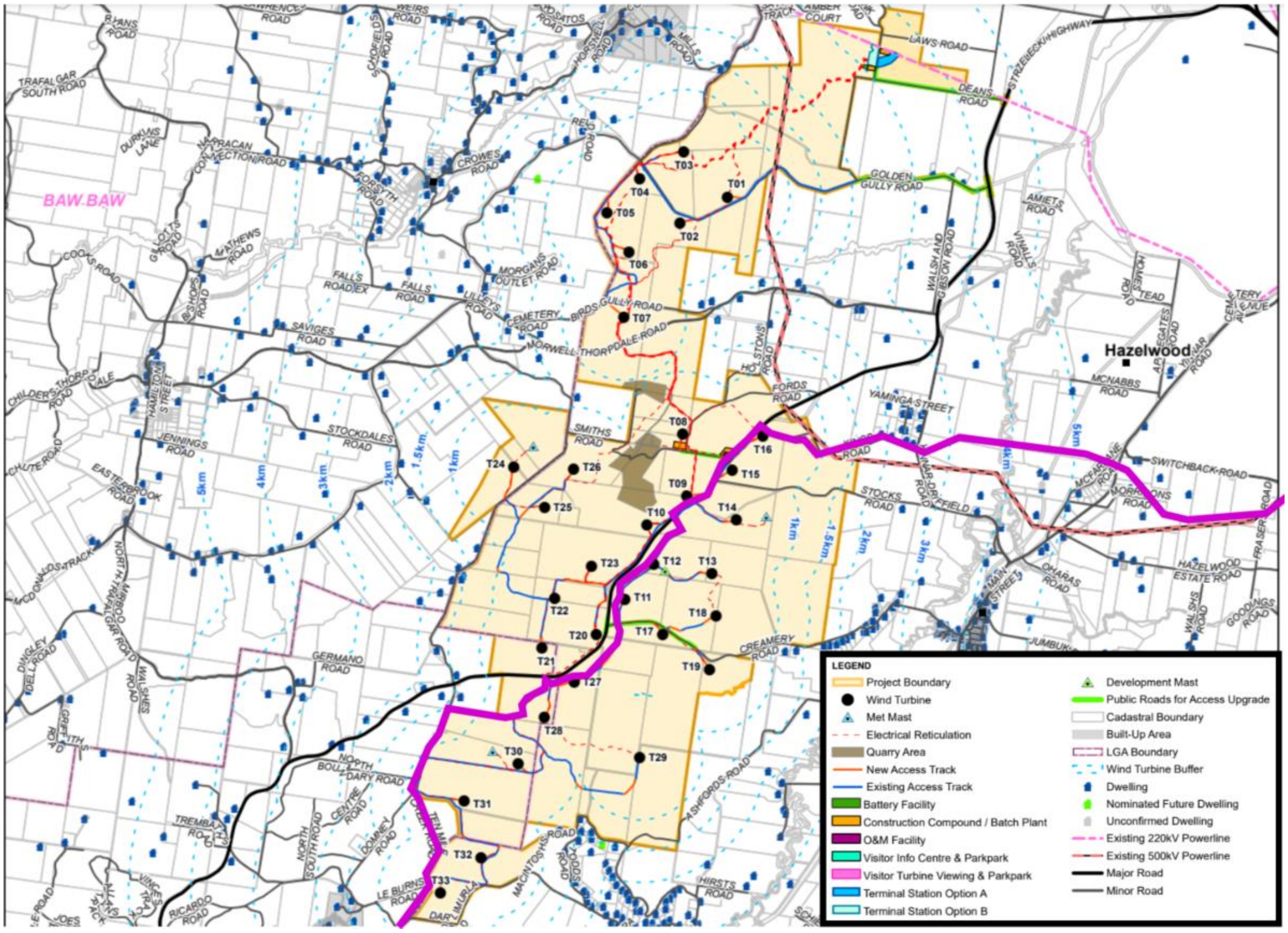


*Figure 7-38: Delburn Wind Farm project area with the proposed Marinus Link HVDC land project alignment overlaid in purple[16]*

There will not be significant cumulative effects from the AC magnetic fields associated with the 500 kV transmission line and the DC magnetic fields generated by the Marinus HVDC land cables. The AC magnetic fields will induce an AC voltage on the sheath and core conductors of each HVDC cable. This may present a safety risk to maintenance staff during work on the out-of-service cables. Safety precautions will be developed to manage this occupational safety risk as part of the detailed design of the HVDC land cables.

## 7.7 Mitigation

The EMF assessment identified a potential impact of the land HVDC cables on the behaviour of honeybees within 5 m of the cable trench. It is recommended that any apiaries located within 5 m of the trench be relocated outside the impact zone during the construction of the HVDC land cable. The identified mitigation requirement will be confirmed and managed by EPR EMF01.

[16] Delburn Wind Farm information and image taken from publicly available information available at: https://osmi.com.au/frequently-asked-questions/#about-the-project . The imaging available at this location has been enhanced around the Marinus Link project alignment for demonstration and explanatory purposes only in this report and does not replace the original.

## 7.8 Monitoring and Review

There were no significant residual EMF or EMI hazards identified in this environmental impact assessment for the proposed project. As such, ongoing monitoring of electric and magnetic fields at sensitive receivers is not considered necessary and has not been recommended.

However, as part of the verification of the analysis conducted as part of this impact assessment and the subsequent detailed design stage, it is recommended that post-construction and commissioning EMF and EMI tests be conducted near key locations within the project area.

## 7.9 Environmental Performance Requirements

The recommended Environmental Performance Requirements (EPRs) identified as a result of the electric and magnetic fields and electromagnetic interference impact assessment are outlined in Table 7-19.

*Table 7-19: EMF and EMI Environmental Performance Requirements (EPRs)*

<table>
<tr><th>EPR ID</th><th>Environmental Performance Requirement</th><th>Project Stage</th></tr>
<tr><td>EPR EMF01</td><td>Design the project to reduce EMF/EMI emissions<br>Design and construct the project to reduce electric and magnetic fields (EMF) and electromagnetic interference (EMI) for the project alignment onshore to below the reference levels or as low as reasonably practicable to avoid and minimise impacts. The applicable reference levels are defined in EIS/EES Technical Appendix A: Electromagnetic Fields Section 7 of the EMI impact assessment prepared for the EIS/EES. The design must be informed by a project wide EMF and EMI assessment for all the proposed infrastructure, identifying existing sensitive receptors and committed future developments within the study area. The assessment must be documented in a management plan that includes, but is not limited to:<ul><li>Outcomes of the project wide EMF and EMI assessment and details of the areas assessed.</li><li>The location of all sensitive receptors including beehives within 5 m of the infrastructure. The location of beehives must also be documented in the property management plans (EPR A02).</li><li>Where at-receiver mitigation works to sensitive equipment are required to avoid or minimise adverse impacts.</li><li>A pre- and post-construction testing strategy to verify design calculations, impacts on sensitive equipment and the efficacy of any specified mitigation measures.</li><li>Remedial action to be undertaken if EMF and EMI limits are not met during the construction, testing, and commissioning.</li></ul>The EMF and EMI management plan must be prepared to inform the design and commissioning of the project.<br>EMF and EMI emissions of the subsea cable are addressed in EPR MERU 12.</td><td>Design<br>Construction<br>Commissioning</td></tr>
<tr><td>EPR EMF02</td><td>Investigate and resolve complaints regarding EMF and EMI during operation<br>As part of the OEMP, develop a protocol for investigating and resolving complaints regarding EMF and EMI during operation. The protocol must outline requirements for working with landholders to assess impacts on sensitive equipment and implement reasonably practicable measures to address impacts.</td><td>Operation</td></tr>
</table>

# 8. Conclusions & Recommendations

## Existing Conditions

The only measurable sources of EMF and EMI within the subsea study area are the earth's geomagnetic fields. The cumulative impact of the proposed new electrical power infrastructure and the geomagnetic fields will only be measurable at the shore crossings of the subsea HVDC cables.

Cumulative effects between any existing and proposed new HVDC cables within the subsea study area will be negligible.

The only measurable sources of EMF and EMI within the mainland Tasmania and mainland Victoria study areas are the earth's geomagnetic fields and the AC electric and magnetic fields generated by operational high voltage power lines and substation equipment. There are existing 500 kV AC power lines that will parallel and cross-over the Marinus HVDC land cables. The physical and biological mechanisms by which DC and AC fields impact people, fauna, flora and equipment are distinct. As such, cumulative impact limits for DC and AC fields are not defined in the relevant standards and guidelines, and the cumulative impact of DC and AC fields on the environment within the study area are considered acceptable if they are below the respective limits and reference levels defined in the relevant standards and guidelines.

## Impact Assessment

Research and analysis of sensitive receivers that could potentially be impacted by the EMF and EMI generated by the proposed project's electrical power infrastructure have been undertaken. Limits and reference levels have been derived from applicable state, national and international standards and research reports/studies to evaluate the possible operational impact of the electrical power infrastructure on the local environment within the defined study area.

Besides the impact of electric and magnetic fields on people, plants and animals, generic household electrical and electronic equipment may also be impacted by AC magnetic fields that exceed 3.8 μT and radio frequency fields. DC magnetic field limits are not specified for generic equipment as the equipment is significantly more immune to DC fields, as compared to AC fields, in the general case. Specialised medical and scientific research equipment may however be sensitive to lower-level AC and also DC magnetic fields, which can interfere with the normal operation and functionality of the equipment.

### Converter Stations and Surrounding Areas

Sensitive receivers that could be impacted by EMF and EMI associated with the proposed converter stations, and were considered in the impact assessment, include people, active implantable medical devices, generic electrical & electronic equipment, very sensitive medical and scientific research equipment, farm equipment, livestock and local flora and fauna.

The maximum calculated EMF at the Heybridge, Driffield and Hazelwood converter stations will be below the reference levels for people, livestock and wildlife at the property boundary for each site. The operating impacts of the converter stations on human health, livestock and wildlife will therefore be negligible. Mitigation and controls will not be required at the installations.

The maximum calculated EMI, specifically the AC magnetic field strength, will be below 3.8 μT (i.e. the generic equipment interference limit) in all areas outside the converter station properties. A desktop study of the area surrounding the three converter station sites was conducted and it was confirmed that there are no sensitive electrical or electronic equipment or systems that could be impacted by the EMI from the converter stations. The operating impacts of the converter stations on nearby sensitive receivers will be negligible. Mitigation and controls will not be required at the installations.

**Land HVDC Cables**

Sensitive receivers that could be impacted by EMF and EMI associated with the proposed land HVDC cables, and were considered in the impact assessment, include people, active implantable medical devices, generic electrical & electronic equipment, very sensitive medical and scientific research equipment, farm equipment, livestock (dairy & beef cattle, sheep, horses, pigs, and poultry), honeybees, fruit trees, feeding grasses, vegetables, local flora and fauna (e.g. birds, frogs, mammals).

The magnetic field distribution was calculated along the land HVDC project alignment. The HVDC cables will only be subject to partial discharges that are contained wholly within the layers of insulation inside the cables and radio frequency interference emitted from these partial discharges within the cable will be much lower than the immunity limits of electrical and electronic equipment.

The maximum calculated EMF along the land HVDC cables will be below the reference levels for people throughout the study area. It was concluded from these calculations that the land cables will be no operating impacts on human health. Mitigation and controls will not be required at the installations.

Similarly, the land cables will not impact the general health of livestock, wildlife and the normal functioning of RFID tags or other farm equipment or machinery along the project alignment.

The HVDC land cables could have some impact on the behaviour of honeybees within 5 m of the cable trench. It is recommended that any apiaries located within 5 m of the trench be relocated outside the impact zone during the construction of the HVDC land cable. The impact of the HVDC cables will then be limited to temporary loss of direction sense for bees foraging within the very localised impact zone above the cable trench. Given the very limited extent of the impact zone and that the impact is momentary disorientation within the impact zone only, it is concluded that the HVDC cable will have negligible impact on bee colonies where the apiary has been relocated outside the impact zone.

A desktop study of the area along the land HVDC project alignment was carried out and it was confirmed that there will be no specialised medical and scientific research equipment near the land HVDC cables that could be impacted by the DC magnetic fields associated with the cables.

**Subsea HVDC Cables – Shore Crossings**

Sensitive receivers that could be impacted by EMF and EMI associated with the proposed subsea HVDC cables in the shore crossing areas, and were considered in the impact assessment, include fish, marine mammals, turtles, marine vessels (e.g. ships and boats), and other marine fauna and flora.

The potential effects of EMF exposure to Marine Flora and Fauna are addressed in the Marine Ecology and Resource Use (MERU) report (EIS/EES Appendix P). This report identifies applicable reference levels and potential effects of EMF exposure on Marine Flora and Fauna, including benthic species, epibenthic species, and those listed as threatened under the Threatened Species Protection Act 1995.

The highest DC magnetic field levels occur on the sea floor at the shore crossings. This is because the cables will be unbundled and spaced far apart along these sections. The maximum calculated EMF along the shore crossing HVDC cables will be below the reference levels for people throughout the study area. It was concluded from the shore crossing cable impact assessment that the calculated field levels are below the applicable reference levels and there will be no operating impacts on human health. Mitigation and controls will not be required at the installations. Similarly, the shore crossing cables will not impact the normal functioning of marine vessels and systems in the study area.

**Subsea HVDC Cables - Bass Strait**

Sensitive receivers that could be impacted by EMF and EMI associated with the proposed subsea HVDC cables in the Bass Strait, and were considered in the impact assessment, include fish, marine mammals, turtles, marine vessels (e.g. ships and boats), and other marine fauna and flora.

The potential effects of EMF exposure to Marine Flora and Fauna are addressed in the Marine Ecology and Resource Use (MERU) report (EIS/EES Appendix P). This report identifies applicable reference levels and potential effects of EMF exposure on Marine Flora and Fauna, including benthic species, epibenthic species, and those listed as threatened under the Threatened Species Protection Act 1995.

The magnetic field distribution was calculated along the subsea HVDC project alignment across Bass Strait. The cables in each circuit will be bundled together within the Bass Strait trench section, which greatly reduces the external magnetic fields associated with the cables. The magnetic fields will be strongest directly above the cables and decrease quickly at increasing distance from the cables. Fluctuations in sea water conductivity were considered in the modelling but were found to have negligible impact on the intensity of the static magnetic fields. The static electric field produced by the cables in the conductive water will be negligible for all reasonable water salinities and ocean current velocities.

The maximum calculated EMF along the subsea HVDC cables will be below the reference levels for people throughout the study area. It was concluded from the subsea cable impact assessment that the calculated field levels are below the applicable reference levels and there will be no operating impacts on human health. Mitigation and controls will not be required at the installations. Similarly, the subsea cables will not impact the normal functioning of marine vessels and systems in the study area.

A desktop study of the area along the subsea HVDC project alignment within the Bass Strait was carried out and it was confirmed that there will be no specialised medical and scientific research equipment near the subsea cables that could be impacted by the DC magnetic fields associated with the cables.

**Cable Heating Assessment**

The heat generated by the subsea and land HVDC cables has been considered in the impact assessment. It is concluded from conservative soil heating calculations that it is unlikely that the operation the HVDC cables will impact plant life, specifically pasture grass, in the vicinity of the cable trench along any section of the cable. The cable system design will provide assurance that any impact on plant health is negligible.

Negligible heating of the seawater near the seabed is expected due to the operation of the subsea HVDC cables. The temperature rise at the seabed surface due to the subsea HVDC cables is indistinguishable from the ambient temperature.

## Monitoring and Review

It is recommended that post-construction and commissioning EMF and EMI tests be conducted near key locations within the project area to verify the calculations presented in this impact assessment and those that will be carried out during the detailed design stage.

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# Appendix I. Greenhouse Gas Assessment

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# Marinus Link: Greenhouse Gas Assessment

**Prepared for:**

## Tetra Tech Coffey Pty Ltd

## May 2024

## Rev 0

**Prepared by:**

**Katestone Environmental Pty Ltd**
ABN 92 097 270 276
Level 4, 154 Melbourne Street, South Brisbane
Queensland, 4101, Australia

**www.katestone.global**
admin@katestone.com.au
Ph +61 7 3369 3699

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### Disclaimer



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# Contents

# Tables



# Figures

# Glossary

| Unit | Definition |
|---|---|
| °C | degrees Celsius |
| GJ | gigajoules |
| GJ/kL | gigajoules per kilolitre |
| ha | hectares |
| kg | kilograms |
| kg/y | kilograms per year |
| kL | kilolitres |
| km | kilometres |
| kV | kilovolt |
| kWh | kilowatt hour |
| L | litres |
| tkm | tonne kilometres |
| $ktCO_{2-e}$ | kilotonnes of carbon dioxide equivalent |
| m | metres |
| MJ | megajoules |
| $MtCO_{2-e}$ | million tonnes of carbon dioxide equivalent |
| MW | megawatt |
| $tCO_{2-e}$ | tonnes of carbon dioxide equivalent |
| $tCO_{2-e}/y$ | tonnes of carbon dioxide equivalent per year |
| tC | tonnes carbon |
| TJ | terajoules |
| t | tonnes |
| t/year | tonnes per year |
| **Nomenclature** | **Definition** |
| $CH_4$ | Methane |
| $CO_2$ | Carbon dioxide |
| $CO_2$-e | Carbon dioxide equivalent |
| $SF_6$ | Sulphur hexafluoride |
| $N_2O$ | Nitrous oxide |
| **Abbreviations** | **Definition** |
| ACCUs | Australian Carbon Credit Units |
| AEMO | Australian Energy Market Operator |
| AIS | Air insulated substation |
| CB | Circuit breaker |
| CC Act 2017 | *Climate Change Act 2017* (Vic) |
| CC Act | *Climate Change Act 2022* (Cwth) |
| CCCA Act | *Climate Change (Consequential Amendments) Act 2022* (Cwth) |
| Cwth | Commonwealth of Australia |
| DCCEEW | Department of Climate Change, Energy, Environment, and Water |
| DTP | Department of Transport and Planning |
| EE Act | *Environmental Effects Act 1978* (Vic) |
| EES | Environment Effects Statement |
| EF | Emission factor |
| EIS | Environmental Impact Statement |
| EMPC Act | *Environmental Management and Pollution Control Act 1994* (Tas) |
| EP Act | *Environment Protection Act 2017* (Vic) |
| EPA | Tasmanian Environmental Protection Authority |
| EPBC Act | Environment Protection and Biodiversity Conservation Act (Cwth) |
| EPR | Environmental Performance Requirements |

| | |
|---|---|
| ERF | Emissions Reduction Fund |
| GED | General Environmental Duty |
| GHG | Greenhouse gas |
| GWP | Global Warming Potential |
| HV | High Voltage |
| HVAC | High voltage alternating current |
| HVDC | High voltage direct current |
| ISP | Integrated System Plan |
| LULUCF | Land-use, land-use change and forestry |
| LUPA Act | *Land Use Planning Control Act 1993* (Cwth) |
| LV | Low voltage |
| MLPL | Marinus Link Pty Ltd |
| MNES | Matters of National Environmental Significance |
| NDC | Nationally determined contribution |
| NEM | National Electricity Market |
| NGER | National Greenhouse and Energy Reporting |
| NGER Act | *National Greenhouse and Energy Reporting Act 2007* (Cwth) |
| NWTD | North-West Transmission Developments |
| PEM | Protocol for the Environmental Management |
| REZ | Renewable energy zone |
| ROV | Remotely Operated Underwater Vehicle |
| SEPP | State Environment Protection Policies |
| UNFCCC | United Nations Framework Convention on Climate Change |

# EXECUTIVE SUMMARY


Katestone Environmental Pty Ltd (Katestone) was commissioned by Tetra Tech Coffey Pty Ltd (Tetra Tech Coffey) to conduct a greenhouse gas (GHG) assessment for Marinus Link.

Marinus Link Pty Ltd (MLPL) is proposing to construct a high-voltage direct current (HVDC) electricity interconnector between Tasmania and Victoria, to be known as Marinus Link. Marinus Link will allow for the continued trading, transmission, and distribution of electricity within the National Electricity Market (NEM).

Marinus Link will be a 1500-megawatt (MW) HVDC electrical interconnector between Burnie in Tasmania and the Latrobe Valley in Victoria. Marinus Link is proposed to be executed in two stages. Each stage will consist of a 750 MW HVDC bundled cable between Tasmania and Victoria. The Marinus Link interconnector will provide a second link between the Tasmanian and Victorian electricity grids enabling energy transfer between these regions in the NEM.

Within the NEM, electricity with low GHG emissions intensity generated in Tasmania will have the potential to replace electricity generated with higher GHG emissions intensity, including electricity from coal fired power stations. Marinus Link will provide an opportunity to achieve GHG emissions reductions at a national level, contributing towards Australia's GHG emissions reduction commitments under the Paris Agreement and updated Nationally Determined Contribution (NDC).

One option is for the project alignment from the Heybridge Converter Station to Hazelwood connection, and the other options is for the project alignment from Heybridge Converter Station to Driffield connection. The GHG emission for both options exclude the Heybridge Converter Station emissions as they are reported separately.

- Heybridge Converter Station (Tasmania)
  - Annual Scope 1 and Scope 2 GHG emissions over the construction phase of the project, including land clearing in Year 1, range between 3 and 232 $tCO_2$-e/y.
  - Total Scope 1 and Scope 2 GHG emissions over the construction period, including land clearing, are estimated to be 508 $tCO_2$-e.
  - Scope 3 emissions, including from concrete and steel for construction, are estimated to be 25,582 $tCO_2$-e.
  - Annual Scope 1 and Scope 2 GHG emissions during operation of the project are estimated to be 1,431 $tCO_2$-e/y.
  - GHG emissions contributions to the Tasmanian GHG emissions inventory will reduce the -3.7 $MtCO_2$-e buffer by approximately 0.04%.
  - The project is estimated to contribute < 0.001% to the national GHG emissions inventory (as of December 2021) on an annual basis.
- Heybridge to Hazelwood project alignment (Tasmania, Commonwealth, Victoria)
  - Annual Scope 1 and Scope 2 GHG emissions over the construction period, including land clearing, range between 15 and 11,031 $tCO_2$-e/y.
  - Total Scope 1 and Scope 2 GHG emissions over the construction period, including land clearing, are estimated to be 53,015 $tCO_2$-e.
  - Scope 3 emissions, including from concrete and steel for construction, are estimated to be 162,926 $tCO_2$-e.

- Maximum annual total GHG emissions (Scope 1 and Scope 2) during operation of the project are estimated to be 235,128 $tCO_2$-e/y.
- The project is estimated to contribute no more than 0.05% of the national GHG emissions inventory (as of December 2021) on an annual basis during operation.
- The project is estimated to contribute 0.22 to 0.24% to the annual Victorian GHG emissions inventory during operation.

- Heybridge to Driffield project alignment (Tasmania, Commonwealth, Victoria)
  - Annual Scope 1 and Scope 2 GHG emissions over the construction period, including land clearing, range between 15 and 9,550 $tCO_2$-e/y.
  - Total Scope 1 and Scope 2 GHG emissions over the construction period, including land clearing, are estimated to be 45,611 $tCO_2$-e.
  - Scope 3 emissions, including from concrete and steel for construction, are estimated to be 158,510 $tCO_2$-e.
  - Annual Scope 1 and Scope 2 GHG emissions during operation of the project are estimated to be 201,602 $tCO_2$-e/y.
  - The project is estimated to contribute no more than 0.04% of the national GHG emissions inventory on an annual basis during operation.
  - The project is estimated to contribute 0.19 – 0.24% to the annual Victorian GHG emissions inventory during operation.
  - Construction of the Heybridge to Driffield Option will result in 4,416 $tCO_2$-e fewer Scope 3 emissions than the Heybridge to Hazelwood Option, based on current material use assumptions.

The Marinus Link will enable the delivery of low emissions electricity, estimated at 140 million tonnes of $CO_2$-e abatement per year by 2050, contributing towards Australia's GHG emissions reduction commitments under the Paris Agreement and updated NDC.

At a state level the project will also provide improved access to renewable energy and improve the efficiency of both Tasmania's and Victoria's electricity grid, contributing towards both the Tasmanian Government's and Victorian Government's goals of net zero greenhouse gas emissions by 2030 and 2050, respectively.

The following Environmental Performance Requirements (EPRs) are proposed for the project:

**GHG01: Minimise greenhouse gas emissions in construction**

Prior to commencement of project works, identify opportunities to reduce Scope 1 and Scope 2 greenhouse gas emissions (as defined in the NGER Act) so far as reasonably practicable. Measures must be consistent with the Marinus Link Sustainability Framework and include consideration of:

- Use of low emission fuels
- Maintenance of equipment and vehicles
- Minimising vegetation clearance
- Purchase of green energy
- Procurement of energy efficient machinery
- Use of low carbon emission concrete

- Use of recycled materials

The design must include measures to avoid $SF_6$ leakage so far as reasonably practicable.

Scope 1 and Scope 2 GHG emissions during construction must be reported annually on the Marinus Link website.

**GHG02: Report on GHG emissions in operation**

Prior to commencement of operation, identify opportunities to reduce operational Scope 1 and Scope 2 greenhouse gas emissions (as defined in the NGER Act) so far as reasonably practicable. Measures must be consistent with the Marinus Link Sustainability Framework and include consideration of:

- Management and maintenance of SF¬$_6$ insulated equipment in accordance with Australian Standard IEC 62271.4: 2015 – high-voltage switchgear and controlgear – Part 4: Handling procedures for sulphur hexafluoride (SF¬$_6$) and its mixtures and the Energy Network Australia Industry Guideline for SF6 Management (Document 022-2008) and prevention of release of SF¬$_6$ by using a closed cycle during installation, maintenance and decommissioning of equipment where practicable.
- Use of low emission fuels
- Maintenance of equipment and vehicles
- Purchase of green energy
- Procurement of energy efficient machinery

Scope 1 and Scope 2 emissions from operation must be reported annually on the Marinus Link website.

# 1. INTRODUCTION

The proposed Marinus Link (the project) comprises a high voltage direct current (HVDC) electricity interconnector between Tasmania and Victoria, to allow for the continued trading and distribution of electricity within the National Electricity Market (NEM).

The project was referred to the Australian Minister for the Environment 5 October 2021. On 4 November 2021, a delegate of the Minister for the Environment determined that the proposed action is a controlled action as it has the potential to have a significant impact on the environment and requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) before it can proceed. The delegate determined that the appropriate level of assessment under the EPBC Act is an environmental impact statement (EIS).

On 12 December 2021, the former Victorian Minister for Planning under the *Environment Effects Act 1978* (Vic) (EE Act) determined that the project requires an environment effects statement (EES) under the EE Act, to describe the project's effects on the environment to inform statutory decision making.

In July 2022 a delegate of the Director of the Environment Protection Authority Tasmania determined that the project be subject to environmental impact assessment by the Board of the Environment Protection Authority (the Board) under the *Environmental Management and Pollution Control Act 1994* (Tas) (EMPCA).

As the project is proposed to be located within three jurisdictions, the Victorian Department of Transport and Planning (DTP), Tasmanian Environment Protection Authority (Tasmanian EPA) and Australian Department of Climate Change, Energy, Environment and Water (DCCEEW) have agreed to coordinate the administration and documentation of the three assessment processes. One EIS/EES is being prepared to address the requirements of DTP and DCCEEW. Two EISs are being prepared to address the Tasmanian EPA requirements for the Heybridge converter station and shore crossing.

This report has been prepared by Katestone Environmental Pty Ltd (Katestone) for the Tasmanian, Victorian, and Commonwealth jurisdictions as part of the EIS/EES and two EISs being prepared for the whole project.

## 1.1 Purpose of this report

The objectives of this study are to apply an integrated approach to assessing potential environmental impacts that could occur because of the project, explicitly considering the following:

- Compile an inventory of the type and volume of greenhouse gas (GHG) emissions expected to be generated from construction, operation, and maintenance activities consistent with statutory reporting standards.
- Compare total GHG emissions during construction, operations, and maintenance against state and national targets; and
- Propose strategies to reduce, monitor and audit direct and indirect GHG emissions resulting from the construction and operation of the project.

# 2. PROJECT OVERVIEW

The project is a proposed 1500-megawatt (MW) HVDC electricity interconnector between Heybridge in northwest Tasmania and the Latrobe Valley in Victoria (Figure 1). Marinus Link is proposed to provide a second link between the Tasmanian renewable energy resources and the Victorian electricity grids enabling efficient energy trade, transmission, and distribution from a diverse range of generation sources to where it is most needed and will increase energy capacity and security across the National Electricity Market (NEM).

Marinus Link Pty Ltd (MLPL) is the proponent for the project and is a wholly owned subsidiary of Tasmanian Networks Pty Ltd (TasNetworks). TasNetworks is owned by the State of Tasmania, which also owns, operates, and maintains the electricity transmission and distribution network in Tasmania.

Tasmania has significant renewable energy resource potential, particularly hydroelectric power, and wind energy. The potential size of the resource exceeds both the Tasmanian demand and the capacity of the existing Basslink interconnector between Tasmania and Victoria. The growth in renewable energy generation in mainland states and territories participating in the NEM, coupled with the retiring of baseload coal-fired generators, is reducing the availability of dispatchable generation that is available on demand.

Tasmania's existing and potential renewable resources are a valuable source of dispatchable generation that could benefit electricity supply in the NEM. Marinus Link will allow for the continued trading, transmission and distribution of electricity within the NEM. It will also manage the risk to Tasmania of a single interconnector across the Bass Strait and complement existing and future interconnectors on mainland Australia. Marinus Link is expected to facilitate the reduction in greenhouse gas emissions at a state and national level (EIS/EES Technical Appendix C: Climate Change).

Interconnectors are a key feature of the future energy landscape. They allow power to flow between different regions to enable the efficient transfer of electricity from renewable energy zones to where the electricity is needed. Interconnectors can increase the resilience of the NEM and make energy more secure, affordable, and sustainable for customers. Interconnectors are common around the world including in Australia. They play a critical role in supporting Australia's transition to a clean energy future.

## 2.1 Project area

The project area is approximately 345 km in length and runs from Heybridge on the northwest coast of Tasmania across Bass Strait to Waratah Bay on the southeast coast of Victoria before heading inland north to the Driffield and Hazelwood areas (Figure 1).

Most of the alignment (90%) crosses private freehold land, predominantly comprised of agricultural and forestry land uses (Figure 2). For the remainder there are community service facilities, roads, rivers, and residential properties. The Heybridge converter station is the only section of the project located in Tasmania. The land use classification of the Heybridge site is other minimal use, i.e., an area of land that is largely unused in the context of its prime use but that may have ancillary uses. The Victorian component of the project begins at Waratah Bay before travelling inland approximately 90 km to the Driffield and/or Hazelwood areas. The entire 90 km-long alignment will require a nominal 36 m wide (minimum 20 m wide) construction corridor.

The key terrain feature associated with the Tasmanian component of the project is the northwest coastline of Tasmania, directly north of the Heybridge construction footprint. The key terrain feature associated with the Victorian component of the project is Waratah Bay, where the sea cable reaches Victoria and the Grand Ridge Mountain range which exists to the east of the land project alignment.

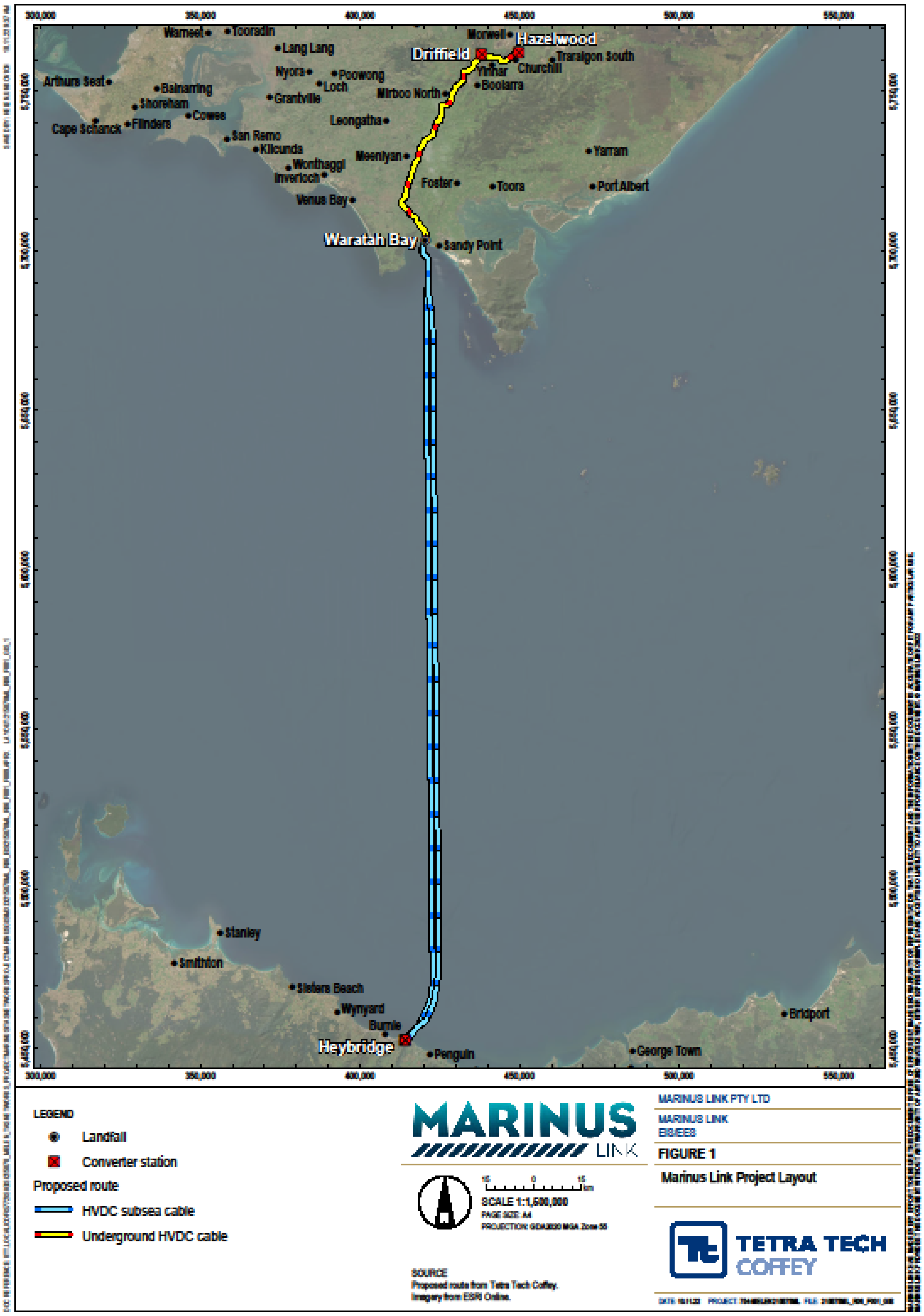


**Figure 1** **Marinus Link Overview (Tetra Tech Coffey, 2022)**

## 2.2 Study focus

This study focuses on the GHG emissions from the construction and operation of the Heybridge Converter Station, and the total GHG emissions from the proposed Heybridge Converter Station[1] to Hazelwood Converter Station and from the proposed Heybridge Converter Station[1] to Driffield Converter Station. The Victorian converter station will be built at either Hazelwood or Driffield and the assessment has considered both proposed converter station sites. The potential Victorian converter station sites are adjacent to the Hazelwood–Cranbourne/Rowville 500 kV transmission lines at Driffield and adjacent to Hazelwood Terminal Station. The Driffield site is in Hancock Victorian Plantations' Thorpdale plantation west of Strzelecki Highway. The Hazelwood site is in farmland adjacent to the southern boundary of the Hazelwood Terminal Station and Tramway Road.

[1] i.e., excluding the emissions from construction and operation of the Heybridge Converter Station.

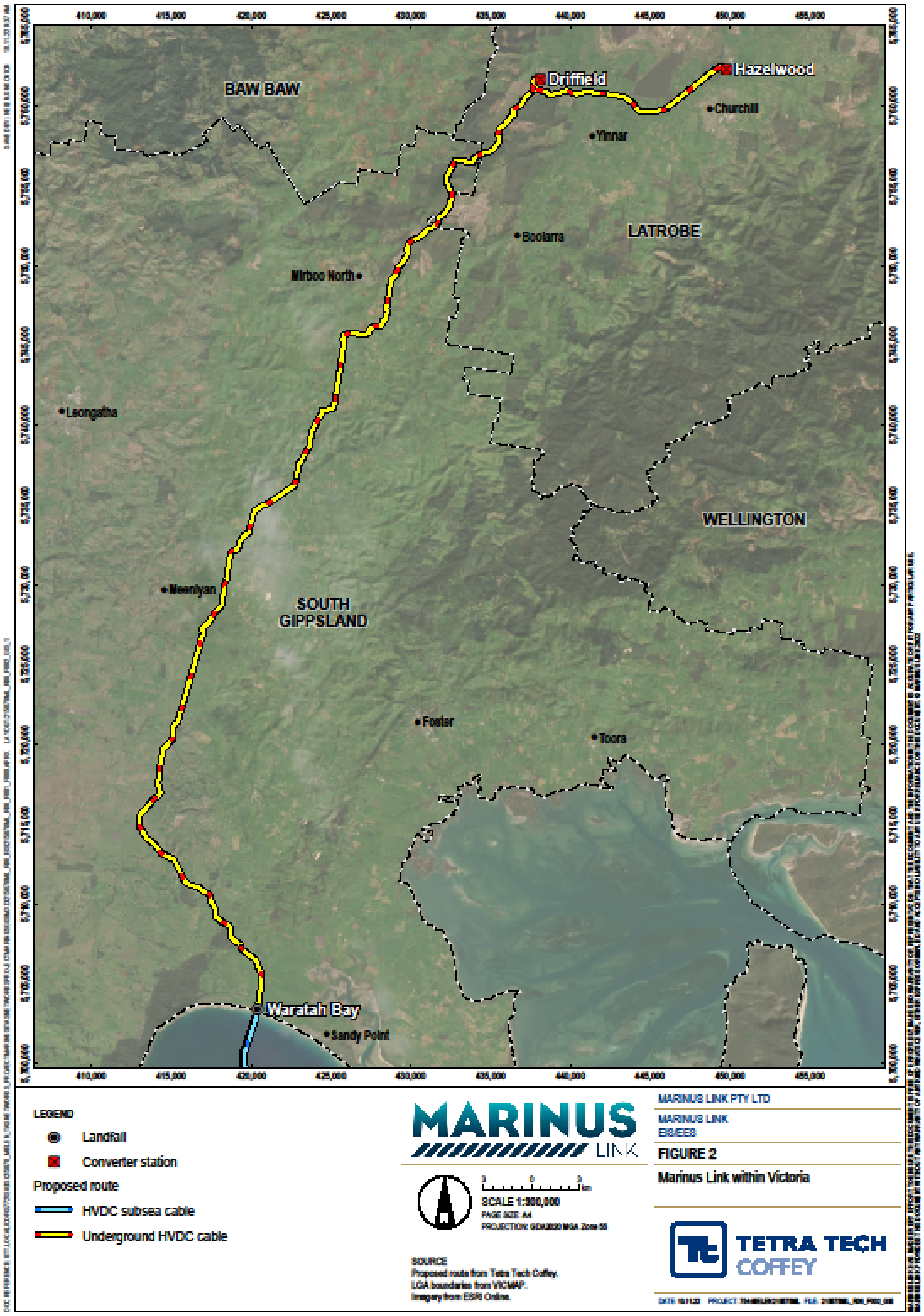


**Figure 2** Marinus Link within Victoria (Tetra Tech Coffey, 2022)

# 3. REGULATORY FRAMEWORK, POLICY CONTEXT, AND ASSESSMENT REQUIREMENTS

## 3.1 Commonwealth

The Commonwealth Government has committed that Australia will reduce GHG emissions by 43% below 2005 levels by 2030 and will achieve net zero GHG emissions by 2050. It is developing new policies to drive the transition to net zero and will build on existing programs such as the Emissions Reduction Fund (ERF). The Commonwealth Government is also reviewing the Safeguard Mechanism, which requires Australia's largest emitters to keep net emissions within baseline levels, to ensure that it will conform to Australia's climate targets.

### 3.1.1 *Environment Protection and Biodiversity Conservation Act 1999*

The Minister for Environment has not previously been required to consider the potential impacts of a project on climate change under the EPBC Act; however, the Australian Senate is currently considering the Environment Protection and Biodiversity Conservation Amendment (Climate Trigger) Bill 2022.

### 3.1.2 *Climate Change Act 2022*

The *Climate Change Act* 2022 (Cwlth) (CC Act) provides the legislative framework to implement Australia's net-zero commitments and codifies Australia's net 2030 and 2050 GHG emissions reductions targets under the Paris Agreement. The legislated targets are to reduce net GHG emissions to 43% below 2005 levels by 2030, and to reduce net GHG emissions to zero by 2050.

The CC Act establishes the 2030 GHG emissions reduction target as a national target and an emissions budget. The CC Act does not impose obligations directly on companies, but it does signal sector-based reforms to achieve the GHG emissions reduction targets.

### 3.1.3 *Climate Change (Consequential Amendments) Act 2022*

The *Climate Change (Consequential Amendments) Act* 2022 (Cwlth) (CCCA Act) embeds the GHG emissions reduction targets into fourteen Commonwealth Acts, including the *Clean Energy Regulator Act 2011*(Cwlth), *Infrastructure Australia Act 2008* (Cwlth), *National Greenhouse and Energy Reporting Act 2007* (Cwlth), and the *Renewable Energy (Electricity) Act 2000* (Cwlth).

### 3.1.4 *National Greenhouse and Energy Reporting Act 2007*

The *National Greenhouse and Energy Reporting Act 2007* (Cwth) (NGER Act) establishes a national framework for corporations to report GHG emissions and energy consumption.

NGER Act mandates reporting by corporations or facilities that have energy production, energy use, or GHG emissions that exceed specified thresholds (Table 3-1). These entities are required to report on their Scope 1 and Scope 2 emissions, where:

- Scope 1 emissions – the release of GHG into the atmosphere from a facility as a direct result of an activity or series of activities (including ancillary activities) that constitute the facility. GHG emissions associated with land clearing are not covered by the NGER scheme.
- Scope 2 emissions – means the release of GHG into the atmosphere as a direct result of one or more activities that generate electricity, heating, cooling, or steam at a facility and that is consumed by the facility.

Scope 3 emissions are not included in NGER reporting due to the potential for double counting. Scope 3 emissions are defined as indirect GHG emissions, other than Scope 2 emissions, that are generated in the wider economy by a facility's supply chain or value chain. They occur because of activities at sources not owned or controlled by that facility's business.

**Table 3-1 NGER annual reporting thresholds – greenhouse gas emissions and energy use**

| Threshold level | Threshold type | |
|---|---|---|
| | GHG (kt $CO_2$-e) | Energy production and/or consumption (TJ) |
| Facility | 25 | 100 |
| Corporate | 50 | 200 |
| Notes: kt $CO_2$-e = kilotonnes of carbon dioxide equivalent. TJ = terajoules. | | |

### 3.1.5 *National Electricity (South Australia) Act 1996*

The *National Electricity (South Australia) Act 1996* (SA) (NEA) establishes the governance framework and key obligations for the NEM, including the role and functions of the Australian Energy Market Operator (AEMO), as well as the regulation of access to electricity networks.

The NEA is supported by the National Electricity (South Australia) Regulations and National Electricity Rules.

Energy Networks Australia, the peak national body representing Australia's gas distribution and electricity transmission and distribution companies, produces a range of codes, specifications, guidelines, and handbooks to support the industry.

## 3.2 Tasmania

### 3.2.1 *Climate Change (State Action) Act 2008*

The *Climate Change (State Action) Act* (Tas) 2008 sets the Tasmanian Government's legislative framework for action on climate change. Under the Act, Tasmania has a legislated GHG reduction target of net zero emissions, or lower, from 2030, and the government is required to work with industry and business to, *inter alia*, develop sector-based emissions reduction and resilience plans, to be updated every five years. A draft of the new action plan is likely to be released for public consultation in 2023.The most recent review of state GHG emissions, Climate Action 21: Report Card 2019 (Tasmanian Climate Change Office, 2019), indicated that GHG emissions at a state level had decreased by 95% below 1990 levels (based on the 2017 reporting period).

### 3.2.2 Climate Action 21

Climate Action 21: Tasmania's Climate Change Action Plan 2017-2021 sets the Tasmanian Government's agenda for action on climate change through to 2021. It reflected the Tasmanian Government's commitment to addressing the critical issue of climate change and articulates how Tasmania will play its role in the global response to climate change. Climate Action 21 had several priority areas including a target to achieve zero net emissions by 2050. Advancing the state's renewable energy capability at both a state and national level was a key component of Climate Action 21.

A new whole-of government action plan is being developed by the Tasmanian Government. This plan will recognise that a new emissions target of net zero emissions by 2030 is achievable.

## 3.3 Victoria

### 3.3.1 *Climate Change Act 2017*

The CC Act 2017 sets the legislative foundation to manage climate change risks, and drive Victoria's transition to net zero emissions by 2050. A key condition under the CC Act 2017 is the requirement of the Victorian Government to develop a Climate Change Strategy every 5 years with interim targets to enable Victoria to reach its long-term net-zero emissions goal. In May 2021, the Victorian Government released Victoria's Climate Change Strategy, with key targets being:

- Reduce Victoria's greenhouse gas emissions from 2005 levels by 28-33% by 2025, and 45-50% by 2030
- 50% renewables target by 2030.

The objectives will be achieved through:

- Increasing renewable energy generation
- Reducing transport emissions by accelerating the transition to zero emission vehicles
- Halving the amount of organic waste going to landfill
- Restoring degraded landscapes and planting trees to remove emissions from the atmosphere.

### 3.3.2 *Environment Protection Act 2017*

The revised *Environment Protection Act 2017* (Vic) (EP Act) came into effect on 1 July 2021, replacing the *Environment Protection Act 1970*. The EP Act introduces a 'general environmental duty' (GED), which places a duty on all Victorians and Victorian businesses who engage in an activity that may cause harm to human health or the environment from pollution or waste to eliminate those risks, or if not possible to do so, to reduce those risks so far as reasonably practicable. GHG emissions are expressly defined as waste in the EP Act, and as such the minimisation of harm from GHG emissions is required to comply with the GED.

The EP Act establishes new subordinate instruments including Regulations, the Environment Reference Standard (ERS), and guidelines, and has discontinued State environment protection policies (SEPP) and Waste management policies (WMP).

### 3.3.3 Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency

The Protocol for the Environmental Management (PEM): Greenhouse Gas Emissions and Energy Efficiency in Industry (PEM GHG) is an incorporated document of the SEPP for Air Quality Management (SEPP AQM) that is still relevant in contributing to the state of knowledge. Under the PEM GHG, all license applicants are required to:

- Step 1: Estimate energy consumption in GJ, by energy type and the associated GHG emissions in $CO_2$-equivalent terms.
- Step 2: Estimate direct greenhouse emissions in $CO_2$-equivalent terms for non-energy sources; and
- Step 3: Identify and evaluate opportunities to reduce greenhouse gas emissions.

### 3.3.4 Guideline for managing greenhouse gas emissions

EPA Victoria has developed a *Guideline for managing greenhouse gas emissions* (EPA Vic, 2022) under the EP Act that outlines a risk management approach that can be applied to GHG emissions for businesses and industries. The general process of the approach is as follow:

- Step 1: Identify GHG emission sources and group them according to Scope
- Step 2: Assess risks from GHG emissions
- Step 3: Implement controls to eliminate risks (or reduce risks so far as reasonably practicable) of harm from GHG emissions
- Step 4: Review controls to ensure they are effective.

## 3.4 Marinus Link Pty Ltd

Marinus Link Pty Ltd intends that the project will contribute to a reduction of at least 140 million tonnes of $CO_2$ emissions per year by 2050 due to increased NEM access to renewable energy[2]. The emission saving is calculated based on the current carbon emission intensity of the NEM. Commissioning of Marinus Link unlocks the achievement of the 200% Tasmanian Renewable Energy Target [TRET] of 10,500 MWh of additional renewable generation. This has been independently verified by the Tasmanian and Commonwealth Governments and is reflected in the Commonwealth-Tasmanian Bilateral Energy and Emissions Reduction Agreement[3].

## 3.5 Assessment Guidelines

As the project is proposed to be located within three jurisdictions, the Victorian Department of Transport and Planning (DTP), Tasmanian Environment Protection Authority (Tasmanian EPA) and Australian Department of Climate Change, Energy, Environment and Water (DCCEEW) have agreed to coordinate the administration and documentation of the three assessment processes. One EIS/EES is being prepared to address the requirements of DTP and DCCEEW. Two EISs are being prepared to address the Tasmanian EPA requirements for the Heybridge converter station and shore crossing.

This section outlines the requirements of assessment guidelines under Commonwealth, Tasmanian and Victorian jurisdictions relevant to GHG emissions and the linkages to other EIS/EES technical studies.

### 3.5.1 Commonwealth

DCCEEW have published the following guidelines for the EIS: 'Guidelines for the Content of a Draft Environmental Impact Statement – Environment Protection and Biodiversity Conservation Act 1999 – Marinus Link underground and subsea electricity interconnector cable (EPBC 2021/9053)'. The EIS guidelines do not include any requirements relevant to the assessment of greenhouse gas emissions from the project and are not addressed further in this report.

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[2] https://www.marinuslink.com.au/2021/10/transmission-delivers-a-clean-energy-future/

[3] https://www.energy.gov.au/sites/default/files/Commonwealth-Tasmania%20Bilateral%20Energy%20and%20Emissions%20Reduction%20Agreement.pdf

### 3.5.2 Tasmania

The EPA Tasmania has published two sets of guidelines (September 2022) for the preparation of an EIS for the Marinus Link converter station and shore crossing. A separate set of guidelines have been prepared for each of these project components.

The sections relevant to the greenhouse gas assessment include:

*Consideration of the evolving national response to climate change and greenhouse gas emissions, and the targets set in the Tasmanian Climate Change Action Plan 2017-2021 or any updated versions thereof available at the time of preparing the EIS.*

- *Provide an estimate of greenhouse gas emissions, energy production and energy consumption for both construction and operational phases of the proposal, including emissions associated with vegetation removal (as relevant). Calculators are available on the Australian Government Clean Energy Regulator website.*
- *Demonstration that the development will implement cost-effective greenhouse best practice measures to achieve on going minimisation of greenhouse gas emissions. Where less emissions-intensive options are not adopted, justification should be provided and/or mechanisms to offset greenhouse gas emissions identified.*

### 3.5.3 Victoria

The EES scoping requirements issued by the Minister for Planning (February 2023) outline the specific matters to be assessed across a number environmental and social disciplines relevant to the project, and to be documented in the EES for the project.

The EES scoping requirements inform the scope of the EES technical studies and define the EES evaluation objectives. The EES evaluation objectives identify the desired outcomes to be achieved and provide a framework for an integrated assessment of the environmental effects of a proposed project.

#### 3.5.3.1 EES evaluation objective

The EES evaluation objectives relevant to the greenhouse gas assessment are:

> *Section 4.5 Amenity, health, safety, and transport:*
>
> *Avoid and, where avoidance is not possible, minimise adverse effects on community amenity, health and safety, with regard to noise, vibration, air quality including dust, the transport network, greenhouse gas emissions, fire risk and electromagnetic fields.*

### 3.5.4 EES scoping requirements

The relevant sections of the final EES scoping requirements that this assessment has addressed are summarised in Table 2.

**Table 3-2 EES scoping requirements relevant to the greenhouse gas assessment**

| Aspects to be assessed | Scoping Requirement | Report Section |
|---|---|---|
| Likely effects | Predict greenhouse gas emissions associated with the project. | Section 7 |
| Mitigation | Describe approaches and measures to minimise greenhouse gas emissions associated with the project. | Section 8 |
| Performance | Describe the framework for monitoring and evaluating the measures implemented to mitigate environmental amenity, human health, transport and safety effects and greenhouse gas emissions and contingencies. | Section 4.1.4<br><br>Section 8 |

## 3.6 Linkages to other reports

This report is informed by or informs the c studies outlined in Table 3.

**Table 3-3 Linkages to other reports**

| Technical studies | Relevance to this assessment |
|---|---|
| Climate Change assessment (Katestone, 2023) | The climate change assessment report considers the potential impact of climate change and extreme weather events, arising due to increased GHG in the atmosphere, on the project. |

# 4. CURRENT GHG EMISSIONS

GHG emissions associated with the project will contribute to State and national GHG inventories. A summary of GHG emissions inventories that have recently been published for Australia, Tasmania and Victoria are provided in Table 4-1 (Commonwealth of Australia, 2020).

**Table 4-1 Annual GHG emissions for Australia, Tasmania, and Victoria**

| Inventory total | Australia[1] | Tasmania[1] | | Victoria[1] | |
|---|---|---|---|---|---|
| | Emissions (Mt $CO_2$-e)[3] | Emissions (Mt $CO_2$-e) | Contribution to national emissions | Emissions (Mt $CO_2$-e) | Contribution to national emissions |
| Including LULUCF[2] | 498 | -3.7 | -0.7%[4] | 83 | 17% |
| Excluding LULUCF | 537 | 7.9 | 1.5% | 104 | 19% |

Notes:

[1] 2020 estimates sourced from National Greenhouse Gas Inventory – Paris Agreement Inventory (https://ageis.climatechange.gov.au/)

[2] Land-use, land-use change and forestry

[3] Mt $CO_2$-e = million tonnes of carbon dioxide equivalent

[4] GHG sequestered by forestry accounts for Tasmania's contribution of negative emissions when LULUCF is included

Marinus Link Pty Ltd is a subsidiary of TasNetworks. TasNetworks has existing reporting obligations under the NGER scheme. Recent annual GHG emissions reported to the NGER scheme are provided in Table 4-2 (Clean Energy Regulator, 2021). Variation in annual reported emissions can partially be explained by annual changes in the emissions factor.

The majority of TasNetworks' emissions stem from the energy lost during the transportation of electricity from generators to customers, due to electrical resistance and the heating of conductors (transmission losses). Transmission losses are a function of electrical infrastructure, electrical throughput, and atmospheric conditions. TasNetworks has limited ability to improve transmission losses in existing infrastructure and changes in emissions are generally related to changing throughput and weather conditions.

Transmission losses are generally calculated based on the amount of electricity entering the network at a facility and the amount of electricity leaving the network at a facility (CER 2022). Transmission losses have been found to be approximately 3% per 1,000km for undersea cables (Gordonnat & Hunt (2020).

**Table 4-2 TasNetworks NGER scheme reporting (2016-2017 to 2020-2021)**

| Category | Units | 2016-2017 | 2017-2018 | 2018-2019 | 2019-2020 | 2020-2021 |
|---|---|---|---|---|---|---|
| Scope 1 | $tCO_2$-e | 7,749 | 7,405 | 7,346 | 7,220 | 7,672 |
| Scope 2 | | 64,110 | 79,006 | 92,225 | 65,361 | 74,779 |
| **TOTAL** | | **71,859** | **86,411** | **99,571** | **72,581** | **82,451** |
| Energy use* | GJ | 1,989,444 | 2,094,265 | 1,807,435 | 1,626,612 | 1,645,882 |

Notes: *Net energy consumed

# 5. ASSESSMENT METHOD

Gases of significance to climate change, associated with the project, include $CO_2$, $CH_4$, $N_2O$, and $SF_6$. The emissions of GHG emissions from the project during construction and operation have been determined based on activity data representative of the proposed activities and the methods described in the following resources:

- The National Greenhouse Accounts, October 2020 (Department of the Industry, Science, Energy and Resources, 2020)
- National Greenhouse and Energy Reporting (Measurement) Determination 2008
- The Greenhouse Gas Protocol (WRI/WBCSD, 2004).

Scope 1, 2, and 3 GHG emissions have been estimated on an annual basis for the project's lifetime. The construction period is projected to occur over five years from 2025 to 2030, although not all construction activities will occur in every year (Figure 3). The baseline operation year occurs immediately after cessation of construction and commissioning. Emission values are calculated for the Heybridge Converter Station, the Heybridge Converter Station to Hazelwood Converter Station, and the Heybridge Converter Station to Driffield Converter Station.

All calculations are made based on data and assumptions provided to Katestone by MLPL.

The emission scopes are detailed in the following sections. Table 5-1 provides a summary of the energy content of emission sources associated with the project and emissions factors for each source, measured in $CO_2$-e per unit of measurement of each of the sources.

## 5.1 Scope 1 GHG emissions

Scope 1 GHG emissions are the direct result of the activity and include:

- Diesel combustion:
  - heavy machinery and various other equipment including rigid trucks, excavators, cranes, drill rigs, front end loader, graders, water trucks and concrete agitators
  - light vehicles
  - generators.
- Marine fuel combustion
  - Sea cable laying vessel.
- Land clearing
  - Land clearing emissions, a component of LULUCF, are a Scope 1 GHG emission associated with the project. LULUCF emissions are not included in NGER scheme reporting.
- Installation, operation, and maintenance of transformers
  - $SF_6$ leakage.

**Table 5-1 Summary of energy content and emissions factors**

| Emission source | Energy/carbon content | | Emission factor | | | |
|---|---|---|---|---|---|---|
| | Value | Units | Scope 1 | Scope 2 | Scope 3 | Units |
| Diesel (transport) | 38.6 | GJ/kL | 70.4 | - | 3.6 | $kgCO_2$-e/GJ[1] |
| Diesel (stationary purposes) | 38.6 | GJ/kL | 70.2 | - | 3.6 | $kgCO_2$-e/GJ[1] |
| $SF_6$ | - | - | 23,500 | - | - | $kgCO_2$-e/GJ[1] |
| Forest clearing | 172.47 | tC/ha | 632 | - | - | $tCO_2$-e/ha[2] |
| Electricity (Victoria) | 3.6 | MJ/kWh | - | 0.91 | 0.10 | $kgCO_2$-e/kWh[1] |
| Electricity (Tasmania) | 3.6 | MJ/kWh | - | 0.14 | 0.02 | $kgCO_2$-e/kWh[1] |
| Electricity transmission losses | 3.6 | MJ/kWh | - | 0.01 | - | $kgCO_2$-e/kWh[1] |
| Aggregate | - | - | - | - | 5.67 | $kgCO_2$-e/t[3] |
| Concrete | - | - | - | - | 250.6 | $kgCO_2$-e/t[3] |
| Steel | - | - | - | - | 1547 | $kgCO_2$-e/t[3] |
| Rigid truck | - | - | - | - | 0.216 | $kgCO_2$-e/tkm[3] |

[1]*National Greenhouse and Energy Reporting (Measurement) Determination 2008*, as amended in July 2021, and *National Greenhouse Accounts Factors* (Department of Industry, Science, Energy and Resources, 2021).

[2]*Australian National Greenhouse Accounts*, *FullCAM Full Carbon Accounting Model*, v 4.1.6.19417 (Australian Government, 2021).

[3]*Infrastructure Sustainability Materials Calculator,* v 1 (Infrastructure Sustainability Council of Australia, 2020), concrete is assumed to be precast concrete with a strength of 65Mpa.

GJ/kL = gigajoules per kilolitre, $kgCO_2$-e/GJ = kilograms of carbon dioxide equivalent per gigajoule, MJ/kWh = megajoules per kilowatt hour, kg $CO_2$-e/kWh = kilograms of carbon dioxide equivalent per kilowatt hour and $kgCO_2$-e/tkm = kilograms of carbon dioxide equivalent per tonne per kilometre.

## 5.2 Scope 2 GHG Emissions

Scope 2 GHG emissions are the indirect emissions arising from generation of electricity purchased and used by the project and include:

- Electricity consumption
  - electricity consumption of site offices during construction.
- Transmission losses:
  - losses in electricity due to resistive losses (in the form of heat when electric currents pass through conductors) and corona losses (power losses because of ionisation of the air immediately surrounding the conductor).

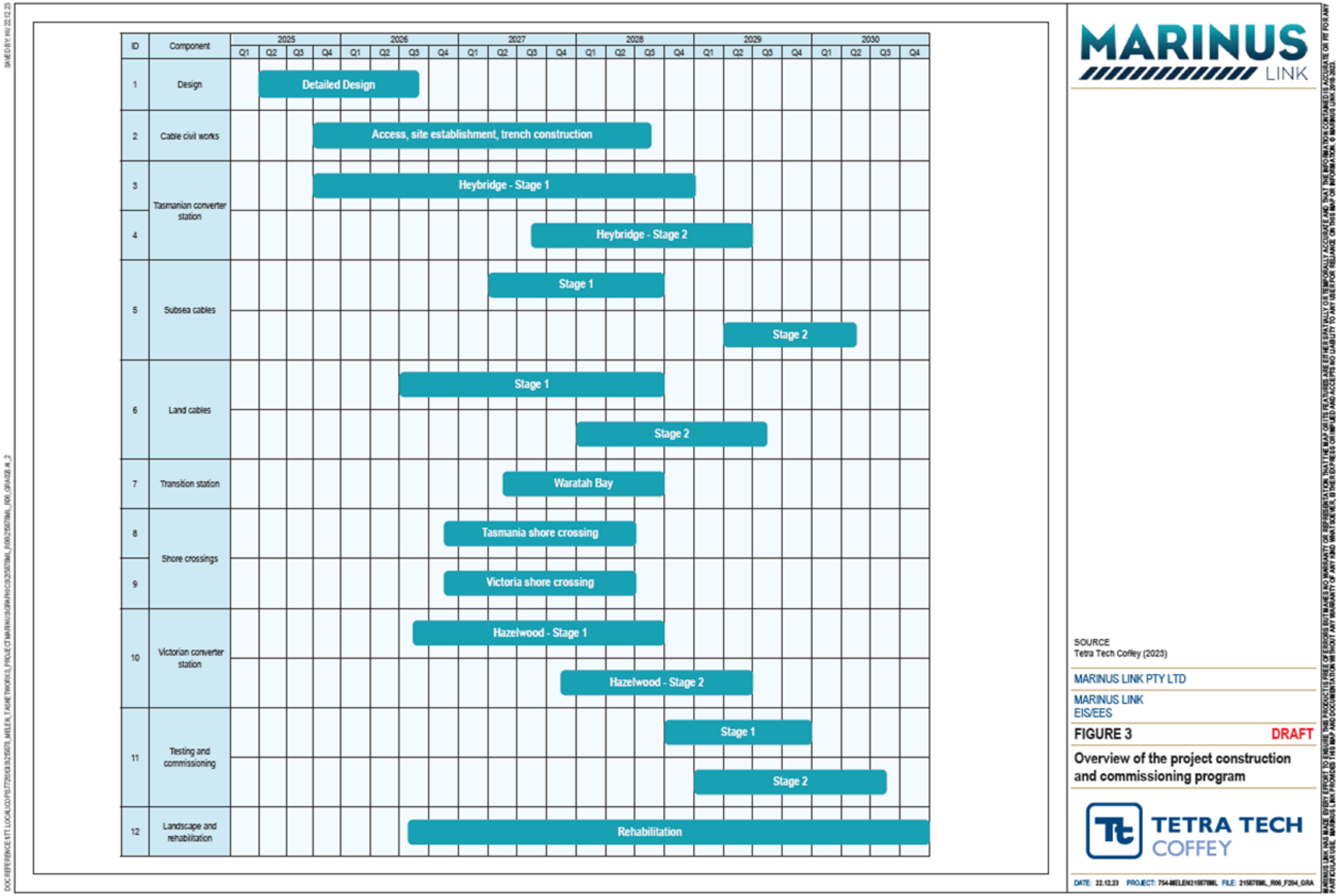


**Figure 3** Indicative construction program (supplied by MLPL)

## 5.3 Scope 3 GHG Emissions

Scope 3 GHG emissions are indirect emissions other than Scope 2 that are generated in the wider economy because of the activity but that are not owned or controlled by the proponent of the project and include:

- Transport of construction materials via road
- Transportation of materials by sea
- Embedded emissions for major construction materials including:
    - Steel
    - Concrete
    - Gravel aggregates.

## 5.4 Heybridge Converter Station

### 5.4.1 Activity data

Activity data used to calculate GHG emissions for the Heybridge Converter Station are provided in Table 5-2. Diesel use in the first three years of construction, electricity use (including ongoing electricity use during operation), and future electricity transmission are the key activities for this site. No more than 10ha of land clearing will be required in the first year of construction. The loss of 22 kg $SF_6$ to the atmosphere per year during operation of the facility is assumed.

**Table 5-2 Summary of activity data for the Heybridge Converter Station**

| Emission source | | | Operations | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Ongoing |
| Diesel | Land cable | kL | - | - | - | - | - | - | - |
| | Switching Stations | kL | 66.0 | 72.2 | 17.1 | | - | - | - |
| | Backup Generators | kL | - | - | - | - | - | - | 5.0 |
| | TOTAL | kL | 66.0 | 72.2 | 17.1 | | - | - | 5.0 |
| Electricity (use) | | MWh | 65.9 | 131.8 | 131.8 | 131.8 | 131.8 | 22.0 | 6,132.0 |
| Electricity (transmission) | | MW | - | - | - | - | - | - | 1500.0 |
| Sea cable laying fuel | | kL | - | - | - | - | - | - | - |
| $SF_6$ | | kg | - | - | - | - | - | - | 22 |
| Land disturbance | | ha | ≤10 | - | - | - | - | - | - |

Over 8,000 tonnes of steel, 40,000 tonnes of aggregate and 50,000 tonnes of concrete will be transported to the site and 615 MWh of electricity used by independent operators (Table 5-3). Assumptions in the calculation include an estimated 100,000 tonne kilometres (t.km), a measure of freight transport, which represents the transport of one tonne of goods by a given transport mode (e.g., road, rail, air, sea, inland waterways, pipeline) over one kilometre.

**Table 5-3 Summary of activity data relevant to calculating Scope 3 GHG emissions associated with construction of Heybridge Converter Station**

| Component | Quantity | Units |
|---|---|---|
| Aggregate | 41,300 | t |
| Concrete | 50,400 | |
| Steel | 8,200 | |
| Transport* | 100,000 | t km |
| Diesel/Sea cable vessel fuel | 0 | kL |
| Electricity (grid) | 615 | MWh |
| Notes: *Transport requirements have been conservatively estimated based on all materials being transported along the length of the transmission line (1 km) in diesel powered rigid trucks | | |

## 5.5 Heybridge to Hazelwood Converter Station Option

### 5.5.1 Activity data

Scope 1 GHG emissions for the Heybridge to Hazelwood Converter Station Option are largely associated with land disturbance and diesel consumption required for the construction phase of the project. Ongoing annual GHG emissions associated with operation of the project are associated with diesel use required for operation and maintenance activities (Scope 1 emissions) and electrical transmission losses (Scope 2 emissions).

The Waratah Bay site may contain a DC transition station if the land and sea cables are provided by different suppliers. This will require $SF_6$ insulated switchgear as the air-insulated alternative requires a large footprint. Consequently, $SF_6$ emissions are assumed and modelled for this site within the Heybridge to Hazelwood Converter Station Option.

A summary of activity rates used to estimate Scope 1 and Scope 2 GHG emissions from the Heybridge to Hazelwood Converter Station Option are provided in Table 5-4. Assumptions used to estimate GHG emissions associated with the project are provided in Appendix A1.

**Table 5-4 Summary of activity data for the project assuming Heybridge to Hazelwood Converter Station Option**

| Emission source | | | Operations | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Ongoing |
| Diesel | Land cable | kL | 28.4 | 94.1 | 205.3 | 8.0 | - | - | - |
| | Switching Stations | kL | 98.7 | 125.8 | 72.6 | 9.0 | - | - | - |
| | Backup Generators | kL | - | - | - | - | - | - | 10.5 |
| | TOTAL | kL | 127.1 | 219.9 | 277.9 | 17.0 | - | - | 19.1 |
| Electricity (use) | | MWh | 65.9 | 131.8 | 131.8 | 131.8 | 131.8 | 22.0 | 12,352 |
| Electricity (transmission) | | MW | - | - | - | - | - | - | 13,140,000 |
| Sea cable laying fuel | | kL | - | 694.7 | 777.0 | 603.3 | 73.1 | - | - |
| $SF_6$ | | kg | - | - | - | - | - | - | 37.4 |
| Land disturbance | | ha | 80.1 | 80.1 | 80.1 | 80.1 | 80.1 | - | - |

A summary of material use and transportation requirements used in the estimation of Scope 3 emissions is provided in Table 5-5.

**Table 5-5 Summary of activity data relevant to calculating Scope 3 GHG emissions associated with the project, assuming the Heybridge to Hazelwood Converter Station Option**

| Component | Quantity | Units |
|---|---|---|
| Aggregate | 318,535 | t |
| Concrete | 102,072 | |
| Steel | 81,323 | |
| Transport* | 43,803,288 | t.km |
| Diesel/Sea cable vessel fuel | 2,809 | kL |
| Electricity (grid) | 615 | MWh |
| Notes: *Transport requirements have been conservatively estimated based on all materials being transported along the length of the transmission line (90 km) in diesel powered rigid trucks | | |

## 5.6 Heybridge to Driffield Converter Station Option

### 5.6.1 Activity data

Scope 1 GHG emissions for the Heybridge to Driffield Converter Station Option are largely associated with land clearing and diesel consumption required for the construction phase of the project. Ongoing annual GHG emissions associated with operation of the project are associated with diesel use required for operation and maintenance activities (Scope 1 emissions) and electrical transmission losses (Scope 2 emissions).

The Waratah Bay site may contain a DC transition station if the land and sea cables are provided by different suppliers. This will require $SF_6$ insulated switchgear as the air-insulated alternative requires a large footprint. Consequently, $SF_6$ emissions are assumed and modelled for this site within the Heybridge to Driffield Converter Station Option.

A summary of activity rates used to estimate Scope 1 and Scope 2 GHG emissions from the Heybridge to Driffield Converter Station Option are provided in Table 5-6. Assumptions used to estimate GHG emissions associated with the project are provided in Appendix A1.

**Table 5-6 Summary of activity data for the project assuming Heybridge to Driffield Converter Option**

| Emission source | | | Operations | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Ongoing |
| Diesel | Land cable | kL | 28.4 | 94.1 | 205.3 | 8.0 | - | - | - |
| | Switching Stations | kL | 98.7 | 125.8 | 72.6 | 9.0 | - | - | - |
| | Backup Generators | kL | - | - | - | - | - | - | 10.5 |
| | TOTAL | kL | 127.1 | 219.9 | 277.9 | 17.0 | - | - | 19.1 |
| Electricity (use) | | MWh | 65.9 | 131.8 | 131.8 | 131.8 | 131.8 | 22.0 | 12,352 |
| Electricity (transmission) | | MW | - | - | - | - | - | - | 11,204,892 |
| Sea cable laying fuel | | kL | - | 694.7 | 777.0 | 603.3 | 73.1 | - | - |
| $SF_6$ | | kg | - | - | - | - | - | - | 37.4 |
| Land clearing | | ha | 69.9 | 69.9 | 69.9 | 69.9 | 69.9 | - | - |

Scope 3 emissions associated with major construction materials and their transportation and fossil fuels have also been estimated for the Heybridge to Hazelwood Converter Station Option. Scope 3 emissions associated with the

Heybridge to Hazelwood Converter Station Option have been estimated in line with the recommendations of the GHG Protocol, with the estimated total expected for at least 95% of actual Scope 3 GHG emissions. A summary of material use and transportation requirements used in the estimation of Scope 3 emissions is provided in Table 5-7.

**Table 5-7 Summary of activity data relevant to calculating Scope 3 GHG emissions associated with the project assuming Heybridge to Driffield Converter Station Option**

| Component | Quantity | Units |
|---|---|---|
| Aggregate | 291,545 | t |
| Concrete | 102,072 | |
| Steel | 78,925 | |
| Transport* | 41,238,689 | t.km |
| Diesel/Sea cable vessel fuel | 2,809 | kL |
| Electricity (grid) | 615 | MWh |

Notes: *Transport requirements have been conservatively estimated based on all materials being transported along the length of the transmission line (90 km) in diesel powered rigid trucks

# 6. RESULTS

This assessment identifies GHG emissions for three project components:

- Heybridge Converter Station (Tasmania only)
- Heybridge to Hazelwood (Tasmania, Commonwealth, Victoria)
- Heybridge to Driffield (Tasmania, Commonwealth, Victoria).

## 6.1 Heybridge Converter Station

### 6.1.1 GHG emissions estimation: Scopes 1 and 2

The largest potential Scope 1 emissions during construction is due to diesel consumption (Table 6-1). Leakage of 22 kg $SF_6$ per year accounts for a significantly large single source of Scope 1 emissions during operation of the facility, due to its relatively large GWP. Electricity use on site and losses in transmission account for all the Scope 2 emissions for the Heybridge Converter Station. Vegetation clearance, i.e. 0.6 ha planted trees and 0.5 ha woody weeds, is an insignificant contribution to emissions.

**Table 6-1 Summary of estimated annual Scope 1 and Scope 2 GHG emissions (tCO2-e) and energy use (GJ) for the construction and operation of Heybridge Converter Station**

| Scope | Year | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Total 2025-30 | Ongoing |
|---|---|---|---|---|---|---|---|---|---|
| Scope 1 | Diesel consumption (vehicles) | 179 | 196 | 47 | - | - | - | 422 | 16 |
| | Diesel consumption (backup generators) | - | - | - | - | - | - | - | 14 |
| | Sea Cable | - | - | - | - | - | - | - | - |
| | $SF_6$ leakage | - | - | - | - | - | - | - | 517 |
| | Land disturbance | 43 | - | - | - | - | - | 43 | - |
| Scope 2 | Electricity (use) | 9 | 18 | 18 | 18 | 18 | 3 | 84 | 858 |
| | Electricity (transmission loss) | - | - | - | - | - | - | - | 26 |
| TOTALS | Total (excl LULUCF)) | 189 | 215 | 65 | 18 | 18 | 3 | 508 | 1,431 |
| | Total (incl LULUCF) | 189 | 215 | 65 | 18 | 18 | 3 | 508 | 1,431 |
| Energy use (GJ) | | 2,566 | 2,823 | 698 | 37 | 37 | 6 | 6,167 | 2,539 |
| | Note: all numbers are rounded | | | | | | | | |

The projected contribution of GHG emissions from the operation of the Heybridge Converter Station are presented in Table 6-2. The contribution to the national emissions is insignificant at <0.001% and is a relatively small contribution to Tasmania's GHG emissions.

**Table 6-2 Contribution of the Heybridge Converter Station to State and national GHG emissions ($MtCO_2$-e) during operation**

| Inventory total | Project | Australia[2,3] | | Tasmania[2,3] | |
|---|---|---|---|---|---|
| | Emissions ($MtCO_2$-e) | Emissions ($MtCO_2$-e) | Project % | Emissions ($MtCO_2$-e) | Project % |
| Excluding LULUCF | 0.001 | 537[1] | <0.001% | 7.9 | 0.018% |
| Including LULUCF | 0.001 | 498 | <0.001% | -3.7[4] | -0.04%[5] |

Notes: [1] Estimated maximum annual GHG emissions at December 2021

[2] 2020 estimates sourced from National Greenhouse Gas Inventory – Paris Agreement Inventory (https://ageis.climatechange.gov.au/).

[3] These emissions are based on the ongoing operations phase, not the construction phase

[4] At a state level Tasmania has net negative GHG emissions, as LULUCF sequesters more carbon dioxide than is emitted.

[5] A negative value means that these emissions reduce the net negative carbon budget for Tasmania by that fraction

### 6.1.2 GHG emission estimation: Scope 3

The projected Scope 3 emissions from the construction of the Heybridge Converter Station are presented in Table 6-3. The largest contributor to Scope 3 emissions at the Heybridge Converter Station by several orders of magnitude will be the concrete and steel used in construction.

**Table 6-3 Summary of estimated Scope 3 emissions in $tCO_2$-e**

| Component | GHG emissions ($tCO_2$-e) |
|---|---|
| Aggregate | 225 |
| Concrete | 12,630 |
| Steel | 12,671 |
| Transport | 21 |
| Diesel | 22 |
| Electricity | 12 |
| **TOTAL** | **25,582** |

## 6.2 Heybridge to Hazelwood Converter Station Option

### 6.2.1 GHG emissions estimation: Scopes 1 and 2

GHG emissions associated with the Heybridge to Hazelwood Converter Station Option have been considered and estimated on an annual basis. A summary of estimated Scope 1 and Scope 2 emissions associated with construction activities and ongoing operations, expressed as tonnes of carbon dioxide equivalent per annum ($tCO_2$-e/y) is presented in Table 6-4. GHG emissions associated with land clearing have been spread evenly over the five-year construction period associated with the Heybridge to Hazelwood Converter Station Option.

Maximum annual GHG emissions (Scope 1 + Scope 2) of 214,432 $tCO_2$-e are anticipated to occur from 2030 onwards. Ongoing operational emissions are predominantly associated with electricity transmission losses.

**Table 6-4** **Summary of estimated annual Scope 1 and Scope 2 GHG emissions ($tCO_2$-e) and energy use (GJ) for the project assuming Heybridge to Hazelwood Converter Station Option**

| Scope | Year | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Total 2025-30 | Ongoing |
|---|---|---|---|---|---|---|---|---|---|
| Scope 1 | Diesel consumption (vehicles) | 345 | 597 | 755 | 46 | - | - | 1,743 | 52 |
| | Diesel consumption (backup generators) | - | - | - | - | - | - | - | 29 |
| | Sea Cable | - | 154 | 77 | 77 | - | - | 308 | - |
| | SF6 leakage | - | - | - | - | - | - | - | 878 |
| | Land disturbance | 10,109 | 10,109 | 10,109 | 10,109 | 10,109 | - | 50,545 | 0 |
| Scope 2 | Electricity (use) (GJ) | 45 | 89 | 89 | 89 | 89 | 15 | 416 | 6,518 |
| | Electricity loss (transmission) | - | - | - | - | - | - | - | 227,651 |
| TOTALS | Total (excl LULUCF) | 390 | 841 | 922 | 213 | 89 | 15 | 2,470 | 235,128 |
| | Total (incl LULUCF) | 10,499 | 10,950 | 11,031 | 10,322 | 10,198 | 15 | 53,015 | 235,128 |
| Energy use (GJ) | | 4,923 | 11,025 | 13,561 | 2,865 | 300 | 6 | 32,707 | 3,654,575 |

The projected contribution of GHG emissions from the operation of the Heybridge to Hazelwood Converter Station are presented in Table 6-5. The contribution to the national emissions is small at 0.04% and is a relatively small contribution to Victoria's GHG emissions including and excluding LULUCF.

**Table 6-5** **Contribution of the Heybridge to Hazelwood Converter Station to state and national GHG emissions ($MtCO_2$-e) during operation**

| Inventory total | Project | Australia[2,3] | | Tasmania[2,3] | | Victoria | |
|---|---|---|---|---|---|---|---|
| | Emissions ($MtCO_2$-e) | Emissions ($MtCO_2$-e) | Project % | Emissions ($MtCO_2$-e) | Project[4] % | Emissions ($MtCO_2$-e) | Project % |
| Excluding LULUCF | 0.24 | 537[1] | 0.04% | 7.9 | 0.018% | 104.4 | 0.22% |
| Including LULUCF | 0.24 | 498 | 0.05% | -3.7[4] | -0.04%[5] | 83.3 | 0.24% |

Notes: [1]Estimated maximum annual GHG emissions at December 2021
[2]2020 estimates sourced from National Greenhouse Gas Inventory – Paris Agreement Inventory (https://ageis.climatechange.gov.au/).
[3] These emissions are based on the ongoing operations phase, not the construction phase
[4]At a state level Tasmania has net negative GHG emissions, as LULUCF sequesters more carbon dioxide than is emitted.
[5] A negative value means that these emissions reduce the net negative carbon budget for Tasmania by that fraction

## 6.2.2 GHG emission estimation: Scope 3

Estimated Scope 3 emissions for the Heybridge to Hazelwood Converter Station Option associated with the embedded emissions of major construction materials, transport of major construction materials and fossil fuels are summarised in Table 6 6. Scope 3 GHG emissions calculated for transport did not include the transport of the cable from overseas to Australia.

Table 6-6 Summary of estimated Scope 3 GHG emissions in $tCO_2$-e

| Component | GHG emissions ($tCO_2$-e) |
|---|---|
| Aggregate | 1,806 |
| Concrete | 25,579 |
| Steel | 125,806 |
| Transport | 9,462 |
| Diesel | 261 |
| Electricity | 12 |
| **TOTAL** | **162,926** |

## 6.3 Heybridge to Driffield Converter Station Option

### 6.3.1 GHG emissions estimation: Scopes 1 and 2

GHG emissions associated with the Heybridge to Hazelwood Converter Station Option have been considered and estimated on an annual basis. A summary of estimated Scope 1 and Scope 2 emissions associated with construction activities and ongoing operations, expressed as tonnes of carbon dioxide equivalent per annum ($tCO_2$ e/y) is presented in Table 6-7**.** GHG emissions associated with land clearing have been spread evenly over the five-year construction period associated with the Heybridge to Hazelwood Converter Station Option.

Maximum annual GHG emissions (Scope 1 + Scope 2) of 183,954 $tCO_2$-e are anticipated to occur from 2030 onwards. Ongoing operational emissions are predominantly associated with electricity transmission losses.

**Table 6-7 Summary of estimated annual Scope 1 and Scope 2 GHG emissions ($tCO_2$-e) and energy use (GJ) for the project assuming Heybridge to Driffield Converter Station Option**

| Scope | Year | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | Total 2025-30 | Ongoing |
|---|---|---|---|---|---|---|---|---|---|
| Scope 1 | Diesel consumption (vehicles) | 345 | 597 | 755 | 46 | - | - | 1,743 | 52 |
| | Diesel consumption (backup generators) | - | - | - | - | - | - | - | 29 |
| | Sea Cable | - | 154 | 77 | 77 | - | - | 308 | 0 |
| | SF6 leakage | - | - | - | - | - | - | - | 878 |
| | Land disturbance | 8,628 | 8,628 | 8,628 | 8,628 | 8,628 | - | 43,140 | 0 |
| Scope 2 | Electricity (use) | 45 | 89 | 89 | 89 | 89 | 15 | 416 | 6,518 |
| | Electricity loss (transmission) | - | - | - | - | - | - | - | 194,125 |
| TOTALS | Total (excl LULUCF)) | 390 | 841 | 922 | 213 | 89 | 15 | 2,470 | 201,602 |
| | Total (incl LULUCF) | 9,018 | 9,469 | 9,550 | 8,841 | 8,718 | 15 | 45,611 | 201,602 |
| Energy use (GJ) | | 4,923 | 11,025 | 13,561 | 2,865 | 300 | 6 | 32,680 | 3,117,045 |

The projected contribution of GHG emissions from the operation of the Heybridge to Hazelwood Converter Station are presented in Table 6-. The contribution to the national emissions is small at 0.04% and is a relatively small contribution to Victoria's GHG emissions including and excluding LULUCF.

**Table 6-8 Contribution of the Heybridge to Driffield Converter Station to state and national GHG emissions ($MtCO_2$-e) during operation**

| Inventory total | Project[1] | Australia[2,3] | | Tasmania[2,3] | | Victoria | |
|---|---|---|---|---|---|---|---|
| | Emissions ($MtCO_2$-e) | Emissions ($MtCO_2$-e) | Project % | Emissions ($MtCO_2$-e) | Project % | Emissions ($MtCO_2$-e) | Project % |
| Excluding LULUCF | 0.20 | 537 | 0.04% | 7.9 | 0.018% | 104.4 | 0.19% |
| Including LULUCF | 0.20 | 498 | 0.04% | -3.7[4] | -0.04%[5] | 83.3 | 0.24% |

Notes: [1]Estimated maximum annual GHG emissions at December 2021
[2]2020 estimates sourced from National Greenhouse Gas Inventory – Paris Agreement Inventory (https://ageis.climatechange.gov.au/).
[3] These emissions are based on the ongoing operations phase, not the construction phase
[4]At a state level Tasmania has net negative GHG emissions, as LULUCF sequesters more carbon dioxide than is emitted.
[5] A negative value means that these emissions reduce the net negative carbon budget for Tasmania by that fraction

### 6.3.2 GHG emission estimation: Scope 3

Estimated Scope 3 emissions for the Heybridge to Driffield Converter Station Option associated with the embedded emissions of major construction materials, transport of major construction materials and fossil fuels are summarised in Table 6-9. Scope 3 GHG emissions calculated for transport did not include the transport of the cable from overseas to Australia.

**Table 6-9 Summary of estimated Scope 3 GHG emissions in $tCO_2$-e**

| Component | GHG emissions ($tCO_2$-e) |
|---|---|
| Aggregate | 1,653 |
| Concrete | 25,579 |
| Steel | 122,097 |
| Transport | 8,908 |
| Diesel | 261 |
| Electricity | 12 |
| **TOTAL** | **158,510** |

## 6.4 $SF_6$

$SF_6$ gas is used to insulate high performance transformers. MLPL recognises that $SF_6$ has a high GWP (23,500 *cf* 1 for $CO_2$). Emissions of $SF_6$ can occur during the manufacture and filling of electrical switchgear, from leakage during operation, and during maintenance throughout the equipment's lifetime.

### 6.4.1 Heybridge site

An Air Insulated Substation (AIS) at Heybridge will require a footprint of 145m x 105m (15,225$m^2$) to provide the same function as the 2,584 $m^2$ footprint for the proposed Gas Insulated Substation (GIS). This is not considered practicable because of space limitations. An AIS yard will not be $SF_6$ free as current technology still requires this in the circuit breaker (CB) interrupters. This will still require approximately 95kg per CB across the 9 CBs in the proposal.

MLPL has explored alternatives and will be applying air insulated switchgear at the proposed Hazelwood or Driffield sites where space is not limited. Dry air insulated switchgear, and compounds such as decafluoro-2-methylbutan-3-one (C5-FK) and heptafluoro-2-methylpropanenitrile (C4-FN), are currently being developed and evaluated for use in high voltage systems but are not yet commercially available for use with 220kV and 500kV (Billen et al, 2020).

### 6.4.2 Waratah Bay site

MLPL is committed to applying alternative gases should these become commercially available and practicable.

The Waratah Bay site may contain a DC transition station to provide connection of two different suppliers of cable, in the event land and sea cables are provided from different suppliers. If the transition station is required a SF6 Gas insulted solution is proposed, as an enclosed AIS solution will be a very large DC hall similar to the converter station at Hazelwood.

## 6.5 Regulatory Obligations – NGER Scheme

The Heybridge Converter Station will not be required to report its emissions to NGER Schemes if considered solely as a facility, as its total emissions will be less than the 25 $ktCO_2$-e/y. However, the total projected emissions for the Heybridge to Hazelwood and Heybridge to Driffield Options exceed the 50 $ktCO_2$-e/y threshold for both facilities and corporations. Consequently, the Marinus Link project will have to report its operating emissions under the projected profile and current regulations.

## 6.6 Victorian Converter Station Options

The Heybridge to Driffield Option will produce approximately 7.4 $ktCO_2$-e/y fewer Scope 1 and Scope 2 emissions than the Heybridge to Hazelwood Option. Similarly, under current assumptions, the Heybridge to Driffield Option will produce approximately 64.4 $ktCO_2$-e/y fewer Scope 3 emissions than the Heybridge to Hazelwood Option.

# 7. REDUCING AND MITIGATING GHG EMISSIONS

The Commonwealth Government is likely to reduce the cap on emissions from industry as we move closer to 2030 and 2050. While there are GHG emissions associated with the construction and operation of Marinus Link, Katestone acknowledges that the project will contribute to Victoria and Australia's GHG emissions reduction challenge by supplying low-emission renewable energy from Tasmania to the NEM.

The following Environmental Performance Requirements (EPR) to reduce total emissions are proposed for the project in Table 7.1.

**Table 7-1 Environmental Performance Requirements**

| EPR ID | Environmental Performance Requirement | Project Stage |
|---|---|---|
| GHG01 | **GHG01: Minimise greenhouse gas emissions in construction**<br>• Prior to commencement of project works, identify opportunities to reduce Scope 1 and Scope 2 greenhouse gas emissions (as defined in the NGER Act) so far as reasonably practicable. Measures must be consistent with the Marinus Link Sustainability Framework and include consideration of:<br>o Use of low emission fuels<br>o Maintenance of equipment and vehicles<br>o Minimising vegetation clearance<br>o Purchase of green energy<br>o Procurement of energy efficient machinery<br>o Use of low carbon emission concrete<br>o Use of recycled materials<br>The design must include measures to avoid $SF_6$ leakage so far as reasonably practicable.<br>Scope 1 and Scope 2 GHG emissions during construction must be reported annually on the Marinus Link website | Construction |
| GHG02 | **GHG02: Report on GHG emissions in operation**<br>Prior to commencement of operation, identify opportunities to reduce operational Scope 1 and Scope 2 greenhouse gas emissions (as defined in the NGER Act) so far as reasonably practicable. Measures must be consistent with the Marinus Link Sustainability Framework and include consideration of:<br>• Management and maintenance of SF¬6 insulated equipment in accordance with Australian Standard IEC 62271.4: 2015 – high-voltage switchgear and controlgear – Part 4: Handling procedures for sulphur hexafluoride (SF¬6) and its mixtures and the Energy Network Australia Industry Guideline for SF6 Management (Document 022-2008) and prevention of release of SF¬6 by using | Operation |

| | | |
|---|---|---|
| | a closed cycle during installation, maintenance and decommissioning of equipment where practicable.<br>• Use of low emission fuels<br>• Maintenance of equipment and vehicles<br>• Purchase of green energy<br>• Procurement of energy efficient machinery<br>Scope 1 and Scope 2 emissions from operation must be reported annually on the Marinus Link website. | |

Katestone recommends that MLPL consider the following initiatives to reduce Scope 1, Scope 2, and Scope 3 emissions associated with the project to comply with the EPR. These are recent practices adopted in large construction projects, including the electricity sector.

Scope 1 emissions

- Use blended or 100% biodiesel where this is cost-effective and does not affect the performance of generators or vehicles.
- Ensure that generators and vehicles are maintained and properly tuned for fuel efficiency.
- Ensure that $SF_6$ insulated equipment is managed and maintained in accordance with *Australian Standard IEC 62271.4: 2015 – high-voltage switchgear and controlgear – Part 4: Handling procedures for sulphur hexafluoride ($SF_6$) and its mixture* and the Energy Network Australia Industry Guideline for SF6 Management (Document 022-2008).
- Prevent release of $SF_6$ by using a closed cycle during installation, maintenance, and decommissioning of equipment where practicable.
- Identify and implement options to replace $SF_6$ insulation with alternative gases with a lower GWP as soon as commercially available and practicable.
- Minimise the extent of vegetation clearance (and soil disturbance) for the construction footprint.

Scope 2 emissions

- Purchase green electricity from Tasmania and mainland sources for construction.
- Optimise machinery, processes, and control systems to ensure maximum energy efficiency during construction.
- Design for energy efficiency in machinery, processes, and control systems for operation of the Marinus Link.
- Ensure reduction in transmission losses by ensuring transformers are correctly sized and that connection quality of ancillary conductors is improved, where practicable.

Scope 3 emissions

- Require that concrete contain low emissions binders such as fly ash, blast furnace slag, biochar, and/or geopolymer cement.
- Substitute virgin sand and aggregate in concrete with recycled aggregate.
- Optimise haulage routes for efficient transportation, minimising stopping/starting and hills where practicable.
- Avoid extended periods of vehicle idling onsite.
- Require contractors to maintain vehicles to ensure highest fuel efficiency.

Offsetting emissions

MLPL may consider offsetting project emissions through (as available):

- Purchasing Australian Carbon Credit Units (ACCU) through the Clean Energy Regulator.
- Purchasing carbon credits or carbon removal certificates through reputable international carbon markets such as Puro.earth.
- Revegetating the construction footprint where practicable and/or revegetating other degraded land.

# 8. SUMMARY

Scope 1, 2, and 3 emissions were estimated for the proposed Heybridge Converter Station, the Heybridge to Hazelwood connection, and the Heybridge to Driffield connection (alternative option) by jurisdiction:

- Heybridge Converter Station (Tasmania)
  - Annual Scope 1 and Scope 2 GHG emissions over the construction phase of the project, including land clearing in Year 1, range between 3 and 232 $tCO_2$-e/y.
  - Total Scope 1 and Scope 2 GHG emissions over the construction period, including land clearing, are estimated to be 549 $tCO_2$-e.
  - Scope 3 emissions, including from concrete and steel for construction, are estimated to be 25,581 $tCO_2$-e.
  - Annual Scope 1 and Scope 2 GHG emissions during operation of the project are estimated to be 1,431 $tCO_2$-e/y.
  - GHG emissions contributions to the Tasmanian GHG emissions inventory will reduce the -3.7 $MtCO_2$-e buffer by approximately 0.04%.
  - The project is estimated to contribute <0.001% to the national GHG emissions inventory (as of December 2021) on an annual basis.
- Heybridge to Hazelwood project alignment (Tasmania, Commonwealth, Victoria)
  - Annual Scope 1 and Scope 2 GHG emissions over the construction period, including land clearing, range between 15 and 11,031 $tCO_2$-e/y.
  - Total Scope 1 and Scope 2 GHG emissions over the construction period, including land clearing, are estimated to be 53,015 $tCO_2$-e.
  - Scope 3 emissions, including from concrete and steel for construction, are estimated to be 162,926 $tCO_2$-e.
  - Maximum annual total GHG emissions (Scope 1 and Scope 2) during operation of the project are estimated to be 235,128 $tCO_2$-e/y.
  - The project is estimated to contribute no more than 0.05% of the national GHG emissions inventory (as of December 2021) on an annual basis during operation.
  - The project is estimated to contribute 0.22 – 0.24% to the annual Victorian GHG emissions inventory during operation.
- Heybridge to Driffield project alignment (Tasmania, Commonwealth, Victoria)
  - Annual Scope 1 and Scope 2 GHG emissions over the construction period, including land clearing, range between 15 and 9,550 $tCO_2$-e/y.
  - Total Scope 1 and Scope 2 GHG emissions over the construction period, including land clearing, are estimated to be 45,611 $tCO_2$-e.
  - Scope 3 emissions, including from concrete and steel for construction, are estimated to be 158,510 $tCO_2$-e.
  - Annual Scope 1 and Scope 2 GHG emissions during operation of the project are estimated to be 201,602 $tCO_2$-e/y.
  - The project is estimated to contribute no more than 0.04% of the national GHG emissions inventory (as at end of financial year 2020) on an annual basis during operation.

- The project is estimated to contribute 0.19 – 0.24% to the annual Victorian GHG emissions inventory during operation.

The Marinus Link will enable the delivery of low emissions electricity, estimated at 140 million tonnes of $CO_2$-e abatement per year by 2050, contributing towards Australia's GHG emissions reduction commitments under the Paris Agreement and updated NDC.

At a state level the project will also provide improved access to renewable energy and improve the efficiency of both Tasmania's and Victoria's electricity grid. Marinus Link will contribute to both the Tasmanian Government's and Victorian Government's goals of net zero greenhouse gas emissions by 2030 and 2050, respectively.

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# APPENDICES

# A1 GHG EMISSIONS ESTIMATION ASSUMPTIONS

## A1.1 Land disturbance and vegetation clearing

The area of land disturbance and potential vegetation clearance required was determined from vegetation cover data from the Tasmanian Land Use Live dataset and the Victorian Land Use Information System (VLUIS) overlaid with the project footprint shapefile (provided by MLPL). The areas reported in Table A1 are rounded up for presentation and the total is slightly higher than the actual value used in analysis. The carbon content stored in woody vegetation used to calculate potential GHG emissions is derived from FullCAM (DISER, 2020b) (Table A1) and will require field validation.

**Table A1 Details of land disturbance and vegetation clearance for the project**

| Groundcover | Stored carbon in woody groundcover vegetation (t/ha) | Waratah Bay to Hazelwood | Waratah Bay to Driffield |
|---|---|---|---|
| | | Area vegetation (ha) | Area vegetation (ha) |
| Pasture and grassland | 0 | 277 | 223 |
| Unclassified native vegetation[4] | 200 | 41 | 34 |
| Native woody cover (*Eucalyptus* woodland) | 180 | 30 | 25 |
| Hardwood plantation (*E. nitens*) | 57 | 6 | 5 |
| Softwood plantation (*Pinus radiata*) | 15 | 0.4 | 0.3 |

## A1.2 $SF_6$ leakage

The parameter used for the estimation of SF6 leakage are provided in Table A2.

**Table A2 $SF_6$ leakage estimation parameters**

| Parameter | Units | Heybridge | Waratah Bay | Hazelwood/Driffield |
|---|---|---|---|---|
| Annual leakage | kg | 22 | 8 | 7.35 |

## A1.3 Diesel usage

Diesel usage for construction activities was estimated based on the following assumptions:

- Construction schedule
- Vehicle trips per quarter provided for Tasmanian and both potential Victorian Converter Station Options
- Each vehicle travels 100km per three months
- Fuel usage rate for light vehicles is 12 litres per 100km and heavy vehicles is 28 litres per 100km.

[4] Actual vegetation classification and allocation of stored carbon will require field assessment

Diesel usage that has been used to estimate emissions is detailed in Table A3 to Table A7.

**Table A3 Diesel usage construction vehicles associated with land cable construction**

| Year | Quarter | Number of vehicles | | Diesel usage (L) | |
|---|---|---|---|---|---|
| | | Light vehicle | Heavy vehicle | Light vehicle | Heavy vehicle |
| 2024 | Q1 | 0 | 0 | 0 | 0 |
| 2024 | Q2 | 0 | 0 | 0 | 0 |
| 2024 | Q3 | 0 | 0 | 0 | 0 |
| 2024 | Q4 | 0 | 0 | 0 | 0 |
| 2025 | Q1 | 0 | 0 | 0 | 0 |
| 2025 | Q2 | 216 | 234 | 2,765 | 6,692 |
| 2025 | Q3 | 216 | 234 | 2,765 | 6,692 |
| 2025 | Q4 | 216 | 234 | 2,765 | 6,692 |
| 2026 | Q1 | 216 | 234 | 2,765 | 6,692 |
| 2026 | Q2 | 216 | 234 | 2,765 | 6,692 |
| 2026 | Q3 | 216 | 234 | 2,765 | 6,692 |
| 2026 | Q4 | 216 | 234 | 2,765 | 6,692 |
| 2027 | Q1 | 216 | 234 | 2,765 | 6,692 |
| 2027 | Q2 | 216 | 234 | 2,765 | 6,692 |
| 2027 | Q3 | 216 | 234 | 2,765 | 6,692 |
| 2027 | Q4 | 216 | 234 | 2,765 | 6,692 |
| 2028 | Q1 | 184 | 199 | 2,350 | 5,689 |
| 2028 | Q2 | 0 | 0 | 0 | 0 |
| 2028 | Q3 | 0 | 0 | 0 | 0 |
| 2028 | Q4 | 0 | 0 | 0 | 0 |
| 2029 | Q1 | 0 | 0 | 0 | 0 |
| 2029 | Q2 | 0 | 0 | 0 | 0 |
| 2029 | Q3 | 0 | 0 | 0 | 0 |
| 2029 | Q4 | 0 | 0 | 0 | 0 |
| 2030 | Q1 | 0 | 0 | 0 | 0 |
| **Sub totals** | | **2,560** | **2,773** | **32,763** | **79,305** |
| **Total** | | **5,333** | | **112,068** | |

**Table A4 Diesel usage construction vehicles associated with Heybridge Converter station**

| Year | Quarter | Movements per quarter | | Diesel usage (L) | |
|---|---|---|---|---|---|
| | | Light vehicle | Heavy vehicle | Light vehicle | Heavy vehicle |
| 2025 | Q2 | 0 | 353 | 0 | 10,096 |
| 2025 | Q3 | 0 | 1,131 | 0 | 32,347 |
| 2025 | Q4 | 100 | 779 | 1,280 | 22,279 |
| 2026 | Q1 | 240 | 459 | 3,072 | 13,127 |
| 2026 | Q2 | 300 | 526 | 3,840 | 15,044 |
| 2026 | Q3 | 300 | 526 | 3,840 | 15,044 |
| 2026 | Q4 | 300 | 503 | 3,840 | 14,386 |
| 2027 | Q1 | 240 | 229 | 3,072 | 6,549 |
| 2027 | Q2 | 120 | 209 | 1,536 | 5,977 |
| **Sub totals** | | **1,600** | **4,715** | **20,480** | **134,849** |
| **Total** | | **6,315** | | **155,329** | |

**Table A5 Diesel usage construction vehicles associated with transition station construction**

| Year | Quarter | Number of vehicles | | Diesel usage (L) | |
|---|---|---|---|---|---|
| | | Light vehicle | Heavy vehicle | Light vehicle | Heavy vehicle |
| 2027 | Q1 | 125 | 125 | 1,600 | 1,600 |
| 2027 | Q2 | 425 | 425 | 5,440 | 5,440 |
| 2027 | Q3 | 425 | 425 | 5,440 | 5,440 |
| 2027 | Q4 | 425 | 425 | 5,440 | 5,440 |
| 2028 | Q1 | 425 | 425 | 5,440 | 5,440 |
| **Sub totals** | | **1,825** | **1,825** | **23,360** | **23,360** |
| **Total** | | **3,650** | | **46,720** | |

**Table A6 Diesel usage construction vehicles associated with both Hazelwood or Driffield Victorian Converter Station Options**

| Year | Quarter | Number of vehicles | | Diesel usage (L) | |
|---|---|---|---|---|---|
| | | Light vehicle | Heavy vehicle | Light vehicle | Heavy vehicle |
| 2025 | Q2 | 0 | 213 | 0 | 6,092 |
| 2025 | Q3 | 0 | 471 | 0 | 13,471 |
| 2025 | Q4 | 0 | 459 | 0 | 13,127 |
| 2026 | Q1 | 0 | 477 | 0 | 13,642 |
| 2026 | Q2 | 0 | 476 | 0 | 13,614 |
| 2026 | Q3 | 0 | 476 | 0 | 13,614 |
| 2026 | Q4 | 0 | 334 | 0 | 9,552 |
| 2027 | Q1 | 0 | 209 | 0 | 5,977 |
| 2027 | Q2 | 0 | 209 | 0 | 5,977 |
| **Sub totals** | | **0** | **3,324** | **0** | **95,066** |
| **Total** | | **3,324** | | **95,066** | |

**Table A7 Diesel usage construction vehicles associated shore crossings**

| Year | Quarter | Tasmanian shore crossing | | | | Victorian shore crossing | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Number of vehicles | | Diesel usage (L) | | Number of vehicles | | Diesel usage (L) | |
| | | Light Vehicles | Heavy Vehicles | Light Vehicles | Heavy Vehicles | Light Vehicles | Heavy Vehicles | Light Vehicles | Heavy Vehicles |
| 2026 | Q4 | 552 | 736 | 7,066 | 21,050 | 552 | 736 | 7,066 | 21,050 |
| 2027 | Q1 | 546 | 728 | 6,989 | 20,821 | 546 | 728 | 6,989 | 20,821 |
| 2027 | Q2 | 546 | 728 | 6,989 | 20,821 | 546 | 728 | 6,989 | 20,821 |
| 2027 | Q3 | 552 | 736 | 7,066 | 21,050 | 552 | 736 | 7,066 | 21,050 |
| **Sub totals** | | **2,196** | **2,928** | **28,109** | **83,741** | **2,196** | **2,928** | **28,109** | **83,741** |
| **Total** | | **5,124** | | **111,850** | | **5,124** | | **111,850** | |

## A1.4 Sea cable fuel usage

The subsea cables will be laid in two campaigns, with the cable lay vessel re-supplied either from the factory or with cable from cable transport vessel. Re-supply of the cable lay vessel will occur in port. Diesel usage for the cable lay vessel was estimated based on the diesel consumption estimate provided by MLPL in Table A8. The diesel consumption summary for the cable lay vessel is presented in Table A9. Cable monitoring systems will be installed to identify the location of a cable fault. Seabed inspection using an ROV will occur periodically. No exclusion zone will be established over the subsea cables.

**Table A8 Subsea cable construction data**

| Vessel purpose | First Link – Expected Schedule | Second Link - Expected schedule | Estimated diesel consumption (tons) |
|---|---|---|---|
| Pre-lay survey (and clearance) | 56 days | 56 days | 594t (MMA data of 5 t/day) |
| Cable lay | 28 days | 28 days | 504 (assume average of 11t for cable burial DP operations) |
| Cable Burial | 42 days | 42 days | 420t (assumes 5t per day) |
| As built survey | 21 days | 21 days | 210t |
| TOTAL | | | 1728t |

**Table A9 Diesel usage construction vehicles associated with Victorian Converter station construction**

| Year | Quarter | Sea Cable Lay Vessel | |
|---|---|---|---|
| | | Days operational | Diesel usage (L) |
| 2024 | Q1 | 0 | 0 |
| 2024 | Q2 | 0 | 0 |
| 2024 | Q3 | 0 | 0 |
| 2024 | Q4 | 0 | 0 |
| 2025 | Q1 | 0 | 0 |
| 2025 | Q2 | 0 | 0 |
| 2025 | Q3 | 0 | 0 |
| 2025 | Q4 | 0 | 0 |
| 2026 | Q1 | 0 | 0 |
| 2026 | Q2 | 76 | 694,745 |
| 2026 | Q3 | 0 | 0 |
| 2026 | Q4 | 0 | 0 |
| 2027 | Q1 | 0 | 0 |
| 2027 | Q2 | 0 | 0 |
| 2027 | Q3 | 0 | 0 |
| 2027 | Q4 | 85 | 777,017 |
| 2028 | Q1 | 58 | 530,200 |
| 2028 | Q2 | 0 | 0 |
| 2028 | Q3 | 0 | 0 |

| Year | Quarter | Sea Cable Lay Vessel | |
|---|---|---|---|
| | | Days operational | Diesel usage (L) |
| 2028 | Q4 | 8 | 73,131 |
| 2029 | Q1 | 0 | 0 |
| 2029 | Q2 | 0 | 0 |
| 2029 | Q3 | 0 | 0 |
| 2029 | Q4 | 8 | 73,131 |
| 2030 | Q1 | 0 | 0 |
| **Total** | | **235** | **2,148,224** |

## A1.5 Transmission losses

The specifications for the project call for a maximum transmission loss of 25MW within the cable at full load, or a 3.3% transmission loss. This is close to the published figure of 3% for undersea cables (Gordonnat and Hunt, 2020).

## A1.6 Electricity

In the absence of specific project information, electricity consumption was based on North West Transmission Developments Project. The use of similar construction intensity and activities was the basis for this assumption. It was assumed that 615 MWh over the 6 years of construction will be used.

Operational power consumption has been calculated based on information provided for the power consumption at the converter stations.

- Heybridge converter station has a power consumption approximately 700kW
- Hazelwood / Driffield Converter Station Options have a power consumption of approximately 700kW
- Transition station has a power consumption of approximately 10kW.

# Appendix J. Social Impact Assessment

J.1 Social Impact Assessment

J.2 Social Impact Assessment Addendum

# Marinus Link

## Heybridge Social Impact Assessment

May 2024

# MARINUS LINK

## QUALITY INFORMATION

### Revision history

| Revision | Description | Date | Author | Reviewer | Approver |
|---|---|---|---|---|---|
| 0 | Final | 16/05/2024 | TP | KW | KW |

### Restriction on Disclosure and Use of Data



The front cover image depicts Tasmania's north west coastline, north-west of Heybridge.

Source: Community Update – Tasmania Marinus Link

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# EXECUTIVE SUMMARY

**Background**

Marinus Link Pty Ltd (MLPL) proposes to construct and operate a second electricity interconnector between Tasmania and Victoria, known as Marinus Link. The main components of Marinus Link are a converter station at Heybridge Tasmania, a subsea cable under Bass Strait that leads to a transition station at Waratah Bay in Victoria before continuing underground to a converter station located in the Latrobe Valley.

This report presents the social impact assessment (SIA) of the Tasmania terrestrial and marine components of the Marinus Link. The social impacts of the project are considered for the populations that live in the local study area (Heybridge State) and the regional study areas (Burnie City and Central Coast local government areas).

**Impact assessment methodology**

A significance assessment approach was applied to assess the impacts on social values, determined by the sensitivity of the value itself and the magnitude of the change it experiences.

Sensitivity is determined by assessing uniqueness or rarity, importance, resilience to change and replacement potential. Key sources for determining the sensitivity of a value include community consultation feedback and the social baseline outcomes.

Whilst magnitude is determined based on the criteria of severity, affected population and duration. Technical reports and project activities have determined the magnitude ratings.

**Social baseline**

A social baseline was established for the local and regional study areas using data from the Australian Bureau of Statistics 2021 census, government reports and academic publications. More than 100 stakeholders were invited to participate in the SIA, including local government, service providers, community groups and residents. A small number provided their feedback and views during one-on-one interviews with independent consultants. Data from the SIA consultation and ongoing project engagement informed the identification of the social impacts of the project and associated management measures to mitigate the identified impacts and a range of initiatives to enhance the range of benefits from the project.

The social baseline highlighted the following:

- The median household income in the local and regional study areas is lower than the median in Tasmania.
- Unemployment rates in the Central Coast LGA have generally been under that of the state; however, Tasmania has historically had unemployment rates above that of mainland Australia. The exception is the Burnie LGA, where unemployment rates have consistently been above that of the state.
- Youth unemployment is an issue in the region. As of August 2022, the youth unemployment rate for males was 10 %, for females was 8.5 % in the west and north-west region, with youth unemployment at 12 % in Tasmania.

The key social values and sensitivity ratings are detailed below:

| Social value | Attributes and indicators | Sensitivity |
|---|---|---|
| **Community identity** | Amenity and landscape | Very sensitive |
| | Natural resources and ecology | Very sensitive |
| **Economy and livelihood** | Employment and workforce | Very sensitive |
| | Industry and business | Very sensitive |
| | Housing affordability and availability | Extremely sensitive |
| | Socio-economic dis/advantage | Very sensitive |
| **Infrastructure and services** | Community infrastructure and services – health and wellbeing | Sensitive |
| | Community infrastructure – childcare | Very sensitive |
| | Physical infrastructure – connectivity | Very sensitive |
| | Physical infrastructure – safety and capacity | Very sensitive |
| **People's productive capacities** | Health – physical and mental | Very sensitive |
| | Education, training, and skills | Sensitive |
| | Health – physical and mental | Very sensitive |

**Impact assessment pre-mitigation**

The impact assessment, before mitigation and enhancement measures, identified:

- Eight impacts of major negative impacts, seven during construction and one during operation.
- Eight negative impacts of high significance, with six during construction and two in the operation phase.
- Two positive impacts of high significance, during the operational phase.
- Ten impacts of moderate significance, of which four are positive impacts.
- Five impacts of low significance, of which four are positive impacts.

***Environmental Performance Requirements (EPRs)***

The technical assessments that have informed this evaluation have identified a range of EPRs aimed at mitigating potential adverse impacts and maximising the realisation of benefits. The purpose of adhering to these EPRs is to minimise the project's impacts and the risk of harm to environmental, social, and cultural values within reasonable limits, taking into account contextual factors and the practical execution of the project. By following the prescribed EPRs, the project strives to strike a balance between minimising negative effects and ensuring the practical and responsible delivery of the project while safeguarding the relevant environmental, social, and cultural considerations.

A key EPR is the development of a SIMP (EPR S01 Tas), an overarching plan to monitor and manage social impacts. The SIMP will be developed before construction, in consultation with agencies, stakeholders and the affected community to be specific to locations along the alignment. The SIMP will draw on the supporting engagement, management and action plans that detail specific mitigation measures and management strategies; these include the workforce and accommodation strategy (EPR S02 Tas) and the community and stakeholder engagement framework (EPR S03 Tas).

**Residual impacts**

The residual impact assessment determined no major impacts remained and eleven high residual impacts were identified; of which three are positive. These are summarised below and in the following table.

*Negative*

- After-hours construction works may concern neighbouring residents, including the new residential development that consists of six hamlets for residential subdivision, being constructed at Devonshire Drive Hamlet in the Heybridge Residential Nature Reserve.
- The converter station will be visible from the southern edge of the Bass Highway. It will also be a dominant view from the exit of the tioxide beach foreshore reserve, the only visitor access point and informal parking area, and this may impact the community's strong values linked to character and amenity.
- The project's construction may contribute to the demand for construction workers and attract employees away from local businesses. This may reduce the availability of these workers for other industries, and result in increased lead times for other types of construction or workforce shortages for local businesses.
- The project's workforce may contribute to the demand for rental housing in the regional study area and exacerbate existing rental availability and affordability issues, disproportionally affecting very low- and low-income households.
- The project's construction workforce may increase demand for childcare providers, compromising service provision to the existing local and regional community.
- Construction fatigue, given night works are expected to occur seven days a week for up to 12 months, are expected to exceed average noise levels that result in sleep disturbance.
- Community members may experience impacts to physical and mental health due to construction fatigue and ongoing after hours works. The community members in the study area may experience stress, anxiety or frustration due to a lack of understanding of the project's scope, the cumulative impacts of projects in the area and the lack of perceived local benefits.
- Concern about the project's potential impacts (e.g. EMF, operational noise) may result in feelings of stress, anxiety and frustration for surrounding residents and communities.

*Positive*

- A residual positive high impact rating has been determined for the support of local businesses through the purchase of goods and services required to support the project's development.
- The project is expected to result in large taxation receipts ($762 million in total from 2025 to 2050) from the economic activity generated by the project, which will flow to local, state and the Australian Government.
- Another positive impact is that the project may add to the health and wellbeing of residents in the study area through investments in community infrastructure, the potential for downward pressure to be placed on the market regarding energy prices, as well as greater telecommunication security through expansion of the supply-side infrastructure.

| Potential impact | Pre-mitigated impact assessment | | | Residual impact assessment | |
|---|---|---|---|---|---|
| | Sensitivity | Magnitude | Significance | Magnitude | Significance |
| : Construction activity undertaken outside of regular working hours to complete shore crossing works with noise levels exceeding sleep disturbance measure. | **Very sensitive** | **Major** | Major | **Moderate** | High |
| **Negative**: Visual amenity: View of the converter stations from the southern edge of the Bass Highway and the converter stations will be a dominant view from the exit of the tioxide beach foreshore reserve, the only visitor access point and informal parking area. | Very sensitive | Major | Major | Moderate | High |
| **Negative**: The project's construction will generate demand for construction workers, potentially drawing employees from other construction projects, industry sectors and local businesses. Due to this potential constraint on the workforce, there may be longer lead times for other construction projects and possible workforce shortages in the study area. | Very sensitive | Moderate | High | Unchanged | High |
| **Negative**: The project's workforce may contribute to the demand for rental housing in the regional study area and exacerbate existing rental availability and affordability issues, disproportionally affecting very low- and low-income households. | Very sensitive | Major | Major | Moderate | High |
| **Negative**: The project's construction workforce may increase demand for childcare providers, compromising service provision to the existing local and regional community | Very sensitive | Moderate | High | Unchanged | High |
| **Negative**: Construction fatigue, given night works are expected to occur seven days a week for up to 12 months, are expected to exceed average noise levels that result in sleep disturbance at the Devonshire Drive Hamlet. | Very sensitive | Major | Major | | High |
| **Negative**: Lack of understanding of the project's scope, cumulative impacts of projects in the areas and not seeing local benefit. | Very sensitive | Major | Major | Moderate | High |
| **Negative**: Concern about the project's potential impacts (e.g. EMF, operational noise) may result in feelings of stress, anxiety and frustration for surrounding residents and communities | Very sensitive | Moderate | High | Unchanged | High |
| **Positive:** The project's construction will support local businesses through the goods and services required to support the project's development. | Very sensitive | Minor | Moderate | Moderate | High |

| Potential impact | Pre-mitigated impact assessment | | | Residual impact assessment | |
|---|---|---|---|---|---|
| | Sensitivity | Magnitude | Significance | Magnitude | Significance |
| **Positive:** The project is expected to result in large taxation receipts ($762 million in total from 2025 to 2050) from the economic activity generated by Marinus Link, which will flow to local, state and the Australian Government. | Very sensitive | Moderate | High | Unchanged | High |
| **Positive:** The project may add to the health and wellbeing of residents in the study area through investments in community infrastructure, the potential for downward pressure to be placed on the market regarding energy prices, as well as greater telecommunication security through expansion of the supply-side infrastructure. | Very Sensitive | Moderate | High | Unchanged | High |

### Cumulative impacts

Fourteen projects were considered for the cumulative assessment; these projects are in the environs of the proposed Heybridge converter station. The approach to cumulative impact assessment is an adaptive environmental management approach, adopting ongoing proactive use of management plans involving monitoring, evaluation, and mitigation.

The cumulative assessment highlighted the need for a collaborative approach between the government and industry to manage accommodation requirements, availability of the construction workforce and impacts on local services and infrastructure.

# GLOSSARY AND ABBREVIATIONS

| Term | Descriptions |
|---|---|
| **ABS** | Australian Bureau of Statistics |
| **DCCEEW** | Australian Department of Climate Change, Energy, Environment and Water |
| **DTP** | Victorian Department of Transport and Planning |
| **EE Act** | Environment Effects Act 1978 (Vic) |
| **EES** | Environment effects statement |
| **EIS** | Environmental impact statement |
| **EMPCA** | Environmental Management and Pollution Control Act 1994 (Tas) |
| **EPBC Act** | Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) |
| **HVAC** | High voltage alternating current |
| **HVDC** | High voltage direct current |
| **MLPL** | Marinus Link Pty Ltd |
| **MW** | Megawatt |
| **NEM** | National Electricity Market |
| **SIMP** | Social impact management plan |
| **SIA** | Social Impact Assessment |
| **Tas Networks** | Tasmanian Networks Pty Ltd |
| **Tasmanian EPA** | Tasmanian Environment Protection Authority |

# 1. INTRODUCTION

The proposed Marinus Link (the project) comprises a high voltage direct current (HVDC) electricity interconnector between Tasmania and Victoria, to allow for the continued trading and distribution of electricity within the National Electricity Market (NEM).

The project was referred to the Australian Minister for the Environment 5 October 2021. On 4 November 2021, a delegate of the Minister for the Environment determined that the proposed action is a controlled action as it has the potential to have a significant impact on the environment and requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) before it can proceed. The delegate determined that the appropriate level of assessment under the EPBC Act is an environmental impact statement (EIS).

In July 2022 a delegate of the Director of the Environment Protection Authority Tasmania determined that the project be subject to environmental impact assessment by the Board of the Environment Protection Authority (the Board) under the *Environmental Management and Pollution Control Act 1994* (Tas) (EMPCA).

On 12 December 2021, the former Victorian Minister for Planning under the Environment Effects Act 1978 (Vic) (EE Act) determined that the project requires an environment effects statement (EES) under the EE Act, to describe the project's effects on the environment to inform statutory decision making.

As the project is proposed to be located within three jurisdictions, the Tasmanian Environment Protection Authority (Tasmanian EPA), Victorian Department of Transport and Planning (DTP), and Australian Department of Climate Change, Energy, Environment and Water (DCCEEW) have agreed to coordinate the administration and documentation of the three assessment processes. Two EISs are being prepared to address the Tasmanian EPA requirements for the Heybridge converter station and shore crossing. A separate EIS/EES is being prepared to address the requirements of DTP and DCCEEW.

This report has been prepared by RPS and Tetra Tech Coffey for the Tasmanian jurisdiction as part of the two EISs being prepared for the project.

## 1.1 PURPOSE OF THIS REPORT

This report has been prepared to inform the environmental impact assessment of the components of the project within Tasmania, addressing the EMPCA and EPBC Act assessment guidelines described in Section 2. The social impact assessment (SIA) considers potential socio-economic impacts and benefits to people's community identity; economy and livelihoods; infrastructure and services; and people's productive capacity. For the purposes of this assessment, 'people' refers to individuals, households, groups, communities or organisations.

This report aims to assess the potential social impacts and benefits of constructing and operating the project. The report:

- describes the existing social baseline conditions of potentially affected communities and groups in the project study area.
- uses an integrated approach to assess potential social impacts and benefits of constructing and operating the project; and
- considers cumulative impacts that may occur as a result of concurrent projects.
- The methodology for the assessment is described in Section 5.

## 1.2 PROJECT OVERVIEW

The project is a proposed 1500 megawatt (MW) HVDC electricity interconnector between Heybridge in North West Tasmania and the Latrobe Valley in Victoria (Figure 1-1). The project is proposed to provide a second link between the Tasmanian renewable energy resources and the Victorian electricity grids enabling efficient energy trade, transmission and distribution from a diverse range of generation sources to where it is most needed, and will increase energy capacity and security across the NEM.

Marinus Link Pty Ltd (MLPL) is the proponent for the project and is a wholly owned subsidiary of Tasmanian Networks Pty Ltd (TasNetworks). TasNetworks is owned by the State of Tasmania and owns, operates and maintains the electricity transmission and distribution network in Tasmania.

Tasmania has significant renewable energy resource potential, particularly hydroelectric power and wind energy. The potential size of the resource exceeds both the Tasmanian demand and the capacity of the existing Basslink interconnector between Tasmania and Victoria. The growth in renewable energy generation in mainland states and territories participating in the NEM, coupled with the retiring of baseload coal-fired generators, is reducing the availability of dispatchable generation that is available on demand.

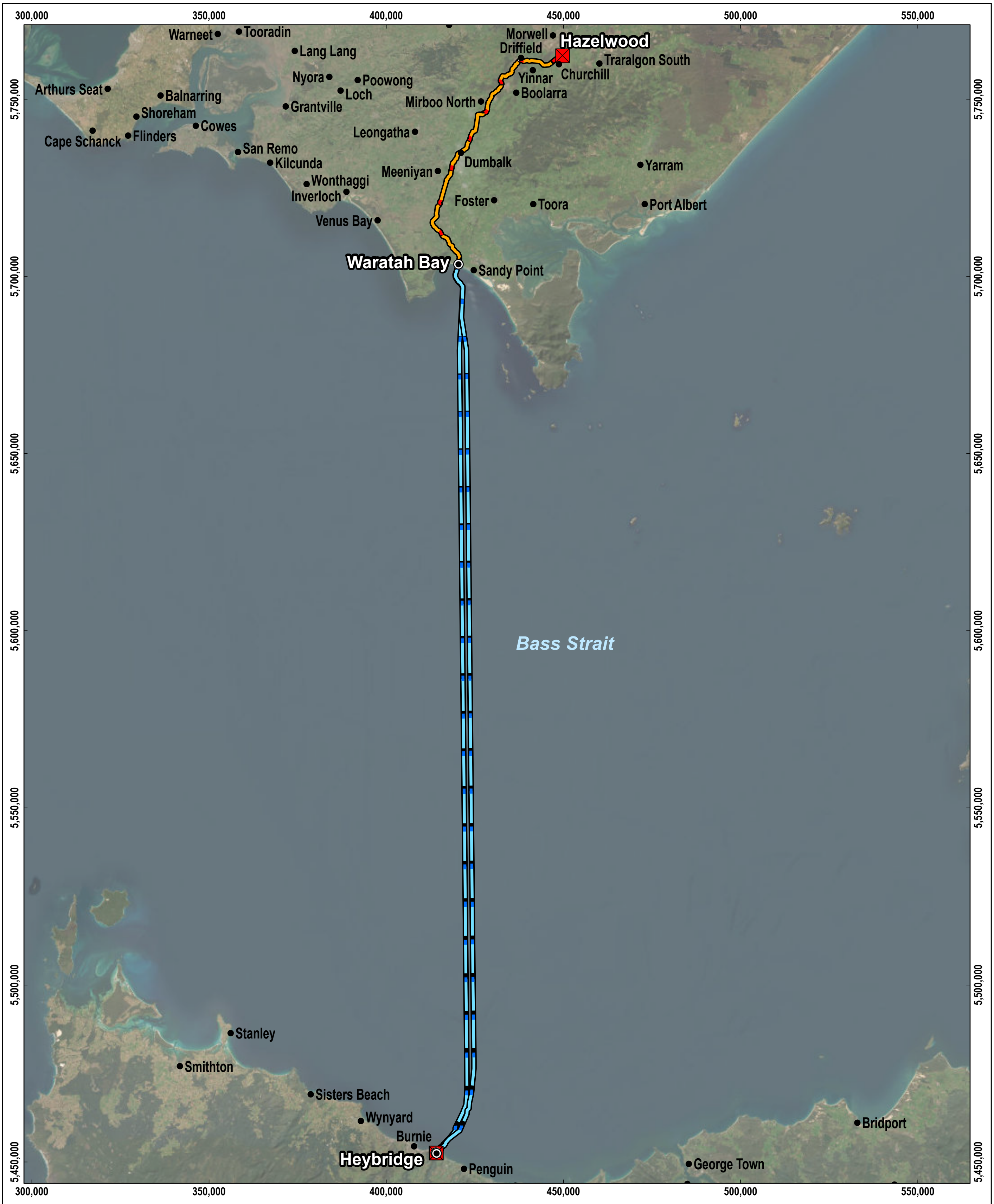
Tasmania's existing and potential renewable resources are a valuable source of dispatchable generation that could benefit electricity supply in the NEM. The project will allow for the continued trading, transmission and distribution of electricity within the NEM. It will also manage the risk to Tasmania of a single interconnector across the Bass Strait and complement existing and future interconnectors on mainland Australia. Marinus Link is expected to facilitate the reduction in greenhouse gas emissions at a state and national level.

Interconnectors are a key feature of the future energy landscape. They allow power to flow between different regions to enable the efficient transfer of electricity from renewable energy zones to where the electricity is needed. Interconnectors can increase the resilience of the NEM and make energy more secure, affordable and sustainable for customers. Interconnectors are common around the world including in Australia. They play a critical role in supporting Australia's transition to a clean energy future.

## 1.3 ASSESSMENT CONTEXT

A social impact is defined as a change that impacts upon the social values, wellbeing and way of life that the residents and stakeholders highly value within a potentially affected community. Examples of social impacts include changes to the local and regional economy from a project that could lead to positive outcomes such as more employment opportunities or negative outcomes such as reduced viability of industries such as manufacturing.

A SIA is the process of identifying the intended and unintended social consequences of a project. The results of consultation with potentially affected stakeholders informs the development of each SIA. All potential issues and benefits affecting people within the study areas, either directly or indirectly, are pertinent to SIAs.




**LEGEND**

- Landfall
- Converter station
- HVDC subsea cable
- Underground HVDC cable
- Cable option not progressing

MARINUS LINK

SCALE 1:1,500,000 (0 – 15 – 30 km)
PAGE SIZE: A4
PROJECTION: GDA2020 MGA Zone 55

SOURCE
Proposed route from Tetra Tech Coffey.
Imagery from ESRI Online.

MARINUS LINK PTY LTD
MARINUS LINK

**FIGURE 1-1**

**Project overview**

TETRA TECH COFFEY

DATE: 16.05.24 PROJECT: 754-MELEN215878ML FILE: 215878ML

# 2. ASSESSMENT GUIDELINES

This section outlines the assessment guidelines relevant to social impacts and the linkages to other technical assessments completed for the project. Two separate EISs are being prepared to address the EIS guidelines published by EPA Tasmania for the Heybridge converter station and shore crossing.

DCCEEW have published the following guidelines for the EIS: '*Guidelines for the Content of a Draft Environmental Impact Statement – Environment Protection and Biodiversity Conservation Act 1999 – Marinus Link underground and subsea electricity interconnector cable (EPBC 2021/9053)*' (EIS guidelines).

The relevant sections of the Commonwealth EIS guidelines addressed in this report are outlined in Table 2-1.

**Table 2-1 Commonwealth EIS guidelines relevant to SIA**

| Aspects to be assessed | EIS guidelines section | Scoping Requirement | SIA Section |
|---|---|---|---|
| Description of the existing environment | Section 4.2 | The EIS must include a description of the environment of the proposed site and the surrounding areas that may be impacted by the action. The description should also include information on the importance and value of potentially impacted environmental features at the local and regional scale. The description must be sufficiently detailed to inform the assessment of impacts with greater detail provided for the species, habitats, and environmental features with the greatest potential impact. At a minimum, this section must include detail of:<br>Cultural heritage values (Indigenous and non-Indigenous); people and communities and other relevant social considerations. | Section 7 |
| Cumulative impacts | Section 5.11 | The EIS should identify and address cumulative impacts, where potential project impacts are in addition to the existing impact of other activities. Cumulative impacts must be considered in terms of the potential overall consequence or magnitude of impact on each of the MNES. The assessment of cumulative impacts must include the following:<br>• review and analysis of residual impacts of the proposed development and of other known proposals where there may be a spatial or temporal overlap.<br>• consideration of the potential for cumulative impacts on the resilience of any important population of listed marine species, migratory species, threatened species and ecological communities and on overall habitat quality and availability; and<br>• discussion of the potential for existing pressures and threats to be exacerbated by the proposed development. | Section 10 |
| Economic impacts | Section 9 | The economic and social impacts of the proposed action, both positive and negative, must be analysed and provided in the EIS. Matters of interest may include:<br>• details of any public consultation activities undertaken, or that will be undertaken, and their outcomes (including identification of affected parties and their views);<br>• overview of the economic costs and benefits of the project; and<br>• employment opportunities expected to be generated by the project (including construction and operational phases); and<br>• details of the relevant cost and benefits of alternative options to the proposed action. | Section 9 |

| Aspects to be assessed | EIS guidelines section | Scoping Requirement | SIA Section |
|---|---|---|---|
| Consultation | Section 10.1 | Any consultation about the action, including:<br>consultation that has taken place;<br>• proposed consultation about relevant impacts of the action;<br>• if there has been consultation about the proposed action, any documented response to, or the result of, the consultation; and<br>• identification of affected parties, including a statement mentioning any communities that may be affected and describing their views. | Section 6 |

## 2.1 EPA TASMANIA GUIDELINES

EPA Tasmania has published two sets of guidelines (September 2022) for the preparation of an EIS for the Marinus Link converter station and shore crossing. A separate set of guidelines have been prepared for each of these project components:

- *Environmental Impact Statement Guidelines Marinus Link Pty Ltd Converter Station for Marinus Link*, September 2022, Environment Protection Authority Tasmania (Tasmanian converter station EIS guidelines); and
- *Environmental Impact Statement Guidelines Marinus Link Pty Ltd Shore Crossing for Marinus Link*, September 2022, Environment Protection Authority Tasmania (Tasmanian shore crossing EIS guidelines).

The sections relevant to the social impact assessment are provided in Table 2-2.

**Table 2-2 EIS scoping requirements relevant to SIA**

| Aspects to be assessed | EPA (Converter station/shore crossing) | Scoping Requirement | SIA Section |
|---|---|---|---|
| Socio-economic aspects | Section 5.3 and Section 9.3 | A summary of the social or demographic characteristics of the population living in the vicinity of the proposal site, identifying any special characteristics which may make people more sensitive to impacts from the proposal than might otherwise be expected. | Section 7 |
| | | A summary of the characteristics of the local and regional economy. | Section 7.3 |
| | | Human uses of the area may be impacted by or interact with the proposal. | Sections 9.2.1.4 and 9.2.1.5 |
| Potential impacts | Section 6 and Section 10 | Outline the potential environmental, social and economic impacts of the proposal (positive and negative) through all stages, including construction, operation and closure, in the absence of special control measures. Any foreseeable variations in impacts during the start-up and operational phases should be identified. Include an analysis of the significance of the relevant impacts. | Section 9 |
| | | Identify the environmental performance requirements to be achieved for each environmental impact and provide evidence to demonstrate that these can be complied with. These may be standards or requirements specified in legislation, codes of practice, state policies, national guidelines (including relevant recovery plans or | Section 9.7 |

| Aspects to be assessed | EPA (Converter station/shore crossing) | Scoping Requirement | SIA Section |
|---|---|---|---|
| | | conservation advice) or as determined by agreement with the assessing agencies. | |
| Socio-economic issues | Section 6.11/ Section 6.12 | The impacts on local and State labour markets for both the construction and operational phases of the proposal. The number and nature of direct and indirect jobs arising from the proposal must be detailed. Skills and training opportunities should also be discussed. | Section 9.3 |
| | | The impacts on upstream/downstream industries, both locally and for the State. | Section 9.3 |
| | | A qualitative assessment of impacts on local social amenity and community infrastructure, including recreational, cultural, health and sporting facilities and services. Any proposals to enhance or provide additional community services or facilities should be described. | Section 9.4 |
| | | Impacts on land values and demand for land and housing. | Section 9.3.1.4 |
| | | Impacts on the local, regional, state, and national economies. | Section 9.3 |
| | | Human uses of the area may be impacted by or interact with the proposal. | Section 9.2 |
| Mitigation measures | Section 6 and Section 10 | Describe the measures proposed to avoid or mitigate potential adverse impacts (having regard to best practice environmental management as defined in the EMPC Act) in order to achieve the environmental performance requirements (such as through pollution control technology or management practices). | Section 9, |
| Residual impacts | | Describe the measures proposed to avoid or mitigate potential adverse impacts in order to achieve the environmental performance requirements. | Section 9.7 |
| Cumulative impacts | Section 6.16 and Section 10.16 | Provide an assessment of the potential cumulative impacts of the proposal in the context of existing and approved projects in the region. | Section 10 |

### 2.1.1 EIS Objective

The Tasmania EPA guidelines set out the objectives of the EIS relevant and the section relevant to the SIA are, as follows:

- Information for individuals and groups to gain an understanding of the proposal, the need for the proposal, the alternatives, the environment that it could affect, the positive and negative environmental impacts that may occur and the measures that will be taken to maximise positive outcomes, and minimise any adverse environmental impacts, including specific management measures.
- A basis for public consultation and informed comment on the proposal.
- A framework against which decision makers, particularly the Board, and sometimes the relevant Planning Authority, can consider the proposal and determine the conditions under which any approval might be given.

## 2.2 LINKAGES TO OTHER REPORTS

As noted by Vanclay (2003), the social, economic, and biophysical domains of an environment are inherently interrelated and "change to any of these domains leads to changes in the other domains".

This report is informed by or informs the technical assessments outlined in Table 2-3.

**Table 2-3 Connections to other technical assessments**

| Technical assessment | Relevance to this SIA |
|---|---|
| Heybridge terrestrial ecology assessment (Entura, 2023) | The findings and recommendations of the ecological impact assessment have informed the assessment of concerns about potential impacts on significant fauna species. |
| Air quality assessment (Katestone, 2023) | The findings and recommendations of the air quality assessment have informed the assessment of potential changes to amenity and character. |
| Noise and vibration assessment (Marshall Day, 2023) | The findings and recommendations of the noise impact assessment have informed the assessment of potential changes to amenity and character. |
| Landscape and visual impact assessment (Landform Architects, 2023) | The findings and recommendations of the landscape and visual impact assessment have informed the assessment of potential changes to amenity and character. |
| Traffic and transport assessment (Stantec, 2023) | The findings and recommendations of the traffic risk assessment have informed the assessment of potential changes to the transport network. |
| Contaminated land assessment (Tetra Tech Coffey, 2023) | The findings and recommendations of the contaminated land assessment have informed the assessment of potential risks due to potential contamination at the former industrial site where the converter station will be constructed. |
| Electromagnetic field and EMI Assessment (JMME, 2023) | The findings and recommendations of the EMI assessment have informed the assessment of potential impacts on human health because of EMI and EMF generated by the project. |
| Marine ecology and resource assessment (EnviroGulf, 2023) | The findings and recommendations of marine ecology and resource use assessment have informed the assessment of potential impacts on the marine environment. |
| Economics assessment (SGS, 2023) | The findings economic impact assessment has informed the assessment of potential changes to employment, workforce availability, and economic contribution to the study area. |
| Summary Community and stakeholder engagement report (July 2018 – December 2022) | The report provides a summary of community consultation activities and themes/areas of interest raised by stakeholders. These outcomes are important in understanding community values, concerns and opportunities. |

# 3. LEGISLATION, POLICY AND GUIDELINES

The content or methods for completing an SIA are not prescribed in Tasmanian legislation or guidelines. The International Association for Impact Assessment (IAIA) published a guideline for SIA (Vanclay, Esteves, Aucamp, Franks 2015) which informed the content and process adopted in the development of this SIA.

The cumulative assessment was undertaken in line with the International Finance Corporation's *Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (2013).*

The SIA also had regard for the following guidelines:

- Social Impact Assessment Guideline (NSW DPIE February, 2023);
- Technical Supplement - Social Impact Assessment Guideline for State Significant Projects (NSW DPIE February, 2023);
- International Finance Corporation Environmental and Social Performance Standards (IFC, 2012); and
- Coordinator-General's Social Impact Assessment Guideline (QLD DSDILGP, 2018).

# 4. PROJECT DESCRIPTION

## 4.1 OVERVIEW

The project is proposed to be implemented as two 750 MW circuits to meet transmission network operation requirements in Tasmania and Victoria. Each 750 MW circuit will comprise two power cables and a fibre-optic communications cable bundled together in Bass Strait and laid in a horizontal arrangement on land. The two 750 MW circuits will be installed in two stages with the western circuit being laid first as part of stage one, and the eastern cable in stage two.

The key project components for each 750 MW circuit are, from south to north are:

- HVAC switching station and HVAC-HVDC converter station at Heybridge in Tasmania. This is where the project will connect to the North West Tasmania transmission network being augmented and upgraded by the North West Transmission Developments (NWTD).
- Shore crossing in Tasmania adjacent to the converter station.
- Subsea cable across Bass Strait from Heybridge in Tasmania to Waratah Bay in Victoria.

In Tasmania, a converter station is proposed to be located at Heybridge near Burnie. The converter station will facilitate the connection of the project to the Tasmanian transmission network. There will be two subsea cable landfalls at Heybridge with the cables extending from the converter station across Bass Strait to Waratah Bay in Victoria. The preferred option for shore crossings is horizontal directional drilling (HDD) to about 10 m water depth where the cables will then be trenched, where geotechnical conditions permit.

Approximately 255 kilometres (km) of subsea HVDC cable will be laid across Bass Strait. The preferred technology for the project is two 750 megawatt (MW) symmetrical monopoles using ±320 kV, cross-linked polyethylene insulated cables and voltage source converter technology. Each symmetrical monopole is proposed to comprise two identical size power cables and a fibre-optic communications cable bundled together. The cable bundles for each circuit will transition from approximately 300 m apart at the HDD (offshore) exit to 2 km apart in offshore waters.

This assessment is focused on the Tasmanian terrestrial and shore crossing section of the project. This report will inform the two EISs being prepared to assess the project's potential environmental effects in accordance with the legislative requirements of the Tasmanian government (Figure 4-1).

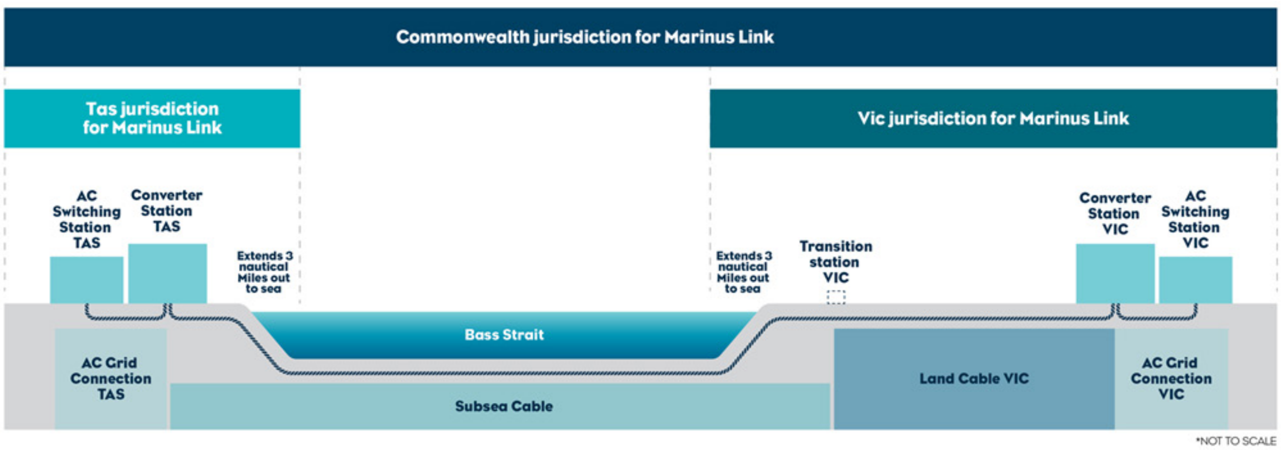



**Figure 4-1 Project components considered under applicable jurisdictions (Marinus Link Pty Ltd 2022)**

The project is proposed to be constructed in two stages over approximately five years following the award of works contracts to construct the project. On this basis, stage 1 of the project is expected to be operational by

2030, with Stage 2 to follow, with final timing to be determined by market demand. The project will be designed for an operational life of at least 40 years.

## 4.2 CONSTRUCTION

Activities that are relevant for assessing the impacts on the potentially affected parties and social values include the construction of the Heybridge converter station and shore crossing construction using HDD.

## 4.3 HEYBRIDGE CONVERTER STATION

The Heybridge converter station will connect the subsea cables to the Tasmanian 220 kV HVAC network. The overhead steel lattice gantries will terminate at the site and connect to a switching station which is connected to the converter stations. Internal roads will be constructed within the converter station site to provide access between buildings.

The construction of the converter station will also include the delivery of transformers to the site. The transport arrangements for this piece of equipment are significant in size, consisting of a vehicle approximately 130 m long and 650 tonnes.

It is expected the Heybridge Converter Station construction will take to be up to 36 months. Construction activities will occur six days per week, from 7:00 am to 4:00 pm.

Converter station construction involves the following activities:

- Site preparation, surveying and vegetation clearing as needed.
- Establishing construction site offices and amenities, and laydown areas.
- Bulk earthworks to construct the converter station bench. Remediation or disposal of contaminated soils disturbed during bulk earthworks.
- Civil works including station access and internal roads, stormwater drainage system, converter hall (comprising phase reactor, valve and HVDC reactor halls), control and auxiliaries building.
- GIS building foundations, cable trenches and foundations for electrical apparatus and transformer bays.
- Installation of the fire water tank, if required.
- Structural steelwork for buildings and electrical apparatus and infrastructure.
- Installation of HVDC converter equipment and associated apparatus.
- Delivery and installation of HVAC switchgear and auxiliary transformers.
- Installation of electrical, mechanical and firefighting systems.
- Testing of electrical, mechanical and firefighting systems.
- Commissioning the converter station and switching station.
- Installation of automated security lighting.

It is the aim to source all civil works materials for the Heybridge converter station from Tasmania. No air or sea transportation will be required. It is assumed the HVDC converter station components will be shipped to Port of Burnie and trucked to the site. Seven oversized loads are expected to be required for the delivery of seven transformers for two converter stations.

## 4.4 SHORE CROSSING

In Tasmania, the shore crossing will be in Heybridge, approximately 6 km east of Burnie. The shore crossing will be constructed using HDD and will extend approximately 900 m offshore into a 10 m water depth. The subsea cables and land cables will be connected close to the Tasmanian coast. The land-sea cable joint will be installed at the shoring crossing drill pad location in Heybridge.

The site will be accessible via Minna Road, at the same access point as the converter station. The shore crossing construction process will be a continuous 24-hour, 7-day-per-week operation, to ensure borehole stability.

## 4.5 OPERATION

The project will operate 24 hours a day, every day of the year, for the expected 40 year operational life span. The converter stations will not be manned 24/7 and will only be attended during normal working hours (Monday to Saturday, 7:00 am to 4:00 pm).

## 4.6 DECOMMISSIONING

The operational lifespan of the project is a minimum 40 years. At this time the project will be either decommissioned or upgraded to extend its operational lifespan.

Decommissioning will be planned and carried out in accordance with regulatory requirements at the time. A decommissioning plan in accordance with approvals conditions will be prepared prior to planned end of service and decommissioning of the project.

Requirements at the time will determine the scope of decommissioning activities and impacts. The key objective of decommissioning is to leave a safe, stable and non-polluting environment.

In the event that the project is decommissioned, all above-ground infrastructure will be removed, the site rehabilitated.

Decommissioning activities required to meet the objective will include, as a minimum, removal of above ground buildings and structures. Remediation of any contamination and reinstatement and rehabilitation of the site will be undertaken to provide a self-supporting landform suitable for the end land use.

Decommissioning and demolition of project infrastructure will implement the waste management hierarchy principles being avoid, minimise, reuse, recycle and appropriately dispose. Waste management will accord with applicable legislation at the time.

Decommissioning activities may include recovery of land and subsea cables. The conduits and shore crossing ducts would be left in-situ as removal may cause significant environmental impact. Subsea cables would be recovered by water jetting or removal of rock mattresses or armouring to free the cables from the seabed.

A decommissioning plan will be prepared to outline how activities would be undertaken and potential impacts managed.

# 5. ASSESSMENT METHOD

This section describes the method that has been used to identify the values and assess the potential impacts on social values and wellbeing from the project's construction and operational activities.

## 5.1 THE PROCESS

SIA is the process of analysing and managing the intended and unintended social consequences of a project (Vanclay 2003). The methods used to complete this SIA are shown in Figure 5-1 and are explained further in the following sections.

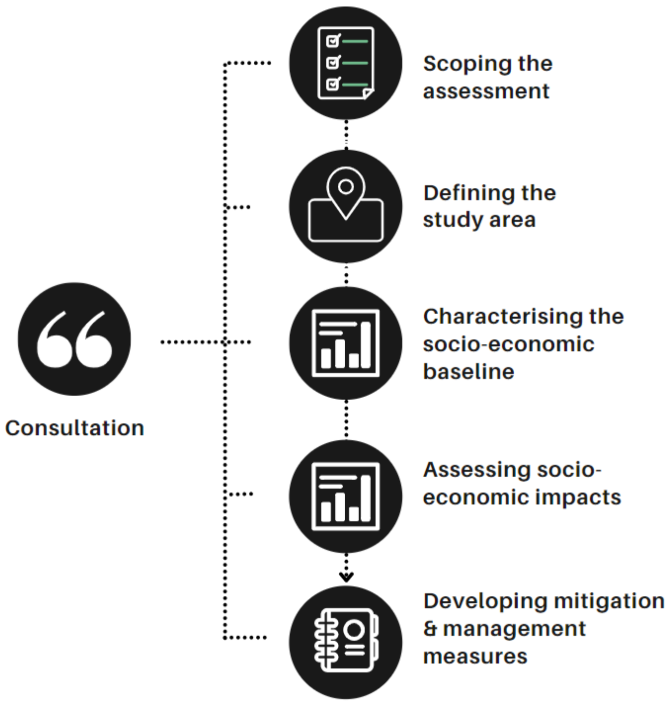



**Figure 5-1 SIA procedure**

## 5.2 SCOPING THE ASSESSMENT

The scoping phase of the SIA involved the preliminary identification of the project's potential socio-economic issues, impacts and opportunities. The scoping phase provides a basis for identifying the issues that will need to be investigated by the SIA. Specifically, the scoping phase provided a framework for the definition of the study area, which included:

- Identifying socio-economic values that may be affected by the project.
- identifying key stakeholders for inclusion in SIA consultation.
- The scoping of issues was informed by:
- A review of literature relating to the social context of the study area and the social impacts of linear infrastructure.
- The description of the project.
- The outcomes of stakeholder and community engagement.

## 5.3 DEFINING THE STUDY AREA

Study areas delineate areas potentially affected by a project. The SIA study area encompasses the communities that may experience the effects of the project's construction, operation, and decommission in Tasmania. In line with the social wellbeing framework (see Table 5-2), this SIA considers the areas most affected by the impacts of the project to include:

- The local study area; Heybridge State Suburb, the area for the converter station.
- The regional study area: includes the two local government areas intersected by the project. State and national impacts are considered where relevant.

The study areas are based on the Australian Bureau of Statistics (ABS) Census Statistical Areas to enable the compilation of data on baseline socio-economic indicators. The ABS State Suburb (SSC) are an ABS approximation of the locality gazetted by the Geographical Place Name authority in each state and territory. The Heybridge (SSC) is the study area, and it is highlighted yellow in .

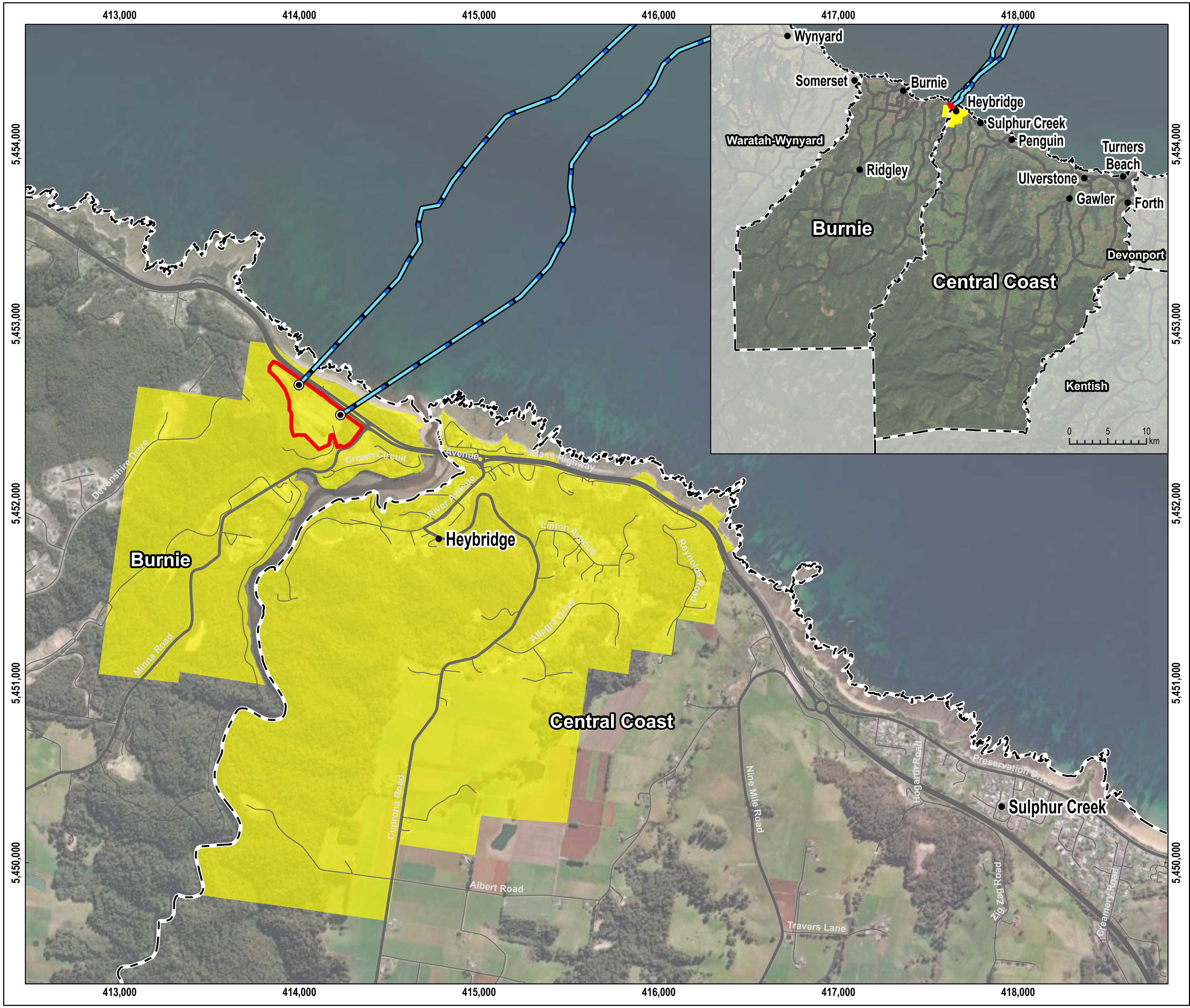
The state of Tasmania is used as a benchmark or external point of comparison for the data present, in line with the guidance provided by IAIA (Vanclay, Esteves, and Franks 2015).

For various demographic indicators, the data collected by the ABS at the state suburb level was subject to high levels of fluctuation, primarily due to the size of populations present within each suburb. To account for the variation, data for the local study area is shown as an aggregated whole. However, data at the regional study area is shown at a local government level, to allow for the identification and discussion of any localised trends. Data is benchmarked against the state of Tasmania.

**Table 5-1 ABS statistical areas used in this report**

| Geographic area | ABS Statistical Area |
|---|---|
| Local Study Area | Heybridge State Suburb (SSC) |
| Regional Study Area: Local government areas (LGA) | Burnie City LGA |
| | Central Coast LGA |
| State | Tasmania |

Figure 5-2 shows the spatial extent of the social study area.




**MARINUS LINK**

**LEGEND**

- Landfall
- Proposed route
- HVDC subsea cable
- Heybridge converter and switching station site boundary
- Major road
- Minor road
- Heybridge (SSC)
- Local Government Area

Source:
Routes from Tetra Tech Coffey.
Heybridge SSC from ABS.
Place names, roads, and LGAs from DPIPWE.
Imagery from NearMap (8 March 2022).

0 300 600 m

SCALE 1:30,000

PAGE SIZE: A4

PROJECTION: GDA2020 MGA Zone 55

MARINUS LINK PTY LTD

MARINUS LINK
EIS/EES

FIGURE 5-2

**Social study area**

TETRA TECH COFFEY

DATE: 04.10.23 PROJECT: 754-MELEN215878ML FILE: 215878ML_R06_F213_GIS



DOC REFERENCE: \\TT.LOCAL\COFS\S772\GIS\GIS\215878_MELEN_TASNETWORKS_PROJECTMARINUS\GIS\MXD_APRX\215878ML_R06_EIS\215878ML_R06_F211_F220.APRX LAYOUT:215878ML_R06_F213_GIS_1 SAVED BY: GEORGE.YOUNG 04.10.23 2:58 PM

## 5.4 DEVELOPING THE BASELINE

The baseline describes the existing social environment of the study area, including key socio-economic characteristics of the people within it and their living conditions. The baseline is used to form the basis for predicting and assessing the potential social benefits and impacts of the project (Duarte and Sanchez 2020), in line with the social value framework described in Table 5-2. Baseline information was collected from stakeholder engagement (see Table 6-3) and a range of secondary sources, including:

- Demographic information provided by the ABS;
- Selected Commonwealth Government websites (e.g., My School; Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES);
- Commonwealth and Tasmanian government agencies, including the Department of Police, Fire and Emergency Services, Tasmania Health Service, Department of Natural Resources and Environment Tasmania;
- Regional and local government plans and strategies;
- Grey literature, including industry and news reports; and
- Academic literature.

An important requirement of SIA is to have an organising framework that allows for the identification of potential community issues and concerns, as well as conveying the outcomes of the SIA. This SIA uses an approach based on four identified social values: community identity, economy and livelihoods, infrastructure and services, and people's productive capacities to describe social wellbeing. Table 5-2 details these values and the attributes and indicators used to understand these within the project's social context. Wellbeing, according to Rowan (2009), refers to a person's financial, physical, and emotional condition. The social wellbeing framework examines determinants of wellbeing and provides the basis for collecting baseline data and identifying and assessing the potential social impacts of the project.

**Table 5-2 Social wellbeing framework**

| Social value | Attributes and indicators |
|---|---|
| **Community identity**<br>Describes how a community defines itself in terms of civic participation, resilience, feelings of trust and safety and a sense of belonging and place | • Social capital and community cohesion<br>• Cultural diversity and heritage<br>• Character, amenity, and sense of place<br>• Community safety. |
| **Economy and livelihood**<br>Describes how people make a living and the economic structure of the affected community. | • Employment and workforce<br>• Income<br>• Industry and business<br>• Housing affordability and availability<br>• Socio-economic dis/advantage<br>• Land use and natural resources. |
| **Infrastructure and services**<br>Describes the infrastructure and services that meet the needs and priorities of the affected community including municipal and social infrastructure and associated services. | • Governance (local, state, and national)<br>• Community infrastructure and services (open space, health, education, daycare, aged care, religious)<br>• Physical infrastructure (e.g. transport and municipal)<br>• Housing (social). |

| Social value | Attributes and indicators |
|---|---|
| **People's productive capacities**<br>Describes the skills, knowledge, and experience that are vital to survival and participation in society and its economy. | • Health – physical and mental<br>• Education, training, and skills<br>• Food security. |

*Source: Smyth & Vanclay (2017)*

## 5.5 IDENTIFYING THOSE POTENTIALLY VULNERABLE TO CHANGES FROM THE PROJECT

A critical component of developing the baseline is identifying groups that may be vulnerable to changes in the social environment as a consequence of the project's activities (Vanclay, Esteves, and Franks 2015; Vanclay 2003). Vulnerability is commonly defined as the characteristics of a group that influences their 'capacity to anticipate, cope with, resist, and recover' (Blaikie et al. 2014) from the social impacts of a project. Some groups in the community can make use of the opportunities arising from the project, while others are less able and will be more vulnerable to the negative consequences of change. Therefore, this baseline is designed to identify the social attributes and resources that may support vulnerable groups to reach their desired levels of wellbeing and cope with, resist and recover from the impacts of the project as well as where these groups may lack these attributes and resources (Climent-Gil, Aledo, and Vallejos-Romero 2018).

Groups that experience greater impacts due to changes in the social environment may be attributed to a range of social characteristics, including limited access to resources such as capital (i.e., income), or other characteristics, such as poorer health or lower mobility.

As this SIA undertakes an analysis of social context at a group or aggregate level, identifying individuals that may be vulnerable to the project's potential impacts is beyond the SIA method and we consider beyond a method required to address the EIS guidelines. Consequently, vulnerable groups and areas that have higher levels of socio-economic vulnerability have been identified through demographic analysis.

Vulnerable groups at the regional study area level were defined as those who are:

- Within very low and low incomes households (Section 7.3.3).
- Relatively socio-economically disadvantaged as defined by the ABS' Index of Relative Socio-economic Advantage and Disadvantage (SEIFA) (Section 7.3.6).
- Reliant on the affordability of rental housing (Section 7.3.5).
- At risk of exclusion based on cultural identity (), age - youth and seniors (7.2.4), ability (Section 7.5.2) and Indigenous status (Section 7.2.3).

## 5.6 IDENTIFYING AND PROFILING COMMUNITY INFRASTRUCTURE

Community infrastructure is described as the range of facilities and services that support the creation and development of human and social capital within settlements. Community infrastructure is essential to creating liveable, sustainable, and resilient communities and is comprised of health, education, open space, sport and recreation, emergency services and social housing. In developing the community infrastructure audit for this study, health and emergency infrastructure, transport connectivity and infrastructure and childcare services have been considered for the study area, based on their contribution to community wellbeing. In particular, traffic impacts and childcare availability were also raised during the consultation for the SIA.

### 5.6.1 Community engagement activities

MLPL and specialist consultants have undertaken community engagement since mid-2018. These activities are summarised in Section 6.1. In addition, Tetra Tech Coffey undertook consultation specifically to inform this SIA. The detail of SIA-specific consultation is provided in Section 6.3.

Jointly, the findings of community engagement and SIA consultation have informed the SIA by developing an understanding of the following:

- existing social conditions within the local and regional study area;
- local community values about their area and what places are important to them;
- attitudes towards the project and areas of community concern;
- potential social impacts from the project to inform the impact assessment and identification of management measures; and
- benefits (if any) the community views the project as providing.

### 5.6.2 SIA consultation

The scoping phase identified the range of potential social impacts and provided the basis for identifying the stakeholders for inclusion in the SIA consultation. The social wellbeing framework described in Section 5 is also used to identify stakeholders who may be impacted or can provide input about potential impacts, for instance, community housing organisations offer valuable information about the availability of affordable housing in the study area.

The selection process for inclusion in the SIA consultation program was based on discussions with TasNetworks as well as the need for a broad representation of community views and values. More than 100 individuals and representatives of community organisations were invited to participate; these include:

- local governments and local business associations;
- emergency services;
- housing stakeholders (real estate agents and emergency accommodation providers);
- First Peoples; and
- representatives from community organisations, recreation groups, conservation organisations and youth groups.

Consultation for the SIA involved one-on-one structured qualitative interviews with key stakeholders undertaken by an independent SIA specialist. The interviews are confidential, and the feedback has been used in the SIA assessment to confirm existing baseline and project engagement outcomes and inform the impact assessment and development of management measures.

The interviews sought to understand the perceived potential impacts and opportunities, as well as potential management and mitigation measures. Questions asked were designed to allow the participant to talk about what they felt was important. The flow of the conversation was dictated by the participant's responses and questions.

The responses that participants provided to the questions about the project were analysed according to the social wellbeing framework (see Table 5-2), these have been presented in Section 8

The authors of this report followed the social ethical standards of the IAIA, of which they are members.

## 5.7 IDENTIFYING AND ASSESSING IMPACTS

In addition to examining the impacts of the project to wellbeing in the baseline assessment, it is important to note that the SIA looks beyond impacts on individual property rights and looks more at the groups of people that make up the community.

### 5.7.1 Impact identification and description

The impact identification phase involved a review of the potential socio-economic issues, impacts and opportunities identified during the scoping phase. Impact identification is primarily focused on understanding how project-related activities or inputs may result in changes in socio-economic values. A social impact occurs when these changes are experienced by people and communities (Slootweg, Vanclay, and Van Schooten 2001). The project's impact pathways were identified through an analysis of the project description, and:

- consideration of key areas of concern or opportunity identified during SIA consultation and community engagement;
- review of relevant literature on the socio-economic impacts of linear energy and similar infrastructure;
- the professional judgement of the SIA study team; and
- the findings of other technical studies (Section 2.2).

### 5.7.2 Impact assessment approach

A significance-based approach was used to assess potential project impacts (positive and negative) on the identified social values. A significance-based approach uses the principles of social sensitivity and magnitude of impact to assess the significance of an impact. These are defined further below.

A key consideration in assessing impacts are the principles of ecologically sustainable development, where the identification and assessment of impacts and development of mitigation or enhancement measures:

- Considers the potential for short and long-term effects on the socio-economic environment and develops mitigation or enhancement measures accordingly.
- Considers how socio-economic values can be maintained or enhanced for the benefit of future generations.
- Adopts the precautionary principle and proactively implements mitigation measures where there is uncertainty regarding potential impacts on socio-economic values.

This SIA, and EIS as a whole, is precautionary in nature, as it uses a conservative approach or assumes that impacts will be experienced as a worst-case scenario. Where negative impacts or sensitivity may be classified between two levels, the higher or greater level of sensitivity or magnitude has been selected. While for positive impacts, where impacts or sensitivity may be classified between two levels the lower level of sensitivity or magnitude has been selected.

SIA and the assignment of sensitivity and magnitude ratings are subjective and a matter of professional judgement. Similarly, the technical studies that are used to inform the SIA (see Section 2.2) apply a range of techniques (for example, traffic engineering and visual impact assessment) to support an assessment of the significance of impacts within their disciplinary area. The sensitivity and magnitude criteria cannot be compared across technical studies, and as such, the criteria used to measure the significance of social impacts will differ from those used in the technical studies.

Given the precautionary approach in some situations the implementation of a mitigation or enhancement measure may not significantly change the overall impact.

### 5.7.3 Sensitivity criteria

Social sensitivity to change is determined with respect to its uniqueness or rarity, importance and resilience to change. These contributing factors are described below:

- Uniqueness or rarity of a place or service is an assessment of its occurrence, abundance and distribution within and beyond its reference area (e.g., local government area, Central Coast and Burnie LGAs).
- Importance of a place or service considers the level of value attributed to a place or service by receivers. Importance may be indicated by conservation status, cultural importance (e.g., use in festivals), or economic value.
- Resilience to change is determined by the extent to which a place, service or receiver can cope with or withstand changes without affecting the level of value.
- Replacement potential is the potential a representative, or equivalent place or service, can be found to replace any losses.
- Community Value is the community infrastructure, assets, places and values of importance and concern to the community in which a project is proposed to be located. This factor also considers what is currently provided for the community (for example, road capacity, community facilities, and open space areas) and how it could be affected by a project.

The criteria for determining social sensitivity are set out in Table 5-3 below.

**Table 5-3 Social sensitivity criteria**

| Level | Criteria |
|---|---|
| **Extremely Sensitive** | It is unique. |
| | The value is intact and retains its intrinsic value. |
| | The place or service is highly valued by the community. The place or service may:<br>• Be listed on a recognised or statutory state register.<br>• Contributes to community events or uses at a state or local level.<br>• Contributes to the state or regional economy in terms of the number of jobs or gross domestic product. |
| | The place, service or receiver cannot adapt to change. |
| | It is not widely distributed throughout the system/area and consequently would be difficult or impossible to replace. |
| | There are no accessible and available alternative services or places. |
| **Very Sensitive** | It is locally unique to the community in which it occurs, with few regionally available alternatives. |
| | The value is relatively intact and retains most of its intrinsic value. |
| | The place or service is highly valued by the community. The place or service may:<br>• be listed on a recognised or statutory state register.<br>• contribute to community events or uses at a state or local level.<br>• contribute to the state or regional economy in terms of number of jobs or gross domestic product. |
| | The place, service, or receiver has a limited capacity to adapt to change. |
| | It is not widely distributed throughout the system/area and consequently, recovery potential would be limited. |
| | There are no regionally available alternative services. |
| **Sensitive** | It is relatively well represented in the areas in which it occurs, but its abundance and distribution are limited by threatening processes. |
| | The value is in moderate to good condition and retains many of its intrinsic characteristics. |

| Level | Criteria |
|---|---|
| | The place or service is valued by the community. The place or service may:<br>• be listed on a recognised or statutory state or local register.<br>• contribute to community events or uses at a regional or local level.<br>• contribute to the state or regional economy in terms of number of jobs or gross domestic product. |
| | The place or service has the capacity to adapt to change. Receivers have access to socio-economic resources to support their capacity to adapt to change. |
| | There are no locally available alternative services; however, alternative services are available and have capacity at a regional level. |
| **Not very sensitive** | It is not unique or rare, and numerous representative examples exist throughout the system/area. |
| | It is in a poor to moderate condition as a result of existing threatening processes which have degraded its intrinsic value. |
| | The place or service is valued by groups within the community. The place or service may:<br>• be listed on a recognised or statutory local register.<br>• contribute to community events or uses at a local level by groups within the community<br>• contribute to the local economy in terms of a small number of jobs. |
| | There is a slight detectable response to the change in the value, but it can quickly recover. |
| | There are locally available alternative services. |
| **Not Sensitive** | It is not unique or rare and representative examples exist abundantly throughout the system/area. |
| | It is in poor condition as a result of existing threatening processes which have degraded its intrinsic value. |
| | The place or service is not valued within the community. The place or service:<br>• is not listed on a recognised or statutory local register.<br>• does not contribute to community events or uses at a local level by groups within the community.<br>• does not contribute to the local economy. |
| | The place or service has the capacity to adapt to change. |
| | There are locally available alternative services. |

### 5.7.4 Magnitude criteria

The magnitude of impacts on a social value incorporates an assessment of the geographical extent, duration and severity of the impact. These criteria are described below.

- **Duration** is the timescale of the effect, i.e., if it is short, medium or long term.
- **Severity** is an assessment of the scale or degree of change from the existing condition as a result of the impact. This could be positive or negative.
- **Geographical extent** is an assessment of the spatial extent of the impact.

The criteria for determining the magnitude of impacts on social values are set out in Table 5-4.

**Table 5-4 Social magnitude criteria**

| Magnitude level | Criteria |
|---|---|
| Severe | A long term or permanent impact (greater than ten years, that causes a significant change from baseline conditions. Or consequences of the impact are unknown. The effect extends to communities across the State. |
| Major | A medium to long term impact (one to five years) that results in substantial change from baseline conditions. The effect extends to communities in the regional area. |

| Magnitude level | Criteria |
|---|---|
| Moderate | A short to medium term impact (6 to 12 months) that results in a considerable change from baseline conditions. The effects extend beyond the operational area but are contained within communities within the local study area. |
| Minor | A temporary or short-term impact (three to six months) that results in noticeable changes to the baseline conditions. If the effect extends beyond the operational area, it may affect discrete sections of communities within the local study area. |
| Negligible | A temporary impact (less than three months) that results in little or no change from baseline conditions. It affects a small number of individuals. |

## 5.7.5 Assessment of significance

The significance of impacts (positive and negative) on a social value is determined by the sensitivity of the value itself and the magnitude of the change it experiences. Table 5-5 shows how using the criteria described above, the significance of impacts is determined having regard to the sensitivity of the environmental value and the magnitude of the expected change. This approach adopts a five-by-five matrix.

**Table 5-5 Assessment of significance of impacts**

| Magnitude of impact | Sensitivity of Social Value | | | | |
|---|---|---|---|---|---|
| | Extremely sensitive | Very sensitive | Sensitive | Not very sensitive | Not sensitive |
| Severe | Major | Major | Major | High | Moderate |
| Major | Major | Major | High | Moderate | Low |
| Moderate | High | High | Moderate | Low | Low |
| Minor | Moderate | Moderate | Low | Low | Very low |
| Negligible | Moderate | Low | Low | Very Low | Very low |

## 5.7.6 Environmental Performance Requirements

EPRs set out the environmental and social outcomes that must be achieved during the design, construction, operation and decommissioning of the project. Compliance with EPRs is intended to minimise impacts and the risk of harm to the environmental, social and cultural values to within reasonable limits having regard to contextual factors and the practical delivery of the project.

In order to develop EPRs relating to the social impacts of the project, industry-standard approaches, leading practices and the latest international approaches to social impact management have been considered. EPRs are also informed by the legislative and regulatory environment pertaining to the relevant jurisdictions. In addition, project-specific measures are recommended to minimise impacts or risks to identified social values.

This performance-based approach allows for flexibility in how a specified outcome is achieved rather than providing prescriptive measures that must be employed. It allows contractors and MLPL to determine the best way to achieve EPRs and manage impacts whilst developing and optimising their design solutions.

Potential management measures were identified to demonstrate how the magnitude of potential impacts occurring could be reduced and to inform the development of EPRs. Mitigation measures were identified for impacts assessed as having a significance ranking of major, high or moderate with only standard controls applied. Example management measures are based on experience from other infrastructure projects and, where appropriate, have been informed by other technical studies being completed for the EIS. Other key considerations for the development of EPRs are recommendations made by key agencies and the findings of community engagement and SIA consultation.

The residual impact assessment presented in this SIA assumes the implementation of management measures to comply with EPRs. Justification is provided to demonstrate how the management measures serve to reduce the significance ranking.

### 5.7.7 Cumulative impact assessment

The EIS guidelines and EES scoping requirements both include requirements for the assessment of cumulative impacts. Cumulative impacts result from incremental impacts caused by multiple projects occurring at similar times and within proximity to each other.

To identify possible projects that could result in cumulative impacts, the International Finance Corporation (IFC) guidelines on cumulative impacts have been adopted. The IFC guidelines (IFC, 2013) define cumulative impacts as those that 'result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones.'

The approach for identifying projects for assessment of cumulative impacts considers:

- Temporal boundary: the timing of the relative construction, operation and decommissioning of other existing developments and/or approved developments that coincides (partially or entirely) with Marinus Link.
- Spatial boundary: the location, scale and nature of the other approved or committed projects expected to occur in the same area of influence as Marinus Link. The area of influence is defined as the spatial extent of the impacts a project is expected to have.

Proposed and reasonably foreseeable projects were identified based on their potential to credibly contribute to cumulative impacts due to their temporal and spatial boundaries. Projects were identified based on publicly available information at the time of assessment. The projects considered for cumulative impact assessment for Tasmania are:

1. Guilford Windfarm
2. Robbins Island Renewable Energy Park
3. Jim's Plain Renewable Energy Park
4. Robbins Island Road to Hampshire Transmission Line
5. Bass Highway upgrades between Cooee and Wynard
6. NWTD
7. Hellyer Windfarm
8. Table Cape Luxury Resort
9. Lake Cethana Pumped Hydro
10. Youngmans Road Quarry
11. Port Latta Windfarm
12. Port of Burnie Shiploader Upgrade
13. Quaylink – Devonport East Redevelopment.

#### 5.7.7.1 Method

The cumulative impacts that may result from this project in conjunction with other proposed and reasonably foreseeable future projects have been assessed.

The management of social impacts will need to address the peaks in the construction workforce relating to the terrestrial construction activities in Tasmania in the context of other large-scale infrastructure construction projects in the region. The significance assessment method used to identify the residual impacts of the proposed project in Section 9.6 has been used to assess the cumulative socio-economic impacts.

The assessment of potential cumulative socio-economic impacts is described below for each of the affected values. Mitigation or management strategies have been proposed to inform further action that is outside the direct control of Marinus Link to manage cumulative impacts.

The approach to cumulative impact assessment follows Therivel and Ross (2007, p.367). This is essentially an adaptive environmental management approach, in this case, through ongoing proactive use of management plans involving monitoring, evaluation, and mitigation. Consequently, management measures for the monitoring and mitigation of cumulative impacts have been indicated as requirements of the SIMP (EPR S01 Tas).

## 5.8 LIMITATIONS AND ASSUMPTIONS

There are limitations around information on developments surrounding the project area due to the lack of availability and adequacy of publicly available data and information for other projects. Where uncertainty exists regarding the spatial or temporal context of other projects, a conservative approach was adopted, e.g., assuming the timing of the construction phase of a proposed or reasonably foreseeable project entirely within the north west region of Tasmania overlaps with the project timing.

This SIA should be read with the following limitations:

- The SIA relies on information from a range of secondary sources. Except where stated, the authors have not attempted to verify the accuracy or completeness of this information.
- This SIA was undertaken at a point in time. Communities and people within communities change, residents move, businesses start or close, and other external socio-economic factors may result in changes not captured by this report. This SIA study was undertaken after the COVID-19 pandemic, and this affected several baseline conditions in the local and regional study area, including:
    - Increased demand in the construction sector due to a range of socio-economic factors.
    - Changes in the demand experienced in the retail, tourism, and accommodation sector.
    - Changes in health service and emergency service planning and activity.
    - Changes in general wellbeing, including increased anxiety, worry, and loneliness.
- Similarly, this SIA includes information gained from consultation with key stakeholders and the findings of broader community consultation based on their views expressed during consultation. These views may change over time or in response to other changes in the socio-economic environment.
- Changes to baseline conditions may affect the sensitivity of social values to change or result in changes to project activities that otherwise result in changes to the magnitude of social impacts. This introduces a level of uncertainty in assessing the potential socio-economic impacts and benefits of the project.
- This SIA and the assessment of the magnitude of some social impacts are based on the findings of other studies, as outlined in Section 2.2.
- Credible non-project activities that could contribute to a cumulative impact on the valued environmental, social and cultural components will be identified and then assessed for their spatial and temporal relationship to the project to determine if cumulative impacts are possible and, if possible, significant. Management strategies will be proposed where the project could contribute to a significant cumulative impact. Cumulative impacts are outlined in Section 10.

# 6. COMMUNITY CONSULTATION OUTCOMES

## 6.1 PROJECT ENGAGEMENT

The project team has been engaging with stakeholders and the community in Tasmania. The SIA also draws from the stakeholder engagement feedback from key community engagement activities. A summary of areas of engagement and activities and issues raised by stakeholders in Tasmania are detailed in Table 6-1.

**Table 6-1 Summary of community engagement activities and outcomes**

| Key consultation activities on the release of EIS guidelines (2022 to 2023) | | |
|---|---|---|
| **Timing** | **Activities** | **Issues raised during the consultation** |
| **September 2022** | • Community newsletter<br>• Sulphur Creek drop-in information session (near Heybridge)<br>• Burnie Farmers Market pop-up information stall | **Environment:**<br>• General interest in potential impacts on the environment during construction and operations.<br>**Construction impacts:**<br>• General concerns about impacts to residents during construction and interest in construction duration.<br>**Operational impacts:**<br>• Concern about noise during operations of the converter station.<br>**Social:**<br>• Concern about construction workforce housing availability.<br>**Health**:<br>• Concerns about the potential electromagnetic field (EMF) impacts on local residents<br>**Jobs and procurement:**<br>• Opportunity for the use of local suppliers.<br>• Concerns about skilled worker availability.<br>**Community benefits:**<br>• Suggestions for financial or in-kind contributions to community development in the local area near Heybridge. |
| **October 2022** | • Burnie Show and Agri Expo pop-up information stall<br>• Meeting with Burnie City Council<br>• Meeting with Central Coast Council | |
| **November 2022** | • ICT Conference Hobart pop-up information stall<br>• Rotary Club of Burnie presentation<br>• NWTD Meet the Projects presentation<br>• Meeting with Burnie City Council<br>• Meetings with Business North West and Launceston Chamber of Commerce | |
| **December 2022** | • Community newsletter<br>• Burnie Farmers Market pop-up information stall<br>• Launceston industry and stakeholder breakfast<br>• Regional Development Australia presentation | |
| **March 2023** | • Tasmania Aboriginal Centre meetings<br>• Community newsletter<br>• Devonport industry and stakeholder breakfast<br>• Burnie drop-in information sessions | |
| **April 2023** | • Community and stakeholder webinar<br>• Meeting with Aboriginal Heritage Tasmania | |
| **June 2023** | • Burnie City Council presentation<br>• Presentation to Traditional Owner Groups | |
| **Consultation detailing early EIS technical study findings (March to April 2023)** | | |
| **Timing** | **Activities** | **Issues raised during the consultation** |
| **September 2022** | • Community newsletter<br>• Sulphur Creek drop-in information session (near Heybridge)<br>• Burnie Farmers Market pop-up information stall | **Noise:**<br>• Concerns about noise associated with the construction of the converter station. |

| Key consultation activities on the release of EIS guidelines (2022 to 2023) | | |
|---|---|---|
| **Timing** | **Activities** | **Issues raised during the consultation** |
| **October 2022** | • Burnie Show and Agri Expo pop-up information stall<br>• Meeting with Burnie City Council<br>• Meeting with Central Coast Council | • Concerns about noise associated with the operation of the converter station.<br>**Traffic and transport:**<br>• Concerns about the increase of traffic and safety on local roads during construction, particularly at the Minna Road and Bass Highway intersection.<br>**Visual amenity:**<br>• Concerns about the visual impact of the converter station on the local community.<br>**Environment:**<br>• Interest in impacts to fauna at the converter station site.<br>**Jobs and procurement:**<br>• Suggestions to provide further detailed information about local job and procurement opportunities.<br>• Interest in skilled worker availability.<br>**Social:**<br>• Concern about housing availability and affordability and how this will be impacted by the project's construction workforce. |
| **November 2022** | • ICT Conference Hobart pop-up information stall<br>• Rotary Club of Burnie presentation<br>• NWTD Meet the Projects presentation<br>• Meeting with Burnie City Council<br>• Meetings with Business North West and Launceston Chamber of Commerce | |

## 6.2 ABORIGINAL ENGAGEMENT

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In March 2023, MLPL engaged with representatives of the Tasmanian Aboriginal Centre, Tasmanian Aboriginal Community, and Aboriginal Heritage Tasmania. However, upon advice from Aboriginal Heritage Tasmania and stakeholders from within the Tasmanian Aboriginal community, it was agreed that a different approach to First Peoples engagement in Tasmania was more suitable. MLPL has subsequently discussed a collaborative approach to First Peoples engagement with related major projects and organisations (e.g. Renewables, Climate and Future Industries Tasmania (RECFIT), Hydro Tasmania, NWTD projects) to plan coordinated engagement that is both culturally appropriate and addresses the needs of the Tasmanian Community. MLPL has committed to developing and implementing a strategy that commits to an ongoing relationship and partnership with First Peoples for the development and delivery of the project.

Following in-person meetings and ongoing engagement with MLPL, in September 2023 invitations were sent to representatives from the following First Nations groups to participate in one-on-one interviews to inform the SIA:

- Tasmanian Aboriginal Centre
- Aboriginal Land Council of Tasmania
- Cape Barren Island Aboriginal Association Inc.
- Elders Council of Tasmania Aboriginal Corporation
- Six Rivers Aboriginal Corporation
- Circular Head Aboriginal Corporation
- Flinders Island Aboriginal Association Inc.
- Karadi Aboriginal Corporation
- South East Tasmanian Aboriginal Corp.

- Weetapoona Aboriginal Corporation.

To date, none of the organisations contacted have accepted an invitation to participate in an interview.

Table 6-2 lists the identified Tasmanian First Peoples stakeholders.

**Table 6-2 Tasmanian First Peoples stakeholders**

| Tasmanian First PeoplesStakeholders | |
|---|---|
| Community | Flinders Island Aboriginal Association Inc. |
| Aboriginal Affairs Tasmania | Karadi Aboriginal Corporation |
| Aboriginal Heritage Tasmania | Office of Aboriginal Affairs |
| Aboriginal Land Council of Tasmania | Six Rivers Aboriginal Corporation |
| Cape Barren Island Aboriginal Association Inc. | South East Tasmanian Aboriginal Corp. |
| Circular Head Aboriginal Corporation | Tasmanian Aboriginal Centre |
| Elders Council of Tasmania Aboriginal Corporation | Weetapoona Aboriginal Corporation |

## 6.3 SIA CONSULATATION

In February 2023, more than 100 email invitations were sent to invite stakeholders to participate in the SIA consultation. Stakeholders included recreation groups, community groups, local government authorities and tourism bodies. In addition, residents (landowners) in Heybridge were invited to participate in the SIA consultation process. A small number of these stakeholders participated in the SIA consultation.

The interview process was used to confirm existing baseline information, the perceived potential impacts, and potential benefits, as well as potential management and mitigation measures. Questions asked were designed to allow participants to talk about what they felt was important. The participant's responses and questions dictated the flow of the conversation.

Participants' responses to the questions about the project were analysed according to the social wellbeing framework (Table 5-2). A summary of the key themes and views raised in the SIA engagement, which have been used to inform the sensitivity values are detailed in Table 6-3 below.

**Table 6-3 SIA consultation feedback**

| Aspect | Feedback | Stakeholder |
|---|---|---|
| **Community identity** | | |
| **Landscape and amenity** | Concerns about impacts to visual amenity given that the project site at Heybridge is high profile and visible from the highway. Want installation of vegetation screening to "hide it away somewhat". Skyline aesthetics impact. | Community Organisation |
| | Heybridge Beach area, particularly in the study area near the project site, holds significance within the community.<br>Location (Heybridge) within an industrial area means not much housing or recreation areas nearby. Football Oval and Scouts camp are not far from the site. | Local Government Authority, Landowner |
| | Blythe River (water sports and swimming) and the whole of Bass Strait, surfing Sulphur Creek to Preservation Bay, and trail walking/bike riding around Chasm Creek and Dial Range Road are considered recreation areas near the project area. | Local Government Authority, landowner |

| Aspect | Feedback | Stakeholder |
|---|---|---|
| | Rural bushland, riverfront, shopping in Burnie or Ulverstone. | Landowner |
| | Perception proposed energy projects encroach on farmland and nature reserves -— potential to impact lifestyle and environment. *“Key feature is the environment and liveability of this region.”* | Local Government Authority. |
| | Construction impact concerns include noise, vibration and increased traffic on local roads, which already experience daily peak hour congestion, land values, EMFs and dust. | Landowner |
| **Cultural diversity** | Still experiencing subtle racism and gender bias with some migrants unable to get jobs. | Local Government Authority |
| **Social capital and community cohesion** | Tight-knit community where everyone knows everyone, with a heavy retiree or semi-retired population. *“Heybridge is a community, not a town, so very local-orientated.”* | Landowner |
| | An increasing number of activists in Penguin and Ulverstone, with questions about managing economic development with impacts on tourism and the environment and maintaining liveability. | Local Government Authority |
| | Many within the community have moved to the area for its stable character and are generally unsupportive of any developments that may impact this. | Local Government Authority and Landowner |
| **Character and sense of place** | The project impacts a large area consisting of various diverse, mixed communities currently transitioning from rural to semi-rural. | Local Government Authority |
| | The community is characterised by disparity from a two-speed economy effect. | Local Government Authority |
| | Strong sense of identity. The community will want to voice their thoughts and be involved. | Community Organisation |
| **Ecology and natural resources** | Concern about impacting reef beds and marine life located offshore at Heybridge and the white belly sea eagles and penguins | Landowner |
| | Concerns about water contamination and waste. Community focused on circular economy to be more environmentally responsible. | Local Government Authority |
| **Economy and Livelihoods** | | |
| **Employment** | Concerned there will be no long-term local employment opportunities. A development application for a truck and machinery wash facility on land adjoining the project. | Community Organisation |
| | It is a working-class area with a dependence on social welfare. Unemployment is higher than the national average. | Community Organisation |
| **Industry and business** | Economic opportunities within the region include energy, agriculture, defence, services (aged care and health), aquaculture, mining, tourism and education (with the expansion of the UTAS facility). | Chamber of Commerce Organisation, Local Government Authority |
| | The lack of a local workforce makes it hard for businesses to expand to take on opportunities presented by major projects. “*The largest construction company in Tasmania has 200 employees and work lined up for 2 years. It will be a mainlander contractor who will employ other smaller local companies.*” | Chamber of Commerce Organisation |
| | The project needs to continue to provide information to the community and leverage relationships with Business NW and Minister Barnett to promote opportunities for local businesses. Especially around REZs and timelines. | Local Government Authority |
| | Concern project construction may impact/delay local, smaller building projects with the workforce tied up on multiple major projects. | Chamber of Commerce Organisation |
| | The community doesn’t see the value in these projects – “*what does it do for them?”* | Local Government Authority |
| **Workforce skills and availability** | The workforce is primarily blue-collar/industrialised. Difficult to attract professionals to the area (engineers). | Chamber of Commerce Organisation, Local Government Authority. |
| | Workforce inclusion is low for migrants, the elderly, and women. How to get them into careers they value and earn enough. | Local Government Authority |
| | Concerns that the local workforce lacks the capacity and skillset to fill the high-end advanced manufacturing jobs required for ML and other construction projects like it (bridges, football stadiums and wind farms). | Chamber of Commerce Organisation |
| | Concerns local workforce will be drained by the number of major projects in the area. | Chamber of Commerce Organisation, Local Government Authority. |

| Aspect | Feedback | Stakeholder |
|---|---|---|
| | Opportunity for ML to "inspire young people" to seek out further education and obtain skillsets to fill project jobs that don't require a university degree (civil construction and truck licence). | Chamber of Commerce Organisation, Local Government Authority. |
| | DIDO and FIFO culture is increasing, with the workforce living in rural, smaller communities and commuting to where work is. | Local Government Authority |
| | Concerns raised about the local workforce acquiring unique skillsets and experiences only relevant to ML – "*How do you make skillset/experience transferable after the project is completed?*" | Local Government Authority |
| **Socio-economic disadvantage** | Substantial issues of poverty, high unemployment, particularly within the youth and long-term unemployed families, and lack of participation in education and training. | Local Government Authority |
| | Barriers to the workforce include:<br>• not having a driver's licence – due to no/limited public transport, the only option to get to and from jobs.<br>• Limited and low-quality childcare options. | Local Government Authority |
| **Housing affordability and availability** | Extreme concerns about housing supply for major construction projects like Marinus Link. *"Insufficient housing for all of these (construction) projects. We don't have the people to build the houses for the (project) workers to live in."* | Community Organisation |
| | The local community is already struggling to obtain social and affordable housing. *"There are no vacancies. Even all the motels are full."* | Community Organisation |
| | No housing projects/developments are currently planned to fix the crisis. | Chamber of Commerce Organisation, |
| | Leaving a lasting legacy within the local community through the opportunity to leverage innovative new housing solutions to create workers' accommodations, such as 3D printing houses using cement-based products, modular transportable homes, and prefabricated homes. Once construction is completed, transform them into affordable/social housing for the local community. | Chamber of Commerce Organisation, Local Government Authority |
| **Agriculture** | Farmers are concerned by the large area for energy projects, particularly at Robbins Island – unique privately owned land. | Local Government Authority |
| **Tourism** | Concerns the tourism industry will be affected due to the lack of available accommodation for tourists, particularly during construction when FIFO workers occupy hotels. Already shortages and high prices occur during peak season for travel to Tasmania and the area. "*Over Christmas, locals couldn't get children home due to increased price of Spirit of Tasmania and no availability.*" | Chamber of Commerce Organisation, Local Government Authority |
| | Use community benefit scheme to support local tourism events and function art on soundproofing panels etc. | Landowner |
| **Infrastructure and Services** | | |
| **Governance** | No specific governance issues. | |
| **Health infrastructure and services** | Health levels are also low – smoking, obesity and heart problems are greater than in other places in Australia. | Chamber of Commerce Organisation |
| | Higher quality health and community services are needed to attract more professionals to the area. | Local Government Authority |
| **Emergency Services** | Heybridge boat ramp may need upgrading in case of an incident, as it's only accessible during the high or mid tide. | Landowner |
| **Transport** | Minor disruptions from construction, such as traffic interruptions, will cause significant unhappiness within the community. Concerns were voiced via Facebook. | Chamber of Commerce Organisation |
| | The predicted increase in Renewable Energy and associated industries exports via Burnie and Devonport, as well as construction commencing on major projects, will lead to increased traffic along the coastal strip (highway). | Local Government Authority |
| **Other energy infrastructure** | Projects in the local area include:<br>• Robbins Island (140 turbines, DA lodged)<br>• Hellier and Guilford (Arc Energy 125 turbines), | Chamber of Commerce Organisation |

| Aspect | Feedback | Stakeholder |
| --- | --- | --- |
| | • Hampshire – Eco fuel (like ethanol) uses renewable energy to make hydrogen and use the waste from forestry operations (employ 200 people full time and up and running 2026).<br>• Battery of the nation at Lake Cethana – pumped hydro.<br>• Whaleback Ridge – manufacture wind farm with 450 turbines to make hydrogen.<br>• Avebury Nickel – Zeehan – only just started shipping nickel concentrate late last year. Dormant mine, but it is now viable.<br>• MMG – processing tailings in mines.<br>• Lots of mining activities on the west coast.<br>• Also, talk about Mt Lyell being reopened, and if so, about 500 jobs.<br>Marinus Link is critical to these projects going ahead – if MLPL does not go ahead, some of these projects won't go ahead as there will be no export market for energy. | |
| | Biomass energy production, advanced manufacturing and defence component parts, Port Redevelopment in Burnie.<br>Battery projects (Shorewell) and NBN projects in Cradle Coast Region.<br>Heavy reliance on transmission line projects eventuating to connect all these renewable projects to the grid. | Local Government Authority |
| | The high degree of uncertainty of sequencing of projects is dependent on the project. | Local Government Authority |
| **People's productive capacity** | | |
| **Health (mental and physical)** | The project may cause stress and anxiety in the local community. Many within the community don't see any local benefit. The community is unaware of cumulative impacts that are or may occur from other TasNetworks projects currently underway in Tasmania's north-west as a result of the project. Many in the community believe the project is also delivering the transmission project, which agricultural landowners are concerned about. | Chamber of Commerce Organisation<br>Local Government Authority |
| **Education and Training** | Overall, education levels are lower than national averages. | Chamber of Commerce Organisation |
| | TasTafe delivers free placements for certain industry segments, but not sure about the uptake levels. | Chamber of Commerce Organisation |
| | Lack of alignment between skills in demand in the local area and people studying these skills – i.e. STEM subjects highly critical for renewable space. TAFE offers only linear and traditional pathways. | Local Government Authority |

# 7. EXISTING CONDITIONS

This section presents an overview of the socio-economic conditions experienced by the communities within the study area, followed by a comparison of demographic data that characterises the profile of the resident population (measured as a place of enumeration unless otherwise defined).

## 7.1 COMMUNITY IDENTITY

This section provides a consideration of factors that contribute to the way the community identifies itself in terms of civic participation, resilience, feelings of trust and safety and a sense of belonging in the local and regional study area. These social values are largely conceptual in that they are terms used to describe a number of factors that contribute to a community's identity, wellbeing and sense of place. In this baseline, the potential indicators of community identity include social capital, community cohesion, character and amenity, sense of place and community safety.

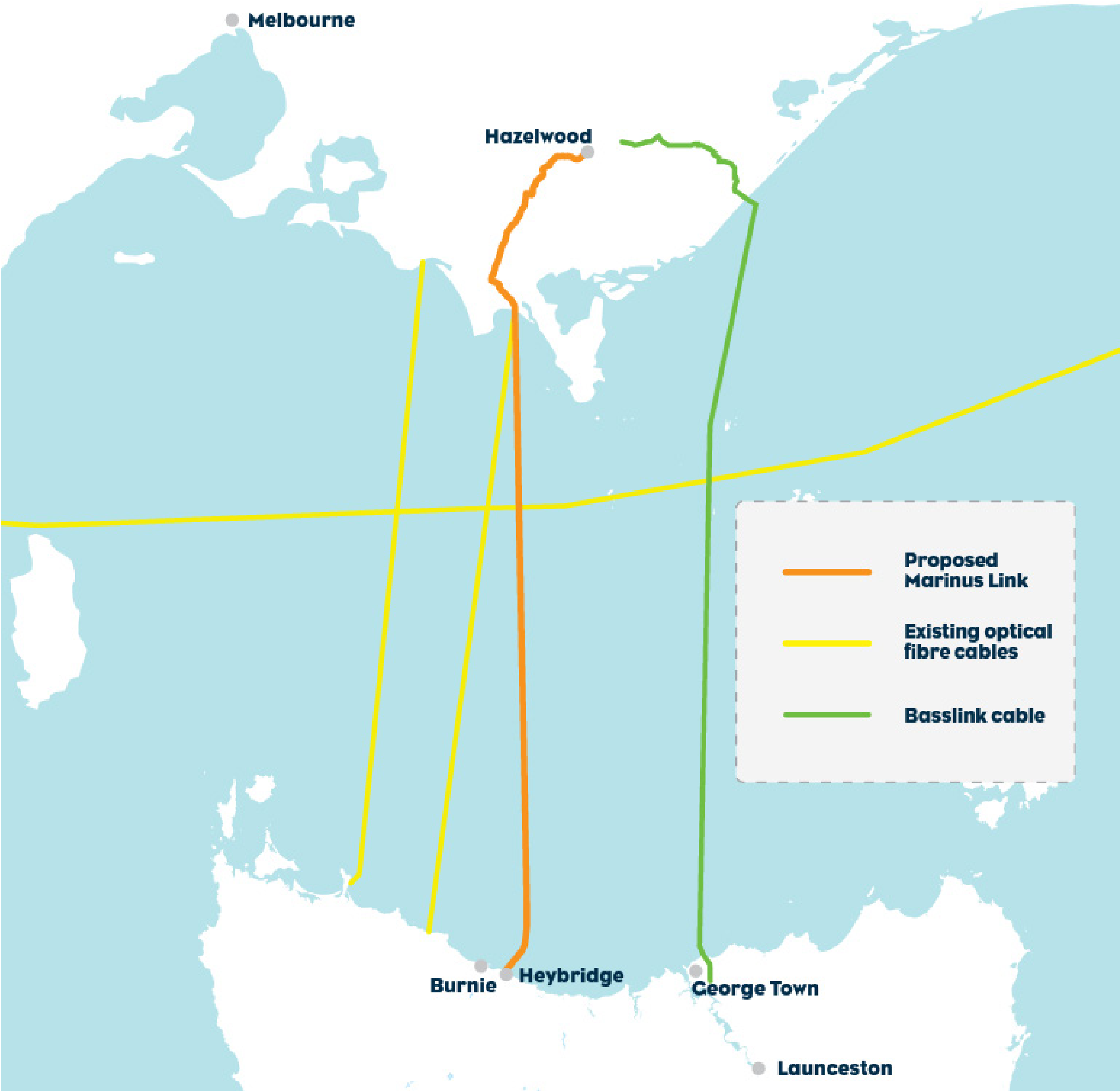
Social capital is a broad concept that is often used to refer to how established social networks within a community can be drawn upon to support individual and group needs. Communities that have social capital typically have more well-developed social networks with greater levels of trust (Pope 2003). These networks can be used to band together to respond to crises and challenges and build on and celebrate community assets (Onyx and Leonard 2010; Bulleen and Onyx 2005; Larsen et al. 2004).

## 7.2 POPULATION AND DEMOGRAPHIC CHARACTERISTICS

### 7.2.1 Place

Two converter stations and a high voltage alternating current (HVAC) switching station are proposed to be located near the coast at Heybridge, within the Burnie City LGA. The Tasmanian landfall and shore crossing are adjacent to the Heybridge Converter Station site.

The subsea cable traverses the Bass Strait from Heybridge in Tasmania and is proposed to make its shore crossing connect at Waratah Bay in Victoria, the land route via a transition station. The subsea cables will connect directly to the two converter stations, which are connected to the HVAC switching station. The offshore subsea cables will run due north-south along a longitude of 146°05' across the Bass Strait. The subsea cables will deviate from this longitude in approximately 60 m water depth off the Tasmania coast and near Tongue Point, and Wilsons Promontory National Park to the Tasmanian and Victorian landfalls and shore crossings, respectively.




*Source: Marinus Link, Proposed Route Overview to Support Community Input, December 2020*

**Figure 7-1 Marinus Link transmission line route**

## 7.2.2 Local government areas

### 7.2.2.1 Burnie City LGA

Burnie City is within the ancestral territory of the Plairhekenillerplue band of the North Peoples Tribe. The Burnie City LGA has a total land area of 611 km$^2$, is located on Tasmania's northwest coast and as of June 30, 2021, had an estimated residential population of 19,646 persons (ABS 2022a). The LGA is bounded to the north by the Bass Strait and adjoins the LGAs of Waratah-Wynyard and Central Coast. The Burnie central business district (CBD) is located about 50 km west of the Devonport CBD and 150 km north-west of the Launceston CBD.

The Burnie area was first settled by Europeans in 1827, with the establishment of a port to service the Surrey and Hampshire pastoral holdings (AEC Group 2007). The region's relative isolation and cold winters resulted in limited population growth, with the population remaining below 200 for its first 50 years (AEC Group 2007). However, there have been two major socio-economic periods of growth in the Burnie region, largely related to industrial development:

- In the 1880s, mineral deposits were discovered on the west coast and the establishment of first a tramway and then a railway connection to Burnie resulted in Burnie becoming the export point for a number of mines in the region, including the Mount Bischoff tin mine, which at the time was one of the richest mines in the world (AEC Group 2007). This, in turn, supported the development and expansion of the Burnie region; by 1900, the population in the Burnie area had grown to over 1,500 people.
- The establishment of the Associated Pulp and Paper Mills in 1938 resulted in rapid population and economic growth, and by 1945 there were more than 10,000 people residing in the area from a base of around 4,000 (GHD 2010).

Today, Burnie City is served by the Bass Highway and the Ridgley Highway and remains the primary population centre for the Burnie City LGA and the regional activity centre for the Cradle Coast Region. Burnie City, at the regional level, provides a range of health, education, cultural, community support and industrial services (Cradle Coast Regional Planning Initiative 2010). The Burnie City LGA also includes the localities of Ridgley and parts of Heybridge, with the remainder of the population sparsely spread across the LGA, although most of the population is located along and close to the coast.

#### 7.2.2.2 Central Coast LGA

The First Peoples of the Central Coast LGA area are the Palawa/Pakana of the Punnilerpanner clan. The Central Coast LGA has a total land area of 933 km² is located on Tasmania's north coast and as of June 30, 2021, had an estimated residential population of 22,176 persons (ABS 2022a). The LGA is bounded to the north by Bass Strait and adjoins the LGAs of Burnie City, Devonport, Kentish and Waratah-Wynyard.

European settlement of the Central Coast LGA began in the late 1830s and was primarily associated with the growing Tasmanian forestry industry. The population grew during the late 1800s when several ports operated and the railway line from Launceston was opened.

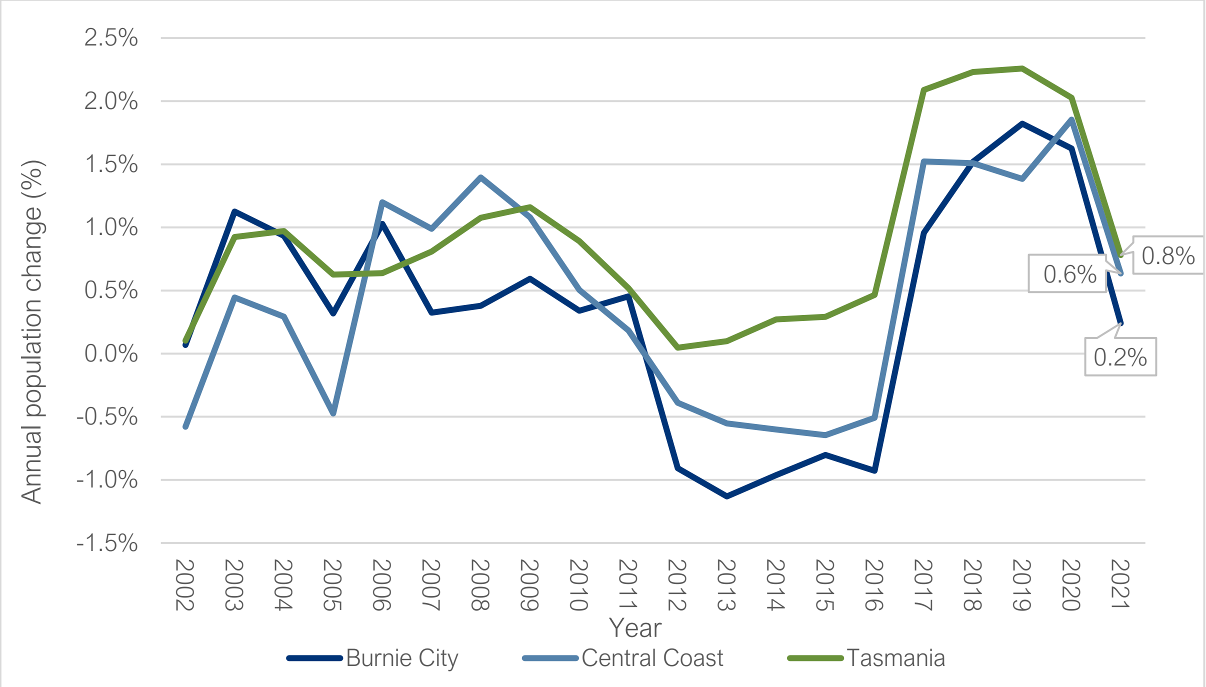
Ulverstone is the urban centre of the LGA and its largest town; the second largest town is Penguin, which is located 13 km to the west of Ulverstone. The majority of the LGA's population is concentrated in the coastal towns, with the remainder living in smaller localities such as Forth, Gawler, Heybridge, Leith, Sulphur Creek and Turners Beach.

### 7.2.3 First Peoples

The proposed alignment takes in areas of Heybridge and Burnie, which is recognised as the Tommeginne Country of the Palawa nation. The Plairhekehillerplue People are represented by the Six Rivers Aboriginal Corporation.

### 7.2.4 Population trends and projections

The population change for the estimated residential population for each of the LGAs within the regional study area is presented in Figure 7-2. Both LGAs experienced a period of population decline between 2012 and 2015. Similarly, both LGAs and Tasmania as a whole experienced a decline in the rate of growth between 2020 and 2021, of which the rate of decline for Tasmania was highest (0.8%) and lowest for Burnie City LGA (0.2%).




*Source: ABS (2022b) Estimated Residential Population LGA, 2001 to 2021*

**Figure 7-2 Population changes in the regional study area and Tasmania**

The estimated resident population for the two LGAs in the regional study area is presented in Table 7-1. Population changes between the years 2001 to 2021 for both LGAs were below that of the State of Tasmania, which grew by 19.9 % over this period. Central Coast shows a larger change in population in the same period (9.6 %) than Central Coast (7.1 %).

The estimated resident population for the two LGAs in the regional study area is presented in Table 7-1 below. Population changes between the years 2001 to 2021 for both LGAs were below that of the State of Tasmania, which grew by 19.9 % over this period. Central Coast shows a larger change in population in the same period (9.6 %) than Central Coast (7.1 %).

**Table 7-1 Estimated resident population in the regional study area and Tasmania, 2001 to 2021**

| Area | 2001 | 2006 | 2011 | 2016 | 2021 | Percentage change | |
|---|---|---|---|---|---|---|---|
| | | | | | | Average annual | 2001-2021 |
| **Burnie City** | 19,077 | 19,748 | 20,164 | 19,228 | 20,441 | 0.3 % | 7.1 % |
| **Central Coast** | 21,242 | 21,428 | 22,332 | 21,736 | 23,278 | 0.5 % | 9.6 % |
| **Tasmania** | 473,668 | 489,302 | 511,483 | 517,514 | 567,909 | 0.9 % | 19.9 % |

*Source: ABS (2022) Estimated Residential Population by LGA 2001 to 2021*

Table 7-2 details the current population projections for LGAs within the regional study area from 2017 to 2042 and their projected changes over this period. As detailed, both LGAs within the regional study area are estimated to experience population decreases between 2027 and 2042. Burnie City is predicted to decrease in population by -8.5 %, whereas Central Coast LGA is predicted to decrease by -3.0 %. However, for Tasmania, in the same period, the population is estimated to grow by 12.5 %.

**Table 7-2 Estimated resident population in the regional study area and State for 2001 to 2021**

| Area | 2017 | 2022 | 2027 | 2032 | 2037 | 2042 | 2017 to 2042 population change % |
|---|---|---|---|---|---|---|---|
| Burnie City | 19,412 | 20,343 | 19,836 | 19,257 | 18,613 | 17,886 | -8.5 |
| Central Coast | 22,067 | 23,253 | 23,133 | 22,787 | 22,155 | 21,425 | -3.0 |
| Tasmania | 528,324 | 570,344 | 583,953 | 593,921 | 600,186 | 603,470 | 12.5 |

*Source: Tasmanian Government (2022a) Population projections for Tasmania and its Local Government Areas*

### 7.2.4.1 Age and sex composition

Age and sex characteristics of a community indicate the existing and future needs of a community. Table 7-3 provides a summary of the age profile in the local and regional study area. All areas are ageing, with median ages greater than 40 years old. The median age is highest in the suburb of Heybridge and LGA of Central Coast at 48 years.

Table 7-3 also provides the dependency ratio for the study area and compares the same to Tasmania. A dependency ratio shows the ratio of the population that is not typically in the labour force (0 – 14 years and 65+ years) compared to those typically within the labour force (15 to 64 years). A high ratio indicates that there are more people of working ages who can support the population of dependent ages and vice versa. The dependency ratio is the highest for Central Coast LGA, at 68 dependent persons for every 100 working-aged people. Whereas the suburb of Heybridge and the LGA of Burnie City ratio' are 62 and 59, respectively.

Table 7-3 also provides the sex ratio for the study area, compared to Tasmania. The sex ratio compares the number of males to every 100 females in the population. The sex ratio for both LGAs shows a relatively even balance between the males and females, with 93 males to every 100 females and is similar to the sex ratio for Tasmania. Heybridge, however, has 118 males for every 100 females, indicating that more males than females live in this suburb.

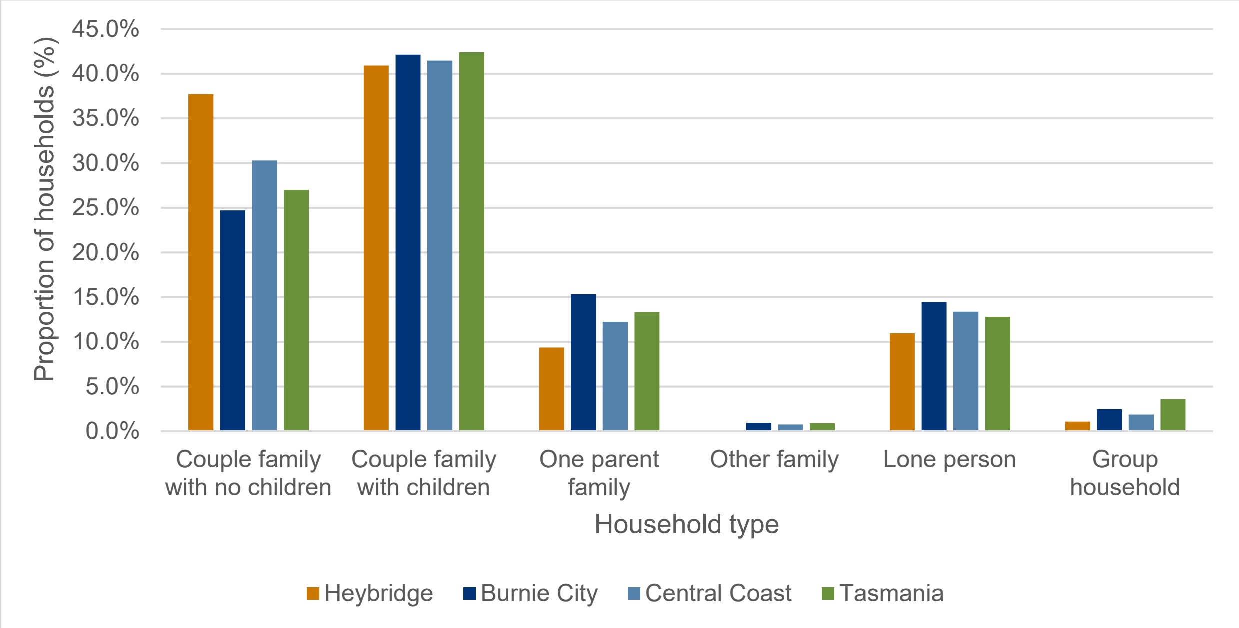
**Table 7-3 Age and sex summary profile of local and regional study areas**

| Area | Median age | 0 to 14 years | | 15 to 64 years | | 65 and over | | Dependency ratio[1] | Sex ratio |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| Heybridge | 48 | 69 | 15.8% | 269 | 61.6% | 99 | 22.7% | 62 | 118 |
| Burnie City | 40 | 3,605 | 18.1% | 12,544 | 63.0% | 3,770 | 18.9% | 59 | 93 |
| Central Coast | 48 | 3,572 | 15.3% | 13,542 | 59.5% | 5,637 | 24.8% | 68 | 93 |
| Tasmania | 42 | 92,640 | 17.0% | 348,308 | 62.5% | 116,642 | 20.9% | 60 | 96 |

[1]Number of dependent persons within a population compared to 100 working persons.
Source: ABS 2021 Census of Population and Housing. General Community Profile

### 7.2.4.2 Household composition

Household composition is used to characterise the type of household (family, single persons, group/shared household) within a dwelling. Figure 7-3 shows the household composition of the local and regional study areas. The dominant household type was couple families with children, followed closely by couple families with no children. The suburb of Heybridge has more couple families with and without children and fewer one-parent, lone-person and group households than the LGAs in the regional study area and Tasmania as a whole.




**Source: ABS 2021 Census of Population and Housing. General Community Profile**

**Figure 7-3 Household composition local and regional study areas (2021)**

### 7.2.4.3 First Peoples

In 2021, 30,186 persons (or 5.4 %) identified as Aboriginal and/or Torres Strait Islanders (First People) in Tasmania. Table 7-4 shows the proportion of First Peoples living within the study area at the time of the 2021 Census. As shown, Burnie and Central Coast LGAs, had similar proportions of First Peoples to the state, while Heybridge had a higher proportion (7.6 %) of residents identifying as First People than the state.

**Table 7-4 Proportion of First Peoples – local and regional study area**

| Study area | Indigenous | | Non-Indigenous | | Not stated | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| **Heybridge** | 30 | 6.7% | 384 | 85.7% | 34 | 7.6% |
| **Burnie City** | 1,692 | 8.5% | 17,341 | 87.0% | 892 | 4.5% |
| **Central Coast** | 1,875 | 8.2% | 19,797 | 87.0% | 1,082 | 4.8% |
| **Tasmania** | 30,186 | 5.4% | 501,521 | 89.9% | 25,851 | 4.6% |

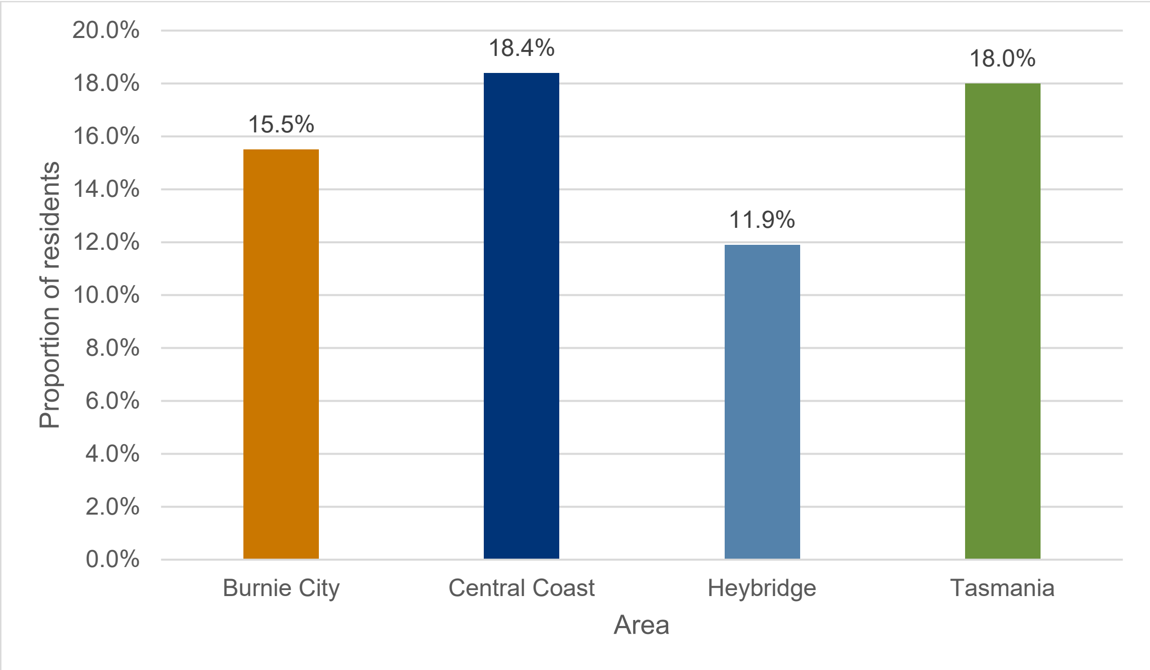
*Source: ABS 2021 Census of Population and Housing. General Community Profile*

## 7.2.5 Heybridge locality

Heybridge is a small rural town situated in Tasmania's north-west coast in the Burnie and Central Coast LGAs. Heybridge covers an area of 6.5 km$^2$ and, as of June 30, 2021, based on the place of usual residence, is home to 442 people (ABS, 2022a). Heybridge shares land borders with Chasm Creek, Round Hill, Stowport, Cuprona, and Howth localities. Bass Strait lies on the northern border. Heybridge's history over the 20th Century is dominated by the construction, operation and eventual closure of the tioxide plant. The factory, at its peak, produced 35,000 tons per annum of tioxide and employed up to 450 people (Summers, 2006). Ongoing rehabilitation has improved the environmental conditions from the plant directly discharging waste into Blythe Creek, causing discolouration of water in 'tioxide beach'. MLPL intends to develop the Heybridge converter station on the former tioxide plant site. Heybridge is now viewed as a small coastal retirement town.

### 7.2.6 Volunteering

Figure 7-4 shows the proportion of the population that stated that they volunteered in the 2021 Census in the study area. Volunteering is a common indicator of social capital, as it provides a basis for working together and forms relationships within communities, which are likely to build social networks and establish higher levels of trust and resilience within a community (Pope 2003). As shown, Heybridge had the lowest proportion of the population who had undertaken voluntary work for an organisation or group in the last 12 months before the 2021 Census (11.9 %). Burnie (15.5 %) was below the state (18.0 %) of people who had volunteered in the previous 12 months. Central Coast (18.4 %) recorded a higher proportion of volunteerism within the LGA population. It should be noted that the 12 months before the 2021 Census included periods when the population were in COVID lockdowns and as a result, the rates of volunteering were much lower than had been recorded at the time of the 2016 Census.




*Source: ABS 2021 Census of Population and Housing, General Community Profile.*

**Figure 7-4 Proportion of residents who have volunteered in the last 12 months**

### 7.2.7 Cultural diversity

The ABS national framework for describing cultural and language diversity (ABS 2022c) includes four indicators, namely, country of birth of the person, a main language other than English spoken at home, proficiency in spoken English and Indigenous status (see Table 7-7). Table 7-5 reports on a self-assessed measure of ethnicity and cultural diversity. The predominant ancestries identified in the study area were English and Australian.

**Table 7-5 Self assessed cultural diversity within the study area**

| Ancestry | Heybridge (%) | Burnie City (%) | Central Coast (%) | Tasmania (%) |
|---|---|---|---|---|
| English | 45.2 | 42.9 | 45.2 | 43.7 |
| Australian | 53.1 | 46.1 | 45.1 | 40.4 |
| Irish | 7.7 | 9.4 | 9.3 | 10.2 |
| Scottish | 10.2 | 9.1 | 9.3 | 9.4 |
| Australian Aboriginal | 6.2 | 7.6 | 7.4 | 4.8 |
| German | 3.2 | 5.5 | 4.5 | 5.8 |

*Note 1:* In this census question, respondents could report up to two ancestries on their census form.
*Note 2:* As multiple responses are recorded, the sum of all ancestry responses will not equal the total number of people in the area.
Source: ABS (2022a) Census of Population and Housing, 2021 Table Builder.

Overall, a review of demographic indicators of cultural diversity suggests a high level of cultural homogeneity. The majority of people were born in Australia (Table 7-6), and over 80 % of people identified as either English or Australian (Table 7-6). Similarly, most people speak English at home (Figure 7-5).

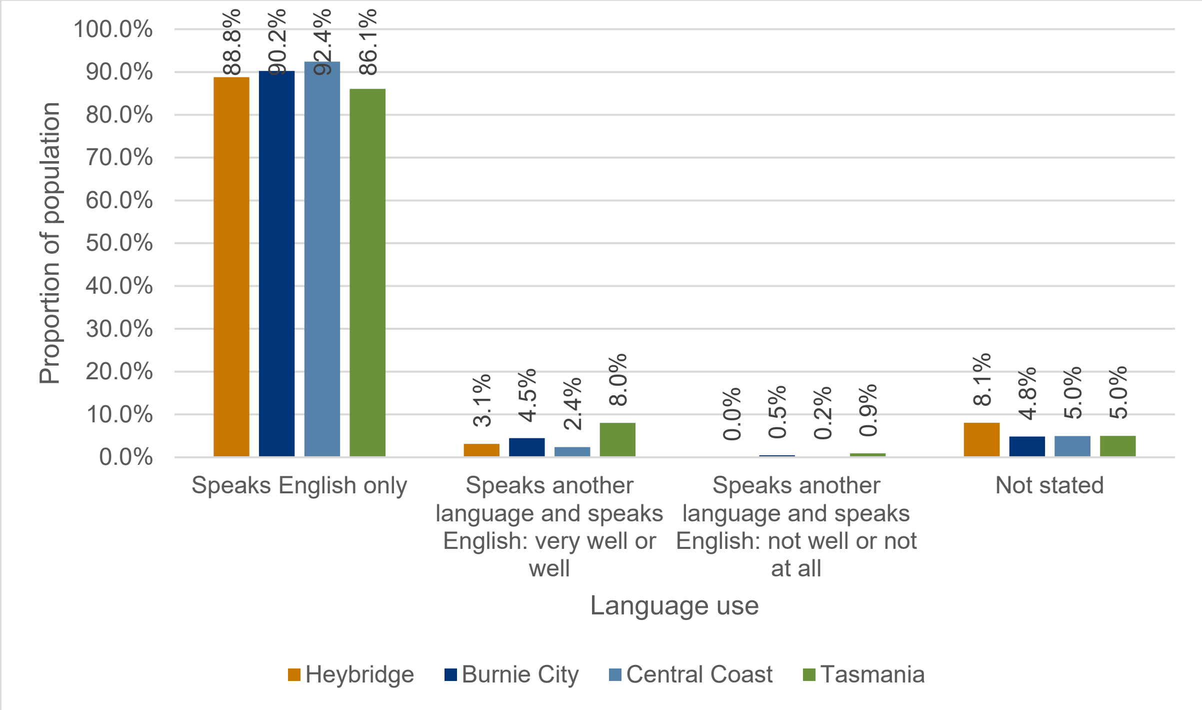
Table 7-6 details the birthplace of residents in the suburb of Heybridge and the LGAs of Burnie and Central Coast. More than four-fifths of the residents in each area were born in Australia, ranging from 80.8 % in Heybridge to 84.4 % in Burnie, compared to 79.1 % in Tasmania. The second most frequently cited country of birth was England for all areas, ranging from 3.5 % in Central Coast to 2.0 % in Burnie, compared to 3.5 % in Tasmania.

**Table 7-6 Birthplace – study area**

| Country of birth | Heybridge (%) | Burnie City (%) | Central Coast (%) | Tasmania (%) |
|---|---|---|---|---|
| Australia | 80.8 | 84.4 | 84.1 | 79.1 |
| England | 2.7 | 2.0 | 3.5 | 3.5 |
| New Zealand | 0.7 | 0.9 | 0.9 | 1.0 |
| Germany | 0 | 0.3 | 0.2 | 0.4 |
| China | 0 | 0.3 | 0.2 | 1.2 |
| India | 0 | 0.8 | 0.3 | 1.1 |
| Nepal | 0 | 0.4 | 0.1 | 1.1 |
| Netherlands | 1.1 | 0.2 | 0.8 | 0.4 |
| Philippines | 0 | 0.4 | 0.4 | 1.1 |
| Scotland | 0 | 0.3 | 0.4 | 0.4 |
| Not stated | 10.4 | 5.5 | 6.4 | 5.6 |

*Source: ABS (2022a) Census of Population and Housing, 2021 Table Builder Pro*

Data presented in Figure 7-5 shows that the majority of residents in the study area only spoke English at home. This ranged from 88.8 % in Heybridge to 92.4 % in Central Coast LGA. There were very few people who did not speak English at all within their homes in the regional study area.




*Source: ABS 2021 Census of Population and Housing, General Community Profile.*

Figure 7-5 Proficiency in English (2021)Table 7-7 below lists the range of languages spoken by residents within the local and regional study area compared to Tasmania. The data highlights the cultural homogeneity in the local and regional study area and shows that the proportion of households that speak a language other than English is low and less than 1% of households for each identified language.

**Table 7-7 Languages spoken at home – local and regional study area**

| Language | Heybridge | Burnie City | Central Coast | Tasmania |
|---|---|---|---|---|
| Afrikaans | 0.0% | 0.1% | 0.0% | 0.0% |
| Arabic | 0.0% | 0.3% | 0.1% | 0.1% |
| Australian Indigenous Languages | 0.0% | 0.0% | 0.0% | 0.2% |
| Chinese languages | 0.7% | 0.6% | 0.0% | 0.0% |
| French | 0.0% | 0.0% | 0.0% | 0.3% |
| German | 0.0% | 0.2% | 0.3% | 1.5% |
| Bengali | 0.0% | 0.1% | 0.4% | 1.8% |
| Hindi | 0.0% | 0.2% | 0.1% | 0.1% |
| Nepali | 0.0% | 0.4% | 0.1% | 0.3% |
| Punjabi | 0.0% | 0.3% | 0.0% | 0.2% |
| Sinhalese | 0.9% | 0.3% | 0.0% | 0.0% |
| Urdu | 0.7% | 0.1% | 0.0% | 0.1% |
| Other Indo-Aryan languages: | 0.0% | 0.0% | 0.0% | 0.1% |
| Italian | 0.0% | 0.1% | 0.1% | 0.2% |
| Japanese | 0.0% | 0.1% | 0.2% | 1.3% |
| Khmer | 0.0% | 0.0% | 0.1% | 0.5% |
| Korean | 0.0% | 0.0% | 0.0% | 0.2% |

| Language | Heybridge | Burnie City | Central Coast | Tasmania |
|---|---|---|---|---|
| Macedonian | 0.0% | 0.0% | 0.0% | 0.3% |
| Malayalam | 0.0% | 0.2% | 0.0% | 0.0% |
| Persian (excluding Dari) | 0.0% | 0.0% | 0.4% | 2.8% |
| Polish | 0.0% | 0.0% | 0.0% | 0.2% |
| Portuguese | 0.0% | 0.1% | 0.0% | 0.1% |
| Samoan | 0.0% | 0.0% | 0.0% | 0.1% |
| Serbian | 0.0% | 0.0% | 0.0% | 0.0% |
| Filipino | 0.0% | 0.1% | 0.0% | 0.1% |
| Indonesian | 0.0% | 0.0% | 0.0% | 0.1% |
| Tagalog | 0.0% | 0.1% | 0.0% | 0.1% |
| Other Southeast Asian Austronesian languages: | 0.0% | 0.1% | 0.0% | 0.1% |
| Spanish | 0.0% | 0.2% | 0.0% | 0.1% |
| Tamil | 0.0% | 0.1% | 0.0% | 0.0% |
| Thai | 0.0% | 0.1% | 0.0% | 0.0% |
| Vietnamese | 0.0% | 0.1% | 0.1% | 0.1% |
| Other* | 0.0% | 0.7% | 0.0% | 0.1% |

* *Includes languages not identified individually, 'Inadequately described' and 'Non-verbal, so described'.*

*Source: ABS 2021 Census of Population and Housing. General Community Profile*

### 7.2.8 Landscape amenity and character

Landscapes are defined by people. The definitions are, therefore, just as varied, dynamic, and complex as the people who define them. Sense of place describes the relationship between people and the spatial area (including landscapes) that they live in and/or identify with. How a change in the landscape affects individuals and communities is dependent on the meaning that each individual attaches to the features within the landscape. If the change is deemed by an individual to be inconsistent with either their values or the physical setting, then change is viewed negatively. Similarly, if a change in the landscape is consistent with the values or physical setting, then the change is perceived to be neutral or positive.

SIA consultation for the project identified several natural and recreation areas (Table 7-8) that are sensitive to changes in the landscape. These included the Chasm Creek Conservation Area and Blythe River Conservation Area and numerous unnamed and informal public reserves. These are described in Table 7-8 below.

**Table 7-8 Natural and recreational areas within 3.0 km of the Heybridge Converter Station site**

| Name | Description and community use | Distance from the project |
|---|---|---|
| **Blythe River Conservation Area** | 935 ha Central Coast LGA | 1 km |
| **Chasm Creek Conservation Area** | 55 ha Burnie City LGA | 1 km |
| **Public Reserves** | River Reserves, Public Reserves and Informal Reserves are managed under the Crown Land Act and by DIPWE and local government. | Ranging from 100m to 3km from the site |

## 7.3 ECONOMY AND LIVELIHOODS

This section describes how people make a living in the local and regional study area in comparison to Tasmania as a whole and provides an overview of the structure of the economy.

### 7.3.1 Employment profile

This section provides an overview of the employment profile within the local and regional study area.

#### 7.3.1.1 Employment

Table 7-9 shows the employment characteristics of the local and regional study areas compared to Tasmania at the 2021 Census. As detailed, the proportion of people in Heybridge (5.0 %) who were unemployed is slightly below the state level (5.9 %). Central Coast LGA had the lowest unemployment rate in the regional study area at 4.6%. Labour force participation for Heybridge (53.7 %), Central Coast (54.6 %) and Burnie City (56.9 %) was lower than that of the state (58.2 %). Lower participation rates may, in part, be due to the comparatively aged population in the local and regional study area; however, it is noted that low participation along with higher unemployment rates can also exacerbate socio-economic disadvantage in the region.

**Table 7-9 Employment status – local and regional study areas (2021)**

| | Heybridge | Burnie | Central Coast | Tasmania |
|---|---|---|---|---|
| **Unemployed** | 10 | 559 | 484 | 16,058 |
| **Unemployment rate (%)** | 5.0 | 6.0 | 4.6 | 5.9 |
| **Labour force** | 202 | 9,295 | 10,461 | 270,774 |
| **Labour force participation (%)** | 53.7 | 56.9 | 54.6 | 58.2 |

*Source: ABS 2021 Census of Population and Housing. General Community Profile*

#### 7.3.1.2 Unemployment

Table 7-10 shows the proportion of people aged 15 and over who reported being in the labour force in the area compared to Tasmania at the 2021 Census. As detailed, the proportion of people in the local and regional study area who were unemployed was slightly below the state level, except for the Burnie LGA, where the unemployment level was slightly above Tasmania's average. With the exception of Central Coast, full time employment in the study area was higher than that of the state (51.6 %). It is noted that low participation, along with higher unemployment rates, has been a feature of socio-economic disadvantage in Tasmania for some time and is symptomatic of the area's generational disadvantage (Barton, Denham, and Fairbrother 2019).

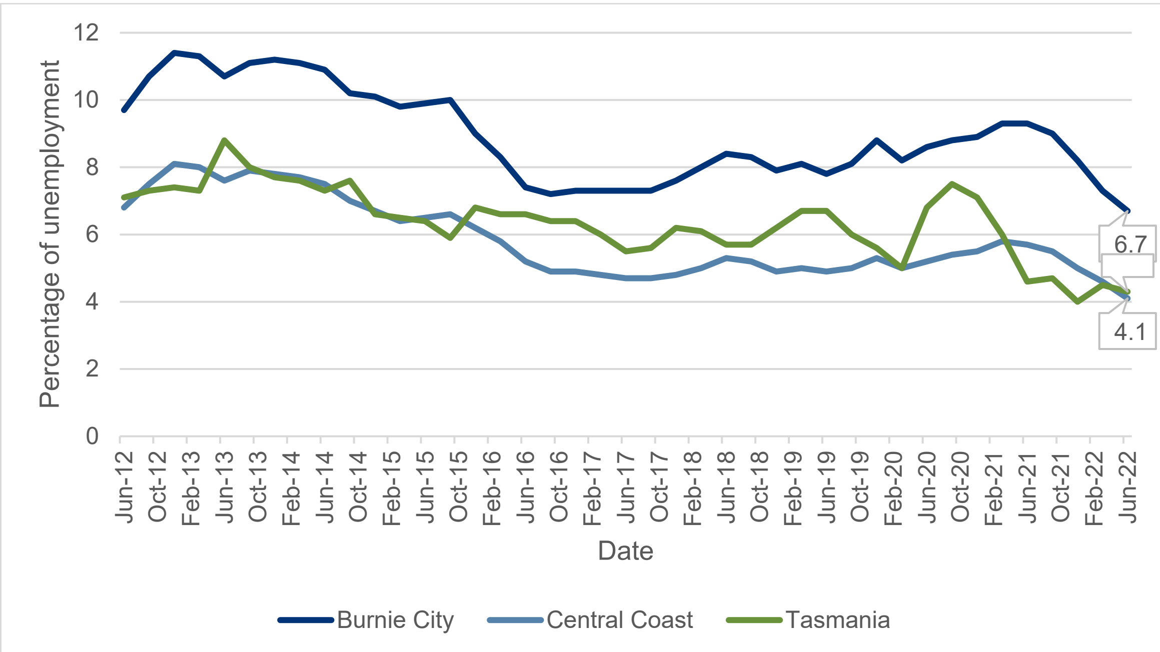
**Table 7-10 Employment status (15 years and over)**

| Area | Worked full time | Worked part time | Away from work | Unemployed |
|---|---|---|---|---|
| Heybridge | 52.0% | 35.6% | 7.4% | 5.0% |
| Burnie City | 53.5% | 34.4% | 6.1% | 6.0% |
| Central Coast | 51.4% | 37.0% | 7.0% | 4.6% |
| Tasmania | 51.6% | 36.4% | 6.0% | 5.9% |

*Source: ABS 2021 Census of Population and Housing. General Community Profile*

Figure 7-6 below shows the unemployment rate in the regional study area from June 2012 to June 2022. As shown, unemployment rates in Central Coast LGA area have generally been under that of the state; however, noting that Tasmania has historically had unemployment rates above that of mainland Australia. The exception to this is the Burnie LGA, where unemployment rates have consistently been above that of the state.

The COVID-19 pandemic began to have a negative impact on the Australian labour market from March 2020, when the initial shutdown of non-essential services and trading restrictions took effect (Department of Education, Skills and Employment 2021). The effect of COVID-19 can be clearly seen in the regional study area, where the unemployment rate increased in all areas from March 2020. The Department of Education, Skills and Employment has noted that the unemployment rate may not fully reflect the labour market adjustment to COVID-19, noting that record numbers of people left the labour force, leading to a smaller increase in the unemployment rate than would have otherwise occurred (Department of Education, Skills and Employment 2021). As such, there is potential that there has been a greater change in the labour market in the regional study area than shown or currently understood.



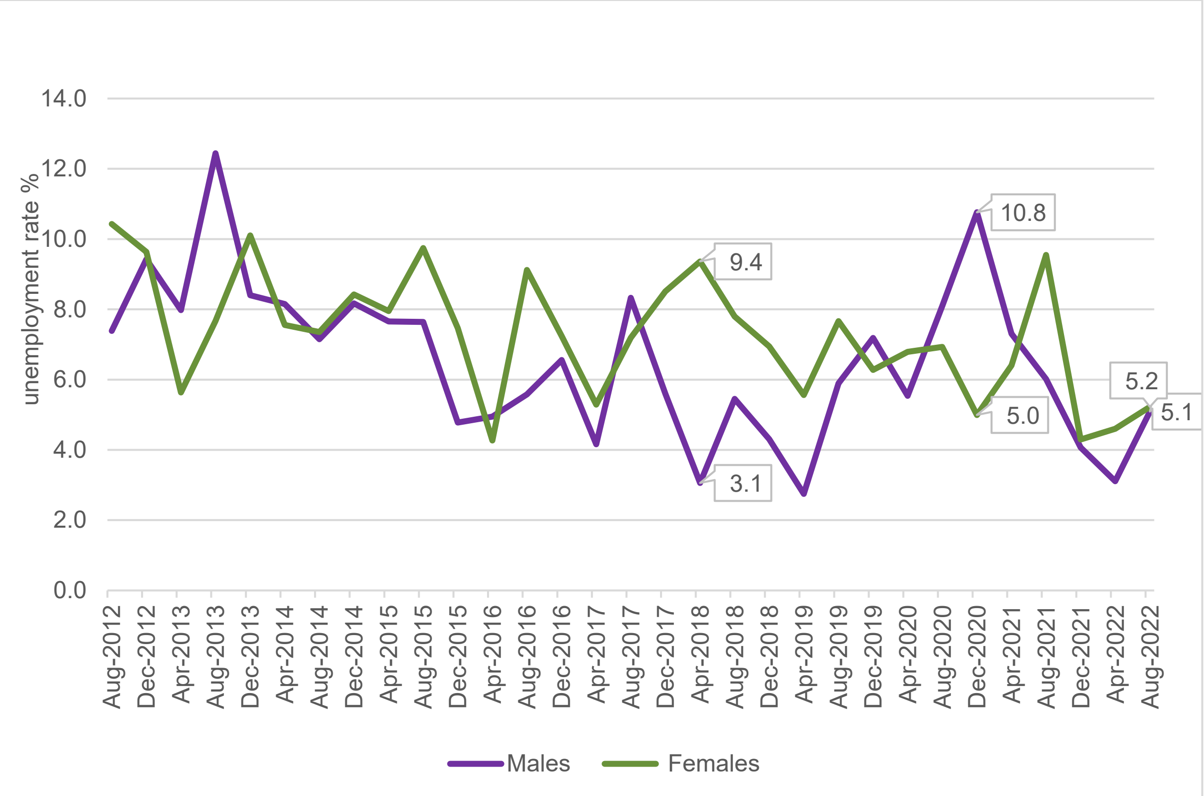

*Source: Department of Education, Skills and Employment (Department of Education, Skills and Employment 2022) Small Area Labour Markets (SALM), June Quarter 2022 and ABS (ABS 2022b) 6202.0 Labour Force, Australia*

**Figure 7-6 Unemployment rate from June 2012 to June 2022**

This section reviews unemployment data to identify groups in the regional study area that have higher unemployment rates. The groups considered include women and young people (16-24 years). Given the volatility of unemployment data, particularly since the COVID-19 pandemic, this section presents the most up-to-date data available, which is provided by the ABS at a statistical area 4 (West and North-West Tasmania) level.

Figure 7-7 displays the monthly female and male unemployment rates between August 2012 and August 2022. As shown, females in the West and North-West regions of Tasmania typically have higher unemployment rates than males. This was particularly prominent between December 2017 and August 2019, when the female unemployment rate was between 8.5 % and 7.7 %, while male unemployment was between 5.6 % and 5.9 %. However, over the ten-year period between August 2012 and August 2022, the average difference between male and female unemployment was 0.7%.

As of August 2022, the male unemployment rate was 5.2 % and the female rate was 5.1 %.

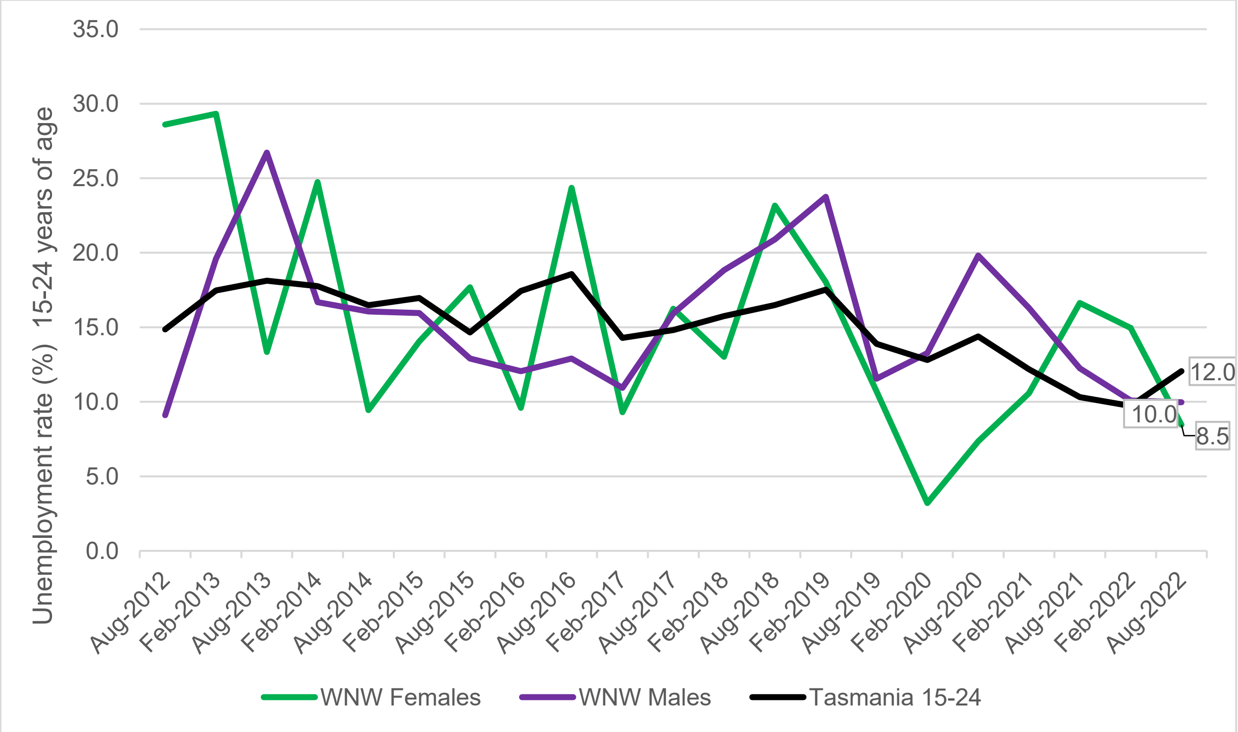



*Source: ABS (ABS 2022) 6291.0.55.001 – RM1 – Labour force status by Age, Labour Market Region (ASGS) and Sex, October 1998 onwards*

**Figure 7-7 Unemployment rate by sex – West and North-West region (2022)**

Youth unemployment is a noted issue in the region (Walker and Fairbrother 2105). Figure 6-8 shows the youth unemployment rate every month between August 2012 and August 2022 for females and males in the West and North-West region against the Tasmanian average. There have been large fluctuations in the youth unemployment rate for youth in the West and North West, and there have been a number of periods in which the female youth unemployment rate reached over 20 %, including February 2013 (29.3 %), February 2014 (24.7%), August 2016 (24.4%) and August 2018 (23.2%). As of August 2022, the youth unemployment rate for males was 10 % and for females was 8.5 % in the West and North-West regions, while youth unemployment across Tasmania was 12 %. Youth unemployment is comparatively lower in the LGAs; 6.4% in Burnie, 6.7% in Central Coast and 0.00%* in Heybridge.

*Youth that are not currently employed full-time, part-time or away from work are not looking for part-time work, in the labour force or are not stated.




*Source: ABS (ABS 2022) 6291.0.55.001 – RM1 – Labour force status by Age, Labour Market Region (ASGS) and Sex, October 1998 onwards*

**Figure 7-8 Unemployment rate 15- to 24-year-olds – West and North-West region and Tasmania (2022)**

## 7.3.2 Workforce skills and availability

This section considers the availability of a suitably qualified workforce to service the project, including identifying any potential workforce shortages, particularly as it relates to the project's workforce requirements. It primarily draws upon the findings of the Civil Construction Industry Workforce Plan 2019-2025 (Civil Contractors Federation Tasmania 2019) (workforce plan), which outlines workforce requirements for the civil construction industry in Tasmania, with a focus on identified large-scale projects identified within the Tasmanian Infrastructure Plan (2018). In addition to the skills requirements for the construction phase of the project, the workforce requirements of the operations phase would be focused on electricians.

The workforce plan projected that based on the 2018 understanding of infrastructure development, the following additional number of workers would be required state-wide to 2028:

- 193 managers (e.g., construction manager, project builder, engineering manager).
- 186 paraprofessionals (e.g., engineers, occupational health and safety advisors, building associates, technicians).
- 115 administration workers (e.g., contract administrator, general clerks, bookkeeper, payroll clerk).
- 276 plant operators (e.g., earthmoving plant operator, excavator operator, grader operator, loader operator, truck driver).
- 189 onsite construction workers (e.g., builder's labourer, concreter, paving and surfacing labourer, road traffic controller, labourers.

The workforce plan notes that the largest projected shortfall was for plant operators and paraprofessionals. This projected shortfall appears to be a continuation of an existing shortage of qualified and available workers in the construction industry in Tasmania, which was noted by the Department of Jobs and Small Business in

August 2018. This historical data was reiterated in the SIA consultation, where shortages in the construction industry were noted by a number of stakeholders.

At a more granular level, the Department of Small Jobs and Small Business publishes occupational-level skill shortage information for Tasmania. The current published status of workforce availability for occupations relevant to the project is detailed in Table 7-11

**Table 7-11 Workforce availability – Tasmania**

| Occupation | Labour market rating | Key findings | Date |
|---|---|---|---|
| Civil engineering professionals (Department of Jobs and Small Business 2019) | Shortage | The majority of vacancies were located across Tasmania. The majority of vacancies were for civil engineers, geotechnical, structural and transport engineers.<br>Regional vacancies were more difficult to fill than metropolitan vacancies. | February 2019 |
| Electrical engineer (National Skills Commission, Skills priority list) | Shortage | There is a shortage of electrical engineers in Tasmania and nationally with a moderate future demand. | July 2023 |
| Electrician<br>(National Skills Commission, Skills priority list) | Shortage | Shortage in Tasmania and nationally, with strong future demand. | July 2023 |

## 7.3.3 Income

The median household income in the local and regional study areas is lower than the median in Tasmania, with the Central Coast LGA median at $150 per week less than the state median of $1,358.00 (Table 7-12).

**Table 7-12 Median household income – local and regional study areas, 2021**

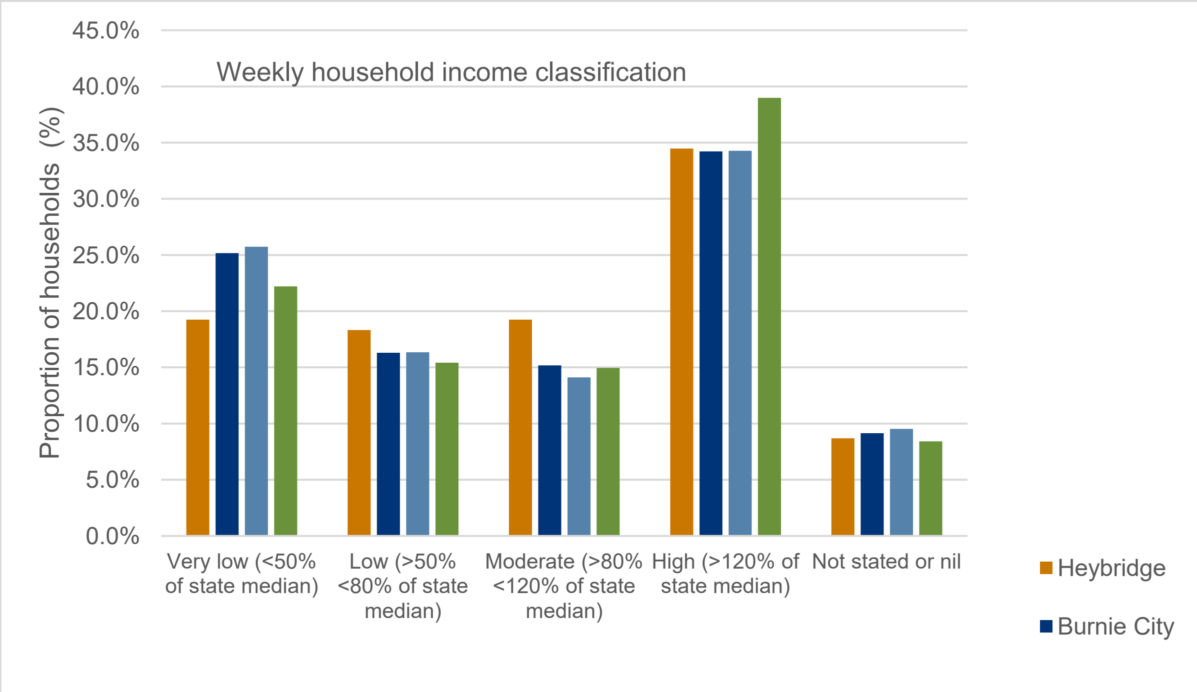
| Area | Heybridge | Burnie City | Central Coast | Tasmania |
|---|---|---|---|---|
| **Median household income ($/weekly)** | $1,289.00 | $1,225.00 | $1,209.00 | $1,358.00 |
| **Median household income ($/annual)** | $67,028.00 | $63,700.00 | $62,868.00 | $70,616.00 |

*Source: ABS 2021 Census of Population and Housing. General Community Profile*

Figure 7-9 shows the median weekly household income as at the 2021 Census, with incomes aggregated as follows:

- Very low-income households are defined as those with incomes <50 % of the state median income.
- Low-income households are defined as those with incomes between >50 % and <80 % of the state median income.
- Moderate-income households are defined as those with incomes between >80 % and <120 % of the state median income.
- High-income households are defined as those with incomes >120 % of the state median.
- Slightly higher proportions of households in each of the LGAs were classified in the very low- and low-income brackets compared to that of the state (22.2 %) and Heybridge (19.3 %). Conversely, slightly

lower proportions of households in the local and regional study area were classified in the high-income bracket compared to the state (39.0 %).




*Source: ABS (2022a), Census of Population and Housing. General Community Profile 2021*

**Figure 7-9 Household income distribution, 2021**

## 7.3.4 Industry and businesses

Table 7-13 details employment by industry in the local and regional study area at the 2021 Census (counting persons 15 years and over), with the industries that represent the top three industries of employment for the local and regional study area highlighted in grey. As shown, health care and social assistance, along with retail trade and education and training, are the most common industries of employment in the local and regional study area. Nearly one-quarter of the Heybridge local study area works in health care and social assistance. Other dominant industries of employment include:

- Agriculture, forestry, and fishing, which employed 7.3 % of the workforce in the Central Coast LGA, 3.8 % of the workforce in the Burnie City LGA, and 5.1 % of the local study area.
- Manufacturing, which employed 7.7 % of the workforce in the Burnie LGA, 8.1 % of the workforce in the Central Coast LGA and 9.6 % in the local study area.
- Construction, which employed 9.4 % of the workforce in the Central Coast LGA, 6.5 % of the workforce in Burnie City LGA, and 8.4 % in the local study area.

**Table 7-13 Employment by industry local and regional study area**

| Area | Heybridge | Burnie City | Central Coast | Tasmania |
|---|---|---|---|---|
| **Agriculture, Forestry and Fishing** | 4.7% | 3.8% | 7.3% | 5.3% |
| **Mining** | 1.6% | 4.2% | 2.3% | 1.0% |
| **Manufacturing** | 8.9% | 7.7% | 8.1% | 6.4% |

| Area | Heybridge | Burnie City | Central Coast | Tasmania |
|---|---|---|---|---|
| Electricity, Gas, Water and Waste Services | 0.0% | 0.7% | 1.3% | 1.8% |
| Construction | 7.9% | 6.5% | 9.4% | 8.6% |
| Wholesale Trade | 4.2% | 3.5% | 2.9% | 2.2% |
| Retail Trade | 8.4% | 11.9% | 10.0% | 9.6% |
| Accommodation and Food Services | 1.6% | 7.3% | 6.5% | 7.6% |
| Transport, Postal and Warehousing | 8.9% | 5.0% | 5.3% | 4.1% |
| Information Media and Telecommunications | 0.0% | 0.7% | 0.4% | 1.0% |
| Financial and Insurance Services | 1.6% | 1.5% | 1.0% | 1.9% |
| Rental, Hiring and Real Estate Services | 0.0% | 1.0% | 0.8% | 1.1% |
| Professional, Scientific and Technical Services | 3.1% | 2.9% | 3.6% | 5.1% |
| Administrative and Support Services | 3.1% | 2.6% | 2.4% | 2.9% |
| Public Administration and Safety | 2.1% | 5.6% | 5.2% | 7.3% |
| Education and Training | 5.8% | 8.1% | 9.6% | 9.4% |
| Health Care and Social Assistance | 22.0% | 19.0% | 16.5% | 16.4% |
| Arts and Recreation Services | 0.0% | 0.6% | 0.9% | 1.8% |
| Other Services | 3.7% | 4.3% | 4.0% | 3.8% |
| Inadequately described/Not stated | 5.8% | 2.9% | 2.8% | 2.8% |

*Source: ABS, Census of Population and Housing. General Community Profile 2021*

## 7.3.5 Housing affordability and availability

This section provides an overview of housing in the regional study area, including dwelling structure and occupancy, tenure type and affordability.

### 7.3.5.1 Dwelling structure and occupancy

Housing in the local and regional study area is predominantly detached or separate houses, ranging from 96.4 % of dwellings in the suburb of Heybridge to 90.2 % for both Central Coast and Burnie City LGAs, as shown in Table 7-14. The proportion of detached or separate houses in the local and regional study area is above the 87.7 % of Tasmania.

The proportion of private dwellings that were occupied on the 2021 Census night in the local and regional study area was above that of the State (88.2 %).

**Table 7-14 Dwelling structures – local and regional study area**

| Area | Dwelling structure | | | | | Total private dwellings | Occupancy |
|---|---|---|---|---|---|---|---|
| | Detached | Semi-detached | Attached | Other | Not stated | | |
| Heybridge | 96.4% | 3.6% | 0.0% | 0.0% | 0.0% | 195 | 89.2 |
| Burnie City | 90.2% | 7.8% | 1.8% | 0.2% | 0.1% | 8,856 | 91.5 |
| Central Coast | 90.2% | 7.8% | 0.3% | 1.5% | 0.1% | 9,968 | 92.6 |
| Tasmania | 87.7% | 6.1% | 5.3% | 0.6% | 0.2% | 247,597 | 88.2 |

*Note: Based on the census count of all persons enumerated in the dwelling on Census Night, including visitors from within Australia. Excludes usual residents who were temporarily absent on Census Night. Excludes 'Visitors only' and 'Other non-classifiable' households.*
*Source: ABS 2021 Census of Population and Housing. General Community Profile*

### 7.3.5.2 Tenure

Social and affordable housing supports the productivity of socially and economically vulnerable people through improved education, health, and wellbeing outcomes. If socially and economically vulnerable individuals and families do not have access to social and/or affordable housing, then they are excluded from accessing education and employment, which in turn affects their health and wellbeing.

Table 7-15 describes the tenure and landlord type in the local and regional study area. The rate of home ownership (owned outright and with a mortgage) was higher in Heybridge (78.3 %) and Central Coast LGA (75.7 %) than in the state (70.1 %) and Burnie City (65.5 %). Real estate agents accounted for a third (32 %) of landlord types in Central Coast LGA, nearly half (48 %) in Burnie City LGA and 61.8 % for Heybridge. However, nearly two-fifths of landlords in Heybridge and Central Coast is a person not in the same household. Landlords in Heybridge were either real estate agents or a person not living in the same household, whereas Burnie City and Central Coast LGA and Tasmania had a more diverse mix of landlord types, including community housing providers and the state housing authority.

**Table 7-15 Tenure and landlord type – local and regional study area**

| | Heybridge | Burnie City | Central Coast | Tasmania |
|---|---|---|---|---|
| **Tenure type** | | | | |
| Owned | 78.3% | 65.5% | 75.7% | 70.1% |
| Rented | 19.4% | 31.9% | 20.8% | 26.4% |
| Other tenure type | 0.0% | 1.0% | 1.5% | 1.9% |
| Not stated | 2.3% | 1.6% | 2.0% | 1.6% |
| Rental Tenure | | | | |
| Real estate agent | 61.8% | 48.0% | 32.0% | 45.6% |
| State or territory housing authority | 0.0% | 18.9% | 19.7% | 15.3% |
| Community housing provider | 0.0% | 4.1% | 4.7% | 4.9% |
| Person not in the same household* | 38.2% | 23.9% | 37.7% | 28.9% |
| Other landlord type† | 0.0% | 4.6% | 4.4% | 4.5% |
| Landlord type is not stated | 0.0% | 0.5% | 1.4% | 0.9% |

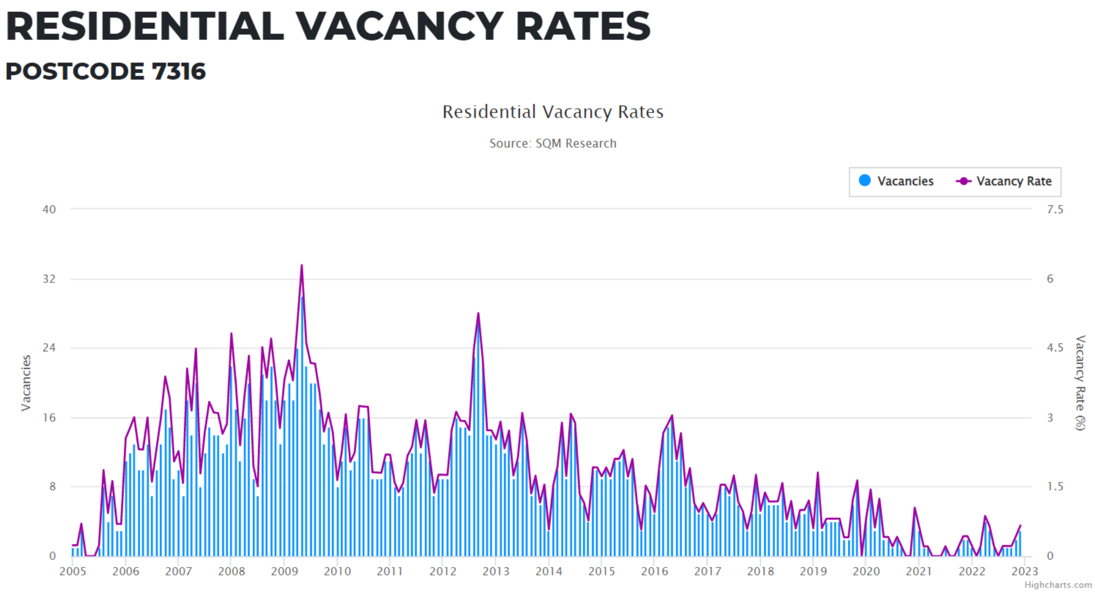
** Comprises dwellings being rented from a parent/another relative or other person.*
*† Comprises dwellings being rented through an 'Owner/manager of a Residential park (including caravan parks and manufactured home estates)', 'Employer - Government (includes Defence Housing Australia)' and 'Employer – other employer'.*
*Source: ABS (2022a) Census of Population and Housing, 2021.*

### 7.3.5.3 Rental availability and affordability

Rental vacancy rates are used to indicate the availability of rental properties. In general, vacancy rates are indicative of demand and the potential difficulty in securing rental housing as follows:

- Rates above 3.5 % are indicative of weak demand and most people would be able to access housing.
- Rates between 2.5 % and 3.5 % are indicative of a normal market, and most households without socio-economic vulnerabilities would be able to access housing.
- Rates below 2.5 % are indicative of high demand and many households may compete for housing and some households may have difficulty in accessing the housing they would prefer.
- Rates below 1.0 % are indicative of a rental shortage, which often results in rent increases and pushes low income households out of the private rental market (REIQ 2020; UTAS 2019).

Rental vacancy rate data are published by postcode by SQM Research. In the regional study area, data published for the Heybridge/Penguin postcode 7316 are shown in Figure 7-10. The most recent vacancy rate (April 2023) was 0.7 %. Vacancy rates in this area have been tight since May 2020, which indicates that the region has experienced a rental shortage since COVID and has not yet recovered. Rental vacancy rates for other postcodes in the region, such as Burnie City (7320) was 1.3 %, Burnie LGA (7321) was 1.1 %, Central Coast (7315) was 0.5 %, and Somerset (7322) was 1.2 %.




**Source: SQM Research 2023**

**Figure 7-10 Rental vacancy rates – 7316 postcode**

SGS Planning, National Shelter, Community Sector Banking, and Brotherhood of St Laurence (2019) have developed a Rental Affordability Index that calculates rental affordability on an annual basis. As affordability is based on household income, the index calculates affordability based on several different types of renting cohorts. Rental affordability as at quarter 2 in 2022 across various state suburbs in the local study area is shown in Table 7-16. Rental housing is defined as affordable for the average rental household with a household income of $100,000 per annum (2022 income levels).

Affordability for single part time worker parents on benefits (with a household income in the region (where data was available) was rated as unaffordable or severely unaffordable.

**Table 7-16 Rental affordability – various postcodes within the local study area (Quarter 2, 2022)**

| Area (postcode) | Average rental household | Pensioner couple | Single part time parent worker on benefits | Student share house |
|---|---|---|---|---|
| Heybridge/Penguin (7316) | Affordable | No data available | No data available | Acceptable |
| Burnie City (7320) | Affordable | Moderately unaffordable | Unaffordable | Acceptable |
| Central Coast LGA (7315) | Affordable | Moderately unaffordable | Unaffordable | Acceptable |
| Somerset (7322) | Affordable | Acceptable | Moderately unaffordable | Data not available |

*Source: SGS Planning et al. (2023) Rental Affordability Index*

## 7.3.6 Socio-economic disadvantage

ABS produces four socio-economic indices for areas (SEIFA), the latest being based on the 2016 Census. These indices identify relative advantages and disadvantages at a geographic level. Each has been examined for the local and regional study areas to ascertain levels of economic prosperity.

First is the index of relative socio-economic advantage and disadvantage (IRSAD), which looks at multiple indicators that measure people's ability to access materials or social resources and participate in society. These measures include income, employment, education, car ownership, and housing. The components of IRSAD are:

- **Ranks:** All areas are ordered from the lowest to highest score, then the area with the lowest score is given a rank of 1, the area with the second-lowest score is given a rank of 2 and so on.
- **Deciles:** The IRSAD divides the state population into ten equal deciles. The lowest-scoring 10 % of the decile groups is the most disadvantaged group and is given a decile number of 1, and the highest-scoring 10% is the most advantaged, which is given a decile of 10.
- **Percentile:** The IRSAD divides the state population into one hundred equal percentiles. The lowest-scoring 1 % of the decile groups is the most disadvantaged group and is given a decile number of 1, and the highest-scoring 1 % is the most advantaged, which is given a decile of 100.

Data as shown at the ABS Statistical Area 1 (SA1) level and discussed for the regional and local study areas in Table 7-17.

**Table 7-17 Index of relative socio-economic advantage and disadvantage (IRSAD)**

| | | *Ranking within Australia* | | | *Ranking within Tasmania* | | |
|---|---|---|---|---|---|---|---|
| **Area** | **Usual resident population** | **Rank** | **Decile** | **Percentile** | **Rank** | **Decile** | **Percentile** |
| **Heybridge (suburb)** | 430 | 2101 | 2 | 16 | 223 | 4 | 33 |
| **Burnie City (LGA)** | 18895 | 67 | 2 | 13 | 9 | 4 | 31 |
| **Central Coast (LGA)** | 21362 | 138 | 3 | 26 | 18 | 7 | 61 |

*Source: Census of Population and Housing: Socio-economic Indexes for Areas (SEIFA), LGAs, Australia, 2016*
*Census of Population and Housing: Socio-economic Indexes for Areas (SEIFA), State suburbs, Australia, 2016*

### 7.3.7 Accessibility and affordability of goods and services (cost of living)

There is limited recent data published on the cost of living in Tasmania. The most recent data available is concerned with access to and the affordability of food.

In 2014, the University of Tasmania conducted a survey of the price and availability survey for healthy food across Tasmania, which found that the cost of healthy food in the North West Tasmanian region that includes the regional study area was generally in line with food costs across the state as a whole (UTAS 2015). However, it has been noted that food costs may be an issue in the region, particularly in the less densely populated areas of the North West such as the local study area (Eat Well Tasmania 2021), where people are likely to rely on smaller grocery stores and convenience shops. The cost of using these stores in the North West to fill a standardised basket of food was $ 497, compared to $ 355 at a major supermarket. More recently, the Tasmania Project Cost of Living Survey (UTS 2021) received a total of 1,284 responses. Key findings of the report were found that 18% of Tasmanians are food insecure, indicating that almost one in five people in Tasmania had issues accessing adequate food. It also found that one in two (51 %) Tasmanian households has experienced food insecurity over the previous month. This is nearly double the rate recorded in May 2021 (27 %).

Food insecurity was reported to be higher for several cohorts, including (Kent et al. 2022):

- Most young adults in Tasmania aged 18-24 years experienced food insecurity over the previous month (92 %), a figure which comprises marginal, low and very low food security.
- Other at-risk groups included Tasmanians who are unemployed (85 % food insecure), temporary residents (84 %), single parents with dependents (78 %), people living with a disability (76 %), and Aboriginal and Torres Strait Islander identifying people (76 %).

When coupled with older data about the food costs outside of major centres, this data indicates that it is likely that people living in less densely populated areas who are socio-economically vulnerable are at heightened risk of food insecurity, which would be in part driven by the affordability of food.

Consequently, people in the local study area are required to drive to major centres to access basic goods at an affordable price, which in turn increases transport costs. Therefore, it is likely that there is diminished access to affordable food in the local study area.

Similarly, a 2014 report on the cost of living in Tasmania (Eccleston, Churchill, and Smith 2014) found that electricity prices increased by 66.8 % between 2008 and 2013. These cost increases, alongside the cost increases in other essentials such as food and health services, resulted in households with very low incomes experiencing financial stress. A more recent statement by the Tasmanian Council of Social Service (2019) reiterated these findings, noting that the cost of energy in Tasmania is burdensome for those on very low incomes.

### 7.3.8 Land use and natural resources

Tourism is an important industry for North West Tasmania, with visitors attracted by the region’s natural features and scenic coastline.

Approx. 840 tourism businesses operate across the region in the form of accommodation (45 %), attractions (19 %), tours, transport, events, dining + info services. This does not include Airbnb, which fluctuates around 1,600 listings. There are three airports, one cruise port and the TT-Line ferry port (West by Northwest, 2022).

The region saw over 500,000 visitors annually (pre-covid) which accounted for 38% of all visitors to Tasmania and generated $462 million into the regional economy (West by Northwest, 2022). The region's top tourist attractions include:

- International Visitor icons such as Cradle Mountain, Stanley and Strahan;
- World's equal highest-rated wilderness world heritage area;
- Vibrant agricultural district – Tasmania's food-bowl and Tasting Trail;
- Some of the world's best golf courses;
- Access to three airports and Spirit of Tasmania; and
- New world-class mountain bike trails and walking trails.

**Table 7-18 LGAs within the West by North West and Visit Northern Tasmania**

| West by North West | Visit Northern Tasmania |
|---|---|
| • West Coast Council<br>• Circular Head Council<br>• King Island Council<br>• Waratah-Wynyard Council<br>• Burnie City Council<br>• Central Coast Council<br>• Devonport City Council<br>• Latrobe Council<br>• Kentish Council | • Meander Valley Council<br>• West Tamar Council<br>• Northern Midlands Council<br>• George Town Council<br>• Launceston City Council<br>• Dorset Council |

## 7.4 INFRASTRUCTURE AND SERVICES

This section describes the infrastructure and services available to the local and regional community including municipal and social infrastructure and associated services.

### 7.4.1 Governance and planning

This section describes state, regional and local government plans for the regional and local study area. These plans identify governance and planning priorities, and community values, aspirations and challenges at the regional and local scale for the communities within the regional study area.

The Tasmanian Renewable Energy Plan (Tasmanian Government 2020b) focuses on the delivery of renewable energy in a way that supports the Tasmanian community, including the development of the Tasmanian workforce through training and education investments. The regional land use and economic development strategies described below seek to create opportunities for economic growth through coordinated infrastructure development, increasing the value of productivity per worker, increasing the number of skilled workers, and investing in the Tasmanian people's productive capacity through health, education, and wellbeing initiatives. Both the Cradle Coast Regional Land Use Strategy (Tasmanian Government 2022c) and the Northern Tasmania Regional Land Use Strategy (Tasmanian Government 2021b) identify the importance of energy generation, distribution and supply.

The Cradle Coast Regional Land Use Strategy (Tasmanian Government 2022c) acknowledged that new transmission lines and corridors generate community concern for potential visual and amenity impacts to areas of high natural conservation. The Northern Tasmanian Land Use Strategy (Tasmanian Government 2021b) focused on the economic opportunities associated with the renewable energy sector for energy generation and the need to support sector development through infrastructure. This plan also acknowledged the challenges of age, labour and skill shortages associated with the capacity of the region's resident population to participate in the renewable energy sector development.

The Cradle Coast Regional Futures Plan (Cradle Coast Authority 2018) takes a collaborative approach to identify ways to address the key challenges that could impair the capacity of the local workforce to transition into the new emerging industry development associated with renewable energy, advanced manufacturing, and agriculture. Unlike the individual local government plans described below (and the statutory land use plans summarised above), this plan is a regionally owned and implemented strategy that identifies ways to prepare the region so that it may access the benefits and opportunities associated with the new and emerging industries.

The local governments within the region varied in terms of the number and type of plans and strategies addressing the aspirations of their respective communities. It should be noted that none of the local government strategies or plans mentioned renewable energy generation or infrastructure as an economic platform. Burnie City Council's Strategic Plan (Burnie City Council 2020) and Settlement and Investment Strategy (Burnie City Council 2017) contained actions to address the ongoing consequence of the cessation of the Burnie pulp mill. These actions focus on repositioning its future through industry and land use diversification and investment in education and transport infrastructure to consolidate its role as the hub of the Cradle Coast region.

The Central Coast Strategic Plan (Central Coast 2019) and the Central Coast Social Planning Framework (Central Coast Council 2022) place emphasis on the social priorities of its residents through their social planning framework, food security strategy and youth strategy. In addition to the council's corporate strategic plan and economic development strategy. The priorities for the Central Coast Council focus on connectivity (transport and social networks), increasing its population base through attracting creative professionals, retirees and families whilst retaining their youth and enhancing their community identity. The food strategy, social planning framework and youth strategy highlight the actions and processes that would be taken to achieve the community priorities.

#### 7.4.1.1 State government plans and regional plans

The State government plans and regional plans are discussed in turn below.

##### Tasmanian Renewable Energy Action Plan 2020

The Tasmanian Renewable Energy Action Plan 2020 (Tasmanian Government 2020b) aims to deliver in the following three areas:

1. Transforming Tasmania into a global renewable energy powerhouse.
2. Making energy work for the Tasmanian community.
3. Growing the economy and providing jobs.

The following objectives and actions are relevant to the project:

- Major renewable energy projects such as Battery of the Nation and Project Marinus, as well as other existing and future wind farm developments, are highlighted as central to achieving the objectives of the plan.
- To support the expansion of renewable energy in Tasmania in a way that supports the Tasmanian community, the plan committed to the development of the Renewable Energy Coordination Framework.
- To support the development of the sector, the Tasmanian Government committed to the development of a skills and training initiative, Energising Tasmania (Tasmanian Government 2021a), to expand the workforce skills in areas such as engineering, project management, civil construction and trades. The program includes a training grants fund, a training market development fund to support training providers, a fund to deliver an industry-led workforce development plan, and the establishment of an industry advisory group.

## Cradle Coast Regional Futures Plan 2019 – 2022

The Cradle Coast Authority (2018) developed the Regional Futures Plan to guide the industry transition from manufacturing and food processing, agriculture, and forestry to new and emerging industrial development. The plan was published in 2018 and acknowledged that net employment opportunities in the new industries of aquaculture, niche food production, renewable energy, tourism and health care and social assistance would exceed predicted trends at the time of publication. Accordingly, pre-COVID-19 growth was strong; however, post-COVID-19 is demonstrating continuing upward trends for the creation of new job opportunities in the region. The Cradle Coast Authority is comprised of nine LGAs in North and North West Tasmania, namely:

- Circular Head
- Waratah/Wynyard
- West Coast
- Burnie City (membership lapsed in July 2022)
- Central Coast
- Kentish
- Devonport
- Latrobe
- King Island

The Regional Plan identified several structural challenges to overcome to develop the skills and abilities of the workforce so that the residential population may be in a position to be considered for the jobs associated with the new and emerging industries, especially in full-time higher-skilled occupations. These challenges include (Cradle Coast Regional Futures Plan 2018:8):

- High unemployment rates – Including youth unemployment and longer term unemployed (higher in most of the regions Council areas than the Tasmania average).
- Low educational attainment levels – There is a need to improve education outcomes, including life skills. Many employers have trouble recruiting suitable workers. Most new jobs require post-school qualifications.
- Shrinking working-age population – Due to a combination of older and aging workforce, static population growth and out-migration.
- Retaining population – The region has an ageing population, and retaining youth in the region, particularly for the workforce, is a challenge.
- Regionally dispersed population – Isolation of some communities, such as King Island, far North West and the West Coast, presents challenges for economic and services development. The hotspot for population growth is at the eastern end of the region.
- Significant labour demands – A significant number of new, skilled jobs will be added to the economy. This coincides with an ageing / shrinking workforce; therefore, filling these jobs/skills gaps will be a challenge.

## Cradle Coast Regional Land Use Strategy

The amended Cradle Coast Regional Land Use Strategy (CCRLUS) (Tasmanian Government 2022c) came into effect on the 11$^{th}$ of May 2022. The amendments were made to provide greater recognition of King Island's unique circumstances as a result of its economy, historical pattern of development and isolation. The Cradle Coast Regional Land Use Strategy will guide land use planning processes from 2010 to 2030. The Strategy has a statutory function to inform the purpose and content of local planning schemes.

The CCRLUS applies To the local government areas of:

- Burnie City
- Central Coast
- Circular Head
- Devonport
- Kentish
- King Island
- Latrobe
- Waratah/Wynyard
- West Coast

The CCRLUS describes the strategic directions of the state and the region and how these will be implemented through the land use planning system. The purpose of the regional land use strategy is to provide certainty and predictability for the Government, local councils, developers, and the community on where, when and what type of development will proceed. Included in the CCRLUS are a range of land use strategies that protect and enhance energy generation, distribution, and supply within the region. This includes finding ways to become more energy efficient and reducing carbon emissions as a climate change mitigation and adaptation strategy, facilitating commercial and small-scale renewable energy generation and energy efficiency technology and practices in domestic, commercial and industrial use and recognising the strategic importance of inter-state connections for the import and export of energy. The CCRLUS also acknowledged that the development of the renewable energy industry in Tasmania would necessitate the development of new transmission lines and corridors and that these corridors can generate concern around potential visual and amenity impacts to areas with high natural conservation value, in part related to the many renewable energy generation sites that are located within or proximal to areas of conservation value.

#### 7.4.1.2 Local government

This section provides an overview of community and strategic plans that are applied by the local governments within the regional study area. The vision and goals are articulated in each community plan and are summarised in Table 7-19.

**Table 7-19 Community and strategic plan visions – regional study area**

| LGA | Vision | Goals/Objectives |
|---|---|---|
| **Burnie City Council** | | |
| Making Burnie 2030 – Community Strategic Plan (Burnie City Council 2020) | 'A vibrant, thriving beautiful place; a caring community; a regional leader engaged with the world; and a city that realises its dreams' (Burnie City Council 2020). | • Attractive place to live, work and play<br>• An inclusive and healthy community<br>• A centre for information, knowledge and learning<br>• A secure, innovative and diverse economy<br>• A natural and built environment that is respected and cared for<br>• A regional hub |
| Settlement and Investment Strategy for Burnie to 2026 (Burnie City Council 2017) | 'A forward-looking sustainable development framework and efficient land use planning system that leverages competitive advantages, encourages local economic and employment growth, recognises community, landscape and environmental values, and addresses land use planning challenges to position Burnie as a prosperous and liveable regional city and a preferred location in Tasmania and Australia for people to live, work and invest.' | • To reinforce Burnie's position as a major regional centre to the Cradle Coast Region and hub for trade, business, employment, transport, culture and leisure activities, health and education services.<br>• To promote Burnie's economic base.<br>• To support the operation of existing enterprise.<br>• To attract and retain new business to Burnie that leverages the city's skill base and supply chains.<br>• To foster diversity, growth and development for business and industry.<br>• To transition functionally obsolete precincts to more suitable alternative uses.<br>• To foster market and investment opportunities for business and industry.<br>• To provide increasing employment for existing and future residents.<br>• To provide education opportunities for existing and future residents.<br>• To encourage population growth to sustain and extend services.<br>• To ensure the provision of well-developed transport infrastructure.<br>• To provide cost-effective infrastructure services. |

<table>
<tr><th>LGA</th><th>Vision</th><th>Goals/Objectives</th></tr>
<tr><td colspan="3">Central Coast Council</td></tr>
<tr><td>Central Coast Strategic Plan 2014-2024<br>(Reviewed 2019)</td><td>Central Coast – Living our potential:<ul><li>‘We are a vibrant, thriving community that continues to draw inspiration and opportunities from its natural beauty, land and people and connected by a powerful sense of belonging.’</li></ul></td><td>The Shape of the Place<ul><li>When planning for a vibrant and liveable place, it is important to focus on its shape – planning, precincts, open spaces, the physical environment and augmenting these to highlight the distinctiveness of Central Coast.</li></ul>A Connected Central Coast<ul><li>Seeks to enhance connectivity both within Central Coast and the region – how people move from place to place, how accessible places are, and how people connect and with services within Central Coast.</li></ul>The Environment and Sustainable Infrastructure<ul><li>Sustaining built infrastructure and the natural environment by encouraging innovation and investment in Central Coast.</li></ul>Council Sustainability and Governance<ul><li>A leading Council is well governed and managed and engages effectively with its community.</li></ul></td></tr>
<tr><td>Long Term Economic Development Strategy Central Coast Council 2020</td><td>Willing and Able<ul><li>Central Coast’s economic development is supported by all in our community;</li><li>Our industries, businesses, products and places are actively promoted by all; and</li><li>Whatever we are promoting, or doing and wherever we are, there is a visible and authentic link to the Coast to Canyon’s place marketing brand.</li></ul>Local Businesses<ul><li>We work together, share knowledge and provide referrals to local businesses in order to improve the Central Coast business environment and spread the economic and social benefits to all in our community;</li><li>Our industry sectors, local institutions, business leaders and community stakeholders all collaborate and network, aiming to increase economies of scale</li></ul></td><td><ul><li>Strengthen collaborative networks and strategic partnerships.</li><li>Embed a culture of innovation.</li><li>Boost place marketing and management of place making infrastructure.</li><li>Attract investment and supporting business.</li><li>Appeal to relocating creative professionals, retirees, and families.</li><li>Increased the population and retain young people.</li></ul></td></tr>
</table>

| LGA | Vision | Goals/Objectives |
|---|---|---|
| | of outputs through innovation and clustering activities; and<br>• We put ourselves under the microscope to see what we can enhance or build on in order to develop innovative and place-based, local economic development responses to emerging, new, or untapped opportunities or risks.<br>**Identity and Image**<br>• We socialise and enjoy a variety of unique and authentic experiences in our communities, which are honestly captured in our community identities and images;<br>• Our vibrant, thriving and genuine communities are clearly visible and admired by relocating investors, developers, businesses and visitors; and<br>• Industry sectors and businesses in our community are connected and supported by high-quality social and physical infrastructure. | |
| Central Coast Food Security Strategy (Central Coast Council 2021) | **Willing and Able**<br>• Healthy eating is supported and actively promoted in our community;<br>• Whatever we are doing or wherever we are, there is always a healthy food option on offer;<br>• Our food outlets celebrate and make use of local produce; and<br>• Our knowledge and skills support growing, buying, making, creating and presenting healthy food.<br>**Farmers and Producers**<br>• The rich productive soils of our landscapes, farms, communal spaces, public realm and backyards deliver quality products; and<br>• Our farmers are known to us, as are our cooks and chefs, whether they are creating nutritional excitement at school, at work or at play.<br>**Growing our health** | **Making healthy eating part of every aspect of community life:**<br>• Support local food production initiatives and projects.<br>• Identifying and facilitating action to address food security opportunities.<br>• Health and wellbeing promotion.<br>• Engage in targeted food security messaging.<br>**Improving the accessibility and affordability of healthy food:**<br>• Promote and support food security programs.<br>• Identifying barriers to accessing healthy food.<br>• Improve access to clean water.<br>• Improve transport networks.<br>**Increasing knowledge and skills in growing, preparing and purchasing food:**<br>• Support food education programs in educational institutions. |

| LGA | Vision | Goals/Objectives |
|---|---|---|
| | • We are growing our health by eating and using the fruit and vegetables we produce and buy. This is part of our community's culture; and<br>• We work together, share knowledge, skills and resources to make sure healthy food options are available to everyone, everywhere, every time we eat. | • Support community education programs.<br>• Understand the local food production and distribution story. |
| Central Coast Social Planning Framework (Central Coast Council 2022) | 'We are a vibrant, thriving community that continues to draw inspiration and opportunities from its natural beauty, land and people and connected by a powerful sense of belonging.' | **Active**<br>• Opportunities and facilities to gather and participate in recreational activities and cultural experiences.<br>**Engaged**<br>• Capabilities and networks to volunteer our time and skills and engage in decisions that affect us.<br>**Included**<br>• Connectivity and inclusivity for our communities to access services, shops, education, work and play.<br>**Learning**<br>• The knowledge, skills and commitment to learning needed to participate fully in society and reach our potential.<br>**Secure**<br>• Local work opportunities and affordable living in a well-governed and safe community environment.<br>**Healthy**<br>• Local resources to support good food and lifestyle choices that build physical health and emotional resilience |
| Central Coast Youth Strategy 2018-2023 (Central Coast Council 2018) | 'To allow Council to consult and engage with youth on decisions that affect them, and to remain flexible and responsive to the changing world in which youth and the community live. This will allow for new knowledge to be considered over the expected five-year life of the strategy.' | **Engaged**<br>• Youth Engaged: Continue to develop the roles of young people participating in Youth Engaged.<br>• The voice of Central Coast youth is valued, particularly in relation to Council decisions and policy shaping that impacts directly on youth. |

| | | |
|---|---|---|
| | | **Included**<br>• Engage with Central Coast Young people to collect their stories and perspectives of Central Coast.<br>• Central Coast Council Youth specific community grant.<br>• Identify the top 5 priorities/concerns for youth on Central Coast.<br>**Active**<br>• More young people using Councils sport facilities, green spaces, parks and recreation assets and public spaces.<br>• Work with Sporting clubs which utilise council facilities to develop the capacity to increase social inclusion in their club culture.<br>• Increased health and wellbeing of our young people through engagement in visual & performing arts.<br>• Recognise, support, and promote the artistic achievements of young people in Central Coast, including utilising Ulverstone VIC.<br>• Central Coast Youth attending youth conferences, networking and training opportunities.<br>**Healthy**<br>• Young people are more engaged in accredited programs that encourage better health outcomes through activity and good food choices.<br>• Young people utilising Council's cycleway infrastructure, Mountain bike Park facilities and choosing cycling as a healthy transport, recreation, and competition option. Pump and Jump developed if a collaborative funding arrangement is found.<br>• Mental Health – work with young people to develop/explore how to deliver good mental health messages, activities, or practices to young people to assist them in managing/understanding their mental health. |

| LGA | Vision | Goals/Objectives |
|---|---|---|
| | | **Secure**<br>• Young people contributing to making Central Coast a community they feel safe in<br>• Work with young people on ideas that they can develop to help them feel safe in Central Coast<br>**Learning**<br>• Document stories of the Council's UTAS bursary recipients for use in promotion in the E-newsletter.<br>• Understanding of Council's capacity to undertake the "Youth First Employment Program."<br>• Career Information Forum Days. |

## 7.4.2 Community infrastructure and services

### 7.4.2.1 Education

Education facilities have been identified as social receptors and their services may be affected during the construction phase because of their proximity to the Bass Highway. These include a primary school and two schools that combine primary and secondary at the same location. Details of the schools are listed in Table 7-20.

**Table 7-20 Educational facilities – local study area**

| Facility name | Enrolment number[1] | Type | Level | LGA | Distance from site (km) |
|---|---|---|---|---|---|
| Leighland Christian School (Burnie campus) | | Independent | Primary (K-6) | Burnie City | 5.4 |
| North West Christian School | 94 | Independent | P – 12 | Central Coast | 12 |
| Penguin District School | 633 | State | K – 12 | Central Coast | 13 |

*Source: My Schools 2023*

### 7.4.2.2 Health services and hospitals

The Tasmanian Health Service has responsibility for governing and delivering healthcare services in Tasmania and is divided into three regions, namely the North, North West, and Southern regions of Tasmania. Of which, the North West and North regions are relevant to the project. The Tasmanian Health Service administers the public hospital system and primary and community health services (including mental health and oral health services).

Five hospitals provide services to the regional study area:

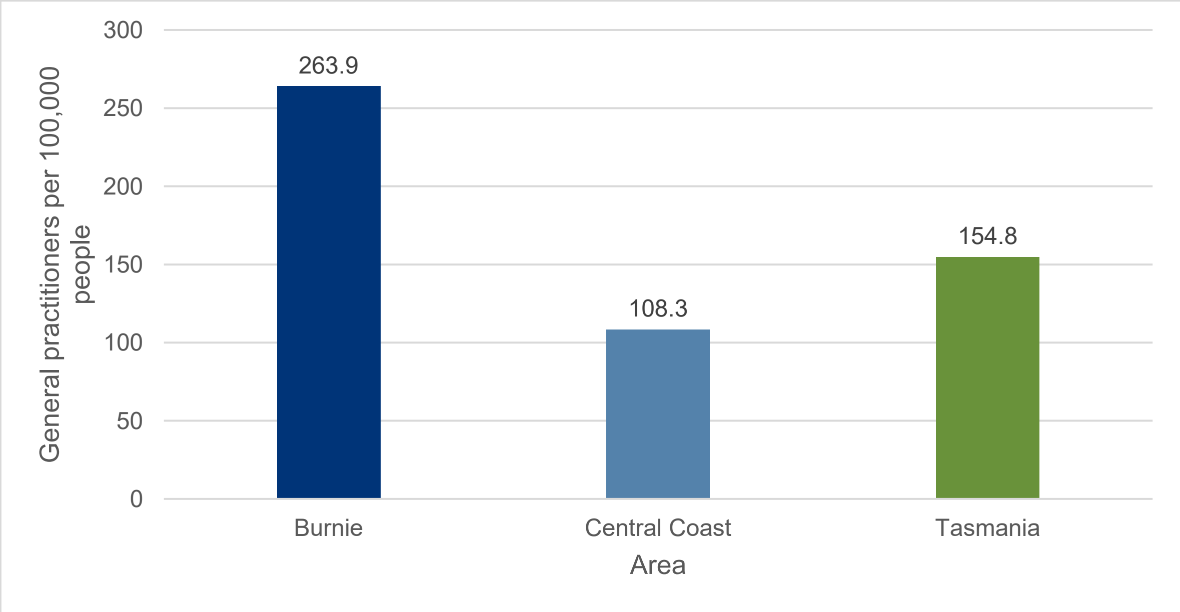
- The North West Regional Hospital in Burnie provides acute general medical care services in the North West region.
- North West Private Hospital is a 48-bed acute medical, surgical, obstetric and mental health hospital.
- The Mersey Community Hospital at Latrobe is a dedicated elective surgery centre for all Tasmanians and provides a mixture of general hospital services to the local community.
- The Launceston General Hospital is the principal referral hospital for the North West and North regions, providing several tertiary services.
- The Deloraine District Hospital is an acute care facility that provides palliative and general medical care services to the Meander Valley region.

Table 7-21 details the medical services providers relevant to the study area and the services offered at each location.

**Table 7-21 Health services relevant to the study area**

| Tasmanian Health Service Region | Facility | Services offered |
|---|---|---|
| North West | North West Regional Hospital | • The North West Regional Hospital at Burnie is a 160-bed facility.<br>• It offers services in medical, surgical and allied health through inpatient and outpatient departments. The hospital caters for emergency resuscitation, surgery and intensive care of most trauma patients and other medical conditions.<br>• North West Regional Hospital is a secondary-level service, so transfer to comprehensive tertiary hospitals occurs for some injuries and illnesses.<br>• Other outpatient services provided by the North West Regional Hospital include diabetes education, pharmacy, physiotherapy and social work.<br>• In 2020/21 the North West Regional Hospital saw 27,396 presentations to emergency, 10,735 inpatient admissions, 31,102 outpatient visits and conducted 5,025 operations. |
| | North West Private Hospital | • The North West Private Hospital is a 48-bed acute medical, surgical, mental health and obstetric facility. This hospital provides the only birthing service on the North West Coast and accepts both public and private maternity patients, delivering around 1,000 babies each year. |
| | Mersey Community Hospital | • The Mersey Community Hospital at Latrobe has 95 beds and offers general and specialist health services. Other services provided include oncology, elective surgery, accident and emergency care and cardiac rehabilitation.<br>• In 2020/21, the Mersey Community Hospital saw 24,009 presentations to emergency, 10,735 inpatient admissions, 31,102 outpatient visits and conducted 5,025 operations. |
| | Burnie Community Health Centre | • The Burnie Community Health Centre provides health and community services.<br>• Community services, visiting services and support groups that operate from the centre include Wetaway Program, Advocacy Tasmania Inc., child health centres, and podiatry. |
| | Central Coast Community Health Centre – Ulverstone | • The Ulverstone Community Health Centre provides a range of community services, visiting services, clinics and support groups from the centre, including palliative care, continence advisor, family and child health clinics and dementia care support service. |
| | Devonport Community Health Centre | • The Devonport Community Health Centre provides a range of community services, visiting services, clinics and support groups from the centre, such as community nursing, drug and alcohol services, diabetes education, continence advisor, dental clinic and sexual health clinic. |
| North | Launceston General Hospital | • The Launceston General Hospital is a 360-bed facility. As the principal referral hospital for the North and North West of Tasmania, the hospital provides emergency and acute care, specialist services, and inpatient and ambulatory care to Launceston and surrounding areas. |

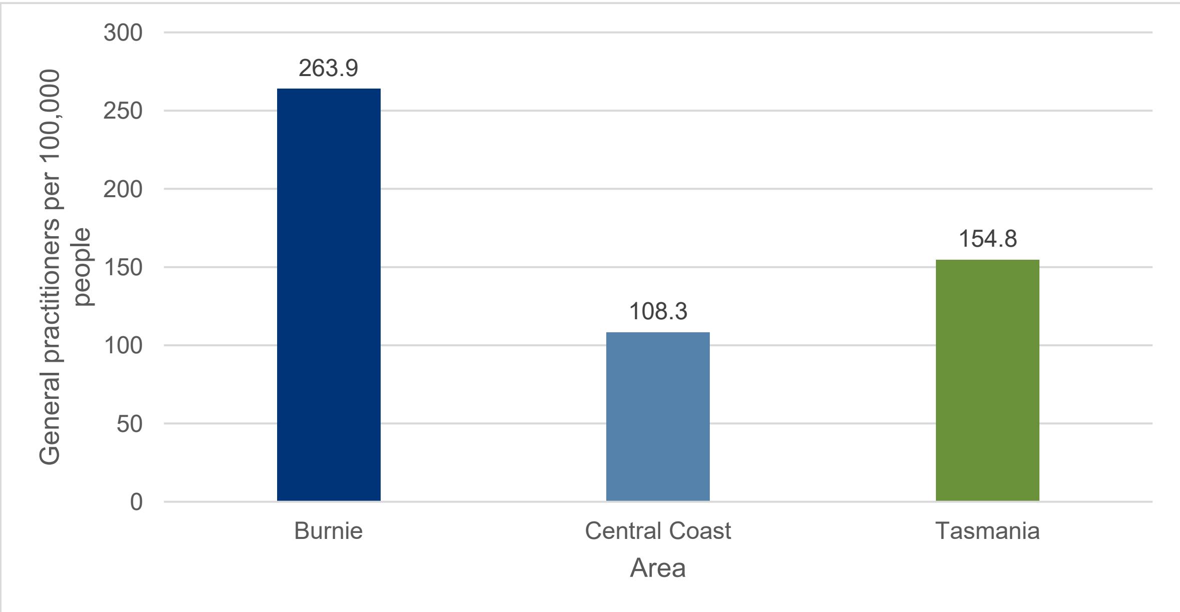
The goal of the Tasmanian Health Service is to see 80 % of all emergency department presentations within the recommended time for all triage categories. In 2018-19 in Tasmania’s North West region, the North West Regional Hospital achieved this 71.1 % of the time and the Mersey Community Hospital achieved this 78.5 % of the time (DHHS 2019). In 2018-19 in Tasmania’s North region, the Launceston General Hospital achieved this 60.8 % of the time (DHHS 2019). A recent audit of Tasmanian emergency department services has noted a 56 % increase in hospital admissions in Tasmania between 2009-10 and 2017-18, which was considered likely to increase (Tasmanian Audit Office 2019). Demand has been noted to increase during winter due to flu and other respiratory illnesses. As a response, the Department of Health publishes winter demand management plans, which also consider the potential for managing COVID-19 on Tasmania’s emergency health network (Department of Health 2020).




Source: *PHIDU Torrens University Australia (2023) Social Health Atlas of Australia: Tasmania. Data by Local Government Area*

Figure 7-11 shows the rate of general practitioners (GPs) per 100,000 people in the study area. As shown, the rate of GPs compared to the population is lowest in Central Coast LGA, with 108.3 GPs per 100,000 people. Burnie City LGA has the highest proportion of GPs in the regional study area, with 263.9 GPs per 100,000 people compared to the state (154.8 per 100,000). Burnie City LGA has two hospitals and one community health facility.

These quantitative indicators are supported by the latest service needs analysis for Tasmania, which notes that Tasmania has an ageing healthcare workforce that is concentrated within the state's regional centres, resulting in a lower capacity of GP services in rural areas such as Central Coast LGA (Tasmania PHN 2019)




*Source: PHIDU Torrens University Australia (2023) Social Health Atlas of Australia: Tasmania. Data by Local Government Area*

**Figure 7-11 General practitioners per 100,000 people in the regional study area, 2020**

### 7.4.2.3 Ambulance services

There are two ambulance services within the regional study area. The location of the stations and the station types are described in Table 7-22.

A review of ambulance service provision in Tasmania has noted that demand for ambulance services in Tasmania has grown at an average annual rate of 5.5 % per annum between 2009-10 and 2015-16, which is significantly higher than the national average annual rate of growth (3.6 % per annum) (Department of Health and Human Services 2017). The review noted that there had been a growth in particular in the transport of non-acute patients, which in rural communities means that a paramedic crew may be tied up by transporting a non-acute patient and therefore unable to respond to a patient with a more acute need (Department of Health and Human Services 2017).

**Table 7-22 Ambulance services within the regional study area**

| Station type | Location |
|---|---|
| Metropolitan/Urban Stations – paramedic crews are rostered 24 hours per day. | Burnie, Ulverston |

*Source: Department of Health (2022): Ambulance locations*

### 7.4.2.4 Fire services

Table 7-23 details the fire stations located within the regional study area. The Heybridge Fire Station, located in the Central Coast LGA, is the only fire station located within 1 km of the project in the regional study area. All of the fire stations, except Burnie, are staffed by volunteer brigades.

**Table 7-23 Fire stations within the regional study area**

| Local government area | Fire station/Brigade |
|---|---|
| Burnie | • Stowport/Natone Volunteer Fire Brigade<br>• Ridgley Volunteer Fire Brigade<br>• Burnie Fire Station |
| Central Coast | • Gunns Plains Volunteer Fire Brigade<br>• Penguin Volunteer Fire Brigade<br>• Heybridge Volunteer Fire Brigade<br>• Sprent Volunteer Fire Brigade<br>• Riana Volunteer Fire Brigade<br>• North Motton Volunteer Fire Brigade<br>• Forth Valley Volunteer Fire Brigade<br>• Castra Volunteer Fire Brigade<br>• Ulverstone Volunteer Fire Brigade |

*Source: Tasmanian Fire Service (2023)*

### 7.4.2.5 Police services

There are three police stations within the regional study area. The closest police station to the project site is Burnie, 8 km away, with Penguin (18 km) and Ulverston stations (28 km) being located much further.

**Table 7-24 Police services**

| Local government area | Police Station |
|---|---|

| | |
|---|---|
| Burnie | • 88 Wilson St, Burnie TAS 7320 |
| Central Coast | • 3/5 Crescent St, Penguin TAS 7316<br>• 38 Victoria Street Ulverstone TAS 7315 |

*Source: Google Maps 2023*

## 7.4.3 Transport

Transport infrastructure supports the liveability in the study area and has the potential to be affected by the project activities.

### 7.4.3.1 Road Network

The road network forms the backbone of transportation in the Central Coast and Burnie LGAs. The main arterial road connecting these regions is the Bass Highway (A2), which runs along the north-west coast of Tasmania. This highway provides a direct and efficient route for commuting between the Central Coast and Burnie. It allows residents and visitors to travel by car, taxi, or ridesharing services, facilitating easy movement of people and goods between the two LGAs.

### 7.4.3.2 Public Transportation

Public transportation options in Heybridge are limited compared to larger cities. The town does not have a dedicated public bus service. However, there are bus services operated by Metro Tasmania that connect Heybridge to nearby towns and cities. These services are particularly useful for commuting to larger urban areas or accessing other parts of the region.

Burnie has a more developed public transportation system compared to Heybridge. Metro Tasmania operates bus services in Burnie, providing convenient transportation options within the town and its surrounding areas. These bus services connect various suburbs, including Heybridge, allowing residents to travel to Burnie for work, education, or leisure activities.

### 7.4.3.3 Cycling and walking

Heybridge provides a pleasant environment for cycling and walking enthusiasts. The town has footpaths and dedicated cycling lanes in some areas, making it safer and more convenient for pedestrians and cyclists. Many residents choose to walk or cycle for short trips within Heybridge, enjoying the scenic beauty of the coastal area.

### 7.4.3.4 Airport

Heybridge does not have its own airport. The nearest major airport is the Burnie Wynyard Airport, located approximately 20 kilometres east of Heybridge. This airport offers domestic flights to Melbourne, making it a convenient option for air travel. For international travel, residents typically travel to larger airports such as Hobart International Airport or Launceston Airport, both of which are a few hours' drive from Heybridge.

## 7.5 PEOPLE'S PRODUCTIVE CAPACITIES

This section describes the health of the population and their skills, knowledge and experience that enable them to participate in society and the economy.

## 7.5.1 Health

### 7.5.1.1 Wellbeing

Social wellbeing is a central component of health and it is increasingly recognised that mental health, in particular, is shaped by the broader social, economic and physical environment in which people live (WHO 2014). Measuring wellbeing is a complex undertaking and there is no 'standard' way to understand social wellbeing. Therefore, it is necessary to select available indicators of wellbeing. The WHO (2014) notes that there are a number of socio-economic factors that are linked to poor wellbeing, including relative socio-economic disadvantage and weak social support.

### 7.5.1.2 Mental health

Data presented in Table 7-25 describes the proportion of the population who experience a mental health condition. The proportion of the Tasmanian population who have a mental health condition is 11.5 %. Burnie has a higher proportion within their communities who experience a mental health condition, 12.7 % than Heybridge (7.6 %) and Central Coast (10.5 %).

**Table 7-25 Mental health conditions**

| | Heybridge | Burnie City | Central Coast | Tasmania |
|---|---|---|---|---|
| Mental health conditions (including depression and anxiety) | 7.6 | 12.7 | 10.5 | 11.5 |
| No mental health Condition | 81.7 | 79.5 | 81.6 | 80.7 |
| Not stated | 10.8 | 7.8 | 7.9 | 7.8 |

*Source: ABS (2022a) Census of Population and Housing, 2021.*

### 7.5.1.3 Need for Support

The purpose of this question within the Census is to identify people with a 'profound or severe core activity limitation' (ABS 2016d). The activity limitation is defined as *people who need assistance in their day-to-day lives with any or all of the following core activities – self-care, mobility or communication because of a disability, long-term health condition (lasting six months or more) or old age* and applies to all persons (ABS 2016d).

Table 7-26 below describes the proportion of the population within the local and regional study area that require support. The regional study areas of Burnie City (7.8 %) and Central Coast (7.5 %) have a higher need for assistance with core activities than the Tasmanian average of 6.8 %. The local study area has the lowest need for assistance, with 5.0 % of the suburb's population identifying a need for assistance with core activities. This data also indicates that the proportion of the population that have a need for support will also require a corresponding need for health services, respite centres and carers to enable this portion of the community to participate in society.

**Table 7-26 Need for Support**

| Area | Has need for assistance with core activities % | Does not have a need for assistance with core activities % | Not stated% |
|---|---|---|---|
| **Heybridge** | 5.0 | 87.2 | 7.7 |
| **Burnie City** | 7.8 | 86.9 | 5.2 |
| **Central Coast** | 7.5 | 87.2 | 5.3 |
| **Tasmania** | 6.8 | 87.8 | 5.4 |

*Source: ABS (2022a), Census of Population and Housing, 2021*

#### 7.5.1.4 Health Conditions

The 2021 Census introduced a new set of questions on diagnosed long-term health conditions. Table 7-27 describes the proportion of the local and regional study area that reported one or more long term health conditions by sex. The data provides insight into the communities and their need for services to support their health needs. This data shows for the regional area that females have one or more health conditions than males in the same area. The local study area indicates a similar proportion of males and females experiencing one or more health conditions.

**Table 7-27 Long term health conditions**

| Area | One or more health conditions | | No health conditions | | Not stated | |
|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Male | Female |
| **Heybridge** | 32.1% | 31.2% | 59.0% | 56.9% | 9.0% | 11.9% |
| **Burnie City** | 32.4% | 38.6% | 59.5% | 53.9% | 8.1% | 7.5% |
| **Central Coast** | 33.2% | 38.3% | 58.4% | 54.4% | 8.5% | 7.3% |
| **Tasmania** | 30.8% | 36.3% | 60.9% | 56.3% | 8.3% | 7.4% |

*Note: Measures the number of people who reported that they have been told by a doctor or nurse that they have any of these long-term health conditions. Includes health conditions that have lasted or are expected to last six months or more, may occur from time to time, are controlled by medication or are in remission.*
*Respondents had the option to record multiple long-term health conditions; the sum of the total responses count will differentiate from the total person count.*
*Source: ABS (2022a) Census of Population and Housing, 2021*

### 7.5.2 Educational attainment

Table 7-28 details the highest level of educational attainment within the local and regional study area at the 2021 Census. The most common levels of educational achievement were year 10 and above (secondary education), and Certificate III.

**Table 7-28 Highest level of educational attainment – local and regional study areas**

| | Heybridge | Burnie | Central Coast | Tasmania |
|---|---|---|---|---|
| **Bachelor's degree level and above** | 10.7 | 12.9 | 14.1 | 21.9 |
| **Advanced Diploma and Diploma level** | 7.4 | 7.1 | 7.7 | 7.9 |
| **Certificate level IV** | 5.5 | 3.7 | 3.8 | 3.5 |
| **Certificate level III** | 20.8 | 18.0 | 18.6 | 15.0 |
| **Year 12** | 10.4 | 11.8 | 9.3 | 12.0 |
| **Year 11** | 2.7 | 5.1 | 4.4 | 4.3 |
| **Year 10** | 19.7 | 19.1 | 19.4 | 15.9 |
| **Certificate level II** | 0.0 | 0.1 | 0.1 | 0.1 |
| **Certificate level I** | 0.0 | 0.0 | 0.0 | 0.0 |
| **Year 9 or below** | 11.2 | 10.6 | 11.5 | 8.6 |
| **Inadequately described** | 1.4 | 2.4 | 2.5 | 2.3 |

| | | | | |
|---|---|---|---|---|
| **No educational attainment** | 0.0 | 0.3 | 0.2 | 0.4 |
| **Not stated** | 10.4 | 8.7 | 8.4 | 8.2 |

*Source: ABS (2022a), Census of Population and Housing, 2021*

## 7.5.3 Training and industry development programs

The regional study area has a number of training and industry development programs, including those that are targeted to the renewable energy sector and the project in particular. These have been detailed in Table 7-29.

**Table 7-29 Training and industry development programs**

| Plan/strategy/program | Summary |
|---|---|
| Interim Local Jobs Plan: North and North West Tasmania (Department of Education, Skills and Employment 2020) | The Plan seeks to maximise the extent to which local people are used to filling job opportunities to meet the needs of large construction projects (including Marinus Link) and identifies a number of programs and pathways aimed to facilitate this, including:<br>The Industry Training Hub and the Career Facilitator in Burnie assists young people to build skills and choose occupations in demand in their region.<br>The JobTrainer Fund provides free training in up to 200 priority qualifications with an identified need for skilled workers.<br>*Energising Tasmania* is a commitment from the Commonwealth Government to develop a skilled workforce to meet the demand for a skilled workforce across major renewable energy projects, including Marinus Link. |
| North West Job Ready Generation Package (Tasmanian Government 2021c) | The package funds initiatives to support the upskilling of North West Tasmanians with qualifications and training required in growth sectors, including agriculture, mining, manufacturing, building and construction. The initiatives targeted at the building and construction sector include the North West Building Futures Program, which supports school-based apprenticeships within the building and construction sector. |
| Energising Tasmania (Tasmanian Government 2021a) | *Energising Tasmania* is a four-year commitment to developing a skilled workforce to support the Battery of the Nation initiative, and the renewable energy and related sectors in Tasmania have four key activities:<br>• Tasmanian Energy and Infrastructure Workforce Advisory Committee, which provides advice to the Tasmanian Government on the implementation of the Energising Tasmania commitment. The Committee includes industry, training, education, and state government members. TasNetworks is a member of the Workforce Advisory Committee.<br>• Energising Tasmania Training Fund, which delivers fully subsidised training for energy, infrastructure and related sectors.<br>• Energy and Infrastructure Training Market Development Fund, which provides support training system capability to meet the needs of energy and infrastructure sectors.<br>• Energy and Infrastructure Workforce Development Fund, which supports workforce development. |

## 7.5.4 Food Security

In 2014, the University of Tasmania surveyed the price and availability of healthy food across Tasmania, which found that the cost of healthy food in the North West Tasmanian region that includes the regional study area was generally in line with food costs across the state as a whole (UTAS 2015). However, it has been noted that food costs may be an issue in the region, particularly in the less densely populated areas of the North West such as the local study area (Eat Well Tasmania 2021), where people are likely to rely on smaller grocery stores and convenience shops. The cost of using these stores in the North West to fill a standardised basket of food was $ 497, compared to $ 355 at a major supermarket. More recently, the Tasmania Project (UTS 2021) found that 18 % of Tasmanians are food insecure, indicating that almost one in five people in Tasmania had issues accessing adequate food. Food insecurity was reported to be higher for several cohorts, including (Kent et al. 2022).

- More than two-fifths (42.9 %) of the young people (aged 18-24 years) who responded to the survey.
- More than half (56 %) of the First Peoples who responded to the survey.
- Nearly two-fifths (38.7 %) of the people living with a disability who responded to the survey.
- Half (50%) of the people earning less than $20,000 per year who responded to the survey.

When coupled with older data about the food costs outside of major centres, this data indicates that it is likely that people living in less densely populated areas who are socio-economically vulnerable are at heightened risk of food insecurity, which would be in part driven by the affordability of food.

Consequently, people in the local study area are required to drive to major centres to access basic goods at an affordable price, which in turn increases transport costs. Therefore, it is likely that there needs to be more access to affordable food in the local study area.

Similarly, a 2014 report on the cost of living in Tasmania (Eccleston, Churchill, and Smith 2014) found that electricity prices increased by 66.8 % between 2008 and 2013. These cost increases, alongside the cost increases in other essentials such as food and health services, resulted in households with very low incomes experiencing financial stress. A more recent statement by the Tasmanian Council of Social Service (2019) reiterated these findings, noting that the cost of energy in Tasmania is burdensome for those on very low incomes.

## 7.6 PROJECT WORKFORCE PROFILE

This section provides an overview of the project’s workforce profile and includes the anticipated workforce size and duration of employment for major construction activities. The anticipated source of the construction workforce is also provided.

### 7.6.1 Construction workforce

The number of construction workers required during the construction phase is expected to peak at approximately 180 persons per day for converter stations (assume all in the same shift). The workforce will be made up of local, intrastate, interstate and international personnel depending on the complexity of the work and the requirement for specialist skills and equipment.

Subsea cable: There are expected to be 80 -100 crew on each cable-laying ship to enable multiple shifts for 24/7 operations over the time the subsea cables are laid.

### 7.6.2 Operations workforce

MLPL will operate 24 hours a day, every day of the year, for the expected 40-year operational life span. The converter stations will not be manned 24/7 and will only be attended to during normal working hours (Monday to Saturday, 7:00 am to 4:00 pm).

At most, five employees will be required to help operate the converter stations and therefore, a magnitude of negligible has been provided.

## 7.7 ECONOMIC VALUE-ADD TO LOCAL AND STATE EMPLOYMENT

The project will generate direct employment for construction and operation, however it will also generation a significant number of indirect jobs in Tasmania. This value-added to the economy creates significant local and state employment across various industries, including construction, professional services, retail, manufacturing and accommodation and food services.

SGS Economics and Planning undertook economic modelling and adopted an integrated approach incorporating Australia-wide, Victorian and Tasmanian impacts. This analysis uses Computable General Equilibrium (CGE) modelling techniques and an assessment period of 25 years from 2025 to 2050. The modelling traces the spending and employment impacts at the state level, but also outlines the impact on the regional communities where the infrastructure will be developed and operated.

In North West Tasmania, the project adds:

- $352 million to the local economy during the five years of construction (2025 to 2029). The peak annual impact occurs in 2027, with an annual contribution of almost $108 million. This construction phase also includes the first half year of operations as the project comes online in the second half of 2029.
- $361 million to the regional economy between 2030 and 2050 for operations and maintenance, at an average of $17 million per annum.

Extending the impact out to all of Tasmania, the project adds:

- $681 million to the state economy during the five years of construction (2025 to 2029), peaking at $213 million in 2027.
- $679 million to the state economy between 2030 and 2050 for operations and maintenance, at an average of $32 million per annum.

In terms of employment, In North West Tasmania, the project adds:

- 1,297 full-time equivalent (FTE) job-years in the regional economy during the five years of construction (2025 to 2029). The peak number of jobs created occurs in 2027 when 430 job-years are added.
- 306 FTE job-years in the regional economy between 2030 and 2050 for operations and maintenance, at an average of 15 job-years supported each year.

Extending the impact out to all of Tasmania, the project adds:

- 2,661 FTE job years during the five years of construction (2025 to 2029), with a peak of 895 job years added in 2027.
- 306 FTE job-years during operations in the state between 2030 and 2050, at an average of 15 job-years supported annually.

Including flow-on impacts, the jobs created occur across various industries, not just construction. Across Tasmania, demand is anticipated to be generate FTE job-years between 2025 and 2050 for the following industries: retail trade (281) and health care and social assistance (184).

There is expected to be a reduction FTE job-years between 2025 and 2050 for the following industries: agriculture, forestry and fishing (-241), manufacturing (-25) and mining (-8) as these sectors are likely to compete for workers with the project during the construction period.

# 8. SOCIAL WELLBEING VALUES, POTENTIAL IMPACTS AND BENEFITS

The social wellbeing framework (Table 5-2) is used to guide the identification of the key social values; the outcomes from the SIA engagement inform the social impact and the sensitivity of these values have been assessed using the sensitivity criteria described in Table 5-3.

**Table 8-1 Social value sensitivity**

| Social value | Attributes and indicators | Sensitivity | Justification for sensitivity rating | Potential project impacts (positive and negative) |
|---|---|---|---|---|
| **Community identity**<br>**Describes how a community defines itself in terms of civic participation, resilience, feelings of trust and safety and sense of belonging and place** | Social capital and community cohesion | Very sensitive | This sensitivity rating was determined based on consultation, indicating that this aspect of the social environment is highly important to the study area. Stakeholders indicated Heybridge was a tight-knit community where everyone knows everyone, and the community is very locally orientated. | No expected project impacts. |
| | Cultural diversity and heritage | Very sensitive | This sensitivity rating was determined based on the consultation through the SIA process with the community and First Peoples representatives. | No expected project impacts. |
| | Amenity and landscape | Very sensitive | This sensitivity rating was determined based on the consultation that indicated the high value of amenity in contributing materially to the livelihood and health of the people in the study area. They value the peace and quiet of their lifestyle.<br>Furthermore, the town is highly visible from the highway and main entrance into town. Stakeholders highly value Blythe River, Bass Strait, surfing Sulphur Creek to Preservation Bay, and trail walking/bike riding around Chasm Creek and Dial Range Road are considered recreation areas near the project area. | **Potential negative impact:** Amenity impacts for nearby residents from noise and vibration as a result of construction activities (standard hours). |
| | | | | **Potential negative impact:** Amenity impacts for nearby residents due to dust from construction activities. |
| | | | | **Potential negative impact:** Amenity would likely be affected by after hours works required to undertake the 24/7 shore crossing works. |
| | | | | **Potential negative impact:** Ongoing 24/7 operations may result in after-hours noise concerns for neighbouring residents, including the new residential development proposed at Devonshire Drive Hamlet in the Heybridge Residential Nature Reserve. |
| | | | | **Potential negative impact:** Noise from construction activities may affect the study area's enjoyment of recreational spaces. |

| Social value | Attributes and indicators | Sensitivity | Justification for sensitivity rating | Potential project impacts (positive and negative) |
|---|---|---|---|---|
| | | | | **Potential negative impact:** View of the converter stations from the southern edge of the Bass Highway and the converter stations will be a dominant view from the exit of the tioxide beach foreshore reserve, the only visitor access point and informal parking area. |
| | Natural resources and ecology | Very sensitive | Consultation has indicated a strong sense of community value towards the natural resources and ecology in the area and the importance of reef beds and marine life located offshore at Heybridge, such as the white belly sea eagles and penguin. As well as water contamination and waste. Community focused on circular economy to be more environmentally responsible. | **Potential negative impact:** There is the potential for increased strikes with increased construction vehicle movements, particularly with Tasmanian Devils and Spotted tail quolls. The project has the potential to impact on marine environment with the cable installation on nearshore Tasmanian seabed habitats. |
| **Economy and livelihood**<br>**Describes how people make a living and the economic structure of the affected community.** | Employment and workforce | Very sensitive | This sensitivity rating was determined based on the consultation and baseline study that highlights the importance of employment in the region in contributing materially to livelihood. Stakeholder feedback further highlighted higher levels of unemployment and the importance of workforce training and longevity of employment or ability to transfer into another industry. There are also higher levels of youth unemployment. | **Potential positive impact:** The project's construction is expected to support the short-term employment of approximately 45% within the study area, which aligns with the values of the community in expanding local employment opportunities and industries. |
| | | | | **Potential positive impact:** The project's construction may contribute to the demand for construction workers and attract employees away from local businesses. This may reduce the availability of these workers for other industries, and result in increased lead times for other types of construction or workforce shortages for local businesses. |
| | | | | **Potential positive impact:** The project's operation is expected to support the employment of a small number of direct employees within the study area (less than 5). |
| | | | | **Potential negative impact:** The project's construction will generate demand for construction workers, potentially drawing employees from other construction projects, industry sectors and local businesses. Due to this potential constraint on the workforce, there may be longer lead times for other construction projects and possible workforce shortages in the study area. |
| | | Sensitive | This sensitivity rating was based on the proportion of jobs provided outside of the study areas and acknowledgement that it could help | **Potential positive impact:** The project's construction is expected to support the short-term employment of approximately 30% of the total construction workforce from the state and national workforce. |

| Social value | Attributes and indicators | Sensitivity | Justification for sensitivity rating | Potential project impacts (positive and negative) |
|---|---|---|---|---|
| | | | alleviate the constraints on local workforce availability. | |
| | Industry and business | Very sensitive | Consultation has indicated a strong community value around local industry and business, with it contributing materially to the livelihoods of people within the study area. Specifically, stakeholders indicated a strong focus and value on buying and supporting local businesses. | **Potential positive impact:** The project's construction will support local businesses by purchasing goods and services required to support the project's development. |
| | Housing affordability and availability | Extremely sensitive | A rating of extremely sensitive was determined based on the consultation that indicates this value contributes to the livelihood and health of people in the study area. Stakeholders noted there is an extreme concern for the lack of housing supply *"There are no vacancies, even the motels are full".* There are no immediate projects or developments underway to fix the problem. | **Potential negative impact:** The project's workforce may contribute to the demand for rental housing in the study area and exacerbate existing rental availability and affordability issues, disproportionately affecting very low and low-income households. |
| | Socio-economic dis/advantage | Very sensitive | This rating was determined to be very sensitive as SIA consultation and baseline characterisation indicated the study area faces issues has unemployment, particularly within the youth, long-term unemployed families and lack of participation in education and training. | **Potential positive impact:** The project's workforce may provide job opportunities directly and indirectly that help to help improve the socio-economic outcomes of the study area<br><br>**Potential positive impact:** The project is expected to result in large taxation receipts ($762 million in total from 2025 to 2050) from the economic activity generated by Marinus Link, which will flow to local, state and the Australian Government. |
| **Infrastructure and services**<br>**Describes the infrastructure and services that meet the needs and priorities of the affected community, including municipal and social** | Community infrastructure and services – health and wellbeing | Sensitive | A rating of sensitive was determined based on the consultation that indicates this value contributes to the livelihood and health of people in the study area. | **Potential negative impact:** The project's construction workforce may increase demand for health and emergency service providers, compromising service provision to the existing local and regional community. |
| | Community infrastructure – Childcare | Very sensitive | A very sensitive rating has been determined based on consultation and the baseline characterisation, which highlights the lack of availability of childcare in the study area, and it was | **Potential negative impact:** The project's construction workforce may increase demand for childcare providers, compromising service provision to the existing local and regional community. |

| Social value | Attributes and indicators | Sensitivity | Justification for sensitivity rating | Potential project impacts (positive and negative) |
|---|---|---|---|---|
| **infrastructure and associated services.** | | | determined to be a barrier to workforce participation. | |
| | Physical infrastructure – connectivity | Very sensitive | A rating of very sensitive was determined based on the consultation that indicates this value contributes to the livelihood and health of people in the study area. The consultation highlighted that people in the study area value their laid-back lifestyle and ease of connection within the town and surrounding areas. | **Potential negative impact:** The performance of the road network in the project area during construction creates delays for existing road users, reducing the efficiency of the study. |
| | Physical infrastructure – safety and capacity | Very sensitive | A rating of very sensitive was determined based on the consultation that indicates this value contributes to the livelihood and health of people in the study area. Safety and the capacity of the local road network are highly valued by the study area. | **Potential negative impact:** The capacity of the road network's road condition, design and operation of the road network to perform safely through the movement of the transformer transporter. |
| | | | | **Potential negative impact:** Increased safety risk due to poor road lighting for shore crossing works at night |
| | | | | **Potential negative impact:** Reduced road safety, including the road safety of vulnerable, particularly school bus routes. |
| **People's productive capacities**<br>**Describes the skills, knowledge, and experience that are vital to survival and participation in society and its economy.** | Health – physical and mental | Very sensitive | A rating of very sensitive has been determined based on mental health contributing materially to the livelihoods of people within the study area. This was supported by the consultation feedback. | **Potential negative impact:** Concern about the project's construction period potential impacts may result in stress, anxiety and frustration for surrounding residents with construction fatigue, given night works are expected to occur seven days a week for up to 12 months and are expected to exceed average noise levels that result in sleep disturbance at the Devonshire Drive Hamlet. |
| | | | | **Potential negative impact:** General road safety with an increase in construction vehicles and the potential to impact traffic and pedestrian safety. |
| | | | | **Potential negative impact:** Stress, anxiety and frustration from the community due to a lack of understanding of the project's scope, cumulative impacts of projects in the areas and not seeing local benefit. |
| | | | | **Potential negative impact:** Human health impacts from contaminated material exposure from construction disturbance from the former industrial site. |

| Social value | Attributes and indicators | Sensitivity | Justification for sensitivity rating | Potential project impacts (positive and negative) |
| --- | --- | --- | --- | --- |
| | | | | **Potential positive impact:** The project may add to the health and wellbeing of residents in the study area through investments in community infrastructure, the potential for downward pressure to be placed on the market regarding energy prices, as well as greater telecommunication security through expansion of the supply-side infrastructure. |
| | | | | **Potential negative impact:** Potential human health impacts from contaminated material exposure from construction disturbance from the former industrial site. |
| | | | | **Potential negative impact**: Transporting hazardous goods and materials to and from site. |
| | | | | **Potential negative impact:** Concern about the project's potential impacts (e.g. EMF) may result in feelings of stress, anxiety and frustration for surrounding residents and communities. |
| | Education, training, and skills | Sensitive | A rating of sensitive was determined based on the consultation that indicates this value contributes to the livelihood and health of people in the study area. | **Potential positive impact:** Employment opportunities for females, youth, First Peoples and socially vulnerable groups in the regional construction workforce are available. Consultation identified opportunities for particularly to engage youth and provide new and transferable skills. |

# 9. IMPACT ASSESSMENT

## 9.1 INTRODUCTION

This section provides a complete summary of the social impacts associated with the project. The broad conceptualisation of social impacts used here is consistent with the IAIA's current guidance on project-level impact assessment. This guidance provides an important insight into the scope of social impacts (Vanclay, Esteves and Franks 2015, p.2).

> *Because 'social impact' is conceived as being anything linked to a project that affects or concerns any impacted stakeholder group, almost anything can potentially be a social impact so long as it is valued by or important to a specific group of people. Environmental impacts, for example, can also be social impacts because people depend on the environment for their livelihoods and because people may have place attachment to the places where projects are being sited. Impacts on people's health and wellbeing are social impacts.*

Fundamentally, social impacts will be identified in other technical studies as dimensions of environmental or physical impacts. The section will summarise the social impacts identified in other technical study that have been produced as part of the current environmental assessment process. These are:

- Ecological Impact Assessment (Entura, 2023);
- Air Quality Assessment (Katestone, 2023);
- Noise and Vibration Assessment (Marshall Day, 2023);
- Landscape and Visual Impact Assessment (Landform Architects, 2023);
- Traffic and Transport Assessment (Stantec, 2023);
- Contaminated Land Assessment (Tetra Tech Coffey, 2023);
- EMF and EMI Assessment (JMME, 2023);
- Marine Ecology and Resource Assessment (EnviroGulf Consulting, 2023); and
- Economics Assessment (SGS Economics & Planning, 2023).

The following sections address the potential impact pathways identified across the social wellbeing framework (Table 5-2) under the following thematic headings:

- Community identity
- Economy and livelihood
- Infrastructure services
- People's productive capacity.

The environmental performance requirements from the relevant technical studies are noted and detailed in Section 9.7.

## 9.2 COMMUNITY IDENTITY

This section considers the project's potential to impact community identity in terms of social capital, community cohesion, cultural diversity, character, landscape and amenity, ecology and natural resources, sense of place and community safety. The elements of community identity from the social wellbeing framework that were identified as being affected are landscape and amenity, and natural resources and ecology. No potential impact pathways were identified for social capital or community cohesion.

### 9.2.1 Construction

The project's construction activities will result in temporary changes to the environment, which have the potential to affect the community identity of the local study area. These changes are considered in the technical studies and include:

- Noise;
- Vibration;
- Air quality;
- Landscape and visual amenity;
- Natural values and ecology; and
- Amenity and access to recreational areas.

#### 9.2.1.1 Noise

Table 9-1 details the acoustic environment indicator levels corresponding to criteria defined by the World Health Organization that are applied to long-term/permanent sources of noise. This is a key point of context, as the acoustic environment indicator levels do not differentiate between short-term and long-term/permanent noise sources.

**Table 9-1 Residential locations – outdoor acoustic environmental indicator levels**

| Specific environment | Critical health effect (s) | Average noise levels and time base (hours) | Max. noise levels |
|---|---|---|---|
| Outdoor living area | Serious annoyance, daytime and evening | 55 dB | |
| Outdoor living area | Moderate annoyance, daytime and evening | 50 dB | |
| Outside bedrooms | Sleep disturbance, window open | 45 dB | 60 dB |

*Source: World Health Organization, Guidelines for Community Noise (1999)*

**Standard hours**

To create a baseline, the Noise and vibration assessment (Marshall Day 2023) considered the impact on existing residential developments to the east and approved residential development sites to the west and southwest. The approved residential developments include:

- the Heybridge Residential Nature Reserve, which consists of six hamlets for residential subdivision, the nearest being the Devonshire Drive Hamlet, where local roads have been constructed (the remaining hamlets set further back from the site from the Eagle Sea Estate, some of which are currently in construction); and
- a residential development located just north of the Heybridge Residential Nature Reserve on George Street.

Seven residential dwellings to the east of the site have been identified as the nearest locations in the residential area. Additional receiver points were defined from inspection of aerial imagery and the Burnie Local Provisions Schedule to represent the boundaries of the nearest approved residential development sites, the Devonshire Drive Hamlet and the George Street development.

Construction activities include:

- Converter station earthworks and infrastructure construction;
- Shore crossing construction; and
- Offsite transportation.

Construction will occur at the converter stations six days per week, between 7:00 am and 4:00 pm. The predicted noise levels are above the daytime background noise levels presented, indicating that construction noise will likely be clearly audible. Table 9-2 provides a prediction of noise levels for key construction activities and references points are existing residential dwellings and proposed residential development sites.

Construction noise levels are predicted to be highest at the proposed development within the south and southeast section of the Devonshire Drive Hamlet of the Heybridge Residential Nature Reserve, specifically at the south and southeast sections of the hamlet. This site is presently undeveloped, and the risk of construction noise impacts on future dwellings depends on the timing of construction of these dwellings (i.e. whether the hamlet will be occupied at the time when construction works are occurring).

These findings represent a common outcome for construction work in urban areas, particularly for a major infrastructure project. However, the results indicate a risk of community disturbance from construction noise, particularly given the duration of the construction program. Accordingly, mitigation and management of construction noise impacts will need to be prioritised during the development of detailed construction plans.

The noise levels are expected to reflect a common outcome for construction work in urban areas, particularly for a major infrastructure project. However, the noise assessment indicated there is a risk of community disturbance from construction noise, particularly given the duration of the construction program, which could be up to 36 months.

Accordingly, mitigation and management of construction noise impacts will need to be prioritised during the development of detailed construction plans.

Construction activities generally occur six days per week in daylight hours and adhere to the time periods specified by the EMPC Noise Regulations unless unavoidable works are required.

**Table 9-2 Predicted noise construction levels**

| | Shore crossing HDD | Earthworks | Infrastructure |
|---|---|---|---|
| **Existing residential dwellings** | **51-57 dB** | **54-60 dB** | **59-66 dB** |
| **Residential development sites** | **51-61 dB** | **53-64 dB** | **58-71 dB** |

**Outside hours works**

Construction works will be restricted to normal working hours (Monday to Saturday, 7:00 am to 4:00 pm) generally. Exceptions to this will be unavoidable works which occur infrequently (e.g. a concrete pour that needs to continue uninterrupted).

Unavoidable works relate to:

- drilling for shore crossings which are expected to involve shore crossing works occurring 24 hours per day, seven days per week, for a combined period of approximately 12 months to ensure the stability of the borehole;
- works that need to be undertaken without a break in the program, such as concrete pouring;
- delivery of essential, oversized plant or equipment;
- time-sensitive maintenance or repair of public infrastructure;
- emergency works required due to unforeseen circumstances;
- protection and control commissioning work within the switching station; and
- project activities that will be scheduled to reduce the need for night-time work.

The primary consideration for works outside normal working hours is the shore crossing works which could occur 24 hours per day, seven days per week, for a period of up to 12 months in total. MLPL advises that these works will need to be continuous to ensure the stability of boreholes.

The predicted noise levels for the shore crossing works are above the reference level corresponding to the night period EPP acoustic indicator level (see Table 9-1). The highest predicted noise levels relate to the Heybridge Residential Nature Reserve, specifically at the south and southeast sections of the Devonshire Drive Hamlet, comprising of 6 hamlets.

The predicted noise levels are based on the assumption of two shore crossing rigs operating simultaneously. However, irrespective, the margin of the predicted noise levels above the reference level for works conducted during the night indicates a risk of sleep disturbance to multiple residential properties around the project.

If approval is obtained for unavoidable works outside of normal working hours for the shore crossing, then dedicated noise mitigation and management measures will need to be developed and implemented to minimise the impact on nearby residents.

#### 9.2.1.2 Vibration

Construction vibration was also assessed in the Noise and Vibration Assessment (Marshall Day, 2023). The assessment considered potential effects in terms of both the potential for cosmetic building damage and disturbance of human comfort. Based on the separating distances to construction activities, vibration from construction activities is not a material consideration for the project.

#### 9.2.1.3 Air quality

The potential for air quality (dust) impact on human health was considered in the Heybridge air quality technical assessment (Katestone, 2023). The assessment considers the following construction activities:

- Demolition – any activities involved in the removal of an existing structure.
- Earthworks – covers the processes of soil-stripping, ground levelling, excavation and landscaping.
- Construction – any activities involving the provision of a new structure, its modification or refurbishment.
- Trackout – the transport of dust and dirt from the construction site onto the public road network, where it may be deposited and then re-suspended by vehicles using the road network.

The assessment considered three separate dust impacts, which are considered to be the key impacts of construction activities:

- annoyance due to dust soiling;
- the risk of health effects due to an increase in exposure to PM10; and
- harm to ecological receptors.

The assessment has shown that, without the implementation of measures to comply with EPRs, the preliminary risk of impacts (in terms of both health effects and nuisance) at nearby sensitive receptors associated with the construction of the proposed Heybridge converter station is low. Even with a low risk of impacts, dust mitigation measures should be applied during construction to minimise emissions and the potential for impact.

#### 9.2.1.4 Landscape and visual amenity

Visual amenity was described in the SIA consultation as very important.

Most of the study area is either within the Environmental Management Zone or Bass Straight to the north. Areas with the most significant protection are landscapes within the Environmental Management Zone. They include the foreshore areas along tioxide beach and the steep-sided vegetation areas to the west of the site and east of Heybridge.

The purpose of the Environmental Management Zone is to provide for the protection, conservation and management of land with significant ecological, scientific, cultural or scenic value.

Recreational Zones include the Cuprona Football Club to the south of Heybridge and foreshore areas at Blythe Head to the north of the Bass Highway. These areas are highly valued for their natural appearance, recreational uses and biodiversity values.

Settlements and residential areas include a greater number of people than vegetation areas within the Environmental Management and Recreational Zones. Residential areas and communities include land within the General Residential Zone within Heybridge, the Landscape Conservation Areas in the elevated areas to the west of the site, and areas within the Rural Living Zones. The sensitive landscape area is confined to coastal areas and foreshore locations.

Direct impacts to these areas have been avoided by shore crossing of the proposed cables from within the boundaries of the site, under the Bass Highway and foreshore areas, to a distance of approximately 1.0 km offshore.

Topography and vegetation will screen the construction and operation of the project from many areas, including the nearby township of Heybridge, foreshore areas and reserves, and the public road network.

There may be dwellings within the township of Heybridge where the site may be visible. However, from the review of the project from publicly accessible locations, there were no obvious locations where this may occur.

Impacts on recreational locations such as foreshore areas, reserves and trails will be limited. Most ground-level construction activity will be screened or filtered by topography and existing vegetation retained along the site's eastern and northern edges or vegetation along the foreshore areas. There will be the potential elevated equipment, such as cranes, would be visible above the tree line. However, these impacts will be temporary and short in duration.

The greatest visual impact will be from the tioxide beach access road directly to the north of the site. From this location, the converter stations will be approximately 65 m to the south and visible over the train line, median-separated travelling lanes of the Bass Highway and overhead power lines.

#### 9.2.1.5 Natural resources and ecology

**Terrestrial (land-based)**

The *Nature Conservation Act 2002* (NC Act) provides for the conservation and protection of the fauna, flora and geological diversity in Tasmania and for the declaration of national parks and other reserved land.

Within the study area, the following native vegetation listed under the NC Act was identified:

- Eucalyptus amygdalina coastal forest and woodland – on the shoreline crossing

- Coastal scrub – on the shoreline crossing
- Eucalyptus viminalis–*Eucalyptus globulus* coastal forest and woodland – on the converter station site

The Environment Protection and Biodiversity Conservation Act 1999 Act (EPBC Act) is Commonwealth Government legislation that protects Matters of Environmental Significance (MNES). The EPBC Act provides for Commonwealth involvement in the assessment and approval of proposed actions that could have an impact on an MNES.

The potential presence of five EPBC Act listed fauna species, including:

- Tasmanian devil
- Spotted tail quoll
- Tasmanian wedge-tailed eagle
- White throated needletail
- Fork-tailed swift
- The potential presence of the white bellied sea-eagle which is listed on the NC Act for fauna species.

No raptors have been identified in the immediate vicinity, with the last known nest site being more than 1.5 km from the site, and no raptor has been verified as present since 2006. Ongoing monitoring for raptor nests is recommended, with mitigation measures to be adopted should a nest be within 500 m or 1 km line-of-sight in the period priority to construction.

There are no significant impacts expected from the proposal on threatened ecological communities, threatened flora or threatened fauna species at either the converter station or the shore crossing site.

The only species assessed with a higher magnitude of impact were Tasmanian devils (Sarcophilus harrisii) and spotted tail quolls (Dasyurus maculatus subsp. maculatus), due to the risk of roadkill.

**Marine**

The shore crossings of the project's individual HVDC and optical fibre cables will be undertaken using HDD. The nearshore zone in Tasmania is defined as the zone from the low tide level at 1 m depth (i.e., end of the Tasmanian shore trench) to 2.5 km seaward where the water depth is 20 m.

The project's proposed construction activities in nearshore Tasmania include:

- Pre-lay grapnel runs for route clearance.
- Shore crossing marine exit hole to the subtidal seabed.
- Cable lay on the seabed.
- Post lay cable installation and burial in soft seabed.
- Post lay cable installation on the hard seabed.
- Post lay cable crossings of third-party seabed infrastructure.

The potential impacts of shore crossing exit hole breakthroughs in soft sediment seabed include:

Disturbance of seabed nearshore habitats.

- Changes to water quality:
- Unavoidable minor release of drilling fluids (water including bentonite clay) at shore crossing borehole breakthrough; and
- Releases of shore crossing borehole solids (cuttings and coarse sediments).

Disturbance of nearshore seabed benthic communities.

There is a low diversity and abundance of benthic fishes, macroinvertebrates and infauna present in the seabed. Jet trenching cable installation and burial impacts are expected to temporarily displace benthic and pelagic fauna and flora, including more mobile bottom-living fishes, crabs, cetaceans and pinnipeds.

### 9.2.1.6 Summary of potential impacts

The SIA consultation found that residents highly value the existing amenity which underpins their coastal lifestyle. The construction activities may affect the amenity and character for some residents. These activities may also temporarily impair residents' enjoyment of their properties and activities that are undertaken within them and, for some, may be experienced as disruptive or annoying.

Table 9-3 details the pre-mitigated assessment and provides justification for each magnitude rating.

**Table 9-3 Pre-mitigated impact assessment on community identity values (construction)**

| Affected social value | Potential impact | Pre-mitigated impact assessment | | | |
|---|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact | Justification for magnitude rating |
| **Amenity and Landscape** | **Negative:** Amenity impacts for nearby residents from Noise, vibration and visual as a result of construction activities (standard hours). | Very sensitive | Moderate | High (negative) | The moderate magnitude rating has been provided as the amenity impacts during construction will likely result in a noticeable change from baseline conditions in the study area. Noise, vibration and visual amenity changes may impact residents' enjoyment of their properties and activity undertaken within them. General construction activities are expected to be six days a week. The proportion of people affected will be notable and works are expected to occur for up to 36 months. |
| **Amenity and Landscape** | **Negative:** Amenity impacts for nearby residents due to, dust from construction activities. | Very sensitive | Minor | Moderate | The minor magnitude rating has been provided as the amenity impacts during construction will likely result in a temporary/occasional change from baseline conditions in the study area and may affect a discrete section of the community. While dust is not expected to be of significant concern, the construction will generate dust, particularly from earthworks and access track construction. |
| **Amenity and Landscape** | **Negative:** Construction activity undertaken outside of regular working hours to complete shore crossing works with noise levels exceeding sleep disturbance | Very sensitive | Major | Major (negative) | The major magnitude rating has been provided as the amenity impacts during construction will likely result in a noticeable change from baseline conditions in the study area. Noise, vibration and visual amenity changes are likely to impact residents' enjoyment of their properties and activity undertaken within them. Construction activities are expected to be undertaken 24 hrs a day, seven days a week |

| Affected social value | Potential impact | Pre-mitigated impact assessment | | | |
|---|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact | Justification for magnitude rating |
| | measure (outside hours). | | | | and for a period of up to 12 months. The levels exceed the noise level from WHO for sleep disturbance. |
| **Amenity and Landscape** | **Negative:** Noise from construction activities may affect the study area's enjoyment of recreational spaces. | Very sensitive | Minor | Moderate (negative) | Construction activities may be heard from neighbouring recreational areas, but given the distance from key locations, this magnitude has been rated as minor as it's likely to result in a small but measurable change from the baseline conditions and be intermittent in nature. |
| **Natural resources and ecology** | **Negative:** Impact on fauna and flora, with consideration for roadkill as a result of construction vehicle movements. | Very sensitive | Minor | Moderate (negative) | While the project is expected to not impact threatened flora or fauna, there is the potential for increased roadkill due to construction vehicle movements, particularly with Tasmania Devils and Spotted Tail Quolls. |
| **Natural resources and ecology (marine)** | **Negative:** Impact on marine environment with the cable installation on nearshore Tasmanian seabed habitats. | Very sensitive | Minor | Moderate (negative) | The minor magnitude aligns with technical studies that indicate the seabed habitats are likely to be restored within a few days or weeks and the sediment will recover within six months to a year. The studies also showed a low diversity and abundance of benthic fishes, macroinvertebrates and infauna. |

### 9.2.1.7 Environmental performance requirements

EPRs have been recommended in the following technical studies:

- Noise and vibration assessment (Marshall Day 2023)
- Air Quality assessment (Katestone 2023)
- Landscape and visual assessment (Landform Architects 2023)
- Terrestrial ecology assessment (Entura 2023)

The proposed EPRs to manage and mitigate the impacts related to social impacts for the Marinus Link project are listed in Table 9-4 .

**Table 9-4 EPRs for community identity impacts (construction)**

| EPR ID | Environmental Performance Requirements | Project stage |
|---|---|---|
| S03 Tas | **Develop and implement a community and stakeholder engagement framework**<br>Prior to commencement of project works, develop a community and stakeholder engagement framework to outline the approach to engagement with community, stakeholders and First Peoples will be undertaken for project and by all contractors. The community and stakeholder engagement framework must:<br>• Identify key community and stakeholder groups across the project.<br>• Describe the approach for engaging the community, stakeholders and First Peoples.<br>• Establish communication protocols and tools for communication.<br>• Outline complaints policies and management procedures for recording, managing, and resolving complaints. The complaints management system must be consistent with Australian Standard AS/NZS 10002: 2014 Guidelines for Complaints Management in Organisations.<br>Principal contractors must prepare a community and stakeholder engagement management plan in accordance with the framework for their works package.<br>The community and stakeholder engagement framework and contractors community and stakeholder engagement management plan must be updated annually to reflect any project or stakeholder changes and improvements identified.<br>The community and stakeholder engagement framework must be implemented during construction. | Construction |

Other technical studies will also contribute to addressing EPRs and are detailed below.

**Noise and Vibration**

**NV02:** Develop and implement a construction noise and vibration management plan (CNVMP)

**Air Quality**

**AQ01**: Develop and implement a construction dust management plan.

**Terrestrial ecology**

**EC01 Tas**: Minimise vegetation removal and implement and implement vegetation protection measures

**EC02 Tas**: Implement measures to protect fauna

**EC03 Tas**: Implement measures to protect raptors

**Marine**

**MERU01**: Monitor HDD activities for the shore crossing to avoid or minimise impacts to the marine environment

**MERU02**: Placement of final subsea project alignment to avoid or minimise impacts on benthic habitats

#### 9.2.1.8 Residual impact

The residual impacts are detailed later at the end of this section (see Table 9-15) and summarised briefly below:

**Amenity and landscape**

Following the implementation of mitigation and management measures to comply with the EPRs listed above, it is anticipated that the changes in amenity values from general construction activities and visual impacts will affect some residents during construction.

Visual amenity from construction works occurring during the day will result in an overall residual impact of **moderate** for both the impact on residential dwellings and the enjoyment of nearby recreational areas. The daytime noise is expected to be above daytime background noise but reflects common noise from construction projects in urban areas, while minor dust may also be generated from the works.

Impacts for nearby residents due to dust from construction activities will be mitigated with the development and implementation on construction dust management plan and air quality will be monitored and measured to minimise dust from construction activities will be implemented. With the implementation of EPRs, the magnitude can be reduced to **negligible**, resulting in a residual impact of **moderate.**

In relation to the noise generated by outside-of-hours work, following the application of EPRs, the impact magnitude can be reduced to negligible, resulting in a residual **high** impact . The impact can be further reduced by avoiding or limiting shore crossing works at night. At this stage, the rating reflects the noise level expected for shore crossing drilling as it would exceed the sleep disturbance level set by WHO and the noise is expected to be occur over a period of up to 12 months.

**Natural resources and ecology**

Following the implementation of measures to comply with EPRs, the residual impact for ecology and natural resources is **low**, as the possibility of increased roadkill because of construction vehicle movement will result in a **negligible** magnitude of impact, as no Tasmanian devil dens have been located in close proximity to the site. Mitigation measures include site inductions and toolbox talks.

Overall, there is expected to be no impact on threatened ecological communities, threatened flora or threatened fauna species at either the converter station or the shore crossing site. The EPRs require ongoing monitoring and vigilance to detect any potential change of conditions, such as a raptor nest being located within proximity to the construction works.

With respect to the marine environment, the project has avoided the reef area and there is a low diversity of benthic in these areas and it is expected that the impacts will be short term on the seabed habitat. Based on this, the magnitude can be reduced to **negligible**, resulting in a residual impact of **low**.

### 9.2.2 Operation

Minor maintenance activities will occur over the project’s lifetime to access the underground cable and converter station. This may result in temporary changes for people in the study area, infrequent and short-term in nature.

#### 9.2.2.1 Noise

The primary sources of operational noise associated with the project are the fixed items of the plant to be located at the converter station.

Environmental noise associated with the operation of the converter station was identified as a key design consideration during the concept development for the project, primarily due to the proximity of potential future dwellings to the west of the site at the Devonshire Drive Hamlet of the Residential Nature Reserve.

A particular consideration for these homes is their elevated position relative to the site of the project. The effect of this height difference is that barriers are not a practical noise control measure. The main noise control options for the project, therefore, comprise strategic equipment placement, selection of low noise emission plant, and the use of acoustically rated enclosures for certain equipment items.

There is a risk that tones could be audible or characterised as a low frequency. If this were to occur, the noise levels will be above the design targets at the Devonshire Drive Hamlet. This aspect of the converter station, therefore, warrants further scrutiny and review during the design and procurement of the plant.

In terms of the emergency standby generator plant, the predicted noise levels, levels will increase but will stay below the *Environment Protection Policy (Noise) 2009* acoustic environment indicator noise level.

#### 9.2.2.2 Visual amenity

Once the converter station is complete, the community may be concerned about the visual impact from the tioxide beach access road directly to the north of the site.

#### 9.2.2.3 Natural resources and ecology

The native vegetation communities on the sites will be maintained during the operation of the converter station. It will be necessary to manage these to minimise disturbance to these communities and reduce the potential impacts from the introduction of weeds, pests and pathogens.

#### 9.2.2.4 Summary of potential impacts

Once constructed, the converter station may result in impacts on social values, including visual amenity and operational noise, particularly the proposed new development at Devonshire Drive. Also, the project may require maintenance activities, and ongoing monitoring of fauna (particularly for raptor nests) will be required to minimise any adverse impacts. Table 9-5 details the pre-mitigated assessment and provides justification for each magnitude rating.

**Table 9-5 Pre-mitigated impact assessment on community identity values (operations)**

| Affected social value | Potential impact | Pre-mitigated impact assessment | | | |
|---|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact | Justification for magnitude rating |
| **Landscape and amenity** | **Negative**: Ongoing 24/7 operations may result in after-hours noise concerns for neighbouring residents, including the new residential development proposed at Devonshire Drive Hamlet in the Heybridge Residential Nature Reserve. | Very sensitive | Moderate | High (negative) | The technical studies indicated there is the potential for operational noise to cause disturbance to proposed new residential developments. Also, there may be a tonal noise that impacts surrounding residential properties. Based on the potential of a noticeable change from baseline conditions impacting a small section of the community and the long-term impact, this has been rated as a moderate magnitude. |
| **Landscape and amenity** | **Negative**: Visual amenity: View of the converter stations from the southern edge of the Bass Highway and the converter stations will be a dominant view from the exit of the tioxide beach foreshore reserve, the only visitor access point and informal parking area. | Very sensitive | Major | Major (negative) | The converter stations will present a noticeable visual change from the baseline, affect a large section of the community and be there for the long term at, as such present a major magnitude rating. |

| Affected social value | Potential impact | Pre-mitigated impact assessment | | | |
|---|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact | Justification for magnitude rating |
| **Natural resources and ecology** | **Negative**: Ongoing impacts on flora and fauna in line with maintenance activities and operation of the converter station. | Very sensitive | Negligible | Low (negative) | There is no expected impact on threatened species of flora or fauna. Therefore, the magnitude rating is negligible. |

### 9.2.2.5 Environmental performance requirements

EPRs have been recommended in the following technical studies:

- Noise and vibration assessment (Marshall Day 2023)
- Landscape and visual assessment (Landform Architects 2023)
- Terrestrial ecology assessment (Entura 2023)

Proposed EPRs to manage and mitigate the impacts related to noise and vibration, landscape and visual amenity, and terrestrial ecology for the project are listed below.

**Noise and vibration**

**NV05:** Prepare an operational noise management plan

**NV06:** Prepare an operational noise compliance assessment report

**Terrestrial Ecology**

**EC06 Tas:** Operational implementation of vegetation protection measures

**EC05 Tas:** Operational implementation of measures to protect raptors

**Landscape and visual amenity**

**LV01:** Design converter station buildings to minimise visual impacts from public locations;

**LV02:** Implement measures to establish and maintain a vegetative screen for public views of above-ground components

**LV03:** Design of enabling works to minimise visual impacts from public locations.

### 9.2.2.6 Residual impact

The residual impacts are detailed later at the end of this section (see Table 9-15) and summarised briefly below:

**Amenity and landscape**

Following the implementation of mitigation and management measures to comply with the EPRs, it is anticipated that the changes in amenity values from general operational activities and visual impacts will affect some residents.

With the implementation of the noise management and compliance requirements, the magnitude of the noise impacts has been reduced to minor for the long-term operation of the project. However, in the short term, with the commissioning of stages, the noise will remain at a medium magnitude. Once commissioning is completed, it is expected the residual impact will be **moderate**.

The visual amenity magnitude of impact has reduced to **moderate** with the implementation of vegetative screening and the application of design elements, such as the building being painted green to blend more sympathetically into the surrounding environment. The residual impact is **high,** and this could be further mitigated in the future should roadwork or intersection upgrade works occur.

**Natural resources and ecology**

The magnitude rating for flora and fauna will remain negligible and a residual impact rating of **low**.

## 9.3 ECONOMY AND LIVELIHOODS

This section considers the potential for the project to affect characteristics of the socio-economic environment that support affordable lifestyles. Specifically, this section examines employment, local businesses, workforce availability, and housing affordability and availability.

### 9.3.1 Construction

The project's construction activities will result in impacts on the study area's economy and livelihoods. These changes are considered in the technical studies and include changes to:

- Employment opportunities;
- Workforce availability;
- Industry and business;
- Skills development; and
- Availability and affordability of housing.

#### 9.3.1.1 Employment opportunities and workforce availability

Employment will be associated with a range of activities for the construction of the project for onshore and offshore components. Local employment associated with the project will be predominantly through contractors.

The number of construction workers required during the construction phase is expected to peak at approximately 180 persons per day for the converter station.

Jobs are projected to be created across a range of local industry categories and occupational classifications. The construction phase will lead to employment for technicians and trades workers (e.g., electricians, architectural, building and surveying technicians, welders and metal fitters and machinists), labourers and machinery operators. Other opportunities include professionals (e.g., electrical engineers), tradespeople (e.g., electricians), managers and clerical and administration for operations.

Given the project is also maritime project, local professionals and tradespeople with experience in maritime settings will be required. Examples include maritime safety employees, marine preservation advisors, maritime construction and engineering experts, maritime logistics, and transportation specialists.

Employment impacts from the project will represent a benefit to the region. The workforce will be made up of local, intrastate, interstate and international personnel depending on the complexity of the work and the requirement for specialist skills and equipment.

For the Heybridge site, it is anticipated that local workers from North West Tasmania may make up approximately 45 % of the construction workforce, with 30% from elsewhere within Tasmania. Interstate resources coming from other locations within Australia may make up approximately 17 % of the workforce, with the balance international.

It is expected the Heybridge Converter Station construction will take to be up to 36 months for each stage, including approximately 12 months of shore crossing drilling to construct both of the 750 MW circuits.

According to the Economic Assessment (SGS Economics & Planning, 2023) during construction phase, the project is expected to add 1,337 FTE job-years in construction, 281 in retail trade and 184 in health care and social assistance. There is estimated to be a slight reduction in job-years in agriculture, forestry and fishing (-241), manufacturing (-25) and mining (-8) as these sectors are likely to compete for workers with the project during the construction period.

During the SIA consultation, a number of stakeholders raised concerns that there is an existing shortage of workers in the construction industry, which has flow-on impacts on residential construction/renovation and other projects in the region, and that this may be exacerbated by the project. There may also be an impact on local businesses and other key industries including agriculture, forestry and fishery, manufacturing and mining with challenges to recruit and attract employees.

#### 9.3.1.2 Training and education

Any skill development associated with the project's employment will be an indirect impact (i.e., not undertaken for the project) and largely associated with cumulative demand for employees in the construction sector. Consequently, the construction of the project may contribute to the demand for the construction sector that may require formalised workforce training and development in the local and regional study area and for the state and national workforce.

Economic assessment (SGS Economics & Planning, 2023) outline that the University of Tasmania, TAFE Tasmania, Skills Tasmania, and the Education Department are all looking to the project and the induced renewable energy projects to provide demand for high-quality jobs and career pathways for students. These organisations are planning to shape curriculums and course offerings to create the workforce required and provide opportunities to young Tasmanians.

#### 9.3.1.3 Industry and business

The project construction will require a range of goods and services. In addition to direct procurement by the project, some local and regional businesses will benefit from expenditure by the project's workforce. This expenditure will primarily be on local goods and services providers (e.g., grocery stores, food, and restaurant outlets).

The Economic Assessment (SGS Economics & Planning, 2023) details that the Tasmanian Renewable Energy Action Plan (TREAP) sets clear objectives and actions to transform Tasmania into a global Renewable Energy Powerhouse. Section 3.4 of the TREAP refers specifically to procurement and opportunities for local businesses. The aim is to maximise local Tasmanian business and employment opportunities for renewable energy projects. Ensuring the widest participation by Tasmanian businesses in renewable energy projects is a key priority for government. That means ensuring that renewable energy projects, where possible, will generate employment and opportunities for local businesses.

The assessment also outlines that during the construction phase of the project (2025-2029), $351 million is expected to be added to the North West Tasmania economy, while the operational phase (inclusive of half of 2029 through 2050 in the modelling) is projected to contribute a cumulative $306 million to the North West Tasmania economy. The assessment highlights that the project will result in large taxation receipts ($762 million in total from 2025 to 2050) from the economic activity generated by the project, which will flow to local, state and the Commonwealth government.

#### 9.3.1.4 Availability and affordability of housing

Non-local Tasmania workers will seek accommodation for short periods in major townships in North West Tasmania. It is expected that the non-residential workforce will require short-term and/or rental accommodation within proximity to the worksites to reduce fatigue limits on travel for the construction workforce.

As outlined in the baseline characteristics, the availability and affordability of rental housing in the regional study area are highly constrained. Housing affordability is a community concern and has the highest effect on vulnerable groups, such as those on a limited or fixed income.

Given the limited availability of affordable rental accommodation in the regional study area, the non-residential the project's workforce will compete for the limited accommodation available, affecting housing availability and affordability. This will affect people on very low- and- low incomes in the regional study area to a greater extent than those on moderate and higher incomes.

However, there is potential that housing could be sourced from outside of this region or that there will be an increased uptake of short-term accommodation, given the limited availability of housing. This is highly dependent on the availability of short-term accommodation at the time of construction, though this source of accommodation is likely to be limited.

#### 9.3.1.5 Summary of impacts

An influx of workers and their families in North West Tasmania during construction will inevitably result in positive and negative impacts on the area's economy and livelihoods; this will present opportunities for investment in new or improved facilities supported by population growth and economic development.

**Table 9-6 Pre-mitigated impact assessment on economy and livelihood values (construction)**

| Affected social value | Potential impact | Pre-mitigated impact assessment | | | Justification for magnitude rating |
|---|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact | |
| **Employment and workforce** | **Positive:** The project's construction is expected to support the short-term employment of approximately 45 % of the total construction workforce within the local and regional study area. | Very sensitive | Minor | Moderate (positive) | The magnitude has been defined as minor as it will result in a small but measurable change from the baseline condition and will affect a small section of the community. |
| | **Positive:** The project's construction is expected to support the short-term employment of approximately 30% of the total construction workforce from the state and national workforce. | Sensitive | Negligible | Low (positive) | The magnitude has been defined as negligible as, from a broader state and national perspective, the impact will be a marginal change and only affect a small proportion of the population. |

| Affected social value | Potential impact | Pre-mitigated impact assessment | | | Justification for magnitude rating |
|---|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact | |
| | **Positive:** The project may contribute to a diversity of longer-term and secure employment opportunities and skills training opportunities for residents across a range of skill levels. There might also be jobs created in related industries who benefit from the economic activity, including retail, administrative services and accommodation and food. | Very sensitive | Minor | Moderate (positive) | The magnitude has been defined as minor as it will result in a small but measurable change from the baseline condition and will affect a small section of the community. |
| | **Negative:** The project's construction will generate demand for construction workers, potentially drawing employees from other construction projects, industry sectors and local businesses. Due to this potential constraint on the workforce, there may be longer lead times for other construction projects and possible workforce shortages in the study area. | Very sensitive | Moderate | High (negative) | The proposed development will provide a range of direct and indirect employment opportunities, which should increase participation in the workforce. A moderate magnitude has been provided based on the noticeable change expected in the region with the high demand for construction workers to deliver this project and with the medium-term nature of the project. |
| | **Positive:** The project's construction | Very sensitive | Minor | Moderate (positive) | Demand for labour for the construction |

| Affected social value | Potential impact | Pre-mitigated impact assessment | | | Justification for magnitude rating |
|---|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact | |
| | may contribute to existing and predicted demand for the construction sector, which may require formalised workforce training and development in the study area. | | | | sector may require the training and development of the local and regional workforce, which will create a minor magnitude positive impact given the small section of the community that will be affected by this project. |
| **Industry and business** | **Positive:** The project's construction will support local businesses through the goods and services required to support the project's development. | Very sensitive | Minor | Moderate (positive) | Local and regional businesses will benefit from expenditure by the project's workforce. This expenditure will primarily be on local goods and services providers (e.g., grocery stores, food, and restaurant outlets) and, in particular, local accommodation providers. The impact will be small but measurable and will affect a small proportion of the community (business owners). |
| **Housing affordability and availability** | **Negative**: The project's workforce may contribute to the demand for rental housing in the regional study area and exacerbate existing rental availability and affordability issues, disproportionally affecting very | Very sensitive | Major | Major (negative) | Given the limited availability of rental housing in the study area, the magnitude of major has been determined as there may be a significant impact on vulnerable groups due to the increasing demand for housing and rental prices |

| Affected social value | Potential impact | Pre-mitigated impact assessment | | | Justification for magnitude rating |
|---|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact | |
| | low- and low-income households. | | | | likely to escalate. It may also have flow on impacts to the livelihoods of those in the business community if short term accommodation is utilised for construction workers and not made available to tourists in peak seasons. |
| **Socio-economic dis/advantage** | **Positive**: The project's workforce may provide job opportunities directly and indirectly that help to help improve the socio-economic outcomes of the study area. | Very sensitive | Negligible | Low (positive) | With the diversity of jobs on offer combined with the forecast increase in the purchase of local goods, there will be a potential economic uplift; however, this is likely to impact on a small section of the community so the magnitude is considered minor. |

### 9.3.1.6 Environmental performance requirements

Proposed EPRs to enhance and mitigate the impacts related to employment and workforce; industry and business; socio-economic dis/advantage and housing affordability and availability for the project are listed in Table 9-7.

**Table 9-7 EPRs for economy and livelihood impacts**

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| **S01 Tas** | **Develop and implement a social impact management plan**<br><br>Prior to commencement of project works develop a social impact management plan. The plan must be developed in consultation with relevant government and local government agencies, key stakeholders, and directly affected parties to minimise social impacts across the project during construction.<br><br>The social impact management plan should be location specific and address key components of the construction program, including the staging of land cable trenching and installation. The plan should be a public document and be readily available on the project website.<br><br>The plan must include:<br><br>• A high-level summary of community baseline conditions, a summary of the anticipated social impacts (positive and negative), potential residual impacts and consideration for cumulative impacts. The plan will be reviewed and updated to | **Construction** |

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| | address any shifts in the socio-economic environment on the baseline and impacts and consider the ongoing cumulative impacts of projects in the region.<br>• Incorporate key strategies, their objectives for managing social impacts and the responsibilities for implementation of the strategies including the workforce and accommodation strategy (EPR S02), community and stakeholder engagement framework (EPR S03), community benefits sharing scheme (EPR S04), and industry participation plan (EPR S05).<br>• An employment and training performance strategy with a focus on providing local opportunities<br>• Describe the requirement for first response medical capabilities on-site for both local and non-local employees and contractors to minimise the impact on local health services.<br>• Outline of a protocol to be developed for engaging with community and managing social impacts during an emergency that must be developed in consultation with local emergency response providers and referenced in the project's emergency response plan.<br>The social impact management plan must be implemented during construction. | |
| **S02 Tas** | **Develop and implement a workforce and accommodation strategy**<br>Develop a workforce and accommodation strategy to address the potential social impact from the project's workforce and accommodation requirements during construction. The strategy must:<br>• Be developed in consultation with government, industry and other relevant providers.<br>• Include a protocol for the identification and management of impacts due to accommodation requirements.<br>• Address cumulative impacts on accommodation due to other large-scale construction and infrastructure projects in the identified local study areas.<br>The outcomes of the strategy must be considered during construction planning. | **Construction** |
| **S03 Tas** | **Develop and implement a community and stakeholder engagement framework**<br>Prior to commencement of project works, develop a community and stakeholder engagement framework to outline the approach to engagement with community, stakeholders and First Peoples will be undertaken for project and by all contractors. The community and stakeholder engagement framework must:<br>• Identify key community and stakeholder groups across the project.<br>• Describe the approach for engaging the community, stakeholders and First Peoples.<br>• Establish communication protocols and tools for communication.<br>• Outline complaints policies and management procedures for recording, managing, and resolving complaints. The complaints management system must be consistent with Australian Standard AS/NZS 10002: 2014 Guidelines for Complaints Management in Organisations.<br>Principal contractors must prepare a community and stakeholder engagement management plan in accordance with the framework for their works package.<br>The community and stakeholder engagement framework and contractors community and stakeholder engagement management plan must be updated annually to reflect any project or stakeholder changes and improvements identified.<br>The community and stakeholder engagement framework must be implemented during construction. | **Construction**<br>**Operation** |
| **S05 Tas** | **Develop an industry participation plan**<br>Prior to the commencement of project works, develop an industry participation plan to integrate First Peoples, females, youth and socially vulnerable groups into the project workforce. The purpose of industry participation plan is to stimulate entrepreneurship, business and economic development, providing First Peoples and vulnerable groups with more opportunities to participate in the economy.<br>The plan must:<br>• Set out an employment and supplier-use participation target within the project's locality. | **Construction** |

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| | • Outline the project's social procurement policies and local procurement policies considering each component and phase of construction.<br>• Be developed in conjunction with the requirements under the Indigenous Employment and Supplier-use Infrastructure Framework (February 2019).<br>• Identify a range of potential opportunities for job-seekers and businesses to be involved in the project across the construction supply chain.<br>    • Set employment targets with reference to the local First Peoples working age population within the project area and consistent with the 'locals first principle'.<br>    • Identify opportunities for females, youth and other socially vulnerable groups to be involved in the project workforce.<br>The plan must be implemented during construction and operation. | |

#### 9.3.1.7 Residual impact

The residual impacts are detailed later at the end of this section (see Table 9-15) and summarised briefly below:

**Employment and workforce**

The project's construction is expected to support the short-term employment of approximately 45 % of the total construction workforce within the local and regional study area. The residual magnitude of impact is unchanged and the measures in place to support the short-term employment of the workforce from the local and regional study area will have a positive residual impact of **moderate**.

The project's construction is expected to support the short-term employment of approximately 30% of the total construction workforce from the state and national workforce. The residual magnitude of impact is unchanged and existing measures in place to support the short-term employment of the project's construction workforce from the state, national and international workforce will have a positive residual impact of **low**.

The project may contribute to a diversity of longer-term and secure employment opportunities and skills training opportunities for residents across a range of skill levels. The residual magnitude of impact is unchanged. The demand for labour in the construction sector may require the training and development of the local and regional workforce, which has the potential to create a positive residual impact of **moderate**.

The project will also increase the demand for employees and potentially drawing them from other industries and local sectors. Whilst a workforce and accommodation strategy will be prepared for the project, the community expressed concerns about an existing workforce shortage for construction and that this shortage would increase with the number of energy projects being proposed in northern Tasmania including the project. The residual magnitude of moderate remains unchanged resulting in a residual **high** impact.

**Industry and business**

Through the application of the industry participation plan for all its own corporate purchases and through the contracts and tenders it manages, the residual magnitude of impact has increased to moderate and will create a positive residual impact of **high**.

**Housing affordability and availability**

The project's non-residential and short-term construction workforce will contribute to the demand for rental housing in the regional study area and exacerbate existing rental availability and affordability issues, disproportionally affecting very low- and low-income households. The implementation of the \workforce and accommodation strategy could reduce the residual magnitude of impact to moderate and lead to a negative residual impact that is **high**.

**Socio-economic dis/advantage**

Application of the industry participation plan, alongside the indirect employment opportunity, may create a **moderate** positive impact.

### 9.3.2 Operation

The converter stations will not be manned 24/7 and will only be attended to during normal working hours (Monday to Saturday, 7:00 am to 4:00 pm). Outdoor spaces will be unlit at night unless activated by a security system or sensors. Operation and maintenance vehicles entering and exiting the converter station site per day will be a maximum of five light vehicles per day (for operational employees). On some days, it may be as low as two vehicles per day.

Given that the operational phase employment is expected to be minimal, the project workforce will not result in workforce draw or affect workforce availability or availability or affordability of housing. Therefore, this has not been considered further.

**Summary of the potential impact**

Fewer than five employees will be required to help operate the converter stations. There will also be planned outages up to twice a year which will involve 15-20 employees for up to two weeks. Revenue of an estimated $762 million will flow on to local, state and federal government over the anticipated 25 years of operations (SGS Economics & Planning, 2023).

**Table 9-8 Pre-mitigated impact assessment economy and livelihoods (operations)**

| Affected social value | Potential impact | Pre-mitigated impact assessment | | | Justification for magnitude rating |
|---|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact | |
| **Employment and workforce** | **Positive**: Jobs during operations | Very sensitive | Negligible | Low (positive) | Fewer than five employees will be required to help operate the converter stations and therefore, a mitigation of negligible has been provided. |
| **Industry** | **Positive**: The project is expected to result in large taxation receipts ($762 million in total from 2025 to 2050) from the economic activity generated by Marinus Link, which will flow to local, state and the Australian Government. | Very sensitive | Moderate | High (positive) | Economic prosperity is of significance to the study area and the contribution of revenue over a significance duration to national, state and local governments will result in a magnitude rating of moderate. |

No environmental performance requirements, and therefore, the residual impact rating remains unchanged.

## 9.4 COMMUNITY INFRASTRUCTURE AND SERVICES

As detailed in Section 7.5.1, the project's anticipated construction workforce is expected to peak at approximately 180 persons per day for converter stations. It is expected that around 45 % of the workforce will be sourced locally within North West Tasmania. The remainder of the workforce is expected to be sourced from other areas of Tasmania and from outside of Tasmania.

With the increased workforce, this is likely to result in impacts on the study area's community infrastructure and services, including:

- Community health and emergency services
- Childcare availability
- Traffic and transport.

## 9.4.1 Construction

The project's construction activities will result in temporary changes to the environment, which have the potential to affect the community services and infrastructure values of the local study area. These changes are considered in the technical studies and include changes to:

- Access to healthcare and emergency services;
- Access to childcare services; and
- Traffic and transport.

### 9.4.1.1 Community health and emergency services

An increase in population has the potential to result in an increase in demand for health and emergency services. Where this demand is greater than the capacity of these services, service provision for the existing community may be compromised.

It is probable that the increased demand for GPs associated with the non-resident workforce may result in the referral of more patients to hospitals and health centres within the region to help meet the demand. This will increase the demand for existing service provision. It is expected that demand from the non-resident workforce for health services will be directed towards regional centres.

Hospital services may be required in the event of an accident. Any increase in demand associated with potential accidents or other health services will be directed towards a regional service centre. Consequently, the increase in demand could affect regional service provision.

Should an accident occur, local emergency services (e.g., ambulance, police and fire services) will be required to respond. In some parts of the regional study area, there is limited emergency services infrastructure and personnel. This means that when an ambulance is occupied, it may be the only ambulance in that area. Country Fire Association (CFA) services are staffed entirely by volunteers; any additional impost upon the demands upon volunteers may render the service unmanageable. This indicates that additional demand by the project(s) may place additional stress on the capacity of emergency services.

In summary, the project's non-resident workforce will result in a small population increase during the construction phase, and this may have an associated short-term increase in demand for health and emergency services. At the emergency services level, particularly in rural areas, capacity is limited or affected by high levels of existing demand.

### 9.4.1.2 Childcare provision

An increase in population has the potential to result in an increase in demand for childcare services. Where this demand is greater than the capacity of these services, service provision for the existing community may be compromised. Feedback from a local government association during the SIA consultation indicated that a barrier to workforce participation is a result of "limited and low-quality childcare options".

A recent report by Victoria University: *Deserts and Oasis: How accessible is childcare in Australia* defines a childcare desert as a populated area where there are more than three children per childcare place, or less than 0.333 places per child aged four or under. In the study area, there is a shortage of childcare, with 0.2 spaces available for every child aged under four, making it a desert for children.

### 9.4.1.3 Traffic and transport

The stakeholders interviewed for this SIA expressed concern that the traffic network may be affected by additional use during the construction phase of the project. Concerns were raised about the capacity of the road network to cope with the movement of construction vehicles.

**Connectivity**

Traffic and transport assessment (Stantec, 2023) indicates that both Minna Road and the Bass Highway will continue to operate well below capacity with the addition of project-generated traffic. There are two intersections primarily impacted by site-generated traffic to access the site. The intersections will operate in accordance with industry standards. The site access point operates well under its capacity in the AM and PM peak hours. However, the study did note that during construction scenarios, the delay increases at the Minna Road approach; however, the intersection continues to operate well under capacity.

**Safety and capacity**

An increase in the number of heavy vehicles on the road network may give rise to perceptions of reduced road safety for users and wide loads may result in an increase in travel times. It is expected that all bridges within the study can accommodate vehicles up to and including a 19 m semi-trailer, given they are all contained within the approved B double road network. Traffic and transport assessment (Stantec, 2023) also provides recommendations for any road or intersection upgrades.

Pedestrian activity within the study area and along the construction traffic routes is primarily limited to the townships. The heavy movements through townships are primarily constrained to the Bass Highway and are therefore operating in line with expectations and existing use. Vehicle movements may occur through smaller townships in the event of a road closure on the Bass Highway. When construction vehicles pass through these locations, there is potentially an increased risk of crashes with a more significant consequence due to the increased number of pedestrians that are present within the townships.

**Transformer**

The transformer transporter is a 6 m high and approximately 130 m long vehicle. The movement of the transformer transporter will require permanent traffic management personnel to supervise. This will include operations to block traffic during periods of time when the transformer transporter is travelling down the centre of the carriageway or completing turning movements. Moving warnings will be provided for approaching vehicles that a large, slow-moving vehicle is on the approach.

### 9.4.1.4 Summary of potential impacts

The SIA consultation found that residents highly value their laid-back lifestyle, which includes easy connection and no delays. The consultation highlighted that community services are in demand and childcare, in particular, is low on vacancies.

Therefore, during construction activities, the project may impact community services and traffic infrastructure for residents. Table 9-9 details the pre-mitigated assessment and provides justification for each magnitude rating.

**Table 9-9 Pre-mitigated impact assessment on community infrastructure and services**

| Affected social value | Potential impact | Pre-mitigated impact assessment | | | Justification for magnitude rating |
|---|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact | |
| **Health and wellbeing** | **Negative:** The project's construction workforce may increase demand for health and emergency service providers, compromising service provision to the existing local and regional community. | Sensitive | Moderate | Moderate (negative) | The project's non-resident workforce will result in a small population increase during the construction phase, and this may have an associated short-term increase in demand for health and emergency services. At the emergency services level, particularly in rural areas, capacity is limited or affected by high levels of existing demand. The moderate magnitude is based on the criteria that there will be a noticeable change, it will affect a notable proportion of the community and it will be medium term (longer than six months). |
| **Childcare** | **Negative:** The project's construction workforce may increase demand for childcare providers, compromising service provision to the existing local and regional community. | Very sensitive | Moderate | High (negative) | The project's non-resident workforce will result in a small population increase during the construction phase and this may have an associated short-term increase in demand for childcare services. This has been flagged as a present issue during consultation. |
| **Connectivity** | **Negative:** The performance of the road network in the project area during construction creates delays for existing road users, reducing the efficiency of in the study. | Very sensitive | Minor | Moderate (negative) | The level of traffic generated on the local road network will increase the relative traffic in the area. This minor magnitude reflects a small but measurable change from the baseline and that it affects a small but notable proportion of people within the community. Also, it will be intermittent in nature. |
| **Safety and capacity** | **Negative:** Disruption from the movement of the transformer transporter will have on the road network's condition, design and operation to perform safely. | Very sensitive | Major | Major (negative) | This rating is of a major magnitude in alignment with the Traffic and Technical study, given the considerable change from baseline conditions and could affect a large number of people. However, it is a one-off activity. |
| | **Negative:** General road safety with an increase in construction vehicles and the potential to impact traffic and pedestrian safety. | Very sensitive | Moderate | High (negative) | A moderate magnitude has been allocated based on a noticeable change to the baseline, the potential to affect notable proportions of the community. |

| Affected social value | Potential impact | Pre-mitigated impact assessment | | | Justification for magnitude rating |
|---|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact | |
| | **Negative:** Reduced road safety, including the road safety of vulnerable, particularly school bus routes. | Very sensitive | Moderate | High (negative) | The rating of high was provided based on the movement of construction vehicles on the alignment of school bus routes. |
| | **Negative:** Increased safety risk due to poor road lighting for shore crossing works at night. | Very sensitive | Major | Major (negative) | This rating has been determined based on the potential consequences on health and livelihood and the long-term effect an accident could cause. |

### 9.4.1.5 Environmental performance requirements

EPRs have been recommended in the following technical studies:

- Traffic and transport assessment (Stantec, 2023).

Proposed EPRs to manage and mitigate the impacts related to community services and infrastructure for the project are listed in Table 9-10.

**Table 9-10 EPRS for community infrastructure and services**

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| **Health, emergency services and childcare services** | | |
| **S01 Tas** | **Develop and implement a social impact management plan**<br>Prior to commencement of project works develop a social impact management plan. The plan must be developed in consultation with relevant government and local government agencies, key stakeholders, and directly affected parties to minimise social impacts across the project during construction.<br>The social impact management plan should be location specific and address key components of the construction program, including the staging of land cable trenching and installation. The plan should be a public document and be readily available on the project website.<br>The plan must include:<br>• A high-level summary of community baseline conditions, a summary of the anticipated social impacts (positive and negative), potential residual impacts and consideration for cumulative impacts. The plan will be reviewed and updated to address any shifts in the socio-economic environment on the baseline and impacts and consider the ongoing cumulative impacts of projects in the region.<br>• Incorporate key strategies, their objectives for managing social impacts and the responsibilities for implementation of the strategies including the workforce and accommodation strategy (EPR S02 Tas), community and stakeholder engagement framework (EPR S03 Tas), community benefits sharing scheme (EPR S04 Tas), and industry participation plan (EPR S05 Tas).<br>• An employment and training performance strategy with a focus on providing local opportunities<br>• Describe the requirement for first response medical capabilities on-site for both local and non-local employees and contractors to minimise the impact on local health services.<br>• Outline of a protocol to be developed for engaging with community and managing social impacts during an emergency that must be developed in consultation with local | Design |

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| | emergency response providers and referenced in the project's emergency response plan.<br>The social impact management plan must be implemented during construction. | |
| **All (advanced notification, understanding and impacts on community infrastructure and services)** | | |
| **S03 Tas** | **Develop and implement a community and stakeholder engagement framework**<br>Prior to commencement of project works, develop a community and stakeholder engagement framework to outline the approach to engagement with community, stakeholders and First Peoples will be undertaken for project and by all contractors. The community and stakeholder engagement framework must:<br>• Identify key community and stakeholder groups across the project.<br>• Describe the approach for engaging the community, stakeholders and First Peoples.<br>• Establish communication protocols and tools for communication.<br>• Outline complaints policies and management procedures for recording, managing, and resolving complaints. The complaints management system must be consistent with *Australian Standard AS/NZS 10002: 2014 Guidelines for Complaints Management in Organisations*.<br>Principal contractors must prepare a community and stakeholder engagement management plan in accordance with the framework for their works package.<br>The community and stakeholder engagement framework and contractors community and stakeholder engagement management plan must be updated annually to reflect any project or stakeholder changes and improvements identified.<br>The community and stakeholder engagement framework must be implemented during construction. | Construction<br>Operation |

Other technical studies will also contribute to addressing EPRS and are detailed below.

**Traffic and transport**

**T01**: Develop a Transport Management Plan.

#### 9.4.1.6 Residual impact

The residual impacts are detailed later at the end of this section (see Table 9-15) and summarised briefly below**.**

**Health and wellbeing and childcare services**

The impact on health care and emergency service providers is expected to be reduced to a minor impact due to the short-term increase in demand for services and results in a negative residual impact of **low.** The social impact management plan will provide an emergency response plan developed in consultation with local emergency response providers.

There is no change to the residual magnitude of the impact on childcare services in the study area due the already constrained supply of services and the rating stays as a negative residual rating of **high**.

**Traffic and transport**

The technical study has indicated that no arterial roads identified will exceed their capacity and the implementation of the TMP will provide further measures to minimise and monitor any traffic impacts. As a result the magnitude has reduced to negligible and the residual impact to **low**.

With respect to the capacity of the road network and its condition, traffic management will be used during the movement of the transformer transporter, which is a one-off movement. This will reduce the residual magnitude to minor and result in a negative residual impact of **low**.

Reduced road safety of vulnerable, particularly school children, in line with the EPR construction vehicles will not travel on school bus routes during pick-up /drop-off times and therefore the residual magnitude has reduced to negligible, and the rating is a negative residual of **low**.

General road safety with the increase in construction vehicles will be managed and monitored as part of the transport management plan. As a result, the residual magnitude has reduced to minor with an over residual impact of **moderate**.

Increased safety risk due to poor road lighting for shore crossing works at night will be mitigated by the provision of temporary lighting at required intersections this will reduce the magnitude to **minor** and a **moderate** residual impact rating.

### 9.4.1 Operation

No expected impacts during operations.

## 9.5 PEOPLE’S PRODUCTIVE CAPACITY

The uncertainty associated with transmission line developments can create fears and concerns about the impact of the proposed change on communities and the environment in which they live. The concerns (described below) that were expressed by community members in the SIA consultation and the community engagement are consistent with those identified in the literature about transmission line placement (see, for instance, Elliott and Wadley 2012 and Wadley et al. 2019).

Potential impacts on wellbeing associated with the planning, construction and operation phases of the project include health and wellbeing and skills development and training.

### 9.5.1 Construction

People’s productivity and livelihoods describe the skills, knowledge, and experience that are vital to survival and participation in society and its economy. This section considers the impacts of the project on the study area. Changes are considered in the technical studies that relate to health and wellbeing (mental and physical) and skills development and training.

#### 9.5.1.1 Health and wellbeing

**Noise**

As outlined in section 9.2.1.2 noise from construction will occur at the converter stations six days per week, between 7:00 am and 4:00 pm. The predicted noise levels are above the daytime background noise levels presented, indicating that construction noise will likely be clearly audible. The noise levels are expected to reflect a common outcome for construction work in urban areas, particularly for a major infrastructure project. However, the results indicate the noise assessment indicated there is a risk of community disturbance from construction noise, particularly given the duration of the construction program, which could be up to 36 months.

The primary consideration for works outside normal working hours is the shore crossing shore crossing works which could occur 24 hours per day, seven days per week, for a period of up to 12 months in total. MLPL advises that these works will need to be continuous to ensure the stability of the boreholes. The margin of the predicted noise levels above the reference level for works conducted during the night indicates a risk of sleep disturbance to multiple residential properties around the project.

These ongoing disturbances may result in mental and health impacts on residents in neighbouring residential areas.

**EMF impacts**

During the SIA consultation, concerns regarding the potential for electric and magnetic fields (EMF) to impact the health of nearby residents were expressed. Independent scientific studies examining the potential health effects of exposure to EMF have been undertaken around the world for more than 50 years. Based on the findings of credible public health authorities, the body of scientific research on EMF does not establish that exposure to EMF at levels below the recognised guidelines cause or contribute to any adverse health effects (Energy Networks Association 2016). WHO has also undertaken extensive research into EMF and has advised that current evidence does not confirm the existence of any health consequences from exposure to low levels of EMF. However, it is recognised that some members of the public attribute a range of psychological reactions to exposure to EMF, including headaches, anxiety, suicide and depression (World Health Organisation 2021).

The maximum calculated EMF at the Heybridge, Driffield and Hazelwood converter stations will be below the reference levels for people, livestock and wildlife at the property boundary for each site. The operating impacts of the converter stations on human health, livestock and wildlife will therefore be negligible. Mitigation and controls will not be required at the installations.

The maximum calculated EMF along the subsea HVDC cables will be below the reference levels for people throughout the study area. It was concluded from the subsea cable impact assessment that the calculated field levels are below the applicable reference levels, and there will be no operating impacts on human health. Mitigation and controls will not be required at the installations. Similarly, the subsea cables will not impact the normal functioning of marine vessels and systems in the study area.

**Clean energy development**

The community's concerns regarding projects in the study area have been emphasised in both the SIA consultation and project consultation outcomes. Among these projects, the North Transmission Upgrades Project, which will connect to Marinus Link, is a significant cause for concern among the community, especially for the landowners directly affected by it. Our understanding is the community view the projects as one and the same and, therefore, may be higher levels of anxiety, stress and frustration from the community as Marinus Link progresses.

### 9.5.1.2 Skill development and training

During consultation for this SIA, concern was raised about the skill capacity of the residential workforce to meet the project demand for workers.

In the absence of any affirmative action undertaken by the industry sector or state government, First  People, women and youth will continue to experience high levels of unemployment in the region, despite the significant opportunities presented by the cumulative increase in demand for skilled labour from this and the other energy-related projects.

### 9.5.1.3 Summary of potential impacts

The SIA consultation found that residents highly value their quiet coastal lifestyle; however, it also highlighted higher levels of youth unemployment and barriers to workforce participation. The project may result in some negative impacts on people's productive capacities as well as benefits to those more vulnerable with a range of employment opportunities and potential training and education.

Table 9-11 details the pre-mitigated assessment and provides justification for each magnitude rating.

**Table 9-11 Pre-mitigated impact assessment on people's productive capacity values**

| Affected social value | Potential impact | Pre-mitigated impact assessment | | | |
|---|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact | Justification for magnitude rating |
| **Physical and mental health** | **Negative:** Construction fatigue causing mental and health impacts, given night works, are expected to occur seven days a week for up to 12 months and are expected to exceed average noise levels that result in sleep disturbance at the Devonshire Drive Hamlet. While standard works will be ongoing for up to 36 months, six days a week. | Very sensitive | Major | Major (negative) | The magnitude rating of major has been determined based on the considerable change to baseline conditions and potential impact on health and livelihoods due to the duration of 36 months. |
| | **Negative:** Lack of understanding of the project's scope, cumulative impacts of projects in the areas and not seeing local benefit. The reliance of Marinus Link on the North Transmission Upgrades. | Very sensitive | Major | Major (negative) | A magnitude rating of high has been determined based on it affected a large group of people across the community and the longevity of the project. |
| | **Negative:** Potential human health impacts from contaminated material exposure from construction disturbance from the former industrial site. | Very sensitive | Moderate | High (negative) | In line with the technical study, a rating of moderate magnitude has been determined as it will potentially affect a notable proportion of people in the community and be a noticeable change from baseline conditions. |
| | **Negative:** Transporting hazardous goods and materials. | Very sensitive | Severe | Major (negative) | In line with the technical study, a rating of severe magnitude has been determined as it will be a fundamental change from baseline conditions and would have a permanent impact. |
| **Education, training, and skills** | **Positive:** Employment opportunities for First People, females, youth and socially vulnerable groups in the regional construction workforce are made available. | Very sensitive | Negligible | Low (positive) | Given the marginal change from baseline conditions and the effect of a small number of individuals, a magnitude of negligible has been assigned. |

### 9.5.1.4 Environmental requirements

EPRs have been recommended in the following technical studies:

- Noise and vibration assessment (Marshall Day, 2023);

- Traffic and Transport Assessment (Stantec, 2023).

Proposed EPRs to manage and mitigate the impacts related to noise and vibration, landscape and visual amenity, community safety and terrestrial ecology for the project are listed in Table 9-12.

**Table 9-12 EPRs for people's productivity capacity values (construction)**

| EPR ID | Environmental Performance Requirements | Project stage |
|---|---|---|
| S03 Tas | **Develop and implement a community and stakeholder engagement framework**<br>Prior to commencement of project works, develop a community and stakeholder engagement framework to outline the approach to engagement with community, stakeholders and First Peoples will be undertaken for project and by all contractors. The community and stakeholder engagement framework must:<br>• Identify key community and stakeholder groups across the project.<br>• Describe the approach for engaging the community, stakeholders and First Peoples.<br>• Establish communication protocols and tools for communication.<br>• Outline complaints policies and management procedures for recording, managing, and resolving complaints. The complaints management system must be consistent with *Australian Standard AS/NZS 10002: 2014 Guidelines for Complaints Management in Organisations*.<br>Principal contractors must prepare a community and stakeholder engagement management plan in accordance with the framework for their works package.<br>The community and stakeholder engagement framework and contractors community and stakeholder engagement management plan must be updated annually to reflect any project or stakeholder changes and improvements identified.<br>The community and stakeholder engagement framework must be implemented during construction. | **Construction**<br>**Operation** |
| S04 Tas | **Develop and implement a community benefits sharing scheme**<br>Prior to the commencement of project works, develop a community benefits sharing scheme in consultation with communities and First Peoples in the local study area.<br>The community benefits sharing scheme should be developed having regard to *Renewable energy development in Tasmania: A guideline for community engagement, benefit sharing and local procurement (Draft 2022, Department of State Growth).* | **Construction**<br>**Operation** |
| S05 Tas | **Develop an industry participation plan**<br>Prior to the commencement of project works, develop an industry participation plan to integrate First Peoples, females, youth and socially vulnerable groups into the project workforce. The purpose of industry participation plan is to stimulate entrepreneurship, business and economic development, providing First Peoples and vulnerable groups with more opportunities to participate in the economy.<br>The plan must:<br>• Set out an employment and supplier-use participation target within the project's locality.<br>• Outline the project's social procurement policies and local procurement policies considering each component and phase of construction.<br>• Be developed in conjunction with the requirements under the Indigenous Employment and Supplier-use Infrastructure Framework (February 2019).<br>• Identify a range of potential opportunities for job-seekers and businesses to be involved in the project across the construction supply chain.<br>• Set employment targets with reference to the local First Peoples working age population within the project area and consistent with the 'locals first principle'. | **Construction** |

| EPR ID | Environmental Performance Requirements | Project stage |
|---|---|---|
| | • Identify opportunities for females, youth and other socially vulnerable groups to be involved in the project workforce.<br>The plan must be implemented during construction and operation. | |

Other technical studies will also contribute to addressing EPRs and are detailed below.

**Noise and Vibration**

**NV02:** Develop and implement a construction noise and vibration management plan (CNVMP)

**Traffic and Transport**

**T01**: Develop a Transport Management Plan.

**Contaminated Land**

**CL01**: Manage excavated soil, contaminated soils and potential risks to the environment due to contamination during construction.

**CL02**: Develop and implement acid sulfate soils (ASS) management controls

**CL04**: Develop and implement measures to manage potential contamination impacts in operation

### 9.5.1.5 Residual impact

The residual impacts are detailed later at the end of this section (see Table 9-15) and summarised briefly below:

**Physical and mental health**

Working hours, will be critical in helping to mitigate this impact. The residual rating has through the implementation of measures to comply with EPRs, the noise impacts may be mitigated to some extent. Should residents be adversely affected for prolonged periods due to out-of-hours works, respite or compensation may be offered in accordance with the CNVMP. Furthermore, communication protocols outlining the situations and types of activities which will warrant notification of neighbouring residents in advance of the work occurring, including unavoidable works outside of normal reduced from major to **high.**

Ongoing project engagement and communications will help to dispel concerns and provide clarity on the project scope. Additionally, providing opportunities for the community to help shape local benefits will be key in mitigating this impact and reducing it from major to a **high** residual impact.

With respect to the potential for human health impacts from exposure to contaminated materials, the EPRs will help mitigate these impacts and reduce the residual rating from a high rating to a residual rating of **moderate.**

With regards to transporting hazardous materials, the implementation of a transport management plan will ensure adherence to requirements and reduce the impact of this activity to a residual rating of **moderate**.

**Education, training, and skills**

Through the adoption of the recommended measures to comply with EPRs, there is the opportunity to increase employment opportunities and therefore increase the magnitude of this potential benefit. This will see a positive residual rating increased to **moderate**.

## 9.5.1 Operation

### 9.5.1.1 Potential impacts – health and wellbeing

From a positive impact perspective, SGS Economics & Planning, 2023 anticipates the delivery of the project will generate economic activity across the regions and states and has the potential to contribute to a higher standard of living, wages and employment opportunities. Among other anticipated benefits to the community are potential lower energy and telecommunications costs.

In terms of lower energy (electricity) costs for consumers, the project assists in securing cost-effective Tasmanian dispatchable generation as the national energy market transitions. The capacity introduced by the project could assist to exert downward pressure on wholesale electricity prices by facilitating the replacement of marginal and coal-powered generators with additional dispatchable capacity.

Under the current circumstances of high and escalating energy costs, downward pressure is a relevant and material benefit to residents and the community. In terms of telecommunications, the project will also expand opportunities for optical fibre routes across the Bass Strait, supporting greater telecommunication diversity and security between Tasmania and mainland Australia. Such an outcome may also translate into opportunities for local innovators and entrepreneurs.

However, there may be ongoing concerns regarding EMF exposure and noise from the converter station during operations. There is a risk that during operations of the converter station, tones could be audible or characterised as a low frequency. If this were to occur, the noise levels will be above the design targets at the Devonshire Drive Hamlet.

As outlined in 9.2.2.1, these impacts may result in increased stress and anxiety for people in the study area, particularly for residential developments in close proximity to the Heybridge converter station.

**Table 9-13 Pre-mitigated impact assessment on people's productive capacity (operations)**

| Affected social value | Potential impact | Pre-mitigated impact assessment | | | Justification for magnitude rating |
|---|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact | |
| **Health and wellbeing** | **Negative:** Concern about the project's potential impacts (e.g. EMF, operational noise) may result in feelings of stress, anxiety and frustration for surrounding residents and communities | Very sensitive | Moderate | High (negative) | A high rating has been assigned based on the potential for a noticeable change to the baseline conditions and impact on health and livelihood. Also, the effect will potentially be long term. |
| **Operation** | **Positive:** The project may add to the health and wellbeing of residents in the study area through investments in community infrastructure, the potential for downward pressure to be placed on the | Very sensitive | Moderate | High (positive) | The very sensitive rating has been determined by consultation and the baseline which rates health and wellbeing as very sensitive. Also, cost of living pressures is currently a considerable concern. |

| Affected social value | Potential impact | Pre-mitigated impact assessment | | | Justification for magnitude rating |
|---|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact | |
| | market regarding energy prices, as well as greater telecommunication security through expansion of the supply-side infrastructure. | | | | |

Other technical studies will contribute to addressing EPRS and are detailed below.

**Noise and Vibration**

**NV05:** Prepare an operational noise management plan

### 9.5.1.2 Residual impact

With the implementation of measures to comply with EPRs, the residual magnitude of impact remains high and therefore a residual rating of **high** remains for the potential noise and EMF concerns.

## 9.6 DECOMMISSIONING

The operational lifespan of the project is anticipated to be a minimum 40 years. At the end of its operational lifespan, the project will either be decommissioned or upgraded to extend the operational lifespan.

In the event that the project is decommissioned, all above-ground infrastructure will be removed, and associated land returned to the previous land use or as agreed with the landowner. All underground infrastructure will be decommissioned in accordance with the requirements of the time. This may include removal of infrastructure or some components remaining underground where it is safe to do so. It is generally considered less impactful from an air quality perspective to leave underground and submarine infrastructure in place rather than remove it. All metal removed will be recycled and concrete broken down for recycling or disposal.

As a result of the timescale and the flexible nature of decommissioning at this stage it has been concluded that a detailed assessment of decommissioning risk will be conducted at the end of the project life when decommissioning is confirmed.

## 9.7 ENVIRONMENT PERFORMANCE REQUIREMENTS

A fundamental shift has occurred in the last ten years in the domain of focus for SIA. Current leading practice, both in Australia and internationally, is for the adoption and implementation of SIMPsfor large-scale projects in the infrastructure and resources space (Esteves, Franks and Vanclay, 2012; Franks and Vanclay, 2013; Vanclay, Esteves and Franks 2015). This management tool better facilitates the monitoring and management of predicted social impacts but also permits a proactive approach to unintended consequences and residual impacts. A further leading practice tool is ongoing project community and stakeholder engagement.

Technical studies that have informed this assessment outlined a variety of mitigation measures to support the EPRs. For this assessment, EPRs have been identified that will support in mitigating the impacts of the project; however, no standalone mitigation measures have been identified. The purpose of adhering to the

EPRs is to minimise the project's impacts and the risk of harm to the environmental, social and cultural values to within reasonable limits having regard to contextual factors and the practical delivery of the project.

The EPRs listed in Table 9-14 will be critical to reduce the social impacts of the project.

**Table 9-14 Environmental Performance Requirements**

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| **S01 Tas** | **Develop and implement a social impact management plan**<br>Prior to commencement of project works develop a social impact management plan. The plan must be developed in consultation with relevant government and local government agencies, key stakeholders, and directly affected parties to minimise social impacts across the project during construction.<br>The social impact management plan should be location specific and address key components of the construction program, including the staging of land cable trenching and installation. The plan should be a public document and be readily available on the project website.<br>The plan must include:<br>• A high-level summary of community baseline conditions, a summary of the anticipated social impacts (positive and negative), potential residual impacts and consideration for cumulative impacts. The plan will be reviewed and updated to address any shifts in the socio-economic environment on the baseline and impacts and consider the ongoing cumulative impacts of projects in the region.<br>• Incorporate key strategies, their objectives for managing social impacts and the responsibilities for implementation of the strategies including the workforce and accommodation strategy (EPR S02 Tas), community and stakeholder engagement framework (EPR S03 Tas), community benefits sharing scheme (EPR S04 Tas), and industry participation plan (EPR S05 Tas).<br>• An employment and training performance strategy with a focus on providing local opportunities<br>• Describe the requirement for first response medical capabilities on-site for both local and non-local employees and contractors to minimise the impact on local health services.<br>• Outline of a protocol to be developed for engaging with community and managing social impacts during an emergency that must be developed in consultation with local emergency response providers and referenced in the project's emergency response plan.<br>The social impact management plan must be implemented during construction. | **Design** |
| **S02 Tas** | **Develop and implement a workforce and accommodation strategy**<br>Develop a workforce and accommodation strategy to address the potential social impact from the project's workforce and accommodation requirements during construction. The strategy must:<br>• Be developed in consultation with government, industry and other relevant providers.<br>• Include a protocol for the identification and management of impacts due to accommodation requirements.<br>• Address cumulative impacts on accommodation due to other large-scale construction and infrastructure projects in the identified local study areas.<br>The outcomes of the strategy must be considered during construction planning. | **Construction** |
| **S03 Tas** | **Develop and implement a community and stakeholder engagement framework**<br>Prior to commencement of project works, develop a community and stakeholder engagement framework to outline the approach to engagement with community, stakeholders and First Peoples will be undertaken for project and by all contractors. The community and stakeholder engagement framework must:<br>• Identify key community and stakeholder groups across the project. | **Construction**<br>**Operation** |

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| | • Describe the approach for engaging the community, stakeholders and First Peoples.<br>• Establish communication protocols and tools for communication.<br>• Outline complaints policies and management procedures for recording, managing, and resolving complaints. The complaints management system must be consistent with Australian Standard AS/NZS 10002: 2014 Guidelines for Complaints Management in Organisations.<br>Principal contractors must prepare a community and stakeholder engagement management plan in accordance with the framework for their works package.<br>The community and stakeholder engagement framework and contractors community and stakeholder engagement management plan must be updated annually to reflect any project or stakeholder changes and improvements identified.<br>The community and stakeholder engagement framework must be implemented during construction. | |
| **S04 Tas** | **Develop and implement a community benefits sharing scheme**<br>Prior to the commencement of project works, develop a community benefits sharing scheme in consultation with communities and First Peoples in the local study area.<br>The community benefits sharing scheme should be developed having regard to *Renewable energy development in Tasmania: A guideline for community engagement, benefit sharing and local procurement (Draft 2022, Department of State Growth).* | **Construction**<br>**Operation** |
| **S05 Tas** | **Develop an industry participation plan**<br>Prior to the commencement of project works, develop an industry participation plan to integrate First Peoples, females, youth and socially vulnerable groups into the project workforce. The purpose of industry participation plan is to stimulate entrepreneurship, business and economic development, providing First Peoples and vulnerable groups with more opportunities to participate in the economy.<br>The plan must:<br>• Set out an employment and supplier-use participation target within the project's locality.<br>• Outline the project's social procurement policies and local procurement policies considering each component and phase of construction.<br>• Be developed in conjunction with the requirements under the Indigenous Employment and Supplier-use Infrastructure Framework (February 2019).<br>• Identify a range of potential opportunities for job-seekers and businesses to be involved in the project across the construction supply chain.<br>• Set employment targets with reference to the local First Peoples working age population within the project area and consistent with the 'locals first principle'.<br>• Identify opportunities for females, youth and other socially vulnerable groups to be involved in the project workforce.<br>The plan must be implemented during construction and operation. | **Construction, Operation** |

## 9.8 RESIDUAL IMPACT SUMMARY

The summary of residual impact aims to comprehend the lasting consequences and possible risks or advantages linked to the identified impacts after taking mitigation or enhancement measures into account. The sensitivity rating remains constant as it reflects the importance placed on community values. However, the actual magnitude of the impact might vary as a result of implementing measures to comply with EPRs. We have included explanations below to justify any changes in the impact's magnitude. To ensure caution in evaluating the residual impact, we have adopted a conservative approach, modifying magnitudes only when there is a reasonable level of certainty.

**Table 9-15 Residual Impact summary**

| Project phase | Potential impact | Type of impact: Positive or negative | Social value | Pre-mitigated impact assessment: Sensitivity | Pre-mitigated impact assessment: Magnitude | Pre-mitigated impact assessment: Impact | Recommended EPR | Residual impact assessment: Magnitude | Residual impact assessment: Justification for change in magnitude | Residual impact assessment: Impact |
|---|---|---|---|---|---|---|---|---|---|---|
| **Community identity** | | | | | | | | | | |
| **Construction** | Noise, vibration and visual disturbances causing amenity impacts (standard hours). | Negative | Community identity: Landscape and amenity | Very sensitive | Moderate | High | NV02: Develop and implement a construction noise and vibration management plan (CNVMP)<br>S03 Tas: Develop and implement a community and stakeholder engagement framework | Minor | Through the development and implementation of a construction noise and vibration plan, a range of mitigation measures will assist in reducing the impact on amenity.<br>Civil and infrastructure works will be restricted to regular working hours generally. Exceptions to this will be unavoidable works for atypical tasks which occur infrequently. | Moderate |
| **Construction** | Amenity impacts for nearby residents due to dust from construction activities. | Negative | Community identity: Landscape and amenity | Very sensitive | Minor | Moderate | AQ01: Develop and implement a construction dust management plan<br>S03 Tas: Develop and implement a community and stakeholder engagement framework | Negligible | Through the development and implementation on construction dust management plan, air quality will be monitored and measured to minimise dust from construction activities will be implemented. | Low |
| **Construction** | Construction activity undertaken outside of regular working hours to complete shore crossing works with noise levels exceeding sleep disturbance measure. | Negative | Community identity: Landscape and amenity | Very sensitive | Major | Major | NV02: Develop and implement a construction noise and vibration management plan (CNVMP)<br>S03 Tas: Develop and implement a community and stakeholder engagement framework | Moderate | Implementing measures such as avoiding or limiting shore crossing works at night; selecting plant equipment with the lowest available noise emissions; scheduling works to reduce late evening disruptions; noise barriers; restricting heavy vehicle movements; compensation for prolonged exposure outside regular working hours; ongoing noise monitoring; and advanced notification to residents and the community will help minimise the impacts on residents. | High |
| **Construction** | Noise from construction activities may affect the study area's enjoyment of recreational spaces. | Negative | Community identity: Landscape and amenity | Very sensitive | Minor | Moderate | NV02: Develop and implement a construction noise and vibration management plan (CNVMP).<br>S03 Tas: Develop and implement a community and stakeholder engagement framework | No change | Through the development and implementation of a construction noise and vibration plan, a range of mitigation measures will assist in reducing the impact on amenity. | Moderate |
| **Construction** | Impact on fauna and flora, with consideration for roadkill as a result of construction vehicle movements. | Negative | Community identity: Natural resources and ecology | Very sensitive | Minor | Moderate | EC01 (TAS): Minimise vegetation removal and implement and implement vegetation protection measures<br>EC02 (TAS): Implement measures to protect fauna<br>EC03 (TAS): Implement measures to protect raptors | Negligible | Through the implementation of measures to comply with EPRs, including proactive monitoring of raptors via a nest survey ahead of construction and minimising vegetation removal, it anticipated that the magnitude of this impact can be reduced to minor. | Low |

| Project phase | Potential impact | Type of impact: Positive or negative | Social value | Pre-mitigated impact assessment | | | Recommended EPR | Residual impact assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Impact | | Magnitude | Justification for change in magnitude | Impact |
| | | | | | | | | | While the traffic increases may be minor for the project, there is the possibility of increased roadkill because of construction vehicle movement; this is considered negligible in the technical study. | |
| **Construction** | Impact on marine environment with the cable installation on nearshore Tasmanian seabed habitats. | Negative | Community identity: Natural resources and ecology | Very sensitive | Minor | Moderate | MERU01: Monitor HDD activities for the shore crossing to avoid impacts to the marine environment<br>MERU02: Placement of final subsea project alignment to avoid or minimise impacts on benthic habitats | Negligible | This is based on a nearshore seabed habitat being frequently exposed to naturally mobile sediments, and a negligible magnitude, given the very small areas and short-term nature of disturbed seabed sediments. | Low |
| **Operation** | Ongoing 24/7 operations may result in after-hours noise concerns for neighbouring residents, including the new residential development at Devonshire Drive Hamlet in the Heybridge Residential Nature Reserve. | Negative | Community identity: Landscape and amenity | Very sensitive | Moderate | High | NV05: Prepare an operational noise management plan<br>NV06: Prepare an operational noise compliance assessment report | Minor | With the implementation of the noise management and the magnitude has been reduced to minor for the long-term operation of the project. However, in the short term, with the commissioning of stages, the noise will remain at a medium magnitude. | Moderate |
| **Operation** | Visual amenity: View of the converter stations from the southern edge of the Bass Highway and the converter stations will be a dominant view from the exit of the tioxide beach foreshore reserve, the only visitor access point and informal parking area. | Negative | Community identity: Landscape and amenity | Very sensitive | Major | Major | LV01: Design converter station buildings to minimise visual impacts from public locations;<br>LV02: Implement measures to establish and maintain a vegetative screen for public views of above-ground components<br>LV03: Design of enabling works to minimise visual impacts from public locations. | Moderate | The implementation of measures to comply with EPRs will assist in reducing the magnitude of the impact. These measures such as vegetation screening, colour choice of the building and the ability for future road upgrades to further mitigate the visual impact upon entry to tioxide beach have contributed to the lower magnitude rating. | High |
| **Operation** | Ongoing impacts on flora and fauna in line with maintenance activities and operation of the converter station from roadkill impacting on Tasmanian devils and spotted tail quolls. | Negative | Community identity: Natural resources and ecology | Very sensitive | Negligible | Low | EC06 Tas: Operational implementation of vegetation protection measures<br>EC05 Tas: Operational implementation of measures to protect raptors | No change | Through the implementation of the EPRs, impacts on threatened species can be minimised or avoided. Specific management measures will be determined by the contractors undertaking maintenance works. | Low |
| **Economy and livelihood** | | | | | | | | | | |
| **Construction** | The project's construction is expected to support the short-term employment of approximately 45% of the total construction workforce within the local and regional study area. | **Positive** | Economy and livelihood: Employment and workforce | Very sensitive | Minor | Moderate | S01 Tas: Develop and implement a social impact management plan<br>S02: Develop and implement a workforce and accommodation strategy<br>S04 Tas: Develop and implement a community benefits sharing scheme<br>S05 Tas: Develop an industry participation plan | No change | | Moderate |
| **Construction** | The project's construction is expected to support the short-term employment of approximately 30% of the total construction workforce from the state and national workforce. | **Positive** | Economy and livelihood: Employment and workforce | Sensitive | Negligible | Low | | No change | | Low |
| **Construction** | The project may contribute to a diversity of longer-term and secure employment opportunities and skills training opportunities for residents across a range | **Positive** | Economy and livelihood: Employment | Very sensitive | Minor | Moderate | | No change | The magnitude is minor as it will result in a small but measurable change from the baseline condition and will | Moderate |

| Project phase | Potential impact | Type of impact: Positive or negative | Social value | Pre-mitigated impact assessment | | | Recommended EPR | Residual impact assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Impact | | Magnitude | Justification for change in magnitude | Impact |
| | of skill levels. There might also be jobs created in related industries who benefit from the economic activity, including retail, administrative services and accommodation and food. | | and workforce | | | | | | affect a small section of the community. | |
| **Construction** | The project's construction will generate demand for construction workers, potentially drawing employees from other construction projects, industry sectors and local businesses. Due to this potential constraint on the workforce, there may be longer lead times for other construction projects and possible workforce shortages in the study area. | Negative | Economy and livelihood: Employment and workforce | Very sensitive | Moderate | High | | No change | | High |
| **Construction** | The project's construction may contribute to existing and predicted demand for the construction sector, which may require formalised workforce training and development in the study area. | **Positive** | Economy and livelihood: Employment and workforce | Very sensitive | Minor | Moderate | | No change | | Moderate |
| **Construction** | The project's construction will support local businesses through the goods and services required to support the project's development. | **Positive** | Economy and livelihood: Industry and business | Very sensitive | Minor | Moderate | | Moderate | The project will procure goods and services in accordance with the project's industry participation plan to support local businesses (including compliance by suppliers and contractors). | High |
| **Construction** | The project's workforce may contribute to the demand for rental housing in the regional study area and exacerbate existing rental availability and affordability issues, disproportionally affecting very low- and low-income households. | Negative | Economy and livelihood: Housing affordability and availability | Very sensitive | Major | Major | S01 Tas: Develop and implement a social impact management plan<br>S02 Tas: Develop and implement a workforce and accommodation strategy | Moderate | A comprehensive workforce accommodation and strategy and plan will be developed to address both the demand from the project construction workforce and the cumulative impact of other large-scale construction and infrastructure projects in the region. This will help mitigate the magnitude of the impact. | High |
| **Construction** | The project's workforce may provide job opportunities directly and indirectly that help to help improve the socio-economic outcomes of the study area. | **Positive** | Economy and livelihood: socio-dis/advantage | Very sensitive | Negligible | Low | S04 Tas: Develop and implement a community benefits sharing scheme<br>S05 Tas: Develop an industry participation plan | Minor | MLPL aims to address existing social issues, including local employment opportunities, particularly for younger people. MLPL has a focus on delivering high-quality jobs, not simply a high number of jobs. Good job quality considers economic (pay and benefits) and social factors like workplace social support and cohesion, voice and representation, health, safety, wellbeing, and work-life balance.<br>Jobs are projected to be created across a range of industry categories and occupational classifications. The construction phase will lead to employment for technicians and trades workers (e.g., electricians, architectural, building and | Moderate |

| Project phase | Potential impact | Type of impact: Positive or negative | Social value | Pre-mitigated impact assessment | | | Recommended EPR | Residual impact assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Impact | | Magnitude | Justification for change in magnitude | Impact |
| | | | | | | | | | surveying technicians, welders and metal fitters and machinists), labourers and machinery operators. Other opportunities include professionals (e.g., electrical engineers), tradespeople (e.g., electricians), managers and clerical and administration for operations. | |
| **Operation** | The project is expected to result in large taxation receipts ($762 million in total from 2025 to 2050) from the economic activity generated by Marinus Link, which will flow to local, state and the Australian Government. | **Positive** | Economy and livelihood | Very sensitive | Moderate | High | | No change | | High |
| **Operation** | Jobs during operations | **Positive** | Economy and livelihood: socio-dis/advantage | Very sensitive | Negligible | Low | S05 Tas: Develop an industry participation plan | No change | Fewer than five employees will be required to help operate the converter stations and therefore, a mitigation of negligible has been provided. | Low |
| **Community infrastructure and services** | | | | | | | | | | |
| **Construction** | The project's construction workforce may increase demand for health and emergency service providers, compromising service provision to the existing local and regional community. | Negative | Infrastructure and services: Health and wellbeing | Sensitive | Moderate | Moderate | S01 Tas: Develop and implement a social impact management plan | Minor | Measures to comply with EPRs will reduce the magnitude to negligible. This is reflective of the fact there will be marginal change; it will impact a small number of individuals, and the effect will not be long term. Furthermore, no compromise to service provision to the existing local and regional community is expected due to the project. | Low |
| **Construction** | The project's construction workforce may increase demand for childcare providers, compromising service provision to the existing local and regional community. | Negative | Infrastructure and services: Childcare | Very sensitive | Moderate | High | S01 Tas: Develop and implement a social impact management plan | No change | There is no change to the residual impact on childcare services in the study area because there is already a shortage of childcare. | High |
| **Construction** | The performance of the road network in the project area during construction creates delays for existing road users, during the movement of the transformer transporter | Negative | Infrastructure and services: Connectivity | Very sensitive | Minor | Moderate | T01: Develop a Transport Management Plan. | Negligible | No arterial roads identified will exceed their capacity and the implementation of the TMP will provide further measures to minimise and monitor any traffic impacts. | Low |
| **Construction** | Disruption from the movement of the transformer transporter will have on the road network's condition, design and operation to perform safely. | Negative | Infrastructure and services: Safety and capacity | Very sensitive | Major | Major | T01: Develop a Transport Management Plan.<br>S03 Tas: Develop and implement a community and stakeholder engagement framework | Minor | Traffic management is required to manage the movement of the transformer transporter. Bridges and culverts should be upgraded to align with the recommendations of a suitably qualified civil engineer. | Low |
| **Construction** | Reduced road safety, including the road safety of vulnerable, particularly school bus routes. | Negative | Infrastructure and services: Safety and capacity | Very sensitive | Moderate | High | T01: Develop a Transport Management Plan.<br>S03 Tas: Develop and implement a community and stakeholder engagement framework | Negligible | Heavy construction vehicles will not travel on school bus routes during pick-up /drop-off times. | Low |

| Project phase | Potential impact | Type of impact: Positive or negative | Social value | Pre-mitigated impact assessment | | | Recommended EPR | Residual impact assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Impact | | Magnitude | Justification for change in magnitude | Impact |
| **Construction** | General road safety with an increase in construction vehicles and the potential to impact traffic and pedestrian safety. | Negative | Infrastructure and services: Safety and capacity | Very sensitive | Moderate | High | T01: Develop a Transport Management Plan.<br>S03 Tas: Develop and implement a community and stakeholder engagement framework | Minor | Through the implementation of measures to comply with EPRs, the magnitude has been reduced to minor. This is based on training and monitoring of drivers as part of the TMP, road/intersection upgrades (as required) and notifying communication should detours through towns be required. Predominantly there will be minimal interaction with pedestrian traffic. | Moderate |
| **Construction** | Increased safety risk due to poor road lighting for shore crossing works at night. | Negative | Infrastructure and services: Safety and capacity | Very sensitive | Major | Major | T01: Develop a Transport Management Plan. | Minor | Provision of temporary construction lighting at required intersections | Moderate |
| **People's productive capacities** | | | | | | | | | | |
| **Construction** | Construction fatigue causing mental and health impacts, given night works are expected to occur seven days a week for up to 12 months, are expected to exceed average noise levels that result in sleep disturbance at the Devonshire Drive Hamlet. | Negative | People's productive capacities: Physical and mental health | Very sensitive | Major | Major | NV02: Develop and implement a construction noise and vibration management plan (CNVMP)<br>S03 Tas: Develop and implement a community and stakeholder engagement framework | Moderate | Through the implementation of measures to comply with EPRs, the noise impacts may be mitigated to some extent. Should residents be adversely affected for prolonged periods due to out-of-hours works, respite or compensation could be offered.<br>Furthermore, communication protocols outlining the situations and types of activities which will warrant notification of neighbouring residents in advance of the work occurring, including unavoidable works outside of normal working hours, will be critical in helping to mitigate this impact. | High |
| **Construction** | Lack of understanding of the project's scope, cumulative impacts of projects in the areas and not seeing local benefit. | Negative | People's productive capacities: Physical and mental health | Very sensitive | Major | Major | S03 Tas: Develop and implement a community and stakeholder engagement framework<br>S04 Tas: Community benefits sharing scheme | Moderate | Ongoing project engagement and communications will help to dispel concerns and provide clarity on the project scope. Additionally, providing opportunities for the community to help shape local benefits will be key in mitigating this impact. | **High** |
| **Construction** | Potential human health impacts from contaminated material exposure from construction disturbance from the former industrial site. | Negative | People's productive capacities: Physical and mental health | Very sensitive | Moderate | High | CL01: Manage excavated soil, contaminated soils and potential risks to the environment due to contamination during construction.<br>CL02: Develop and implement acid sulfate soils (ASS) management controls<br>CL03: Develop and implement measures to manage potential contamination impacts in operation | Minor | Through the implementation of measures to comply with EPRs, requiring the management of all material generated from excavation including contaminated material), the risk to human health or ecological receptors is low. | Moderate |

| Project phase | Potential impact | Type of impact: Positive or negative | Social value | Pre-mitigated impact assessment | | | Recommended EPR | Residual impact assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Impact | | Magnitude | Justification for change in magnitude | Impact |
| **Construction** | Transporting hazardous goods and materials. | Negative | People's productive capacities : Community safety | Very sensitive | Severe | Major | T01: Develop a Transport Management Plan. | Minor | The transportation of any hazardous goods/materials shall be done so in adherence to any standard requirements by the road authority as it relates to that specific material. | Moderate |
| **Construction** | Employment opportunities for First Peoples people, females, youth and socially vulnerable groups in the regional construction workforce are made available. | **Positive** | People's productive capacities: Education, training, and skills | Very sensitive | Negligible | Low | S04 Tas: Develop and implement a community benefits sharing scheme<br><br>S05 Tas: Develop an industry participation plan | Minor | Through the adoption of the recommended EPRs, there is the opportunity to increase employment opportunities and therefore increase the magnitude of this potential benefit. | Moderate |
| **Operation** | Negative: Concern about the project's potential impacts (e.g. EMF, operational noise) may result in feelings of stress, anxiety and frustration for surrounding residents and communities. | Negative | People's productive capacities: Physical and mental health | Very sensitive | Moderate | High | NV05: Prepare an operational noise management plan<br><br>S03 Tas: Develop and implement a community and stakeholder engagement framework | No change | | High |
| **Operation** | The project may add to the health and wellbeing of residents in the study area through investments in community infrastructure, the potential for downward pressure to be placed on the market regarding energy prices, as well as greater telecommunication security through expansion of the supply-side infrastructure. | **Positive** | People's productive capacities: Physical and mental health | Very Sensitive | Moderate | High | N/A | No change | | High |

# 10. CUMULATIVE IMPACTS

A cumulative impact assessment has been completed for the project per the impact assessment method outlined in section 5.7.7. Projects that might potentially affect social values in close proximity to the Heybridge converter station and shore crossing were identified. lists the timeframe, status and job creation (where available) for projects relevant to the cumulative impact assessment.

Cumulative social impacts will likely arise due to the proximity of projects, as this may create ongoing concern around disruption to amenity for the local community. Furthermore, with construction programs overlapping, cumulative social impacts would most likely arise through changes to demand for accommodation and housing, as well as through disruption to access and travel delays caused by the increased movement of workers' vehicles and construction vehicles.

The other driver of social impacts will be the workforce requirements during the construction phase, with the identified projects having overlapping construction periods. The study area may benefit from improved livelihoods through increased patronage and access to employment associated with the combined work. Considering the limited community infrastructure and services in the study area, it is likely that negative cumulative social impacts may arise, especially around healthcare.

Mitigation and management measures implemented for individual projects will assist in managing cumulative impacts on the identified values. Cumulative impacts are most effectively addressed by collaboration between industry, state and local government and other stakeholders in project planning, design and delivery.

**Table 10-1 Projects identified for cumulative assessment**

| | Project | Timeframe and status | Project job creation (where information is available) |
|---|---|---|---|
| 1 | Guildford Wind Farm / Ark Energy | • Notice of intent submitted in 2020<br>• EPA EIS Guidelines issued in 2020<br>• Construction to commence 2024. | |
| 2 | Robbins Island Renewable Energy Park / UPC Robbins Island Pty Limited | • Approved by the Commonwealth Government and EPA assessment underway<br>• Construction proposed to commence in 2023-2025. | Construction workforce: 250 personnel |
| 3 | Jim's Plain Renewable Energy Park / UPC Robbins Island Pty Limited | • All approvals finalised<br>• Construction to commence in 2023. | Construction workforce: over 150 personnel<br>Operations workforce: 15 personnel |
| 4 | Robbins Island Road to Hampshire Transmission Line / UPC Robbins Island Pty Limited | • Detailed planning and environmental approvals underway<br>• Construction to commence in 2023. | Construction workforce: up to 100 personnel over 24 months |
| 5 | NWTD Transmission Line / TasNetworks | • Detailed planning and environmental approvals underway<br>• Construction to commence in 2025. | |
| 6 | Hellyer Wind Farm / Ark Energy | • Notice of intent issued<br>• EPA EIS Guidelines issued in 2022. | |

| | Project | Timeframe and status | Project job creation (where information is available) |
|---|---|---|---|
| 7 | Table Cape Luxury Resort / Table Cape Enterprises | • Approved by Waratah-Wynyard Council. | |
| 8 | Lake Cethana Pumped Hydro / Hydro Tasmania | • Final feasibility stage<br>• Construction to commence 2026-2031 | |
| 9 | Youngman's Road Quarry / Railton Agricultural Lime Pty Limited | • EPA approval granted in 2021<br>• Kentish Council is reviewing land permit. | |
| 10 | Port Latta Wind Farm / Nekon Pty Limited | • EPA approval granted in 2020<br>• Construction status uncertain. | Construction workforce: 15 people over six months |
| 11 | Port of Burnie Shiploader Upgrade / TasRail | • Onsite works commenced in 2022<br>• Commissioning expected in 2023. | Design and construction workforce: 140 personnel |
| 12 | Bass Highway – Cooee to Wynyard / Department of State Growth | • Construction commenced in 2021<br>• Completion expected in 2025. | |
| 13 | QuayLink – Devonport East Redevelopment / TasPorts | • Early works commenced in 2022<br>• Expected completion in 2027. | Design and construction workforce: 1060 direct and indirect jobs in North West Tasmania, and a further 655 broader Tasmanian jobs during construction |

These developments, taken together, are anticipated to place significant demands on construction workforce availability and related issues of workforce accommodation.

Mitigation and management measures implemented for individual projects will assist in managing cumulative impacts on the identified values. Cumulative impacts are most effectively managed by collaboration between industry, state and local government and other stakeholders in the planning, design and delivery of the projects. Some cumulative impacts are most effectively managed by the Tasmanian Government through the development of policies, guidelines and state-wide planning criteria particularly related to the renewable energy sector in the north west region of Tasmania.

## 10.1 SOCIAL VALUES

### 10.1.1 Economy and livelihoods

This social value considers the cumulative impact of the projects using indicators such as the availability and affordability of housing, the cost of goods and services and income levels. Table 10-2 provides an overview of the cumulative impact (beneficial or adverse) to the communities, businesses and government.

Table 10-2 Cumulative impacts to the communities, businesses and government

| Impact | Type | Overview |
|---|---|---|
| **Income levels** | Beneficial | Construction expenditure is anticipated to result in increased purchases of goods and services between sectors in the construction supply chain and results in increased employment outcomes and associated wages and salaries. The combined capital and operating expenditure associated with the projects will contribute significantly to increased gross regional and gross state product. |

| Impact | Type | Overview |
|---|---|---|
| **Housing availability and affordability** | Adverse | Housing affordability was reported as a widespread community concern during consultation for this project. Some of the towns in the local and regional study area are experiencing a shortage of rental accommodation, and most have recorded a rental vacancy rate under 2.0% for some time.<br>Rental availability affects affordability and exacerbates the financial and housing vulnerability of disadvantaged people. Disadvantaged persons (measured by the Index of Relative Socio-Economic Advantage/Disadvantage) are concentrated in the urban areas within the north west region of Tasmania. Accommodating such a large construction workforce poses a significant impact on regional housing affordability if not mitigated appropriately. |
| **Cost of goods and services** | Beneficial | Downstream businesses and broader supply chains are expected to benefit from both supplying the construction and operating activity of the projects, as well as through reduced electricity prices. Service providers to Marinus Link (such as those businesses required for construction, maintenance, operations and decommissioning/ rehabilitation) will service the needs of the project through the flow of impacts in the supply chain. These businesses will benefit due to higher levels of activity, which can lead to increased profits. The associated incomes and profits can also lead to increased investment, production and consumption by businesses and households, further supporting the supply chain. |
| **Workforce participation** | Beneficial | In general, the unemployment rate in the region has remained above the Tasmanian unemployment rate for the past ten years. This has been attributed to industry structural reforms and the redundancies that followed. The proposed developments will provide a range of direct and indirect employment opportunities, which should increase participation in the workforce. |
| **Demand and competition for construction workers** | Adverse | Some businesses/ industries may experience small reductions in growth relative to what would otherwise be expected to occur without the projects due largely to competition for constrained resources. This is primarily anticipated for industries that require similar skill sets to those used in the construction of projects (such as road construction, agriculture, and manufacturing). These sectors may experience higher costs due to competition for constrained labour resources and increased costs of business as competition for resources drives input prices up (including labour). During operations, the competition for labour resources such as engineers and trades workers may impact industries requiring similar skill sets. |
| **Benefits to the supply chain** | Beneficial | Construction expenditure is anticipated to result in increased purchases of goods and services between sectors in the construction supply chain and results in increased employment outcomes and associated wages and salaries. Service providers to the various projects (such as those businesses required for construction, maintenance, operations and decommissioning/ rehabilitation) will service the needs of the project through the flow of impacts in the supply chain. These businesses will benefit due to higher levels of activity, which can lead to increased profits. The associated incomes and profits can also lead to increased investment, production and consumption by businesses and households, further supporting the supply chain. |
| **Government revenue** | Beneficial | The broader economic activity supported through the range of projects will create additional government revenues for the Tasmanian Government. Given the considerable economic impact of the projects, the implications for government revenues will likely be significant. |

**Environmental performance requirements**

***Rental availability:*** The current demand for rental housing is high and the availability is constrained throughout the north west region of Tasmania. To mitigate the impacts of this project, Marinus Link will develop a workforce and accommodation strategy to address its potential impact on the rental housing market within the region. However, the cumulative impacts of the other projects will be severe if they are not mitigated appropriately. Furthermore, despite the mitigations implemented by MLPL, rental availability and affordability is likely to remain an issue for the community.

***Competition for construction workers:*** The construction workforce will consist of a mix of local hires within the region and specialists who will be recruited from other parts of Tasmania and Australia. However, it is noted that any skills development associated with the project's employment will be an indirect impact (i.e., not undertaken for the project) and largely associated with cumulative demand for employees in the construction sector.

Procurement of goods and services by MLPL is governed by the industry participation plan, which seeks to maximise opportunities for local businesses. MLPL also expects that its suppliers and contractors will undertake their procurement activities (i.e., with sub-suppliers and sub-contractors) in a manner that is consistent with this guideline. MLPL will encourage local employment and training through the evaluation of the primary contractor's approach to local employment during the tendering phase.

The relevant EPRs which will manage cumulative impacts are shown in the table below (EPR S01 Tas, EPR S02 Tas). The full EPRs are provided in Section Table 9-15.

**Table 10-3 EPRs for economy and livelihood impacts (cumulative)**

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| S01 Tas | **Develop and implement a social impact management plan**<br>Prior to commencement of project works develop a social impact management plan. The plan must be developed in consultation with relevant government and local government agencies, key stakeholders, and directly affected parties to minimise social impacts across the project during construction.<br>The social impact management plan should be location specific and address key components of the construction program, including the staging of land cable trenching and installation. The plan should be a public document and be readily available on the project website.<br>The plan must include:<br>• A high-level summary of community baseline conditions, a summary of the anticipated social impacts (positive and negative), potential residual impacts and consideration for cumulative impacts. The plan will be reviewed and updated to address any shifts in the socio-economic environment on the baseline and impacts and consider the ongoing cumulative impacts of projects in the region.<br>• Incorporate key strategies, their objectives for managing social impacts and the responsibilities for implementation of the strategies including the workforce and accommodation strategy (EPR S02 Tas), community and stakeholder engagement framework (EPR S03 Tas), community benefits sharing scheme (EPR S04 Tas), and industry participation plan (EPR S05 Tas).<br>• An employment and training performance strategy with a focus on providing local opportunities<br>• Describe the requirement for first response medical capabilities on-site for both local and non-local employees and contractors to minimise the impact on local health services.<br>• Outline of a protocol to be developed for engaging with community and managing social impacts during an emergency that must be developed in consultation with local | **Design** |

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| | emergency response providers and referenced in the project's emergency response plan.<br>The social impact management plan must be implemented during construction. | |
| **S02 Tas** | **Develop and implement a workforce and accommodation strategy**<br>Develop a workforce and accommodation strategy to address the potential social impact from the project's workforce and accommodation requirements during construction. The strategy must:<br>• Be developed in consultation with government, industry and other relevant providers.<br>• Include a protocol for the identification and management of impacts due to accommodation requirements.<br>• Address cumulative impacts on accommodation due to other large-scale construction and infrastructure projects in the identified local study areas.<br>The outcomes of the strategy must be considered during construction planning. | **Construction** |

**Residual cumulative impacts**

***Rental availability:*** Despite the implementation of the workforce and accommodation strategy for the project, it is anticipated that the changes to demand for rental housing in the regional study area will remain high. A collaborative (government and industry) approach to regional workforce accommodation is required to reduce the cumulative impact from **Major** to predevelopment levels (Table 10-4).

***Competition for construction workers:*** Despite the mitigation measures that the Tasmanian government, industry collaborations and MLPL apply, the cumulative demand for construction workers will remain very high throughout the region. This is attributed to the demand by other industries requiring similar skill sets that will remain throughout the construction stages of the projects. It is anticipated that the cumulative residual impact of **Major** (Table 10-4).

**Table 10-4 Assessment of the cumulative residual impact on communities, businesses and government**

| Potential impact | Residual impact assessment for Marinus Link | Cumulative residual impact assessment | | |
|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact |
| The cumulative impact of the project workforce will contribute to the demand for rental housing in the regional study area and exacerbate existing rental availability and affordability issues, which will affect very low and low-income households disproportionally. | Major (negative) | Very sensitive | Major | Major (negative) |
| The demand and competition for skilled labour resources may impact industries requiring similar skill sets **and potentially draw from other industries and local businesses within the study area.** | High (negative) | Very sensitive | Moderate | High (negative) |

## 10.1.2 Infrastructure and services

This social value considers the cumulative impact of the projects using indicators of community services. Table 10-5 provides an overview of the cumulative impact to health and emergency services in the region.

**Table 10-5 Cumulative impacts to health and emergency service provision in the region**

| Impact | Type | Overview |
|---|---|---|
| **Demand for health and emergency services** | Adverse | The cumulative construction workforce will increase the demand for health and emergency services. The combined demand may be greater than the capacity of these services, particularly given that the General Practitioners within the region have already closed their books to new patients.<br>In the event of an accident, local emergency services such as ambulance, police and fire services will be required to respond and workers to be treated at the local community health care centres or the Latrobe Regional hospital facility. |

**Environmental performance requirements**

If additional demand were placed on medical and health services because of the combined construction workforce, it will most likely relate to primary health care services. The current demand for GPs within the region is high. To minimise any potential increase in demand, MLPL will mitigate the impact of their predicted workforce upon the demand for health and emergency services by:

- Providing first-response medical capabilities on-site for both local and non-local employees and contractors.
- Collaborating with government, industry and other providers to develop programs to mitigate the impact on health services in local communities.

Management measures to address cumulative impacts relating to health and emergency provision will form part of the SIMP (EPR S01 Tas). EPRs are listed in Table 10-6 with full EPRs provided in Table 9-15.

**Table 10-6 EPRs for infrastructure and services impacts (cumulative)**

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| S01 Tas | **Develop and implement a social impact management plan**<br>Prior to commencement of project works develop a social impact management plan. The plan must be developed in consultation with relevant government and local government agencies, key stakeholders, and directly affected parties to minimise social impacts across the project during construction.<br>The social impact management plan should be location specific and address key components of the construction program, including the staging of land cable trenching and installation. The plan should be a public document and be readily available on the project website.<br>The plan must include:<br>• A high-level summary of community baseline conditions, a summary of the anticipated social impacts (positive and negative), potential residual impacts and consideration for cumulative impacts. The plan will be reviewed and updated to address any shifts in the socio-economic environment on the baseline and impacts and consider the ongoing cumulative impacts of projects in the region.<br>• Incorporate key strategies, their objectives for managing social impacts and the responsibilities for implementation of the strategies including the workforce and accommodation strategy (EPR S02 Tas), community and stakeholder engagement framework (EPR S03 Tas), community benefits sharing scheme (EPR S04 Tas), and industry participation plan (EPR S05 Tas).<br>• An employment and training performance strategy with a focus on providing local opportunities | **Design** |

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| | • Describe the requirement for first response medical capabilities on-site for both local and non-local employees and contractors to minimise the impact on local health services.<br>• Outline of a protocol to be developed for engaging with community and managing social impacts during an emergency that must be developed in consultation with local emergency response providers and referenced in the project's emergency response plan.<br>The social impact management plan must be implemented during construction. | |

**Residual cumulative impacts**

By implementing the recommended management measures, it is anticipated that MLPL could reduce the residual impact of its workforce and the demand placed on health and emergency services to a **low** impact (Table 10-7). Reducing the cumulative residual impact created by the other projects will require a collaborative (government and industry) approach to regional healthcare provision. Consequently, the **cumulative impact of Moderate**.

However, there is no change to the magnitude of the impact on childcare services in the study area and the **cumulative residual impact** stays as a negative rating of **High**.

**Table 10-7 Cumulative residual impact assessment of childcare, health and emergency service provision in the region**

| Potential impact | Residual impact assessment for Marinus Link | Cumulative residual impact assessment | | |
|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact |
| The cumulative impact of the project workforce will contribute to the demand for health and emergency service providers, which may compromise the service provided to the existing regional population. | Low (negative) | Very Sensitive | Moderate | High (negative) |
| The cumulative impact of increased construction workforce on demand for childcare providers, compromising service provision to the existing local and regional community. | High (Negative) | Very Sensitive | Moderate | High (Negative) |

## 10.1.3 People's productive capacities

This social value considers the cumulative impact of the project on the capacity to participate in society and its economy. Table 10-8 provides an overview of the cumulative impact of the projects upon the inclusion of First Peoples, women, youth and other socially vulnerable populations from construction workforce participation.

**Table 10-8 Cumulative impacts of the exclusion of First Peoples, women, youth and socially vulnerable populations in the construction workforce**

| Impact | Type | Overview |
|---|---|---|
| **High levels of unemployed** | Adverse | If regional unemployment trends continue as they have for the past ten years for both females and youth, then these will be exacerbated with the introduction of a large and predominantly male construction workforce. In the absence of affirmative action, First |

| | | |
|---|---|---|
| **women and youth in the region** | | People, females, youth, and socially vulnerable groups will be excluded from construction workforce participation. |

**Environmental performance requirements**

The civil construction industry workforce in Tasmania is predominantly male and ageing, which places the sustainability of the industry at risk. However, the explicit involvement of females and youth in the industry could address this risk. MLPL will develop an industry participation plan that assesses ways of integrating First Peoples, females, youth and other socially vulnerable groups into the workforce. MLPL will make provision for the integration of the industry participation plan within their contracts and tenders to increase the participation of under-represented groups. This is specified as an EPR (S05 Tas). The full EPRs are provided in Table 9-14.

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| S05 Tas | **Develop an industry participation plan**<br>Prior to the commencement of project works, develop an industry participation plan to integrate First Peoples, females, youth and socially vulnerable groups into the project workforce. The purpose of industry participation plan is to stimulate entrepreneurship, business and economic development, providing First Peoples and vulnerable groups with more opportunities to participate in the economy.<br>The plan must:<br>• Set out an employment and supplier-use participation target within the project's locality.<br>• Outline the project's social procurement policies and local procurement policies considering each component and phase of construction.<br>• Be developed in conjunction with the requirements under the Indigenous Employment and Supplier-use Infrastructure Framework (February 2019).<br>• Identify a range of potential opportunities for job-seekers and businesses to be involved in the project across the construction supply chain.<br>• Set employment targets with reference to the local First Peoples working age population within the project area and consistent with the 'locals first principle'.<br>• Identify opportunities for females, youth and other socially vulnerable groups to be involved in the project workforce.<br>The plan must be implemented during construction and operation. | **Construction** |

**Residual impacts**

Following the implementation of an industry participation plan by MLPL, the residual impact is **Moderate (positive)** for the project. Targeted training and workforce skill development is required to address the inclusion of First Peoples, women, youth and socially vulnerable groups in the regional construction workforce. In the absence of a collaborative (government and industry) approach to regional gender equality and social inclusion to increase workforce participation of under-represented groups, it is anticipated cumulative residual impact will be **Moderate (positive)** impact (Table 10-9).

**Table 10-9 Assessment of the cumulative residual impact on female and youth unemployment**

| Potential impact | Residual impact assessment for Marinus Link | Cumulative residual impact assessment | | |
|---|---|---|---|---|
| | | Sensitivity | Magnitude | Impact |
| Employment pathways for First Peoples, females, youth and socially vulnerable groups in the regional construction and operations workforce are made available. | Moderate (positive) | Very sensitive | Minor | Moderate (positive) |

## 10.2 INSPECTION, MONITORING AND REVIEW

Monitoring, reporting and review will be a requirements of the SIMP (EPR S01 Tas), workforce and accommodation strategy (EPR S02 Tas), community and stakeholder engagement framework (EPR S03 Tas), community benefits sharing scheme (EPR S04 Tas), develop an industry participation plan (EPR S05 Tas)

# 11. CONCLUSION

The project is a significant project supporting Australia's energy transition and a net zero future. The project will unlock Tasmania's renewable energy and storage resources to deliver low-cost, reliable, clean energy for customers in the National Electricity Market.

Through extensive consultation and engagement with the local community, valuable insights have been gained regarding the areas and places that hold significance to them. This feedback has helped identify community concerns and social impacts associated with the project, informing the impact assessment and the development of EPRs. Additionally, potential benefits of the project have been identified, including the creation of employment and training opportunities for regional and local communities.

However, it is important to acknowledge that the construction phase of the project will have some adverse social impacts. These include disturbances caused by noise and dust, changes in visual aesthetics, environmental effects, potential disruption to infrastructure and services, and implications on housing availability that may impact low-income households disproportionately. Additionally, the demand for construction workers in the study area may lead to challenges in other industries and for local businesses with limited workforce availability.

Despite these potential challenges, the project offers benefits to the study area, mainly during the construction phase. These include short-term employment opportunities, training and development prospects, and improved socio-economic outcomes for the region. Additionally, employment opportunities for marginalised groups, such as First Peoples, females, youth, and socially vulnerable individuals, can be created through the regional construction workforce.

Throughout the project's 40-year operation, it is expected to generate substantial tax revenue, benefiting the local, state, and national government. Additionally, potential investments in community infrastructure have the potential to enhance the health and wellbeing of residents in the study area. Moreover, the delivery of the project may exert downward pressure on energy prices and enhance telecommunication security, further contributing to the overall welfare of the community.

The assessment emphasises the importance of mitigating impacts across multiple aspects. This includes effectively managing construction-related challenges, addressing concerns related to rental availability and affordability, ensuring sufficient childcare services, and evaluating the capacity and safety of the road network. It is crucial for project stakeholders and local governments to collaborate closely in order to minimise these impacts in a cumulative manner and safeguard the quality of life and values of the local community.

To address visual and noise impacts stemming from the converter station during the project's operational phase, continuous efforts should be undertaken. The SIA provides a range of mitigation measures and management strategies outlined in various impact management plans and schemes. These include the SIMP (EPR S01 Tas), workforce and accommodation strategy (EPR S02 Tas), community and stakeholder engagement framework (EPR S03 Tas), community benefits sharing scheme (EPR S04 Tas), and an industry participation plan (EPR S05 Tas).

The SIA emphasises the cumulative impact on rental housing, which necessitates a collaborative approach between the government and industry to manage accommodation requirements for the regional workforce. Additionally, addressing the demand for construction workers and local services like childcare and healthcare will require a coordinated effort between the two sectors.

In summary, the SIA demonstrates that by implementing the EPRs, the adverse impacts of the project can be effectively managed. It is essential to recognise that all potential social impacts will be continuously monitored, evaluated, and revaluated as the project advances. Sustained consultation with local communities, Traditional Owners, residents, and community groups within the study area will be crucial in harnessing the local benefits of the project and efficiently addressing potential impacts through knowledge sharing, collaborative actions, and the development of strong relationships.

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**Legislation**

***Commonwealth of Australia***

*Environment Protection and Biodiversity Conservation Act 1999*

***Tasmania***

*Major Infrastructure Development Approvals Act 1999*

*Nature Conservation Act 1992*

# ADDENDUM TO THE MARINUS LINK SOCIAL IMPACT ASSESSMENT – TASMANIAN TERRESTRIAL ENVIRONMENT

## Introduction

This addendum relates to the social impact assessment for the Tasmanian terrestrial environment of the Marinus Link Project Environmental Impact Statement (EIS)/ Environmental Effects Statement (EES) (Volume 2, Chapter 3 – Social). This addendum addresses:

- Changes to social impacts in response to the:
  - Changes to the duration of the horizontal directional drilling (HDD) for the shore crossing at Heybridge (i.e., from 12 to 6 months).
  - Findings of the updated noise and vibration assessment.
- Updated Environmental Performance Requirements (EPRs).

## Changes to social impacts relating to duration of HDD for the shore crossing.

Changes are proposed to reduce the duration of the HDD for the shore crossing from 12 to 6 months. While this would reduce the duration of potential impacts on landscape and amenity relating to noise, vibration and visual disturbances from HDD activities, these impacts would continue to be assessed as being moderate to major pre-mitigation impacts and moderate to high residual impacts. Consequently, there is no change to the assessment outcomes or the proposed EPRs.

## Changes to social impacts relating to updated noise and vibration assessment

Changes to the assessment method for the noise and vibration assessment has resulted in changes to the predicted noise levels at some sensitive receivers from construction works undertaken at night. In particular, night-time noise levels at potential future receivers within the approved development west of the project site (i.e., Devonshire Drive Hamlet) would be above the sleep disturbance reference level. Consequently, there is potential for sleep disturbance to occur if dwellings in these locations are developed and occupied prior to the HDD works occurring.

The social impact assessment currently notes that construction activities outside of regular working hours have potential to result in sleep disturbance at some residential areas (e.g., Devonshire Drive Hamlet, residential areas within the Heybridge Residential Nature Reserve), potentially impacting the health and wellbeing for residents. These impacts are assessed as being of major significance prior to the implementation of EPRs, with residual impacts assessed as high. No changes are proposed to the significance of these impacts or the proposed EPRs.

## Environmental Performance Requirements and mitigation measures

Section 9.7 of the social impact assessment (Volume 2, Chapter 3) outlines several EPRs to support mitigation of the social impacts of the project’s construction and operation. In addition, social impacts will be managed through the implementation of EPRs and mitigation measures recommended in other technical studies (e.g., noise and vibration, traffic and transport, air quality).

The following outlines proposed amendments to the EPRs in the social impact assessment (Volume 2, Chapter 3). The main amendments include:

- Changes to **EPR S01 Tas** to remove the requirement for a standalone social impact management plan (SIMP), given that social impacts of construction will be managed through plans and strategies proposed in other Social Impact Assessment EPRs, or management plans identified in other assessments.
- Inclusion of two additional EPRs (new EPR S01 Tas and EPR S06 Tas) to address the matters outlined in the previous **EPR S01 Tas** not covered by other EPRs (i.e., development and implementation of a worker health and safety plan, and emergency response plan and procedures).
- Clarification in **EPR S02 Tas** that the workforce and accommodation strategy is to be prepared prior to the commencement of project works.
- Inclusion of additional detail in **EPR S03 Tas** regarding specific stakeholders identified through the social impact assessment, facilities or areas important to communities for which communication and engagement will be important in managing social impacts, and issues identified as community concerns and potential cause of social impacts.
- Update of **EPR S04 Tas** to include reference to the final *Renewable energy development in Tasmania: A guideline for community engagement, benefit sharing and local procurement* (May 2024).

The EPRs have also been amended to include mitigation measures, for consistency with other technical studies.

Table 1 outlines the proposed EPRs and mitigation measures to address the social impacts of the Project's construction and operation.

**Table 1 Social impact assessment EPRs and mitigation measures**

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| **S01 Tas (new)** | **EPR: Management of medical incidents and first response capabilities**<br><br>**Mitigation measure(s):** Prior to commencement of project works, in preparing the project's worker health and safety plan, include:<br>• Requirements and measures for responding to health, medical and safety incidents of construction personnel during the construction phase.<br>• Strategies for provision of first response medical capabilities on-site for both local and non-local employees and contractors to minimise the impact on local health services.<br>The plan must be implemented during construction. | Construction |
| **S02 Tas (updated)** | **EPR: Develop and implement a workforce and accommodation strategy**<br><br>**Mitigation measure(s):** Prior to the commencement of project works, develop a workforce and accommodation strategy to address the potential social impact from the project's workforce and accommodation requirements during construction. The strategy must:<br>• Be developed in consultation with government, industry and other relevant providers.<br>• Include a protocol for the identification and management of impacts due to accommodation requirements.<br>• Address cumulative impacts on accommodation due to other large-scale construction and infrastructure projects in the identified local study areas.<br>The outcomes of the strategy must be considered during construction planning. | Construction |

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| **S03 Tas (updated)** | **EPR: Develop and implement a community and stakeholder engagement framework**<br>**Mitigation measure(s):** Prior to commencement of project works, develop a community and stakeholder engagement framework to outline the approach to engagement with community, stakeholders and First Peoples that will be undertaken for the project and by all contractors.<br><br>The community and stakeholder engagement framework should be consistent with IAP2 principles and guidance in the Department of Climate Change, Energy, the Environment and Water National guidelines – *Community engagement and benefits for electricity transmission projects*, and *Renewable energy development in Tasmania: A guideline for community engagement, benefit sharing and local procurement, May 2024* (Department of State Growth, 2024). It must:<br>• Identify key community and stakeholder groups with a likely interest in the Project, including but not limited to property owners; local residents; business owners; business and industry associations; road users, and local Council.<br>• Describe the approach for engaging the community, stakeholders and First Peoples.<br>• Establish communication protocols and tools for communication that provide:<br>  o Early and ongoing information and notification to local communities and stakeholders, including users of public open spaces about details, timing and duration of proposed works, potential impacts, and proposed management measures.<br>  o Information on issues of community concern and proposed management measures, including but not limited to project scope, construction noise (including from after hours works), construction air quality, construction traffic, operational noise, and electromagnetic fields (EMF).<br>• Outline complaints policies and management procedures for recording, managing, and resolving complaints. The complaints management system must be consistent with Australian Standard AS/NZS 10002: 2014 Guidelines for Complaints Management in Organisations.<br>Principal contractors must prepare a community and stakeholder engagement management plan in accordance with the framework for their works package.<br>The community and stakeholder engagement framework and contractors community and stakeholder engagement management plan must be updated annually to reflect any project or stakeholder changes and improvements identified.<br>The community and stakeholder engagement framework must be implemented during construction. | Construction<br>Operation |
| **S04 Tas (updated)** | **EPR: Develop and implement a community benefits sharing scheme**<br><br>**Mitigation measure(s):** Prior to the commencement of project works, develop a community benefits sharing scheme in consultation with communities and First Peoples in the local study area.<br>The community benefits sharing scheme should be developed having regard to *Renewable energy development in Tasmania: A guideline for community engagement, benefit sharing and local procurement, May 2024* (Department of State Growth, 2024). | Construction<br>Operation |
| **S05 Tas (no change)** | **EPR: Develop an industry participation plan**<br><br>**Mitigation measure(s):** Prior to the commencement of project works, develop an industry participation plan to integrate First People, females, youth and socially vulnerable groups into the project workforce. The purpose of industry participation plan is to stimulate entrepreneurship, business and economic development, providing First Peoples and vulnerable groups with more opportunities to participate in the economy. | Construction, Operation |

| EPR ID | Environmental Performance Requirements | Project phase |
|---|---|---|
| | The plan must:<br>• Set out an employment and supplier-use participation target within the project's locality.<br>• Outline the project's social procurement policies and local procurement policies considering each component and phase of construction.<br>• Be developed in conjunction with the requirements under the Indigenous Employment and Supplier-use Infrastructure Framework (February 2019).<br>• Identify a range of potential opportunities for job-seekers and businesses to be involved in the project across the construction supply chain.<br>• Set employment targets with reference to the local First Peoples working age population within the project area and consistent with the 'locals first principle'.<br>• Identify opportunities for females, youth and other socially vulnerable groups to be involved in the project workforce.<br>The plan must be implemented during construction and operation. | |
| **S06 Tas (new)** | **EPR: Engagement to be reflected in the project's emergency response plan and procedures**<br>**Mitigation measure(s):** Prior to commencement of project works, engage with local emergency service providers in the preparation, planning, monitoring and review of the project's emergency response plan and procedures. The project's emergency response plan must outline protocols for:<br>• Ongoing engagement with emergency services about changes to local access and project activities that have potential to cause delay or disruption to emergency response.<br>• Engaging with the community and managing social impacts during an emergency incident.<br>The protocols must form part of the project's emergency response plan and must be implemented during construction. | Construction |

# Appendix K. Economic Impact Assessment

# Economic Impact Assessment of Marinus Link

**Rev0**

Marinus Link Pty Ltd

May 2024

SGS Economics and Planning Pty Ltd
ACN 007 437 729
www.sgsep.com.au

OFFICES IN CANBERRA, HOBART, MELBOURNE, AND SYDNEY ON THE COUNTRY OF THE NGAMBRI/NGUNNAWAL/NGARIGO, MUWININA, WURUNDJERI, AND GADIGAL PEOPLES.

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# Executive summary

## Introduction

As coal retires, Australia needs access to affordable, 'on-demand' electricity and the ability to store energy for long periods. The proposed Marinus Link, a high voltage direct current (HVDC) electricity interconnector, will help deliver this by enabling the flow of electricity in both directions between Victoria and Tasmania, delivering low-cost, reliable and clean energy for customers in the National Electricity Market (NEM).

Tasmania's renewable energy and storage resources will also be available for use throughout the NEM as a result of Marinus Link. Australia's energy ministers have recognised that Marinus Link is a transmission project of national significance, while the Australian Energy Market Operator (AEMO) has also confirmed that Marinus Link is a *'critical, and urgently required part of Australia's low-cost, reliable and clean energy future'*.

Given the scale of Marinus Link and its potential to have a significant impact on the environment, the Australian Minister for the Environment requires assessment and approval under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) before it can proceed. As such, an Environment Impact Statement/ Environment Effects Statement (EIS/EES) is being prepared to describe Marinus Link's effects on the environment to inform statutory decision making.

### Purpose of this report

This report contains an Economic Impact Assessment (EIA) of Marinus Link, which will inform part of the preparation of the EIS/ESS process, alongside other technical assessments and studies as outlined in Table 7.

Prepared by SGS Economics and Planning (SGS) in partnership with the Centre of Policy Studies (CoPS) at Victoria University, this EIA technical report documents estimates of the economic impact that construction and ongoing operations of the Marinus Link, as well as induced investments in renewable energy generation.

### Approach

SGS conducted this EIA in alignment with guidelines as dictated by the Commonwealth Department of Climate Change, Energy, Environment and Water (DCCEEW), State of Tasmania Environment Protection Authority (EPA), and the Victorian EES Scoping Requirements pertaining to an EIA.

The scoping requirements are addressed in one or multiple sections of this report, and the extent to which they have been addressed are reflective of:

- Nature of information and data provided to SGS and CoPS for modelling,
- Whether and to what extent scoping requirements could dealt with quantitatively (e.g., inputs to modelling such as capital investment values for construction) or qualitatively (e.g., characterising downstream industry activities), and

- Extent to which the negative and positive elements of such non-quantifiable socio-economic considerations could be made with the information made available to SGS.

### Methodology

The methodology was completed in accordance with industry best practice for economic analysis and, furthermore, in alignment with the scoping requirements. The methodology includes, as noted above, both quantitative and qualitative components.

- Modelling framework: Central to the quantitative component is the technical methodology employing a Computable General Equilibrium (CGE) model, which is a detailed mathematical representation of Australia's regions, the economic inter-relationships, covering the behaviour of regional agents, interstate and international trade, with explicit modelling of demand for each regional economy's production (i.e., for its interstate and international exports) and of supply into the economy (i.e., of its interstate and international imports).
- Modelling geography: The modelling estimates impacts associated with the capital and operational expenditure of the Marinus Link, as well as the induced capital and operational expenditure of six (6) induced renewable energy projects. Outputs, particularly those reported for operational phase of the Marinus Link, are reported for a timeframe restricted to 25 years from 2025-2050.[1] The outputs are furthermore reported across four geographies: 1) the regions where Marinus Link is situated, North West Tasmania and 2) Gippsland; as well as the broader state economies of 3) Tasmania and 4) Victoria.
- Inputs: To derive estimates of impact, the CGE modelling incorporates: a) Capital investment for construction of the Marinus Link, b) Ongoing operations of the Marinus Link, c) Capital investment related to development of induced windfarm and pumped hydro investments (i.e., representative of upstream economic activity), and d) Ongoing operation related to the induced windfarm and pumped hydro projects.
- Outputs: To reflect the extent of the impact, the modelling provides quantifications of the following layers of impact: a) Total impacts, characterised as direct and indirect economic impacts from construction and operations across the spectrum of industries regionally and across each state, b) Induced impacts, characterised as the direct and indirect economic impacts related to construction and investment in projects that were determined, with information given and available at the time of report preparation, to proceed only under the circumstances that investment in Marinus Link will be made.
- Metrics of Impact: Specifically, the economic impacts related to Marinus Link and the induced renewable energy projects are reported in terms of the following key impact metrics, including: a) Regional and state value added (equivalent to Gross Regional Product, GRP) and b) Regional and state employment (in full-time equivalencies, FTE).
- Upstream/Downstream Industry Activity: Upstream industry activity refers to the activities and outputs from industries that are farther away from the end-user than that of the direct economic activity, e.g., power generation. Downstream industry activity refers to the activities and outputs of

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[1] While the estimated lifespan of the Marinus Link extends 40 years, the CoPS modelling framework only estimates impacts to 2050.

industries closer to the end-user, e.g., household or commercial consumption of power for any number of individual or industrial applications. In this EIA, information was available regarding upstream activities – specifically the induced renewable energy power generation projects. However, with regard to the quantification of downstream industry activities, no data or information about customer usage and applications of such power transmitted through Marinus Link was provided to SGS such that consideration of positive and/or negative impacts could be made.

- Qualitative Assessment and Considerations: The upstream and downstream industry activities and the following non-quantifiable economic considerations were made to address specific aspects of the scoping requirements. Each section of this EIA provides a discussion based upon the extent to which the negative and positive elements of such socio-economic considerations could be made with the information made available to SGS. As such, SGS has provided additional qualitative insights into other socioeconomic considerations and economic opportunities, impacts and externalities, including: a) First Nations employment and procurement opportunities, b) Skills and training opportunities, c) Impacts on agriculture, forestry, shipping and fisheries industries, d) Impacts on tourism industry, e) The extent to which raw materials, equipment, goods, and services may be sourced locally, f) Impacts on local social amenity and community infrastructure, g) Community demographic impacts, h) Impacts on land values, and demand for land and housing, i) Local, State and Federal Government rate, taxation, and royalty revenues, as well as consideration of public subsidies for construction or operations. Note that The analysis of non-quantifiable economic impacts was supported by other technical assessments and studies outlined in Table 7.

## Findings

As they relate to specific scoping requirements, the findings of the EIA are summarised below.

### Economic impacts of construction and operation of Marinus Link

The economic modelling shows considerable economic value-added from Marinus Link in the regional economies of North West Tasmania and Gippsland, and the states of Tasmania and Victoria, as reported in Table 1.

**TABLE 1: VALUE-ADDED OF MARINUS LINK ($), 2025-2050**

| Geography | Construction Phase (2025-2029)[2] | Operational Phase (2029-2050)[3] |
|---|---|---|
| North West Tasmania | $352 million | $306 million |
| Gippsland | $642 million | $361 million |
| Tasmania (including North West Tasmania) | $681 million | $679 million |
| Victoria (including Gippsland) | $1.4 billion | $981 million |
| Total (both states) | **$2.1 billion** | **$1.7 billion** |

Source: SGS Economics & Planning, CoPS (2024)

As shown in Table 2, this value-added to the economy creates significant local and state employment across the economies. These employment opportunities span various industries including construction, professional services, retail, manufacturing and accommodation and food services.

**TABLE 2: EMPLOYMENT GENERATED BY MARINUS LINK (FTE JOB-YEARS), 2025-2050**

| Geography | Construction Phase (2025-2029) | Operational Phase (2029-2050) |
|---|---|---|
| North West Tasmania | 297 FTE | 306 FTE |
| Gippsland | 2,159 FTE | 388 FTE |
| Tasmania (including North West Tasmania) | 2,661 FTE | 494 FTE |
| Victoria (including Gippsland) | 5,247 FTE | 592 FTE |
| Total (both states) | **7,908 FTE** | **1,086 FTE** |

Source: SGS Economics & Planning, CoPS (2024)

[2] The construction phase includes the first half year of operations as the project comes online in the second half of 2029.
[3] The operational phase includes half of 2019 through 2050 in the modelling.

### Economic impacts from induced investments

Tasmania has significant renewable energy resource potential, particularly pumped hydro and wind energy. As such, MLPL has identified six renewable energy projects – comprising four pumped hydro and two windfarm projects in North West Tasmania - collectively generating 33,700 MW of power. These projects are categorised as 'induced investments', as the realisation of these investments largely depend on the completion and delivery of Marinus Link. [4]

The assessment timeframe of induced investments is from 2028 to 2050. The economic value-added and employment impacts are presented in Table 3.

**TABLE 3: VALUE-ADDED AND EMPLOYMENT GENERATED BY INDUCED INVESTMENTS, 2028-2050**

| Geography | Value-added ($) | Employment (FTE) |
|---|---|---|
| North West Tasmania | $2.1 billion | 5,051 FTE |
| Tasmania (including North West Tasmania) | $4.4 billion | 11,705 FTE |

Source: SGS Economics & Planning, CoPS (2024)

### Economic opportunities

As noted above, SGS provided additional qualitative insights into other socioeconomic considerations and economic opportunities, impacts and externalities. Reflecting the scoping requirements and information available at the time of EIA preparation, SGS made the following considerations regarding following impacts and opportunities related to Marinus Link to regional economies to ensure that part of economic opportunities can be realised by local communities. As such, MLPL is exploring strategies aimed at maximising benefits to local communities, which include:

- First Nations employment and procurement opportunities: labour force participation rates among Aboriginal and Torres Strait Islanders are lower than those across the broader population in the project study area. MLPL is committed to putting in place S05 industry participation and social inclusion plan to identify efforts and actions to increase the economic opportunities for First Nations communities in North West Tasmania and Gippsland, which include taking advantage of the estimated employment resulting from the one-time (construction-related) and ongoing (operational) job impacts.
- Skills and training opportunities: concerns were raised through engagement conducted as a part of the Social Impact Assessments that included lack of capacity and skillsets that align with job opportunities stemming from the construction or operation of the Marinus Link project. MLPL is committed to increasing the workforce participation of socially vulnerable populations, including

[4] Capital expenditure regarding similar renewable energy projects in Victoria that would not proceed but for the Marinus Link project were not included in this analysis. Further technical modelling could be completed regarding the economic impact of such induced capital investments were such projects identified in the future with available information.

but not limited to First Nations people, women and youth, through the S05 industry participation and social inclusion plan.

### Externalities and other socio-economic impacts

Given the scale of Marinus Link and its potential to have a significant impact on the environment, it is important to recognise other socio-economic impacts, both positive and negative. Reflective also of various scoping requirement, the following considerations were also made with information that available to SGS in preparation of this EIA:

- Impacts on agriculture, forestry and fisheries: Construction of the Marinus Link will likely disrupt commercial fishing, shipping operations and agricultural activities in the short term. As reflected in the economic modelling, demand for labour during construction creates direct competition with existing labour needs of the region's agriculture, forestry and fishing sectors. In the long term however, these impacts were determined to have very low to low significance. Six environmental performance requirements were identified to enhance outcomes for agriculture and forestry during construction and operation of Marinus Link. In addition, MLPL is committed to putting in place a Marine Communications Plan to alert marine users of construction activities.
- Impacts on tourism: Construction of the Marinus Link may result in temporary changes to the natural amenity and character. Short-term accommodation could be constrained as a result of demand for temporary construction workforce accommodation, which could result in negative impacts to the tourism sector. To address such impacts on the sector, MLPL is committed to putting in place an S02 workforce and accommodation strategy.
- The extent to which raw materials, equipment, goods and services will be sourced locally: Issues related to the sourcing of local materials, equipment, goods and services are broadly related to economic development efforts, such as represented by Economic Development Strategies (as discussed in Section 0). At issue is the extent to which these EDSs and other direct efforts may be able to augment or enhance local sourcing opportunities. MLPL is committed to procuring goods and services in accordance with an S05 industry participation and social inclusion plan to support local businesses, including compliance by suppliers and contractors.
- Impacts on local social amenity and community infrastructure: Influx of construction and/or ongoing workforce from Marinus Link into Gippsland and North West Tasmania could place pressure on the existing system of already-constrained community infrastructure, amenity and social services. The relevant issue related to provision of social amenity and community infrastructure is whether and to what extent existing policies and funding mechanisms are sufficient for building schools, child care, health services and sports facilities. EPRs were recommended in the Social Impact Assessments to mitigate this impact.
- Community demographic impacts: In the absence of any affirmative action undertaken by the industry sector or state government, First Nations people, women and youth may continue experiencing high levels of unemployment in the region, despite the significant opportunities presented by demand for skilled labour from Marinus Link or other energy-related infrastructure projects. Through both the S05 industry participation and social inclusion plan and the S04 community benefits sharing scheme, MLPL seeks to enhance employment and social benefits for the local demographics, particularly those facing high levels of unemployment such as First Nations, women and youth.

- **Impacts on land values, and demand for land and housing**: Increased pressure on the housing markets in North West Tasmania and Gippsland is likely to occur. Increased housing demand is likely to place upward pressure on prices and rents in an already supply-constrained market. To address such issues - in particular, the increased pressure on housing markets caused by the influx of workers during construction phase, an internal MLPL working group commenced and a housing strategy on MLPL's role and actions will be developed for Tasmania and Victoria. Specifically, MLPL is committed to putting in place an S02 workforce and accommodation strategy to reduce pressure on local housing markets through the direct provision of worker housing.
- **Local, state and federal government rate, taxation and royalty revenue**: There is expected to be large taxation receipts ($762 million in total from 2025 to 2050) from the economic activity generated by Marinus Link, which will flow to local, state and the Australian Government.

While not all aspects of negative impact mitigation will be within MLPL's control, all stakeholders may benefit from MLPL proactively engaging in a coordinated approach (i.e., among other relevant stakeholders) to ensure successful implementation of its construction and development. This will give assurances to stakeholders that negative impacts are acknowledged, understood and being proactively addressed.

This characterisation of mitigation measures should be cross-referenced and incorporated with other identified mitigation measures in other reports listed in Table 7.

## Conclusion

Overall, from an economic perspective, Marinus Link will deliver significant outcomes to the regional economies of North West Tasmania and Gippsland, and Tasmania and Victoria. The mitigation of any potential negative externalities will also result in greater possible economic and social benefits to local communities.

# Glossary and abbreviations

| Term | Descriptions |
|---|---|
| AEMO | Australian Energy Market Operator |
| CGE | Computable General Equilibrium - the modelling technique adopted by the Centre of Policy Studies to estimate the economic impacts of Marinus Link. |
| CoPS | The Centre of Policy Studies at Victoria University |
| BaU | Business as Usual i.e., Marinus Link does not proceed. |
| DTP | Department of Transport and Planning (Victoria) |
| DCCEEW | Australian Department of Climate Change, Energy, Environment and Water |
| EE Act | Victorian Environment Effects Act 1978 |
| EES | Environment Effects Statement (Victoria) |
| EIA | Economic Impact Assessment |
| EIS | Environmental Impact Statement (Tasmania) |
| EMPCA | Tasmanian Environmental Management and Pollution Control Act 1994 |
| EPA | Environment Protection Authority Tasmania |
| EPBC | Commonwealth Environment Protection and Biodiversity Conservation Act 1999 |
| EPR | Environmental Performance Requirement |
| FTE | Full-time equivalent |
| GRP | Gross Regional Product |
| GSP | Gross State Product |
| HDD | Horizontal Directional Drilling |
| HVAC | High Voltage Alternating Current |
| HVDC | High Voltage Direct Current |
| ISP | Integrated System Plan produced by the Australian Energy Market Operator |

| Term | Descriptions |
|---|---|
| Job-years | A job-year is one full-time equivalent job for one year. One worker employed for five years for construction is counted as five job-years. |
| MLPL | Marinus Link Pty Ltd |
| MW | Megawatt |
| NEM | National Energy Market |
| NWTD | North West Transmission Developments |
| OEMs | Original Equipment Manufacturers |
| REZ | Renewable Energy Zones |
| RTO | Registered Training Organisations |
| SA4 | Statistical Areas Level 4 (SA4) is defined by the Australian Bureau of Statistics as the largest sub-State regions in the Main Structure of the Australian Statistical Geography Standard (ASGS). |
| SGS | SGS Economics and Planning |
| SIA | Social Impact Assessment |
| TasNetworks | Tasmanian Networks Pty Ltd |
| TREAP | Tasmanian Renewable Energy Action Plan |
| Value-added | Value added reflects the value generated by producing goods and services and is measured as the value of output minus the value of intermediate consumption. Value added also represents the income available for the contributions of labour and capital to the production process. |
| VURM | The Victoria University Regional Model. The assessment model used in this report. |

Source: SGS Economics & Planning, CoPS (2024)

# 1. Introduction

## 1.1 Introduction

The proposed Marinus Link comprises a high voltage direct current (HVDC) electricity interconnector between Tasmania and Victoria, to allow for the continued trading and distribution of electricity within the National Energy Market (NEM).

Marinus Link was referred to the Australian Minister for the Environment 5 October 2021. On 4 November 2021, a delegate of the Minister for the Environment determined that the proposed action is a controlled action as it has the potential to have a significant impact on the environment and requires assessment and approval under the Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) (EPBC Act) before it can proceed. The delegate determined that the appropriate level of assessment under the EPBC Act is by an environmental impact statement (EIS).

On 12 December 2021, the Victorian Minister for Planning under the Environment Effects Act 1978 (Vic) (EE Act) determined that Marinus Link requires an environment effects statement (EES) under the EE Act, to describe Marinus Link's effects on the environment to inform statutory decision making.

In July 2022 a delegate of the Director of the Environment Protection Authority Tasmania determined that Marinus Link be subject to environmental impact assessment by the Board of the Environment Protection Authority (the Board) under the Environmental Management and Pollution Control Act 1994 (Tas) (EMPCA).

As Marinus Link is proposed to be located within three jurisdictions, the Victorian Department of Transport and Planning (DTP), Tasmanian Environment Protection Authority (Tasmanian EPA) and Australian Department of Climate Change, Energy, Environment and Water (DCCEEW) have agreed to coordinate the administration and documentation of the appropriate assessment processes. One EIS/EES is being prepared to address Commonwealth and Victorian jurisdictions; two EIS are being prepared to address the EIS Guidelines issued under the EMPCA by the Tasmanian EPA for the Heybridge Converter Station and the Shore Crossing.

## 1.2 Purpose of this report

This report contains an Economic Impact Assessment (EIA) of Marinus Link. The EIA estimates the economic impact of the construction and operation of the Marinus Link and induced investments in renewable energy generation. The EIA model traces the direct and indirect flows of income and investment to estimate the employment generated and the value added to the economy.

This report has been prepared by SGS Economics and Planning in partnership with the Centre of Policy Studies (CoPS) at Victoria University for the Tasmanian, Victorian, and Commonwealth jurisdictions as part of the EIS/EES and EIS's being prepared for the project.

## 1.3 Project overview

Marinus Link is a proposed 1500-megawatt (MW) HVDC electricity interconnector between Heybridge in North-East Tasmania and the Latrobe Valley in Victoria (Figure 1). Marinus Link is proposed to provide a second link between the Tasmanian renewable energy resources and the Victorian electricity grids enabling efficient energy trade, transmission and distribution from a diverse range of generation sources to where it is most needed and will increase energy capacity and security across the National Electricity Market (NEM).

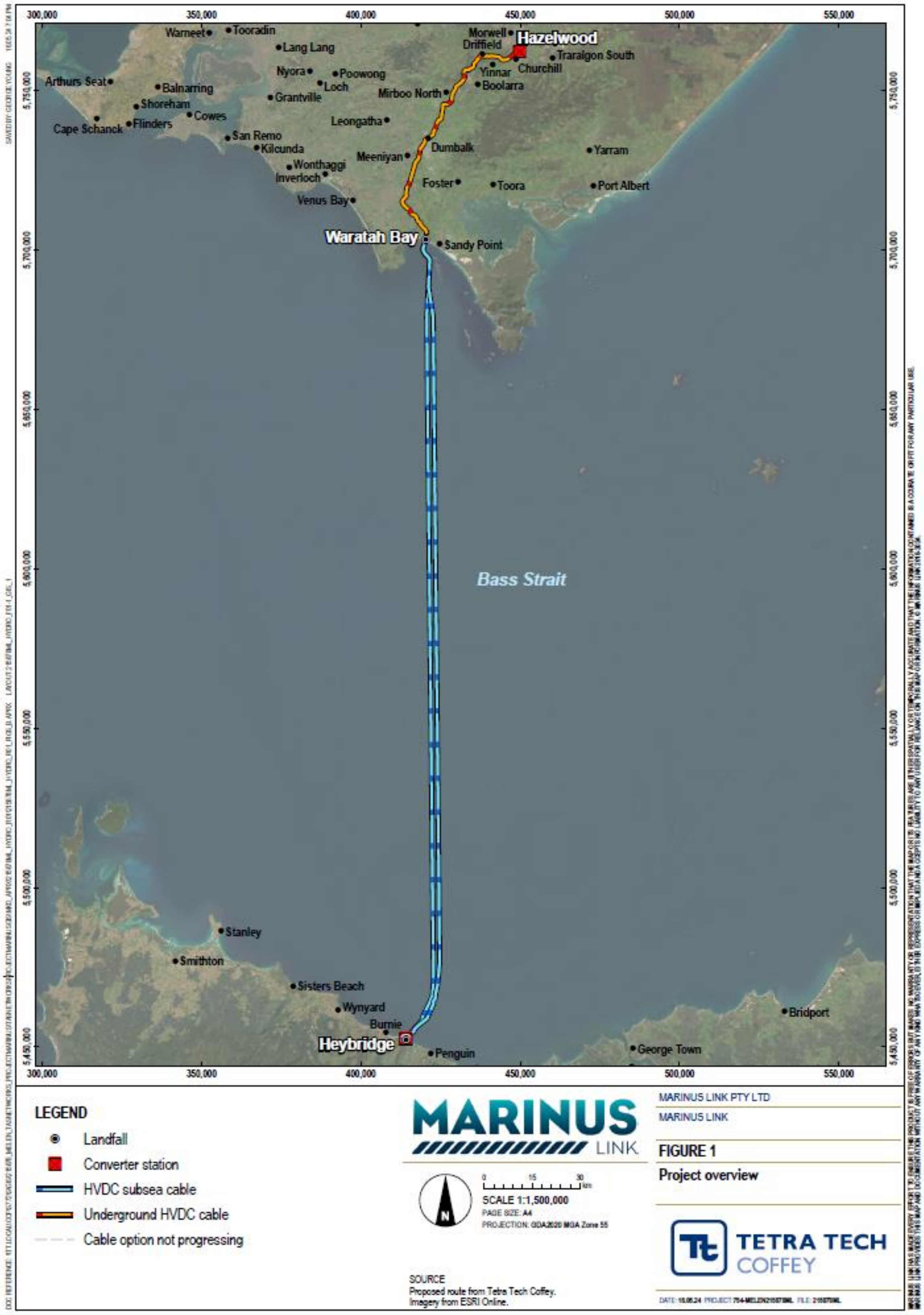
Marinus Link Pty Ltd (MLPL) is the proponent for Marinus Link and is a wholly owned subsidiary of Tasmanian Networks Pty Ltd (TasNetworks). TasNetworks is owned by the State of Tasmania and owns, operates and maintains the electricity transmission and distribution network in Tasmania.

Tasmania has significant renewable energy resource potential, particularly pumped hydro and wind energy. The potential size of the resource exceeds both the Tasmanian demand and the capacity of the existing Basslink interconnector between Tasmania and Victoria. The growth in renewable energy generation in mainland states and territories participating in the NEM, coupled with the retiring of baseload coal-fired generators, is reducing the availability of dispatchable generation that is available on demand.

Tasmania’s existing and potential renewable resources are a valuable source of dispatchable generation that could benefit electricity supply in the NEM. Marinus Link will allow for the continued trading, transmission and distribution of electricity within the NEM. It will also manage the risk to Tasmania of a single interconnector across Bass Strait and complement existing and future interconnectors on mainland Australia.

Interconnectors are a key feature of the future energy landscape. They allow power to flow between different regions to enable the efficient transfer of electricity from renewable energy zones (REZ) to where the electricity is needed. Interconnectors can increase the resilience of the NEM and make energy more secure, affordable and sustainable for customers. Interconnectors are common around the world including in Australia. They play a critical role in supporting Australia’s transition to a clean energy future.

## FIGURE 1: PROJECT OVERVIEW



Source: Marinus Link (2023)

## 1.4 Assessment context

An Economic Impact Assessment is an important tool used in approvals processes. An EIA provides valuable information on the potential economic impacts from a proposed project or policy. They can have significant positive economic impacts on the regions in where they are developed. Such an EIA helps identify these potential economic impacts, such as increased employment, gross value-added, and public taxation revenue.

An EIA, however, does not assess the merits of a project in terms of its costs compared to its benefits (such as the findings of a cost-benefit analysis). An EIA is also not a replacement for a business case in which other metrics can be calculated, such as net present value of an investment and/or return on investment (ROI). An EIA is also not an assessment of whether a project is beneficial from a community welfare perspective.

# 2. Assessment guidelines

This chapter outlines the assessment guidelines relevant to economics and the linkages to other EIS/EES technical assessments for the Commonwealth, Tasmania and Victoria. One EIS/EES is being prepared to address Commonwealth and Victorian jurisdictions; two EIS are being prepared to address the EIS Guidelines issued under the EMPCA by the Tasmanian EPA for the Heybridge Converter Station and the Shore Crossing. This EIA will inform the preparation of the EIS/EES process.

## 2.1 Commonwealth

The Australian Department of Climate Change, Energy, Environment and Water (DCCEEW) publish guidelines for completing an EIS (*Guidelines for the Content of a Draft Environmental Impact Statement – Environment Protection and Biodiversity Conservation Act 1999* – Marinus Link underground and subsea electricity interconnector cable (EPBC 2021/9053)). The relevant section of the guidelines to the completion of this EIA are found in Section 9, on economic and social matters. As summarised from that document, the respective guidelines for the EIA and where they are addressed in this report are shown in Table 4.[5]

**TABLE 4: COMMONWEALTH EIS SCOPING REQUIREMENTS APPLICABLE TO THIS EIA**

| Scoping Requirement | Section addressed |
|---|---|
| Overview of the economic costs and benefits of the Project | Chapter 6 |
| Employment opportunities expected to be generated by the Project (including construction and operational phases). | 6.1 and 6.2 |
| This includes consideration of First Nations employment and procurement opportunities expected to be generated by the Project, and opportunities for engagement with First Nations people in relation to on ground mitigation, management of rehabilitation measures | 5.5.1 |
| Details of the relevant cost and benefits of alternative options to the proposed action | 5.1 |

Source: SGS Economics & Planning (2024)

[5] It is recognised that other sections of the DCCEEW Guidelines (EPBC 2021/9053) require the assessment of economic impacts to Commonwealth marine areas (Section 4.3.2), impacts on other users of Commonwealth marine areas (Section 5.7). The Social Impact Assessments and Marine Ecology and Resource Use Assessment conducted as a part of this broader process identified and discusses such considerations. However, this EIA did not calculate such economic impacts.

## 2.2 Tasmania

The Environment Protection Authority Tasmania (EPA) has published two sets of guidelines (September 2022) for preparing an EIS for Marinus Link. Scoping requirements relevant to the economic impact assessment (EIA) specifically and where they are addressed in this report are summarised below in **Table 5**. Scoping requirements are addressed in one or multiple sections of the report as noted. The extent to which scoping requirements are addressed throughout the report are 1) reflective of the nature of information and data provided to SGS and CoPS for economic impact modelling, 2) reflective of whether and to what extent scoping requirements can dealt with quantitatively (e.g., inputs to modelling such as capital investment values for construction) or qualitatively (e.g., characterising downstream industry activities), and 3) to the extent to which the negative and positive elements of such socio-economic considerations could be made with the information made available to SGS. The remainder are discussed qualitatively (e.g., subsections of Section 6.5 and 6.6).

**TABLE 5: TASMANIAN EPA SCOPING REQUIREMENTS APPLICABLE TO THIS EIA**

| Scoping Requirement | Section addressed |
|---|---|
| An estimate of total capital investment for the proposal and where that capital will be expended (particularly in relation to the source of large capital items of processing equipment). | 5.2 |
| Operational expenditures and revenues. | 5.2, 6.1, 6.2, 6.3, and 6.6.7 |
| The impacts on local and State labour markets for both the construction and operational phases of the proposal. The number and nature of direct and indirect jobs arising from the proposal must be detailed. Skills and training opportunities should also be discussed. | 6.1, 6.2, 6.3, and 6.5.2 |
| The impacts on upstream/downstream industries, both locally and for the State. | 4.2, 5.3, 6.4, 6.5.2 |
| The extent to which raw materials, equipment, goods, and services will be sourced locally. | 6.6.3 |
| A qualitative assessment of impacts on local social amenity and community infrastructure, including recreational, cultural, health and sporting facilities and services. Any proposals to enhance or provide additional community services or facilities should be described. | 6.6.4 |
| Community demographic impacts (changes to cultural background, occupation, incomes). | 6.6.5 |
| Impacts on land values, and demand for land and housing. | 6.6.6 |
| Impacts on the local, regional, state, and national economies. | 6.1, 6.2, 6.3 |
| Any publicly funded subsidies or services to be relied upon for the construction or operation of the proposal. | 5.2, 6.6.7 |
| Any impacts on Local, State and Federal Government rate, taxation, and royalty revenues. | 6.6.7 |

Source: SGS Economics & Planning (2024)

## 2.3 Victoria

The Environment Effects Statement (EES) Scoping Requirements outline the scope of technical studies and define evaluation objectives. The EES Scoping Requirements are issued by the Victorian Minister for Planning (February 2023) outline the specific matters to be assessed across a number environmental and social disciplines, which are to be documented in the EES. Evaluation objectives identify the desired outcomes to be achieved and provide a framework for an integrated assessment of the environmental effects of a proposed project.

### 2.3.1 EES Evaluation Objective

The evaluation objective, and relevant to the completion of this EIA, contained within Section 4.4 of the Environment Effects Statement (EES) Scoping Requirements is to:

- *"Avoid and, where avoidance is not possible, minimise adverse effects on agriculture, forestry and other land uses, social fabric of communities, and local infrastructure, businesses and tourism."*

### 2.3.2 EES Scoping Requirements

The relevant sections of the EES Scoping Requirements that pertain to the completion of this EIA are as outlined in Table 6.

**TABLE 6: VICTORIAN EES SCOPING REQUIREMENTS APPLICABLE TO THIS EIA**

| Aspects to be assessed | Scoping Requirement | Section addressed |
|---|---|---|
| Key Issues | Potential interaction with and interruption to agricultural and forestry activities and infrastructure such as stock lanes, irrigation, water supply, access, fencing, electricity supply and drainage. | Refer to Section 6.6.1, citing also the Agriculture and Forestry Technical Report and Marine Ecology and Resource use Impact Assessment |
| | Loss of productive land either due to loss of access or via soil disturbance, easements, construction traffic and poor reinstatement of land after construction. | |
| | Potential disruption to existing and/or proposed land uses, with associated economic and social effects, including cumulative impacts. | Refer to Section 6.6.1 and Section 6.6.6, citing also the Planning and Land Use Impact Assessment Report, the Agriculture and Forestry Technical Report and Marine Ecology and Resource use Impact Assessment |
| | Potential effects on social cohesion resulting from disruption of existing networks or effects on community services or facilities and recreational activities. | Refer to Section 6.6.5, citing also the Social Impact Assessment |
| | Potential economic and social effects from the project, such as through disruption of business, | Refer to Section 6.6.1 and Section 6.6.2, citing also the Agriculture and Forestry Technical Report, Marine |

| Aspects to be assessed | Scoping Requirement | Section addressed |
|---|---|---|
| | industry (including agriculture, forestry and fisheries) or tourism. | Ecology and Resource Use Impact Assessment, |
| | Biosecurity issues relating to the transfer of plant and animal diseases and weed seeds between properties e.g., Phytothera cinnamomi, Johnes disease. | Refer to the Planning and Land Use Impact Assessment Report |
| | Engagement with landholders. | Refer to **Section 6.6.6**, citing also the Planning and Land Use Impact Assessment Report and Social Impact Assessments |
| | Disruption to commercial and recreational users of the marine environment. | Refer to **Section 6.6.1**, citing also the Agriculture and Forestry Technical Report and Marine Ecology and Resource use Impact Assessment |
| | Potential economic and social benefits from the project. | Refer to **Section 6.5** and **Section 6.6,** which also contain citations to content from the other technical reports as listed in Table 7. |
| Existing Environment | Describe the project area and its environs in terms of land use (existing and proposed), residences, zoning and overlays, public and private land, including any land subject to native title and Indigenous Land Use Agreements, properties affected and infrastructure that supports current and strategic patterns of economic and social activity. | Refer to **Section 6.6.6**, citing also the Planning and Land Use Impact Assessment Report |
| | Describe agricultural and primary production enterprises and practices (for instance use of large-scale equipment, prevalence of specialised production in the area, any key harvest and processing times). | Refer to **Section 6.6.1**, citing also the Agriculture and Forestry Technical Report |
| | Describe the local community and social setting, including community services and facilities, recreational activities, businesses and industries within the area, such as agriculture, forestry, shipping and fisheries. | Refer to **Section 6.6.1**, **Section 6.6.4** and **Section 6.6.5**, which also contain citations to content from the other technical reports as listed in Table 7. |
| | Describe regional planning and economic development strategies. | Refer to **Chapter 0** |
| | Characterise tourism and recreational use of the project area and its surroundings, including water bodies, national parks and reserves. | Refer to **Section 6.6.2**, citing also the Victorian Social Impact Assessment and Marine Ecology and Resource Use Impact Assessment |

| Aspects to be assessed | Scoping Requirement | Section addressed |
|---|---|---|
| | Describe relevant commercial and recreational uses of the marine environment. | Refer to Section 6.6.1 and Section 6.6.2, citing also the Agriculture and Forestry Technical Report and Marine Ecology and Resource use Impact Assessment |
| Likely Effects | Assess potential long and short-term effects from the project on existing and potential public infrastructure and land uses, including agricultural land use and associated businesses, taking into account interruption to agricultural practices, loss of productive land, biosecurity, water supply, access, drainage, and any other issues identified through the assessments. | Refer to Section 6.6.1 and Section 6.6.4, citing also the Agriculture and Forestry Technical Report, the Marine Ecology and Resource Use Impact Assessment and the Victorian Social Impact Assessment |
| | Assess potential social impacts from the project, including interference with the current use of private and public land and community services and facilities in the area. | Refer to Section 6.6.4, citing also the Planning and Land Use Impact Assessment Report and the Social Impact Assessments |
| | Assess potential economic effects of the project, considering direct and indirect consequences on employment, local and regional economy and industries in the area, including agriculture, forestry, shipping and fisheries. | Refer to Section 6.1 through Section 6.4, as well as Section 6.6.1, citing also the Agriculture and Forestry Technical Report and Marine Ecology and Resource use Impact Assessment |
| | Assess the potential impacts of workforce requirements, such as additional demand on housing and public services in the area. | Refer to Section 6.5.2, Section 6.6.4, and Section 6.6.6, citing also the Victorian Social Impact Assessment and Tasmanian Social Impact Assessment |
| | Assess the potential impact on tourism and tourist attractions within the project area and surrounding nature reserves. | Refer to Section 6.6.2, citing also the Victorian Social Impact Assessment and Marine Ecology and Resource Use Impact Assessment |
| Mitigation | Demonstrate whether the project is consistent with relevant planning scheme provisions and other relevant policies. | Refer to Chapter 0 |
| | Outline measures to minimise potential adverse effects of the project and enhance benefits to the community, businesses, industry and land uses. | Refer to Section 6.5 and Section 6.6, which also contain citations to content from the other technical reports as listed in Table 7. |
| | Describe the approach to engaging with individual landholders during design, construction and operation to minimise disruption to landholder activities. | Refer to Section 6.6.6, citing also the Planning and Land Use Impact Assessment Report and Social Impact Assessments |

| Aspects to be assessed | Scoping Requirement | Section addressed |
| --- | --- | --- |
| Performance | Describe the framework for monitoring and evaluating the measures implemented to mitigate agriculture, socioeconomic and land use effects and contingencies. | Referred to through Chapter 6 under relevant topic areas, which also contain citations to content from the other technical reports as listed in Table 7. |

Source: SGS Economics & Planning (2024)

## 2.4 Linkages to other reports

In preparing this EIA, SGS was provided with other technical assessments and studies. Specifically, SGS was provided the EIS/EES Chapter 2 – Environmental Management Framework and five (5) technical assessments and studies, outlined below in Table 7. Content, findings and recommendations from each of these documents, in particular all five (5) technical assessments, were reviewed by SGS for relevance to the economic and socioeconomic considerations being made in this EIA. Where appropriate, SGS incorporated relevant content or recommendations from these technical assessments and studies cited the respective document. Integration of content and recommendations from these technical assessments and studies can be found in Section 6.5 and Section 6.6.

**TABLE 7: LINKAGES TO OTHER REPORTS**

| Technical assessment | Relevance to this assessment |
| --- | --- |
| Victorian Social Impact Assessment (Dated 23 February 2024) | This report represents a social impact assessment (SIA) of the Victorian terrestrial component of the MLPL project.<br><br>Data from the SIA consultation and ongoing project engagement informed the identification of social impacts of the project and associated management measures for mitigating the identified impacts as well as a range of efforts to enhance the range of benefits from the project.<br><br>Reference to the findings and content from this SIA are cited in Section 6.5 and 6.6 of this EIA. |
| Heybridge (Tasmanian) Social Impact Assessment (Dated 7 March 2024) | This report represents a social impact assessment (SIA) of the Tasmania terrestrial component of the Marinus Link. The social impacts of the project are considered for the populations that live in the local study area (Heybridge State) and the regional study areas (Burnie City and Central Coast local government areas).<br><br>Reference to the findings and content from this SIA are cited in Section 6.5 and 6.6 of this EIA. |
| Agriculture and Forestry Technical Report (Victoria) (Dated 14 July 2023) | This report assesses the impacts of Marinus Link on agricultural and forestry land uses and businesses in Victoria on land capability and farm infrastructure, practices and planning.<br><br>Reference to the findings and content from this report are cited in Section 6.6.1 of this EIA. |

| Technical assessment | Relevance to this assessment |
|---|---|
| Planning and Land Use Impact Assessment Report (Victoria) (Dated 13 July 2023) | This report informs the project's compliance with planning policy and its impacts on land use, as required by the scoping requirements.<br><br>Reference to the findings and content from this report are cited in Section 6.6.6 of this EIA. |
| Marine Ecology and Resource Use Impact Assessment (Dated 18 August 2023) | This report describes the existing marine ecology and resource use of Bass Strait and assesses project impacts and propose environmental performance requirements to mitigate the project impacts.<br><br>Reference to the findings and content from this report are cited in Section 6.6.1 of this EIA. |
| Environmental Impact Statement/ Environment Effects Statement Chapter 2 – Environmental Management Framework (Dated 10 November 2023) | The Environmental Management Framework provides a transparent governance framework for the management of environmental impacts from the project to meet Victorian and Commonwealth environmental statutory requirements, achieve necessary environmental outcomes, protect environmental values and sustain stakeholder confidence.<br><br>This EIA cited relevant Environmental Performance Requirements from the framework. |

Source: SGS Economics & Planning (2024)

# 3. Policy alignment

This chapter provides a review of relevant jurisdictional Economic Development Strategies (EDS) within the study area. The purpose of the review is to gauge alignment and consistency between these strategies and the Marinus Link project. For a complete review of the planning and regulatory context, however, refer to the Planning and Land Use Impact Assessment Report (dated 13 July 2023).

## 3.1 Economic development strategies

An Economic Development Strategy (EDS) is a strategic document that can be used to support and guide local and regional efforts to take action and support economic growth and development for the benefit of business, the labour force and the broader community welfare. Local governments often, but are not required to, undertake such efforts in the context of other local and regional strategic planning efforts, as are reviewed through the Planning and Land Use Impact Assessment Report (dated 13 July 2023).

The process for developing an EDS involves: 1) researching local and regional assets and barriers; 2) understanding and documenting opportunities; and 3) developing a vision, objectives and strategies, including tools for implementation. The typical EDS identifies a local area's strategic context, economic characteristics, the issues, perspectives and vision of local and regional stakeholders and industry, a set of targeted objectives, as well as a set of strategic opportunities for achieving those objectives.

The purpose of SGS's review of relevant local and regional EDSs is to document whether and to what extent there is consistency and strategic alignment with the Marinus Link project and local economic development strategy. As outlined in **Table 8**, SGS's review inventoried whether relevant jurisdictions within the study area had completed an EDS and when the most recent one had been completed. Only two of the seven jurisdictions within Tasmania have an EDS, while all six of the jurisdictions within Victoria have an EDS. Those that were completed for Victorian local governments are also more recent than those completed for councils in NW Tasmania.

**TABLE 8: ECONOMIC DEVELOPMENT STRATEGIES**

| State | Council | Most Recent EDS |
|---|---|---|
| Tasmania | Circular Head | None |
| | Waratah Wynyard | None |
| | Burnie | 2011 |
| | West Coast | None |
| | Kentish | 2020 |
| | Latrobe | None |

| State | Council | Most Recent EDS |
|---|---|---|
| | Devonport | None |
| Victoria | Wellington | 2016 |
| | South Gippsland | 2021 |
| | East Gippsland | 2022 |
| | Bass Coast | 2016 |
| | Latrobe | 2016 |
| | Baw Baw | 2022 |

## 3.2 Strategic alignment

SGS reviewed major themes of the EDSs within the study area. It should be noted that each local government's EDS represents their own economic development strategy. There is no overarching economic development strategy, by which all local governments abide. As such, the respective EDSs do not often represent an orientation around multi-jurisdictional or multi-state economic development pursuits, such as would characterise the Marinus Link project.

There are, however, common themes centred around furthering industry and workforce development that is present in all the councils as shown in **Table 9**, which could be interpreted as a strategic direction or objective consistent with the economic outcomes and ongoing workforce benefits of operations of the Marinus Link project. Specifically, themes that present as consistent with the Marinus Link projects are:

- Councils consistently articulate a vision for furthering industry and workforce development initiatives (i.e., industry and workforce expansion). As documented through the economic analysis summarised in Chapter 6, the Marinus Link project is anticipated to have a net positive economic impact in terms of gross value-added and employment over the business-as-usual scenario.
- Councils consistently articulate objectives that seek to grow and diversify industry by providing support to local businesses to achieve this growth. This relates specifically to the indirect impacts of the Marinus Link project. As discussed throughout Chapter 6, indirect impacts relate to the business-to-business or producer-supplier relationships during both the construction and operational stages of the Marinus Link project. That is, the construction and operation of the Marinus Link will require the support of local and regional business for a variety of services. As a result, a wide variety of local business sectors will be in a position to benefit from the project.
- Councils consistently articulate the importance of linkages between its own role as a facilitator between employers and training providers such that the labour force may ultimately build on local skills/experience. In such workforce development objectives, EDSs also accentuate local councils' roles as facilitating matchmaking between the skills that the labour force has and the skillsets that employers need. While the Marinus Link project itself is not a capital or operational investment in

workforce development and skills training, as noted in Section 6.5, MLPL is (as of September 2023) in the process of drafting S05 industry participation and social inclusion plan to leverage and build upon both regions' existing strengths in various sectors. It is also understood that these initiatives will be developed through the execution of EPRs.

- Some, but not all councils, have included limited actions around how Councils will support renewable energy. Many councils have articulated objectives around transitioning to renewable energy sources.
- One Council (Kentish Council) specifically calls out the dependence one of their economic development objectives has on the Marinus Link project proceeding.

The review of these relevant EDSs suggests that local economic development objectives are not inconsistent with the Marinus Link project. That is, while their focus and remit is not to set objectives and a vision oriented around multi-jurisdictional and multi-state investments (such as the Marinus Link project), there are no objectives contained within them that would suggest the Marinus Link is inconsistent with local economic objectives.

**TABLE 9: POLICY ALIGNMENT MATRIX**

| Strategies | Support for renewable energy | Support for workforce and skills development |
|---|---|---|
| Kentish Council: Economic Development Strategy 2020-2025[6] | Council identified pumped hydro as a key part of clean renewable energy generation and opportunities for growth.<br>Cethana is one of the only three final sites in Tasmania currently being considered by Hydro Tasmania for further development.<br>**The EDS noted that final site selection is contingent on the Project Marinus Link proceeding.** | Economic objective: connect local business and potential investors to relevant knowledge, expertise and support through supporting collaboration and learning/ skill development. |
| Wellington Shire Council: Economic Development Strategy 2016-2022[7] | Council identified a need to position Gippsland as a future leader in new, low emissions energy technologies including renewables. A series of climate change mitigation and adaptation plans have been recognised in the Gippsland Regional Plan. | Council is committed to raising the skill base of the local workforce both through consolidation of TAFE operations at a central location in Sale, and are continuing to experiment with incentives to attract professional workers into Wellington. |
| South Gippsland Council: Economic Development Strategy 2021-2031[8] | The EDS identified opportunities for hydrogen, solar, wind, battery and bio-energy as well as a second interconnector with Tasmania in the energy sector, | One of the key objectives identified is to build capacity by building the skills, training and knowledge of our current and future workforce, embracing lifelong learning, |

[6] https://www.kentish.tas.gov.au/__data/assets/pdf_file/0035/847385/2020-2025-Kentish-Economic-Development-Strategy.pdf
[7] https://global-uploads.webflow.com/6021ed7c89cc1c1c01fccf29/6021ed7c89cc1c61d7fcd617_Economic-Development-Strategy.pdf
[8]https://www.southgippsland.vic.gov.au/download/downloads/id/3952/economic_development_strategy_2021-2031_final.pdf

| Strategies | Support for renewable energy | Support for workforce and skills development |
|---|---|---|
| | however, will continue to support Bass Strait oil and gas.<br><br>Actions from the EDS include engaging with the energy sector, businesses and community to achieve positive outcomes from new energy developments, and supporting the development of the Gippsland Renewable Energy Zone by partnering with Energy Vic. | removing barriers to education, and strengthening resilience to economic and natural emergencies. |
| East Gippsland Economic Development Strategy 2022-2032[9] | East Gippsland's 8th focus is on being climate action leaders. Some of the economic opportunities identified in this area include the development and deployment of renewable energy technology, encouraging manufacturing processes that are carbon neutral by using local clean energy supply. | Stakeholders involved in the consultation process identified that the most evident weakness in the East Gippsland economy as undersupply of a skilled, engaged workforce for businesses to tap into. Therefore, attracting new residents with skills and increasing local skills and training opportunities will be important.<br><br>The EDS also highlights that Gippsland are seeing a significant growth in "new energy" opportunities and projects such as medium-large scale solar and large scale offshore wind, and highlights there will be specific opportunities to capitalise and prepare the workforce and industry for these opportunities. |
| Bass Coast Shire Council: Economic Development Strategy 2016 - 2021[10] | The EDS highlighted that changes in climate present new opportunities within Bass Coast such as expansion of the renewable energy market, improved business practices (agriculture, ecotourism, and waste), sustainable transport and buildings. | One of five key strategies identified is to develop economic diversity. Council intends for businesses to have a culture of innovation and diversification and aims to support businesses with education and training services.<br><br>Council has also revised its Education Plan to reflect the changing demands of education (including providing lifelong learning opportunities) and continues to advocate for the construction of the Bass Coast Education Precinct. |
| Latrobe City Council: Economic | Despite being reliant on traditional industries, such as the coal fired power generation sector, Latrobe City Council is committed to leading the community to a | The standout strength of the region is the engineering knowledge and skills. Latrobe City Council intends to build on this competitive strength through the EDS. |

[9] https://global-uploads.webflow.com/5f10ce18aa01d050c26b7c5e/6465cb663e80d1f8b11a189e_Economic%20Development%20Strategy%20-%20EGSC_DIGITAL.pdf

[10] https://www.basscoast.vic.gov.au/assets/general-downloads/Economic-Development-and-Tourism/Economic-Development-Strategy-and-One-Year-Action-Plan.pdf

| Strategies | Support for renewable energy | Support for workforce and skills development |
|---|---|---|
| Development Strategy 2016-2020[11] | sustainable future through the diversification and development of industry and businesses located in the municipality. | The EDS sets out plans to establish working relationships with institutions such as Federation University, assist in the development of the Tech School in Latrobe City, and investigate the potential to establish Engineering related research and development agencies in Latrobe City. |
| Baw Baw Shire Council: Economic Development and Visitor Economy Strategy 2022-2025[12] | As part of supporting key industry sectors, the Investment Incentive Scheme aims to offer a range of incentives and customised support to businesses that meet the eligibility criteria within key industry sectors, such as Tourism, Food and Agribusiness, Health and Wellbeing, Education and Research and/or Renewable Energy. | As part of business and workforce development, Council aims to increase opportunities for education and industry to create a highly skilled, engaged workforce. |

Source: SGS Economics and Planning (2023)

[11] https://www.latrobe.vic.gov.au/sites/default/files/Eco_Dev_Strategy_2016_-_Email_version.pdf
[12] https://www.bawbawshire.vic.gov.au/files/sharedassets/public/economic-development/documents/final-economic-development-and-visitor-economy-strategy-2022-2025.pdf

# 4. Assessment method

This chapter outlines the methodology used to meet the matters of interest in conducting Economic Impact Assessments, including considerations and objectives relevant to the documentation of supporting information for EESs, as outlined in Table 4, Table 5, and Table 6.

## 4.1 Modelling geography

As required by the scoping requirements, the EIA modelling was completed to provide outputs that characterise economic impacts at the regional and state levels (the study area or modelling geography), including:

- North West Tasmania, defined as the ABS SA4 of West and North West Tasmania,
- The whole of Tasmania,
- Gippsland (in Victoria), defined as the ABS SA4 of Latrobe-Gippsland, and
- The whole of Victoria.

As such, outputs reflect impacts realised both locally and throughout each state, both the scale of spending and employment (directly and indirectly) resulting from Marinus Link construction and operations within regional communities, as well as the scale of spending and employment resulting from construction and operations more broadly at the state level.[13]

## 4.2 Impact assessment approach

As noted above, the impact assessment methodology is aligned specifically to meet the criteria associated with the scoping requirements as established by the Commonwealth, Tasmania EPA, and Victoria.

### 4.2.1 Modelling Framework

The modelling framework used by CoPS for quantifying the economic impacts[14] is: 1) Prepare an economic model of the North West Tasmania and Gippsland economies, as well Tasmania and Victoria, using a Computable General Equilibrium (CGE) model (discussed further in Section 4.3 and 4.4 below), and 2) Input capital and operational spending related to Marinus Link as well as capital investment related to the induced renewable energy project.

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[13] In the interpretation of the results which follow, however, note that regional and state impacts cannot be added together.
[14] The analysis of economic impacts is distinct from a cost-benefit analysis (CBA). It is also distinct from a business case analysis, in which metrics such as net present value and/or return-on-investment (ROI) may be quantified.

### 4.2.2 Modelling Inputs

The quantitative assessment contains, as broadly outlined below, inputs to modelling and outputs. As such, the **inputs** used in CoPS modelling (and reported in Chapter 6 in aggregate) were associated with:

- Capital investment for construction of the Marinus Link,
- Ongoing operations of the Marinus Link,
- Capital investment related to development of induced windfarm and pumped hydro investments (i.e., representative of upstream economic activity), and
- Ongoing operation related to the induced windfarm and pumped hydro projects.

### 4.2.3 Modelling Outputs

The outputs of the economic modelling provide quantifications of the direct, indirect and total economic impacts triggered by the capital investment and operational spending related to the Marinus Link and induced renewable energy projects (results which are disaggregated and discussed independently).

- **Total (Direct and Indirect) Impacts** – Direct impacts represent one component of total economic impact and are those carried out by Marinus Link, such as labour employed and wages paid for construction and ongoing operation. Examples of direct impact include activity in sectors such as construction, engineering and professional and technical services, etc., during the construction phase, and professional and technical, IT services, management, etc., during the operational phase. Indirect impacts represent the second component of total economic impact and are those carried out in support of or related to production or operational inputs to construction and operations. Examples of such direct impact include activities in sectors such as construction equipment and materials manufacturing, IT equipment manufacturing, legal, financial, accounting and administrative services, etc.
- **Induced impacts** – Induced impacts are economic activities or investment determined to proceed only under the circumstances that investment in the direct economic activity will be made. At the time of compiling available information for the assessment of Marinus Link's economic impacts, it was determined by SGS and MLPL that investment in six (6) renewable energy projects (2 windfarm and 4 pumped hydro projects) in the North West of Tasmania would not proceed without delivery of the Marinus Link project. Only these six (6) projects were included because they were the only ones for which capital investment information was available. Induced projects in Victoria, however, were not included in the analysis due to the direction of transmission of energy i.e., renewable energy is to be transmitted from Tasmania to Victoria, not vice versa.

### 4.2.4 Metrics of Impact

The economic impacts related to Marinus Link and the induced renewable energy projects are reported in terms of the following key impact metrics:

- Regional and state value added (equivalent to Gross Regional Product, GRP)
- Regional and state employment (in full-time equivalencies, FTE)

As noted above in Section 4.1, each metric is reported at the following four (4) geographic levels, as outlined above: North West Tasmania, defined as the ABS SA4 of West and North West Tasmania, The whole of Tasmania, Gippsland (in Victoria), defined as the ABS SA4 of Latrobe-Gippsland, and the whole of Victoria.

### 4.2.5 Upstream/Downstream Industry Activity

A further note to the limitation of the extent to which economic activities and impacts were assessed relates to the scoping requirement for the Tasmania EPA (regarding impacts of upstream and downstream industry):

- **Upstream industry activity** refers to the activities and outputs from industries that are farther away from the end-user than that of the direct economic activity. In the case of Marinus Link, one main example of upstream activity includes power generation and/or inputs of goods and services required for such. As such, the extent to which upstream industry activities are acknowledged in this EIA include the economic modelling outputs for the six (6) renewable energy projects (Section 5.3). As discussed above, more information regarding other confirmed induced projects and their capital investments was not available at the time of this report's preparation.
- **Downstream industry activity** refers to the activities and outputs of industries closer to the end-user. Examples of such activity would relate to household consumption of power or commercial consumption of power for any number of individual or industrial applications. Marinus Link is understood to be an enhancement to the transmission network, from which both mainland distributors, other network transmission lines, as well as end-users will benefit. Neither quantifications nor representations of the nature, characteristics or investment values associated with such potential downstream industry activities were available to SGS. That is, the quantification of such downstream industry activities requires knowledge of specific user groups, customer usage and applications of such power. However, no data or information about customer usage and applications was provided to SGS such that consideration of positive and/or negative impacts could be made.

### 4.2.6 Qualitative Assessment and Considerations

Also aligned with the Commonwealth and respective state guidance regarding completion of an EIA and consideration of objectives made for the benefit of the overall EES process, this aspect of the EIA identifies considerations as to how Marinus Link could economically impact North West Tasmania and Gippsland in ways other than size of the economy and employment, including:

- First Nations employment and procurement opportunities
- Impacts on agriculture, forestry, shipping and fisheries industries
- Impacts on tourism industry

- Skills and training opportunities
- The extent to which raw materials, equipment, goods, and services will be sourced locally
- Impacts on local social amenity and community infrastructure
- Community demographic impacts
- Impacts on land values, and demand for land and housing
- Local, State and Federal Government rate, taxation, and royalty revenues.

Information on these economic impacts is captured in Section 6 alongside the economic impact assessment modelling.

## 4.3 The CoPS model

The Centre of Policy Studies (CoPS) is a research centre located at Victoria University, Melbourne. CoPS' suite of Australian models includes several detailed, dynamic CGE models of Australia, which have been used to analyse many economic policies, including changes in taxes, tariffs, environmental regulations and competition policy.

The Victoria University Regional Model (VURM), used for the modelling the economic impact of Marinus Link, is a CGE model of Australia's six states and two territories. Each region is treated as an economy in its own right, with region-specific agents, region-specific prices and region-specific governments. The regions are connected via inter-state trade and the movements of labour and capital.

More generally, VURM is a detailed mathematical representation of Australia's regions, specifically designed to capture the disaggregated nature of economic inter-relationships. This representation covers the behaviour of regional agents that supply goods and services (industries – public and private), and regional agents that demand goods and services (industries, the government, households and investors). The model also covers interstate and international trade, with explicit modelling of demand for each regional economy's production (i.e., for its interstate and international exports) and of supply into the economy (i.e., of its interstate and international imports). Flows of capital and labour are accounted for, both as regional incomes (wages and profit) and items of industry costs (labour and capital-used).

The core CGE equations tend to be *neo-classical* in spirit, often assuming cost-minimising behaviour by producers, average-cost pricing, and household demands based on optimising behaviour. However, VURM conforms only loosely to the theoretical general equilibrium paradigm. For example, it can make allowance for:

- Non-market clearing, especially for labour (unemployment) or for commodities (inventories);
- Imperfect competition (e.g., monopoly pricing); and
- Demands not influenced by price (e.g., government demands).

The ability of VURM to represent real-world behaviour depends not only on the realism of its theoretical basis, but also the quality of the underlying database. VURM's database has three parts.

- Tables of transaction values, showing, for example, the value of imported oil used by the Victorian petroleum refining industry. Usually, the database is presented as an input-output table or as a social accounting matrix. In either case, it covers the whole economy of a region, and distinguishes a number of sectors, commodities, primary factors and households. Sectoral coverage ranges from relatively simple representations of capital, labour and intermediates to highly detailed representations of specific sub-sectors.

- Values for dimensionless parameters that capture behavioural response. Examples of such parameters include interstate and international export demand elasticities, which specify by how much export volumes might fall if export prices went up; interstate and international import demand elasticities, which show whether products of different regions are close substitutes; and income elasticities of demand, which show how household demands respond to income changes.
- Values for miscellaneous items associated with the government's fiscal accounts (taxes and other items revenue and expenditure) of each jurisdiction; and with the Australian economy's external balance of payments (exports, imports, foreign capital transfers, etc.).

Further information on the VURM model is available in a technical working paper.[15]

## 4.4 Technical modelling assumptions limitations

A wide range of economic models can be used to estimate how the 'direct' economic impacts of Marinus Link translate to 'indirect' economic impacts and, therefore, 'total' economic impacts (total impacts = direct impacts + indirect impacts). These models are generally known as:

- Static (input-output) models, and
- Computable General Equilibrium (CGE) models.

While static models are simple and cost-effective, their use is increasingly questioned because of their modelling limitations. Static models assume that the past equals the future and that a significant direct impact does not cause substitution, pricing and/or crowding out effects in the regional economy. Moreover, any future productivity improvements in the economy are not captured.

Collectively these shortcomings would cause static models to overestimate the indirect and, therefore, total economic impacts of Project Options.

General equilibrium models overcome these shortcomings and produce highly credible estimates. CoPS' Computable General Equilibrium Model is a large-scale, dynamic, multi-region, multi-commodity model of the world economy. It meets the standards of government, industry and academia, providing Marinus Link with a single, robust, integrated economic framework to analyse economic impacts over time.[16]

> The VURM model is a best-practice economic impact assessment tool, delivering the robust results needed for the approvals process.

[15] https://www.copsmodels.com/elecpapr/g-254.htm

[16] The CoPS modelling outputs are quantifications of absolute FTE jobs above or below the business-as-usual case (i.e., without Marinus Link) or gross value-added (GVA) above or below the BaU. Baseline employment or GVA values are not included as outputs of the CoPS modelling.

# 5. Modelling scenario characteristics

The EIA compares the development of Marinus Link against a baseline scenario in which Marinus Link is not developed.

## 5.1 Business-as-Usual (BaU)

Under the BaU, inputs and assumptions regarding economic activity include:

- Capital expenditure ($3.1 billion) related to construction of the Marinus Link does not occur.
- No flow-on spending occurs in the regional economies of North West Tasmania and Gippsland.
- Spending related to the operations and maintenance of the Marinus Link (totalling $26 million[17] per annum commencing from 2029) also does not occur.
- Capital investment related to the induced renewable energy projects in Tasmania (i.e., wind farms and pumped hydro), which total $4.4 billion, also does not occur.
- Spending related to the operation and maintenance of these induced investments (totalling $788 million between 2029 and 2050) also does not occur in the regional economy. Rather, renewable energy production capacity is still anticipated to be added in Tasmania under the baseline scenario, but the resulting economic activity is anticipated to be lower.

As noted previously in the report, cost estimates above are sourced from AEMO's 2022 Integrated System Plan (ISP). Using the ISP ensures that the inputs are gleaned from an independent source.

## 5.2 Marinus Link Construction and Operations

As it relates to the scoping requirements, this section utilises estimates of direct total capital investment, estimates of the geographic distribution of such capital investment, as well as estimates of ongoing operational costs associated with the Marinus Link construction and operations.

### Overview

Marinus Link is proposed to be implemented as two 750 MW High Voltage Alternating Current (HVAC) links to increase transmission network interconnection capacity in Tasmania and Victoria. Each 750 MW circuit will comprise two power cables and a fibre-optic communications cable bundled together in Bass Strait and laid in a horizontal arrangement on land. The two 750 MW circuits would be installed in two stages with the western circuit being laid first as part of stage one, and the eastern cable in stage two.

The key project components for each 750 MW circuit are, from south to north are:

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[17] In 2021 dollars. Sourced from Marinus Link RIT-T.

- HVAC switching station and HVAC-HVDC converter station at Heybridge in Tasmania. This is where Marinus Link will connect to the North West Tasmania transmission network being augmented and upgraded by the North West Transmission Developments (NWTD).
- Shore crossing in Tasmania adjacent to the converter station.
- Subsea cable across the Bass Strait from Heybridge in Tasmania to Waratah Bay in Victoria.
- Shore crossing at Waratah Bay approximately 3 km west of Sandy Point.
- Land-sea cable joint where the subsea cables will connect to the land cables in Victoria.
- Land cables in Victoria from the land-sea joint to the converter station site in the Driffield or Hazelwood areas.
- HVAC switching station and HVAC-HVDC converter station at Driffield or at Hazelwood, where Marinus Link will connect to the existing Victorian transmission network.

A Transition Station at Waratah Bay may also be required if there are different cable manufacturers or substantially different cable technologies adopted for the land and subsea cables. The location of the transition station will also house the fibre optic transition station in Victoria. However, regardless of whether a transition station is needed, a fibre optic terminal station will still be required in the same location.

In Tasmania, a converter station is proposed to be located at Heybridge near Burnie. The converter station will facilitate the connection of Marinus Link to the Tasmanian transmission network. There will be two subsea cable landfalls at Heybridge with the cables extending from the converter station across the Bass Strait to Waratah Bay in Victoria. The preferred option for shore crossings is horizontal directional drilling (HDD) to approximately 10 m water depth where the cables would then be trenched, where geotechnical conditions permit.

Approximately 255 kilometres (km) of subsea HVDC cable will be laid across Bass Strait. The preferred technology for Marinus Link is two 750 megawatt (MW) symmetrical monopoles using ±320 kV, cross-linked polyethylene insulated cables and voltage source converter technology. Each symmetrical monopole is proposed to comprise two identical size power cables and a fibre-optic communications cable bundled together. The cable bundles for each circuit will transition from approximately 300m apart at the HDD (offshore) exit to 2km apart in offshore waters.

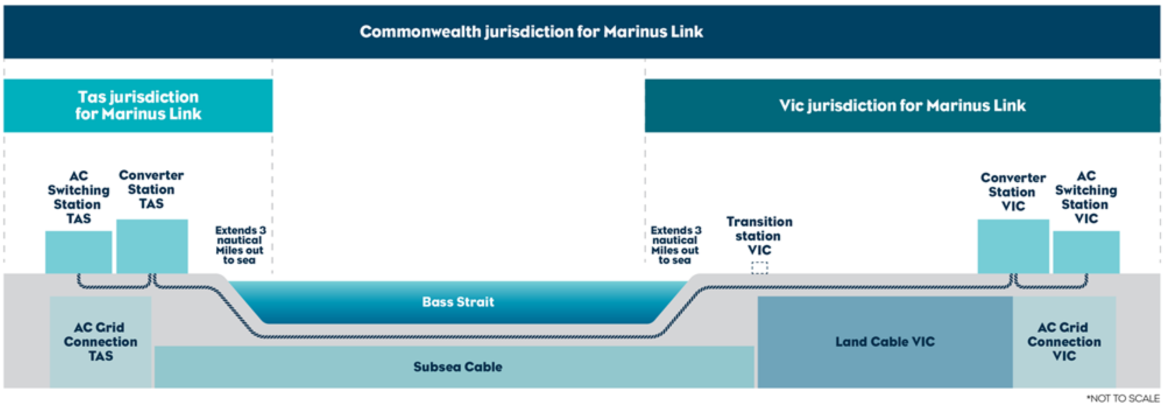
In Victoria, the shore crossing is proposed to be located at Waratah Bay with the route crossing at the Waratah Bay–Shallow Inlet Coastal Reserve. From the land-sea joint located behind the coastal dunes, the land cable will extend underground for approximately 90 km to the converter station. From Waratah Bay the cable would run northwest to the Tarwin River Valley and then travel to the north to the Strzelecki Ranges. The route crosses the ranges between Dumbalk and Mirboo North before descending to the Latrobe Valley where it turns northeast to Hazelwood. The Victorian converter station will be at either a site south of Driffield or Hazelwood adjacent to the existing terminal station.

The land cables will be directly laid in trenches or installed in conduits in the trenches. A construction area of 20 to 36 m wide would be required for laying the land cables and construction of joint bays. Temporary roads for accessing the construction area and temporary laydown areas would also be required to support construction. Where possible, existing roads and tracks will be used for access, for example, farm access tracks or plantation forestry tracks.

Land cables will be installed in ducts under major roads, railways, major watercourses and substantial patches of native vegetation using trenchless construction methods (e.g., HDD), where geotechnical conditions permit. A larger area than the 36m construction area will be required for the HDD crossings.

The assessment is focused on the Victorian/Tasmanian/marine section of the Project. It is understood that the outputs of the technical modelling and reporting in this EIA will be used to inform the EIS/EES being prepared to assess Marinus Link's potential environmental effects in its entirety across each jurisdiction in accordance with the legislative requirements of the Commonwealth, Tasmanian and Victorian governments (Section 2.1, 2.2 and 0).

**FIGURE 2: PROJECT COMPONENTS CONSIDERED UNDER APPLICABLE JURISDICTIONS**




Source: Marinus Link Pty Ltd 2022, Consultation Plan

Marinus Link is proposed to be constructed in two stages over approximately five years following the award of works contracts to construct Marinus Link. On this basis, Stage 1 of the project is expected to be operational by 2030, with Stage 2 to follow, with final timing to be determined by market demand. Marinus Link will be designed for an operational life of at least 40 years.[18]

### Construction Phase

Capital investment values for the Marinus Link have been provided by MLPL to SGS as follows:

- Capital expenditure related to construction and development are estimated to be $3.1 billion (2021 dollars). [19]

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[18] While the estimated lifespan of the Marinus Link extends 40 years, the CoPS modelling framework only estimates impacts to 2050.

[19] The extent to which any capital expenditure does not occur in Australia is accounted for in the economic modelling. As noted in Section 4.3 and 4.4, the economic modelling (into which construction capital investment values are a key input) is a detailed mathematical representation of Australia's regions, the economic inter-relationships, covering the behaviour of regional agents, interstate and international trade, with explicit modelling of demand for each regional economy's production (i.e., for its interstate and international exports) and of supply into the economy (i.e., of its interstate and international imports). As such, the outputs of this EIA contain representations of the regional and state level economic impacts that reflect spending occurring within those geographic boundaries.

- This phase is modelled as five (5) years for construction and completion. Detailed phasing information of capital expenditure by year was not available at the time of technical modelling. The technical modelling distributed labour across the 5-year construction period uniformly. Actual expenditure by year is likely to differ and would be determined by the Original Equipment Manufacturers (OEMs).
- Capital expenditure related to construction is anticipated to occur across the four (4) identified regions (Section **Error! Reference source not found.**), with $1.25 billion estimated to be spent on developing Marinus Link from North West Tasmania, and the remainder, $1.85 billion from Gippsland.

The capital expenditure estimate and the capital expenditure values associated with the induced investments provided by MLPL are sourced from AEMO's 2022 Integrated System Plan (ISP). Application of the ISP ensures that the inputs are gleaned from an independent source.

### Operational Phase

Following construction, the estimation of ongoing economic impacts relate mainly to the operations and maintenance of Marinus Link. The assessment of such impacts relates to the demand created for ongoing employment by Marinus link (labour) and associated wages, payments to suppliers for equipment or contracted services, etc. The assessment of ongoing economic impacts also relates to operational revenues generated by Marinus Link, such as local/regional business and labour surplus related to suppliers to Marinus Link, as well as government surplus such as local, state and federal taxes, etc.

Direct inputs to the assessment of economic impacts related to the operational phase of the Marinus Link have been provided to SGS by Marinus Link, as follows:

- Operational impacts are likely to occur across the two regions, with total direct operational expenditure inputs estimated at $26 million per annum.
- To account for the likely distribution of these impacts, operational expenditure inputs were apportioned evenly between North West Tasmania and Gippsland at $13 million per each region.
- Outputs of the technical modelling identify operational impacts across these two regions between 2030 and 2050, including both total value-added (which includes labour surplus, business profits, and government surplus) and FTE jobs.
- Operational revenues related to Marinus Link were neither available nor provided by MLPL to SGS. However, consideration is given in Section 6.6.7 to the generation of public taxation receipts at various levels of government (local, state and federal).

With regard to capital expenditure and operational expenditure inputs, and with regard to its bearing on the scoping requirements outlined in Section 2, information regarding any one-time or ongoing subsidies or services that would be relied up for the construction or operation of Marinus Link was neither known to SGS or MLPL at the time of the EIA preparation and therefore not considered in the analysis.

## 5.3 Induced Investments

This section details the technical modelling inputs SGS and MLPL made regarding the identification of other investments of significance that are understood to be dependent, i.e., those projects that would not proceed without delivery of the Marinus Link project. As related to the scoping requirements, this section addresses: estimates of direct total capital investment, estimates of the geographic distribution of such capital investment, as well as estimates of ongoing operational expenditure, and is a consideration of upstream industry activity (i.e., power generation).

### Overview

As discussed initially in Section 4.2, SGS and MLPL identified six (6) renewable energy projects (2 windfarm and 4 pumped hydro projects) in the North West of Tasmania, to be included as the relevant extent to which economic activities characterised as induced investments could be assessed. As discussed, these projects were identified based on information available at the time of technical modelling, they were projects for which information on capital investment was available, and they were identified as relevant given the direction of transmission of energy from Tasmania to Victoria.

### Induced project inputs and assumptions

Figure 3 illustrates the anticipated power generation capacity characteristics of the 6 renewable energy projects. Information available at the time of technical modelling regarding capital investment included:

- $2.8 billion in capital expenditure in the North West Tasmania economy for the construction of wind infrastructure between 2029 and 2050, including:
  - $1.4 billion for construction and development commencing in 2029
  - $1.381 billion for construction and development commencing in 2031
- $1.6 billion in capital expenditure in the North West Tasmania economy for the construction of pumped hydro infrastructure between 2029 and 2050, including:
  - $702 million in 2029
  - $67 million in 2034
  - $844 million in 2036
  - $15 million in 2049
- $491 million in operational expenditure for wind projects in the North West Tasmania economy between 2029 and 2050, with an annual operational expenditure ranging between $18 million and $39 million.
- $297 million in operational expenditure for pumped hydro projects in the North West Tasmania economy between 2029 and 2050, with an annual operational expenditure ranging between $7 million and $17 million.

**FIGURE 3: ANNUAL ADDITIONAL POWER GENERATION CAPACITY ABOVE BAU (TASMANIA)**


Source: MLPL. *BaU refers to the installed capacity assumed to occur regardless of Marinus Link being developed.

# 6. Economic impact assessment

This chapter details the outputs of the economic modelling for the impact scenario described in Section 5.2. This chapter discusses outputs as relevant to the documentation of supporting information for EESs, as outlined in Table 4, Table 5, and Table 6. As it relates to the specific scoping requirements, this section incorporates:

- Estimates of direct total capital investment,
- Estimates of the geographic distribution of such capital investment,
- Estimates of ongoing operational costs associated with the Marinus Link construction and operations.
- Impacts on the regional and state economies
- Impacts on upstream/downstream industries

## 6.1 Economic impacts on Tasmanian economy

### Construction and operation

SGS and the CoPS have modelled the economic impact of the construction and operation of Marinus Link on the regional North West Tasmania economy and the whole of Tasmania. Impacts are calculated in terms of value-added to gross economic product and full-time equivalent (FTE) employment.

In North West Tasmania, Marinus Link adds:

- $352 million to the local economy during the five years of construction (2025 to 2029). The peak annual impact occurs in 2027, with an annual contribution of $108 million. This construction phase also includes the first half year of operations as the project comes online in the second half of 2029.
- $306 million to the regional economy between 2030 and 2050 for operations and maintenance, at an average of $15 million per annum.

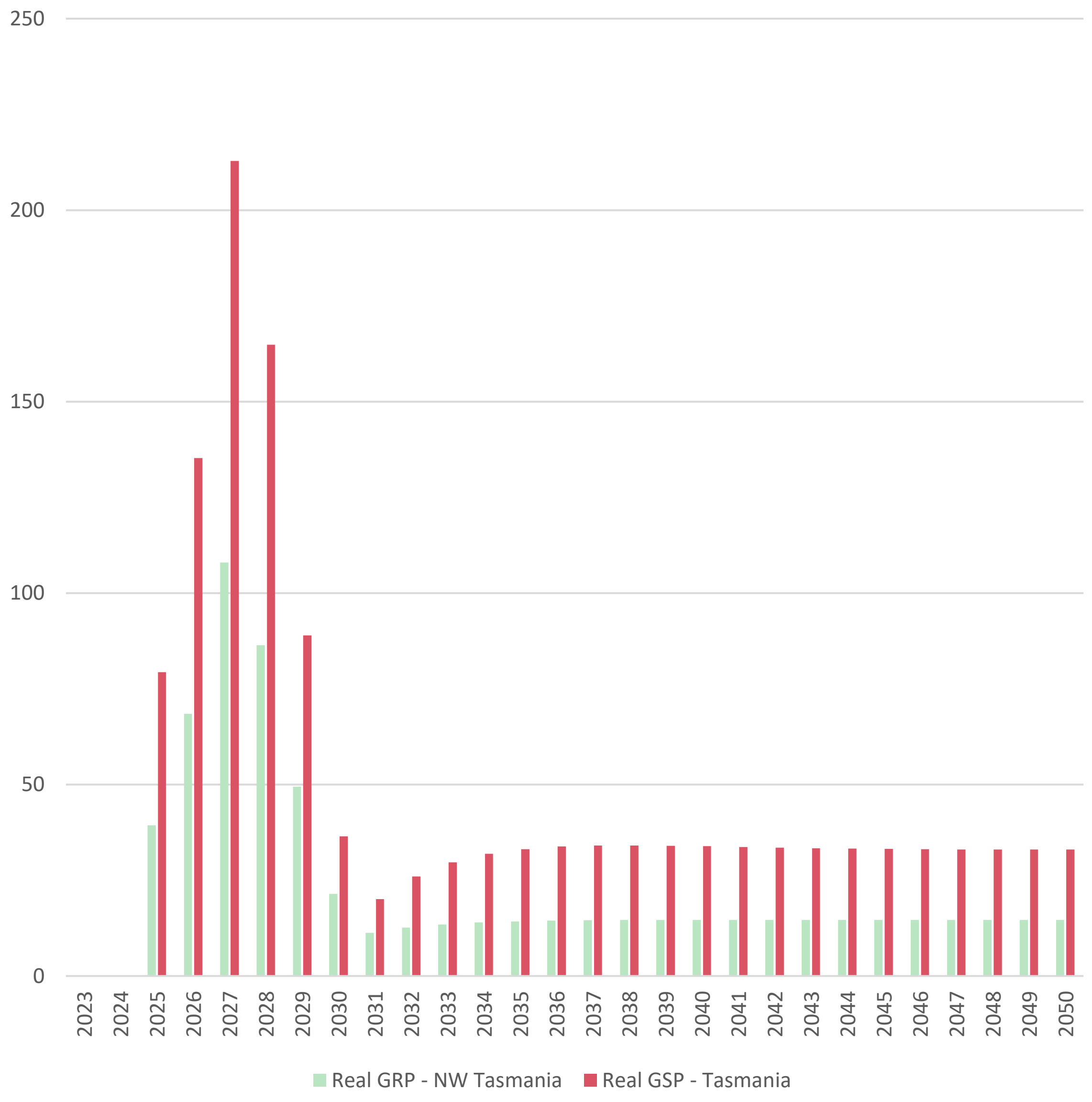
Extending the impact out to all of Tasmania, Marinus Link adds:

- $681 million to the state economy during the five years of construction (2025 to 2029), peaking at $213 million in 2027.
- $679 million to the state economy between 2030 and 2050 for operations and maintenance, at an average of $32 million per annum.

The impact per annum from construction and operations is captured in Figure 4 below. As shown, the estimated economic impact for North West Tasmania is a subset of the state-wide impacts, an indication that a portion of the inputs (e.g., goods and services) required for overall delivery of the Marinus Link operations and maintenance phase would be sourced outside the immediate North West Tasmania region but within the state.

The Marinus Link is expected to have an operational life of forty years, so the economic impacts can be expected to continue flowing beyond 2050.

**FIGURE 4: VALUE-ADDED TO THE ECONOMY FROM CONSTRUCTION AND OPERATIONS ($ MILLIONS)**




Source: SGS Economics & Planning and Centre of Policy Studies

In terms of employment, In North West Tasmania, Marinus Link adds:

- 1,297 full-time equivalent (FTE) job-years in the regional economy during the five years of construction (2025 to 2029). The peak number of jobs created occurs in 2027 when 430 job-years are added.
- 306 FTE job-years in the regional economy between 2030 and 2050 for operations and maintenance, at an average of 15 job-years supported each year.

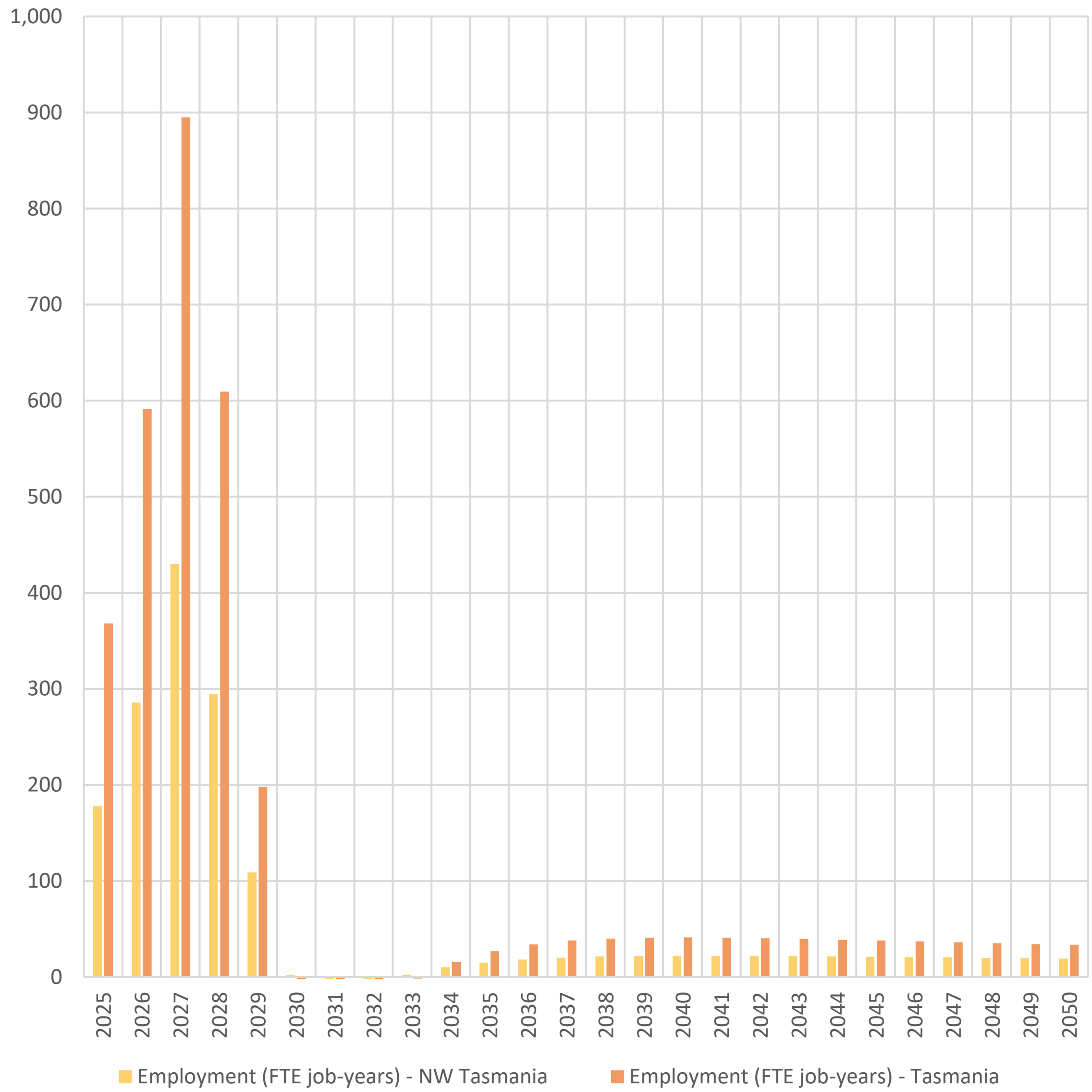
Extending the impact out to all of Tasmania, Marinus Link adds:

- 2,661 FTE job-years during the five years of construction (2025 to 2029), with a peak of 895 job-years added in 2027.

- 494 FTE job-years during operations in the state between 2030 and 2050, at an average of 24 job-years supported annually.

The impact on job-years per annum from construction and operations is captured in Figure 5 below.

**FIGURE 5: FTE EMPLOYMENT GENERATED BY CONSTRUCTION AND OPERATIONS (TASMANIA)**

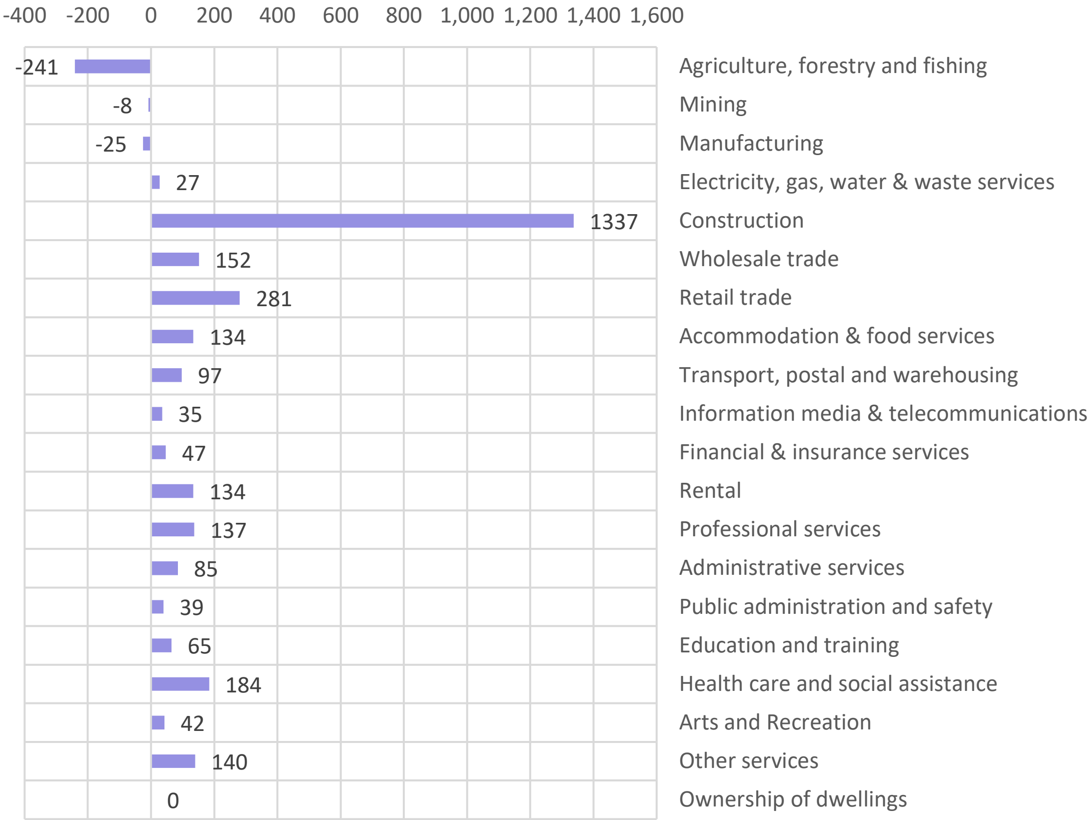



Source: SGS Economics & Planning and Centre of Policy Studies

Including flow-on impacts, the jobs created occur across various industries in Tasmania, not just construction.

During construction phase (refer to Figure 6), Marinus Link is expected to add 1,337 FTE job-years in construction, 281 in retail trade and 184 in health care and social assistance. There is estimated to be a slight reduction in job-years in agriculture, forestry and fishing (-241), manufacturing (-25) and mining (-8) as these sectors are likely to compete for workers with Marinus Link during the construction period.

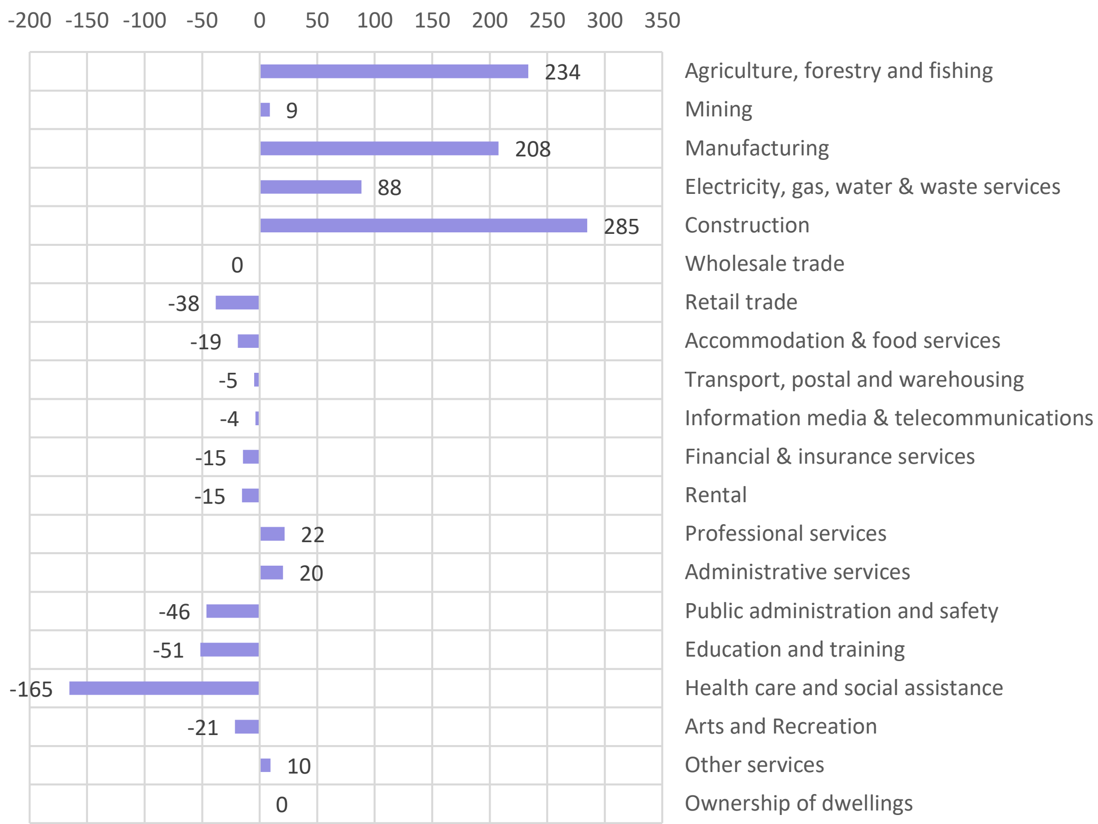
FIGURE 6: FTE (JOB-YEARS) BY INDUSTRY DURING CONSTRUCTION PHASE (TASMANIA) (2025-2029)




Source: SGS Economics & Planning and Centre of Policy Studies

During operational phase (refer to Figure 7), Marinus Link is expected to add 285 FTE job-years in construction. In sectors such as agriculture, forestry and fishing and manufacturing where job-years were slightly reduced during construction phase, it is expected that workers are likely to return to these sectors after the construction of Marinus Link, adding back 234 and 208 FTE job-years respectively from 2030 to 2050.

FIGURE 7: FTE (JOB-YEARS) BY INDUSTRY DURING OPERATIONS PHASE (TASMANIA) (2030-2050)




Source: SGS Economics & Planning and Centre of Policy Studies

## 6.2 Economic impacts on Victorian economy

### Construction and operation

SGS and the CoPS have modelled the economic impact of the construction and operation of Marinus Link on the regional Gippsland economy, and the whole state of Victoria. In Gippsland, Marinus Link adds:

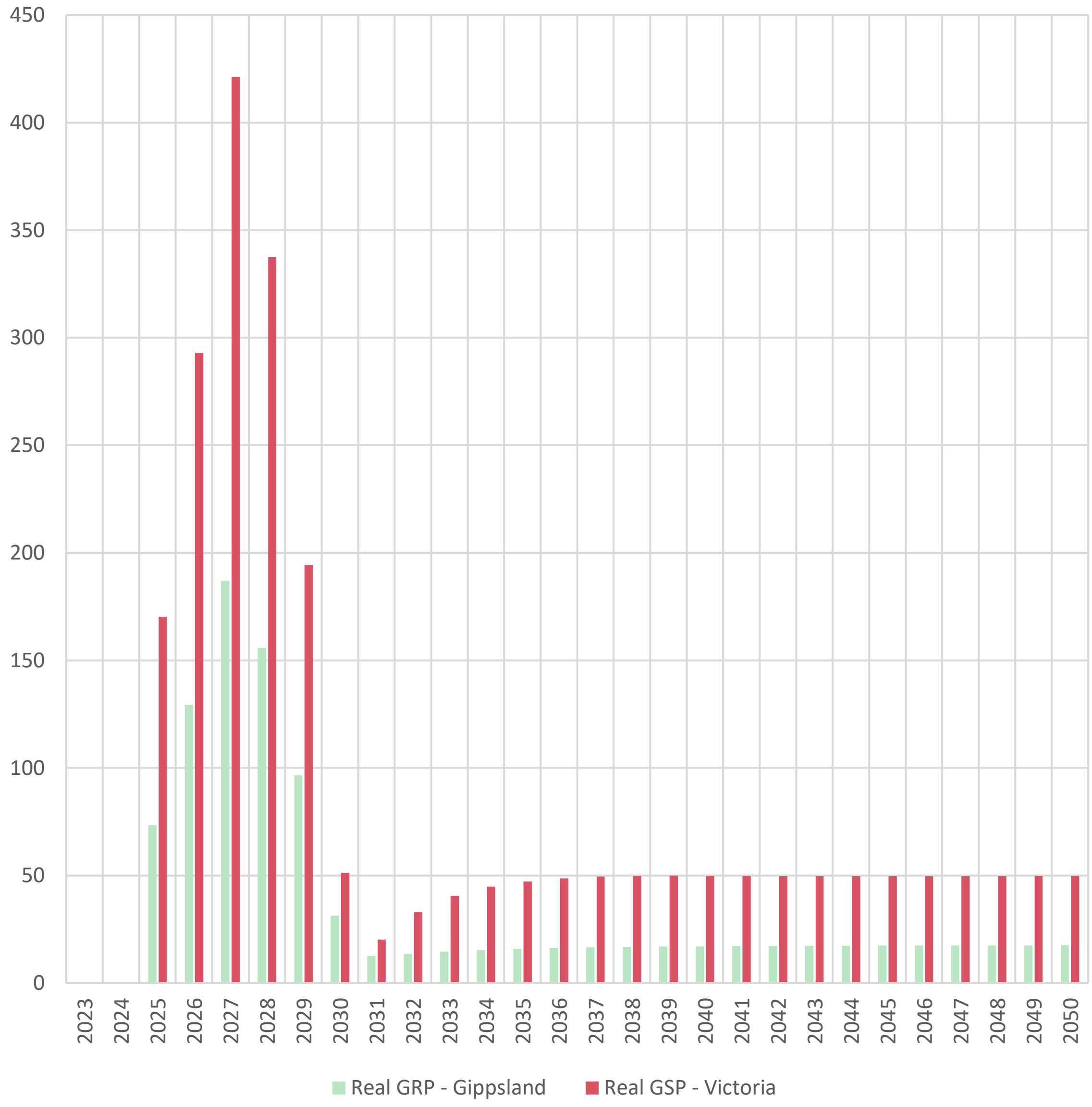
- $642 million to the Gippsland economy during the five years of construction (2025 to 2029). The peak annual impact occurs in 2027, with a yearly contribution of almost $187 million.
- $361 million to the Gippsland economy between 2030 and 2050 for operations and maintenance, at an average of $17 million per annum.

Extending the impact out to all of Victoria, Marinus Link adds:

- $1.4 billion to the Victorian economy during the five years of construction (2025 to 2029), peaking at $421 million in 2027.
- $981 million to the state economy between 2030 and 2050 for operations and maintenance, at an average of $47 million per annum.

The impact per annum from construction and operations is captured in Figure 8 below. The results for Gippsland are naturally smaller than the Victorian results, given that Gippsland is an economic subset of the Victorian economy.

**FIGURE 8: VALUE-ADDED TO THE ECONOMY FROM CONSTRUCTION AND OPERATIONS ($ MILLIONS)**




Source: SGS Economics & Planning and Centre of Policy Studies

In terms of employment, In Gippsland, Marinus Link adds:

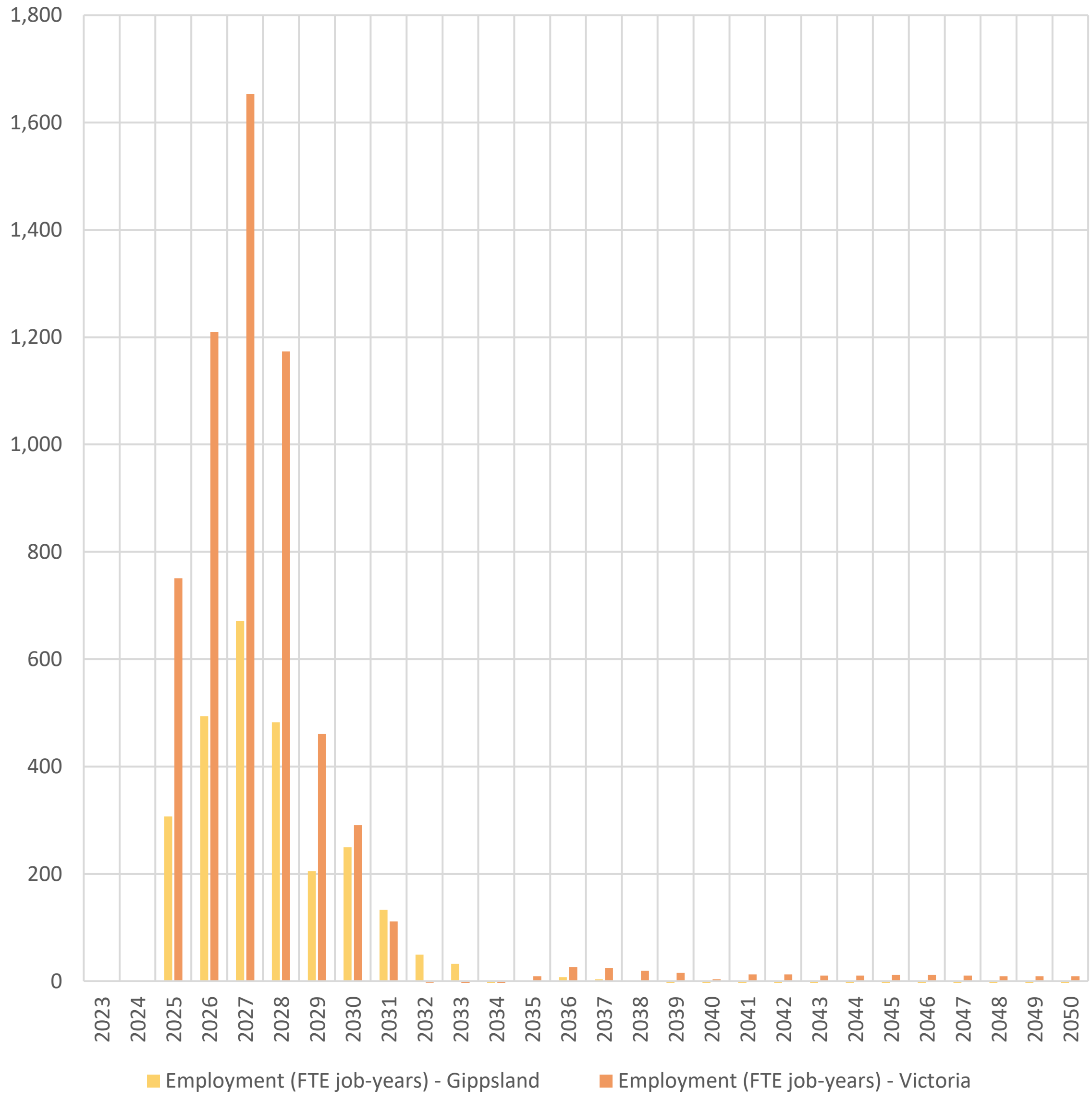
- 2,159 FTE job-years during the five years of construction (2025 to 2029). The peak number of job-years created occurs in 2027 when 671 job-years are added.
- 388 FTE job-years in Gippsland between 2030 and 2050 for operations and maintenance, at an average of 18 each year.

Extending the impact out to all of Victoria, Marinus Link adds:

- 5,247 FTE job-years during the five years construction phase (2025 to 2029), with a peak of 1,653 job-years added in 2027.
- 592 FTE job-years during operations in the state between 2030 and 2050, averaging 28 per annum.

The impact on job-years per annum from construction and operations is captured in Figure 9 below.

**FIGURE 9: FTE EMPLOYMENT GENERATED BY CONSTRUCTION AND OPERATIONS (VICTORIA)**

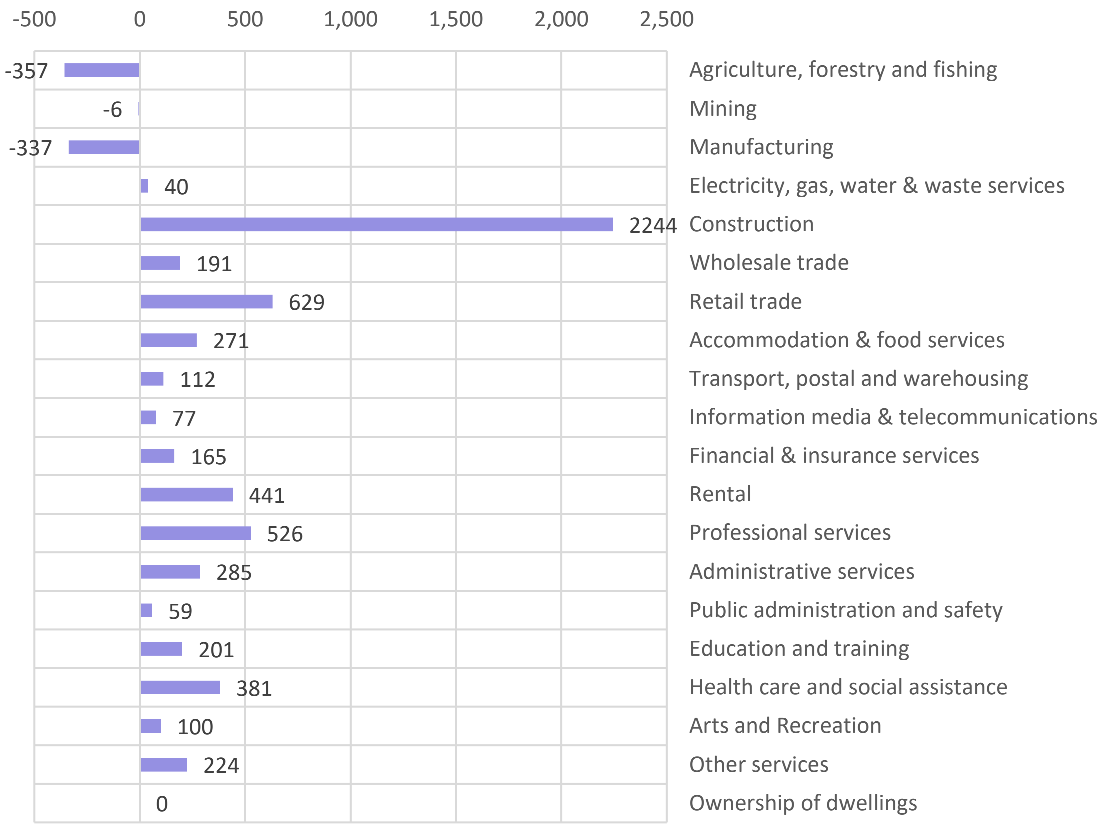



Source: SGS Economics & Planning and Centre of Policy Studies

The number of job-years created occur across a range of industries in Victoria, and include flow-on impacts, not just the number of people hired directly by Marinus Link.

During construction phase (refer to Figure 10), Marinus Link is expected to add 2,244 FTE job-years in construction, 629 in retail trade and 526 in professional services. There is estimated to be a reduction in job-years in agriculture, forestry and fishing (-357) and manufacturing (-337) as these sectors are likely to compete for workers with Marinus Link during the construction period.

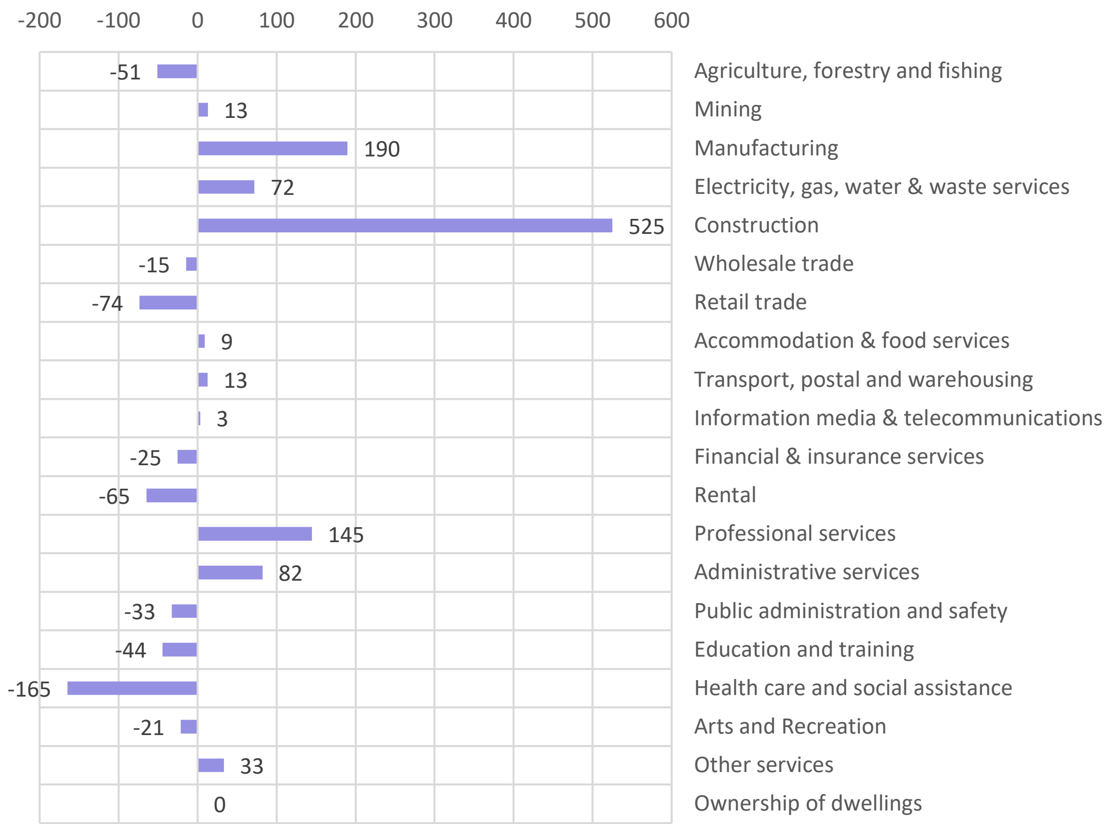
**FIGURE 10: FTE (JOB-YEARS) BY INDUSTRY DURING CONSTRUCTION PHASE (VICTORIA) (2025-2029)**




Source: SGS Economics & Planning and Centre of Policy Studies

During operational phase (refer to Figure 11), Marinus Link is expected to add 525 FTE job-years in construction. Agriculture, forestry and fishing is still expected to have a decline in job-years (-51) while for manufacturing, workers are expected to return to sector with 13 FTE job-years added. Health care and social assistance is expected to see a decline in FTE job-years (-165), as demand for these services might decrease as workers choose to move back to their hometown after the construction phase.

FIGURE 11: FTE (JOB-YEARS) BY INDUSTRY DURING OPERATIONS PHASE (VICTORIA) (2030-2050)




Source: SGS Economics & Planning and Centre of Policy Studies

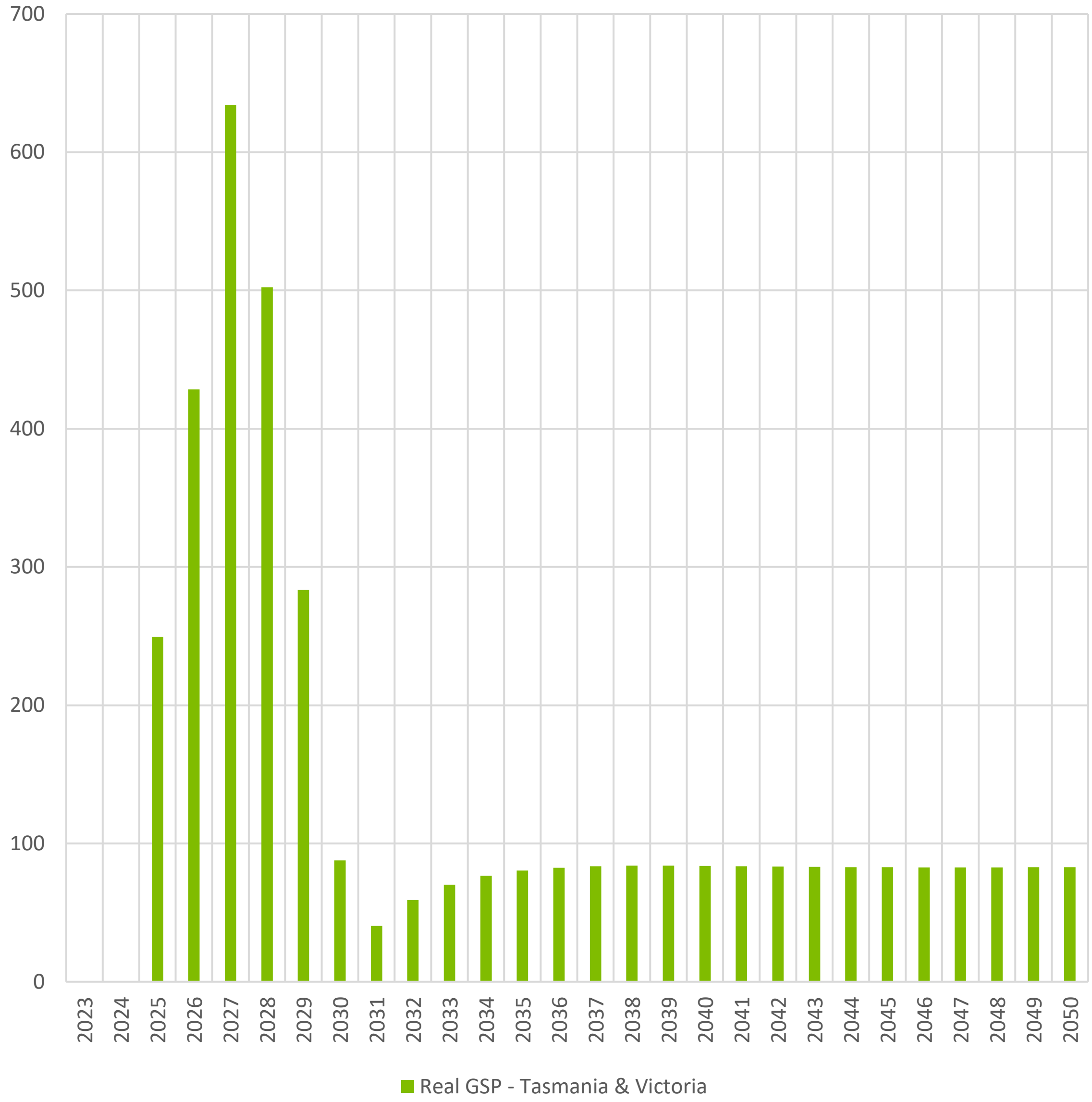
## 6.3 Total impacts from construction and operation of Marinus Link

This section estimates the total economic impact of the construction and operation of Marinus Link on the Tasmanian and Victorian economy as a whole. Marinus Link adds:

- $2.1 billion to the Tasmanian and Victorian economy together during the five years of construction (2025 to 2029). The peak annual impact occurs in 2027, with a yearly contribution of almost $634 million.
- $1.7 billion to the Tasmanian and Victorian economy together between 2030 and 2050 for operations and maintenance, at an average of almost $79 million per annum.

The impact per annum from construction and operation is captured in Figure 12 below.

FIGURE 12: TOTAL VALUE-ADDED TO THE ECONOMY FROM CONSTRUCTION AND OPERATIONS ($ MILLIONS)



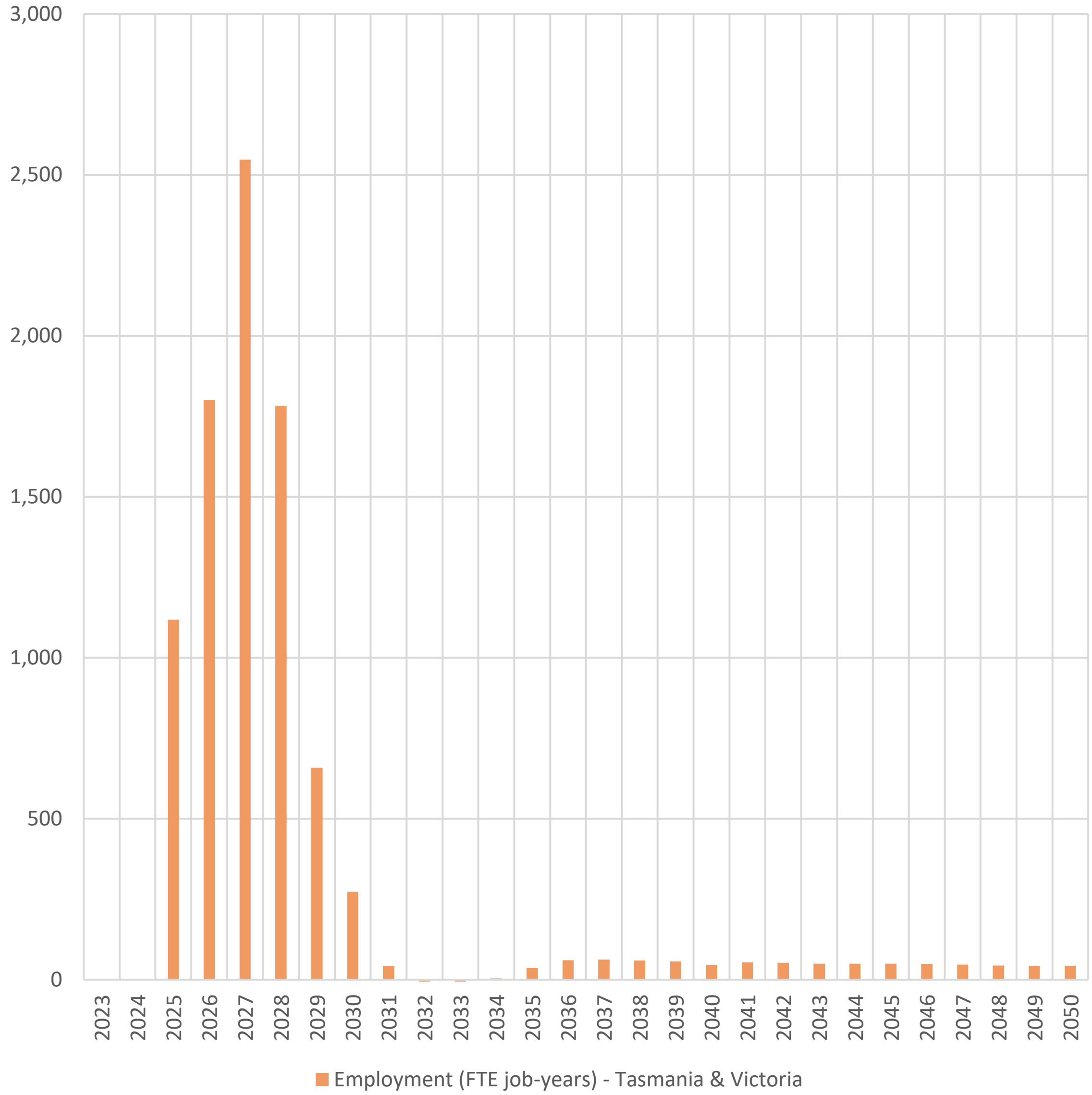

Source: SGS Economics & Planning and Centre of Policy Studies

In terms of employment added to the Tasmanian and Victorian economy combined, Marinus Link brings:

- 7,908 FTE job-years during the five years of construction (2025 to 2029). The peak number of job-years created occurs in 2027 when 2,548 job-years are added.
- 1,086 FTE job-years between 2030 and 2050 for operations and maintenance, at an average of 52 each year.

The impact of job-years per annum from construction and operations is captured in Figure 13 below.

FIGURE 13: FTE EMPLOYMENT GENERATED BY CONSTRUCTION AND OPERATIONS (TOTAL)




Source: SGS Economics & Planning and Centre of Policy Studies

## 6.4 Induced investments

Marinus Link is expected to induce the development of renewable energy electricity generation projects in Tasmania to meet the demand for clean energy in the National Electricity Market (NEM). As noted previously, these induced investments can be characterised as upstream economic activities – in that they are investments related to power generation projects intending to utilise and be integrated into the network via access provided by Marinus Link.

AEMO has identified sites in the North West of Tasmania with natural advantages over sites on mainland Australia for such energy generation and storage. With Marinus Link, such additional investment in renewable energy production capacity increases the state's overall ability to export electricity. These investments represent the inducement of approximately 33,700 MW of additional generation capacity sourced from wind and pumped hydro in Tasmania.

SGS and the CoPS modelled the economic impact of these induced renewable energy investments. As summarised below, the estimated induced economic activity materialising in North West of Tasmania is greater than the construction and operations impact from the Marinus Link itself:

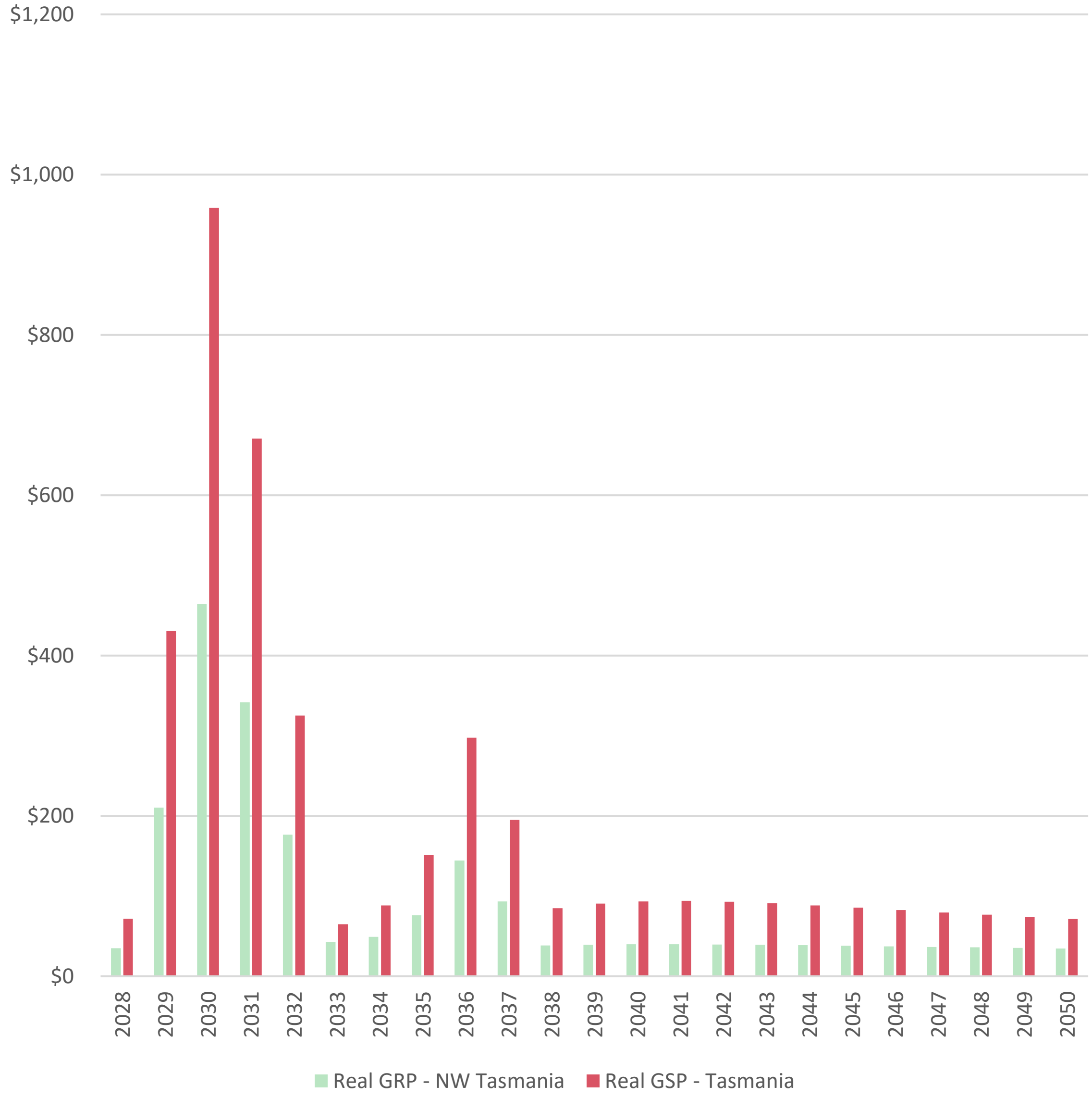
- Combined $2.1 billion to the North West Tasmania economy between 2028 and 2050 from construction and operation with an average per annum contribution of $92 million.
- Construction and operation are expected to support an estimated 5,051 FTE job-years to 2050, for an average of 220 job-years supported per annum.

When the overall impact on the state of Tasmania is included, the total economic activity estimated as a result of these induced renewable energy projects is:

- $4.4 billion to the state economy between 2028 and 2050 due to the construction and operation of new energy generation capacity, for an average per annum contribution of $190 million.
- The construction and operation of new energy generation induced by Marinus Link would 11,705 FTE job-years to 2050, for an average of 509 job-years supported each year.

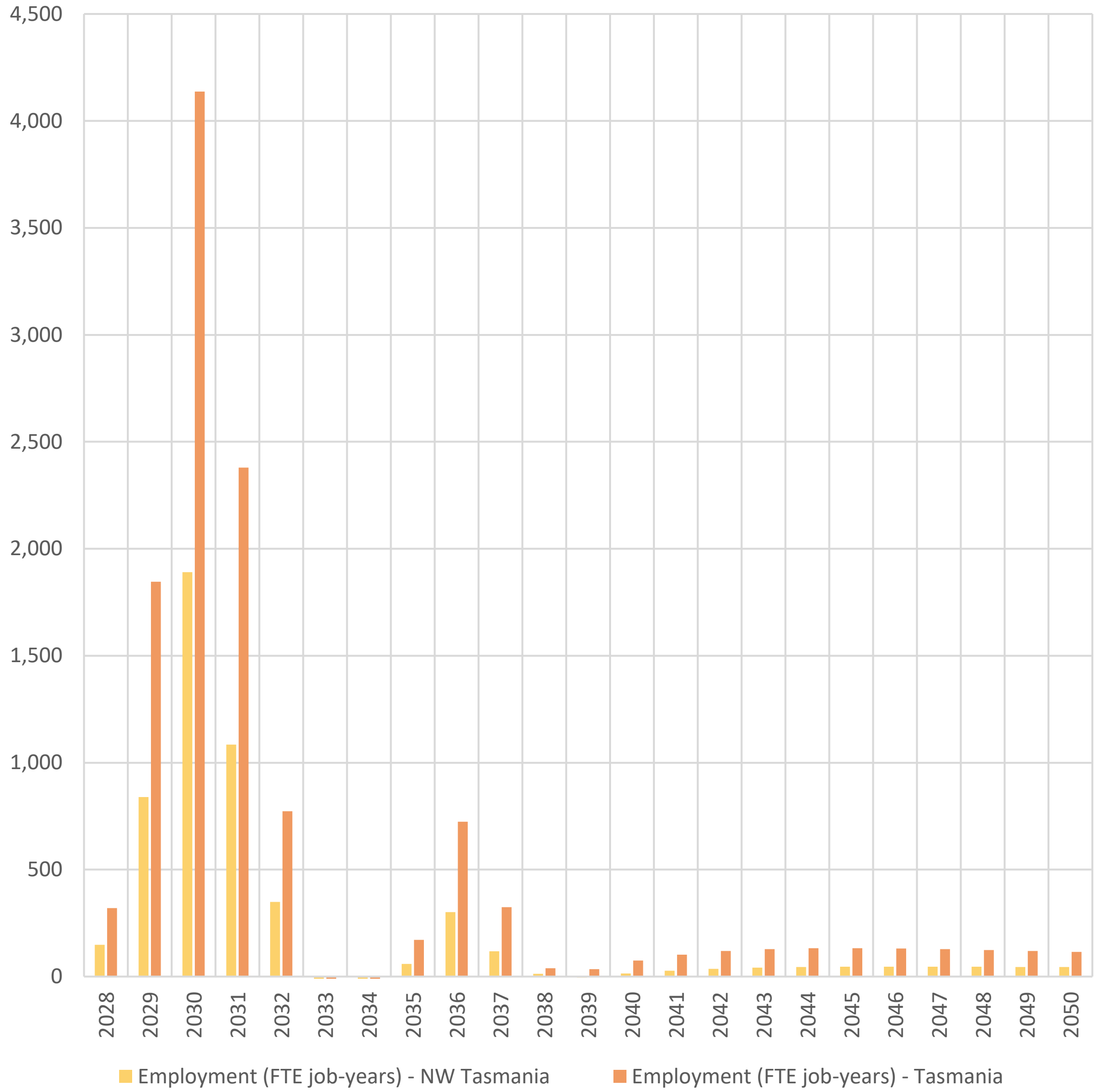
The annual economic and employment contributions to the North West Tasmania and Tasmania economies are captured in Figure 14 and Figure 15.

FIGURE 14: VALUE-ADDED FROM CONSTRUCTION AND OPERATIONS OF INDUCED INVESTMENTS




Source: SGS Economics & Planning and Centre of Policy Studies

FIGURE 15: FTE EMPLOYMENT GENERATED BY CONSTRUCTION AND OPERATIONS OF INDUCED INVESTMENTS




Source: SGS Economics & Planning and Centre of Policy Studies

## 6.5 Economic opportunities

The preceding analysis of the proposed capital investment in the construction and operations of the Marinus Link project present not only a quantification of the project's economic impacts, but also imply an economic opportunity for local and regional labour forces.

This section discusses two key aspects of the overarching economic opportunities presented by the Marinus Link project that align with the scoping requirements, such as how the project might benefit First Nations people and the local workforce (as referenced in Table 4, Table 5 and Table 6 in Section 2)

It should be noted that such assessment of these aspects are considerations and do not constitute comprehensive and/or detailed examination or analysis of the impacts; rather this section discusses the extent to which the negative and positive elements of such socio-economic considerations could be made with the information made available to SGS.

### 6.5.1 First Nations employment and procurement opportunities

*Key issues*

Marinus Link will support jobs stemming from its construction and operational phases, which technical modelling conducted by CoPS is estimated to include such industries as professional and technical professions, administrative services, construction, and a variety of other supportive sectors. The extent to which such economic opportunity will be made available to First Nations peoples through employment and procurement policies, processes and procedure is a key focus for MLPL.

*Existing environment*

Aboriginal and Torres Strait Islander Peoples are the original custodians of the land on which Marinus Link's economic benefits will materialise. According to the 2021 ABS census, there are 358 Aboriginal and Torres Strait Islander Peoples in South Gippsland, and 1,659 in Latrobe City. In both regions, however, labour force participation rates among Aboriginal and Torres Strait Islanders are lower than those across the broader population[20].

*Mitigation*

Consultation for the Victorian and Tasmanian Social Impact Assessments identified opportunities for First Nations people to gain new skills and integrate them into the project workforce[21]. As such, MLPL has established an Aboriginal Advisory Group that facilitates ongoing conversations between Traditional Owners in Gippsland related to the impacts and opportunities of the project – covering topics across employment, procurement, environmental protection, offsets and rehabilitation and cultural heritage.

*Performance*

MLPL is committed to putting in place S05 industry participation and social inclusion plan[22] to identify efforts and actions to increase the economic opportunities for these First Nations communities, which include taking advantage of the estimated employment resulting from the one-time (construction-related) and ongoing (operational) direct and indirect job impacts.

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[20] Victorian Social Impact Assessment
[21] Victorian Social Impact Assessment
[22] Victorian Social Impact Assessment and Tasmanian Social Impact Assessment. These initiatives will be developed through the execution of the EPRs.

### 6.5.2 Skills and training opportunities

*Key issues*

As noted above, the Marinus Link project will support jobs stemming from its construction and operational phases, which technical modelling conducted by CoPS is estimated to include such industries as professional and technical professions, administrative services and construction. The extent to which the broader local and regional labour forces will benefit from such economic opportunities is also a key focus for MLPL.

Concerns were raised in both Tasmanian and Victorian Social Impact Assessments, including:

- Local workforce lacking the capacity and skillset to fill the advanced manufacturing jobs, for example, required for construction and operations of the Marinus Link project[23].
- A lack of alignment between the skills needed for the local and regional labour force to benefit from such opportunity and the low levels of people locally studying these skills, such as science, technology, engineering and mathematics, which are recognised as highly critical in the renewable energy space. It was also acknowledged that TAFE institutions only offer traditional pathways[24].
- Local workforce acquiring unique skillsets and experiences only relevant to Marinus Link, which might not be transferrable after project completion[25].

*Existing environment*

According to the Department of Jobs and Small Business (2019), there is a shortage of civil engineering professionals in Tasmania. The National Skills Commission (2023) also indicated a shortage of electricians and electrical engineers, which are required during operational phase of the Marinus Link. These projected shortfalls appear to be a continuation of an existing shortage of qualified and available workers in the construction industry in Tasmania[26]. These roles are critical to Marinus Link as indicated in **Figure 6**. Similarly, the Victorian Social Impact Assessment notes the absence of an available skilled labour force in rural areas where much of the energy infrastructure will be located.

*Likely effects*

The economic modelling outputs suggest that the Marinus Link project will support jobs in industries related to construction and operational activities, such as professional and technical professions, administrative services, and a variety of other supportive sectors, as classified by the Australian and New Zealand Standard Industrial Classification System (ANZSIC) categories.[27] During the construction

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[23] Tasmanian Social Impact Assessment
[24] Tasmanian Social Impact Assessment
[25] Tasmanian Social Impact Assessment
[26] Tasmanian Social Impact Assessment
[27] Such jobs by ANZSIC category correspond to localised distributions of occupational categories, as identified by the Australian and New Zealand Standard Classification of Occupations (ANZSCO). Occupational classifications include, for example: chief executives, general managers, finance managers, health and welfare services managers, school teachers, clerical and administrative workers, etc. https://www.abs.gov.au/statistics/classifications/australian-and-new-zealand-standard-industrial-classification-anzsic/latest-release

phase, for example, Marinus Link is expected to add 1,337 FTE job-years in the Tasmanian construction sector (refer to Figure 6) and 2,244 FTE job-years in the Victorian construction sector (refer to Figure 10).

While an analysis of the potential local distribution between the estimated construction and operational job impacts by ANZSIC category jobs across ANZSCO occupational classifications has not been completed, SGS believes it is reasonable that such construction and operational job impact will be distributed across different occupational and skill-level spectrums. Given the diversity of ANZSIC job categories estimated by the technical modelling to be impacted by construction and operation of the Marinus Link, a diverse set of career opportunities is likely to be supported.

However, given the lack of depth in the supply and skills sets of the local and regional labour forces, the Victorian Social Impact Assessment noted the possibility of a 'boom bust' employment cycle was possible reflecting during and after construction. Specifically, it was noted that the possible impact would be high for construction-period demand of construction workers, which creates significant risks, i.e., increases competition for labour supply that may be otherwise employed in other efforts, such as home-building or construction of infrastructure[28].

### *Mitigation*

From a skills and training perspective, job creation through the construction and operations of the Marinus Link project presents a clear linkage and motivation to engage in efforts to build and develop a skilled workforce (that could take advantage of job opportunities directly and indirectly related to Marinus Link, as well as those in upstream or downstream industries) through the training opportunities via RTO's, TAFE and universities. The creation of apprenticeships for young people and opportunities for workers transitioning out of declining industrial sectors is paramount for both the North West Tasmania and Gippsland regions.

In Tasmania, the University of Tasmania, TAFE Tasmania, Skills Tasmania, and the Education Department are all looking to Marinus Link and the induced renewable energy projects to provide demand for high-quality jobs and career pathways for students. These organisations are planning to shape curriculums and course offerings to create the workforce required and provide opportunities to young Tasmanians.[29]

MLPL is committed to guiding its procurement in line with Australian Industry Standards and will encourage local employment and training through their tenders and contracts to seek workforce participation of socially vulnerable populations, including but not limited to First Nations people, females and youth.

MLPL will implement strategies and initiatives to mitigate the impacts of competition in the workforce including the development and improvement of skill development pathways with regional partners,

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[28] Victorian Social Impact Assessment

[29] The Victorian Social Impact Assessment also collated feedback from a variety of stakeholders in the fields of education, training and workforce development, in particular, characterising their awareness around the need for proactively aligning with the Marinus Link project. Specifically, "*Education skills and training opportunities for the existing, transitioning and retiring workforce. Reforms to workforce training such as on the job training and accreditation to fast-track skill development instead of going to university or TAFE for years.*"

coordination with regional workforce development and deployment, and expansion of the regional workforce by attracting new residents and assisting disadvantaged people facing barriers to participation. Increasing the size of the regional workforce will reduce competition pressures on labour with existing operations in the agriculture, forestry and fishing industry.

*Performance*

MLPL is committed to putting in place S01 social impact management plan[30] to leverage and build upon both regions' existing strengths in engineering, energy generation and manufacturing.

## 6.6 Externalities and other socio-economic impacts

To meet the scoping requirements, as outlined in Section 2, the following additional considerations to socio-economic impacts and externalities related to the Marinus Link are made, including:

- Impacts on agriculture, forestry and fisheries industries
- Impacts on tourism industry
- The extent to which raw materials, equipment, goods, and services will be sourced locally
- Impacts on local social amenity and community infrastructure
- Community demographic impacts
- Impacts on land values, and demand for housing
- Local, State and Federal Government rate, taxation, and royalty revenues (or any publicly funded subsidies or services to be relied upon for the construction or operation of the proposal)

This discussion of the issues, existing environment, likely effects, mitigation and performance of these aspects are considerations and do not constitute comprehensive and/or detailed examination or analysis of the impacts. That is, this section discusses the extent to which the negative and positive elements of such socio-economic considerations could be made with the information made available to SGS. Furthermore, the following discussion should be cross-referenced and incorporated with other technical reports listed in Table 7.

### 6.6.1 Impacts on agriculture, forestry and fisheries industries

*Key issues*

Findings from the Victorian Agricultural and Forestry Technical Report, Marine Ecology and Resource Use Impact Assessment and the CoPS model suggest that construction of the Marinus Link project will likely disrupt commercial fishing, shipping operations and agricultural activities in the short term. In the long term, however, these impacts were assessed to have very low to low significance.

[30] Tasmanian Social Impact Assessment includes consideration of an employment and training performance strategy. These initiatives will be developed through the execution of the EPRs.

*Existing environment*

The agriculture, forestry and fishing industry (as defined by the ABS) is a critical economic driver in both North West Tasmania and Gippsland. There are 3,800 agriculture, forestry and fishing jobs in North West Tasmania and 9,200 in Gippsland (Australian Bureau of Statistics, 2021).

Agriculture in Southern Gippsland region of Victoria contributes to over $2 billion in gross regional product per year, with 80% of agricultural produce supplied from beef, dairy farming and horticulture[31]. Within the survey area, there are 342 land parcels between the proposed shore crossing point at Waratah Bay and its termination at the potential Hazelwood converter station site, of which 296 are within the proposed easement. Most farming operations in the survey area are family-owned[32].

In addition, Bass Strait contains major east-west shipping lanes with a high density of shipping. There are numerous cross-strait shipping routes used by commercial cargo ships and bulk carriers, as well as passenger ferries and commercial fishing vessels[33]. In the past decade, there were 11 fisheries with catch data indicating that they fished in the vicinity of the project[34].

*Likely effects*

The Agricultural and Forestry Technical Report, the Marine Ecology and Resource use Impact Assessment and both Tasmanian and Victorian Social Impact Assessment, mention potential effects of the construction and operation of the Marinus Link. Specifically in the Agricultural and Forestry Technical Report it is estimated that 105 agricultural properties will be affected by the proposed easement, totalling up to 305 hectares of land[35] and identified the following potential impacts:

- Reduced productivity or yields from disturbance during construction.
- Reduced productivity or yields caused by degraded soil structure, soil moisture content and fertility during operation.
- Impact on production caused by need to modify or adopt alternative agricultural practices.
- Lost or reduced production or yields through breach of biosecurity controls leading to introduction or spread of animal or plant pathogen or noxious weed infestation.
- Reduced farm income due to constraints on farm development plans.[36]

Residual impacts on agricultural sector were assessed as low to moderate significance in the construction period and very low to low in the operation period. It was concluded that Marinus Link would not result in unacceptable or long-term impacts to the existing agricultural practices within the study area. Overall, any agricultural impacts would be localised and site specific. Impacts would be generally short-term and construction period related, such as short-term inconvenient movement within, and around a farming enterprise[37].

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[31] Agricultural and Forestry Technical Report
[32] Agricultural and Forestry Technical Report
[33] Marine Ecology and Resource Use Impact Assessment
[34] Marine Ecology and Resource Use Impact Assessment
[35] Agricultural and Forestry Technical Report
[36] Agricultural and Forestry Technical Report
[37] Agricultural and Forestry Technical Report

In terms of impacts on fisheries industries, commercial fishery resources (e.g., targeted fish, squid, abalone and shellfishes) are not predicted to be impacted, since the project's impacts on marine fauna were assessed low to very low[38]. Impacts of magnetic field, electric field and thermal field as a result of Marinus Link on the marine environment were also assessed low to very low[39].

The CoPS model indicated that construction of the Marinus Link will indirectly place pressure on the industry vis-à-vis increased competition for labour. During the construction phase (2025-2029), employment levels in Victoria in the agriculture, forestry and fishing sector may fall below the BaU by 32 to 113 FTE job-years on a per annum basis. Longer-term, however, given all other macroeconomic assumptions in the CoPS modelling, there is a longer-term trend toward employment levels being nominally (if at all) above or below the BaU.

Similarly in Tasmania, the CoPS model estimates that during the construction phase (2025-2029), employment levels in Tasmania in the agriculture, forestry and fishing sector may fall below the BaU by 18 to 80 FTE job-years on a per annum basis but stabilise post-construction (during operations) to employment levels of 7 to 17 FTE job-years above the BaU.

*Mitigation*

The Agricultural and Forestry Technical Report, as well as other technical reports, identify that landholders will be compensated for acquisition of any land, including currently productive agricultural land in the easement area. It is also understood that during construction, landholders will be compensated through financial arrangements for access licences and construction leases[40].

MLPL will consult with representatives of the various commercial fishery associations in Victoria and Tasmania to alert them of the project's planned schedule of marine construction activities including their proposed locations, dates, times and expected duration[41]. Ships' navigators and the skippers of smaller vessels will adjust their planned routes to deviate around the project's construction vessels. At the completion of Marinus Link, MLPL will assist the Australian Hydrographic Office (AHO) in publishing Notices to Mariners to inform maritime users of the presence of seabed power cables and mark them on navigation charts. It is anticipated that the project will not require exclusion zones over the project's subsea cables during operations as they will have been buried to a nominal depth of 1 m or more for protection against anchor and trawling gear hook-ups[42].

As noted previously, MLPL will deploy several tactics to mitigate the impacts of competition in the workforce. Such tactics are understood to include the development and improvement of skill development pathways with regional partners, coordination with regional workforce development and deployment, and expansion of the regional workforce by attracting new residents and assisting disadvantaged people facing barriers to participation. Increasing the size of the regional workforce will reduce competition pressures on labour with existing operations in the agriculture, forestry and fishing industry.

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[38] Marine Ecology and Resource Use Impact Assessment
[39] Marine Ecology and Resource Use Impact Assessment
[40] Agricultural and Forestry Technical Report
[41] Marine Ecology and Resource Use Impact Assessment
[42] Marine Ecology and Resource Use Impact Assessment

*Performance*

Six environmental performance requirements (EPRs) were identified to provide desirable outcomes for agriculture and forestry during the construction and operation phases of the project. These include A01 complete property condition surveys prior to construction, A02 develop and implement property management plans to avoid or minimise impacts on agricultural and forestry properties etc[43].

MLPL is committed to develop a Marine Communications Plan that outlines the approach to notifying the Australian Maritime Safety Authority (AMSA) and commercial and recreational fisheries of the proposed locations, timing and duration of proposed construction[44].

### 6.6.2 Impacts on tourism industry

*Key issues*

Natural attractions of coastline and state parks including Waratah Bay and Wilsons Promontory are highly-valued tourism assets. As identified in the Victorian SIA, the project's construction activities may result in temporary changes to the amenity and character, which could reduce the use of the beaches, state forests and nature reserves used by the community and are[45].

*Existing environment*

Wilson's Promontory is one of Parks Victoria's most popular sites, with an estimated 197,700 visits in summer 2021-22[46], while the beaches at Waratah Bay attract swimmers, surfers and fishermen.

*Likely effects*

It has been identified that during construction, short-term (i.e., tourism) accommodation could be constrained due to the demand for temporary construction workforce accommodation. Such an eventuality could result in lower business surpluses (i.e., profit) or labour surplus (i.e., wages) during construction, as well as indirect spending impacts, such as tourist spending on other retail expenditure categories, such as retail and food services[47].

While these potential negative impacts are acknowledged in the Social Impact Assessment, the economic modelling completed for this EIA indicates that total expenditure potentials during the construction and operational phases of the Marinus Link project will generate elevated levels of economic activity in the retail trade and accommodation and food services sectors, including support for approximately 358 FTE job-years in Tasmania and 836 job-years in Victoria across 2025 to 2050.[48]

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[43] Agricultural and Forestry Technical Report
[44] Marine Ecology and Resource Use Impact Assessment
[45] Victorian Social Impact Assessment
[46] Victorian Premier (October 2023)
[47] Victorian Social Impact Assessment
[48] The Victorian Social Impact Assessment conducted as a part of this overall process included stakeholder consultation and engagement. Findings of that consultation and engagement related to tourism industry stakeholders identified that the tourism industry may experience disruption during the construction, though exact estimates were not given.

The Marine Ecology and Resource Use Impact Assessment indicated that impacts on marine-based tourism and recreation in both nearshore and offshore Bass Strait were assessed low to very low[49].

*Mitigation*

To manage the impacts to the tourism accommodation and related industries during construction in particular, MLPL is committed to putting in place S01 social impact management plan with relevant government agencies, key stakeholders and key affected parties to minimise such impacts across the project during construction[50].

*Performance*

To alleviate the pressure on short-term accommodation specifically, MLPL is committed to putting in place S02 workforce and accommodation strategy to address the potential social impact of the Marinus Link workforce and accommodation requirements[51].

### 6.6.3 The extent to which raw materials, equipment, goods, and services will be sourced locally

*Key issues*

The economic modelling reflects known relationships between the portion of materials, goods and services procured locally and those that are imported. At a regional level, goods and services are procured to the extent that existing businesses and suppliers exist, are capable of delivering the right goods and services and competitive in the context of non-locally based alternatives.

Issues related to the sourcing of local materials, equipment, goods and services are broadly related to economic development efforts, such as would be represented by Economic Development Strategies (as discussed in Section 0), including the presence of certain industries, local assets and resources, local labour force dynamics, skills, etc. EDSs often seek to facilitate, take advantage of or, at a minimum benefit from major projects or investments such as the Marinus Link project to create local economic opportunities. At issue is the extent to which these EDSs and other direct efforts may be able to augment or enhance those local sourcing opportunities.

The greater the role industry and business in the region can have in supplying goods and services for the construction and operations of Marinus Link, the greater the positive and beneficial workforce and economic impacts may be realised.

*Existing environment*

In Tasmania, the Tasmanian Renewable Energy Action Plan (TREAP) sets clear objectives and actions to transform Tasmania into a global Renewable Energy Powerhouse. Section 3.4 of the TREAP refers specifically to procurement & opportunities for local businesses. The aim is to maximise local Tasmanian business and employment opportunities for renewable energy projects. Ensuring the widest participation by Tasmanian businesses in renewable energy projects is a key priority for Government.

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[49] Marine Ecology and Resource Use Impact Assessment
[50] Victorian Social Impact Assessment. These initiatives will be developed through the execution of the EPRs.
[51] Victorian Social Impact Assessment

That means ensuring that renewable energy projects, where possible, will generate employment and opportunities for local businesses.

*Likely effects*

Outputs of the technical modelling by CoPS suggest that the capital investment related to construction and development of the Marinus Link will generate spending and economic activity for local business at the local level, as well as the state and national levels. The outputs of economic activity characterised in Section 6.1 and Section 6.2 respectively, detail the extent to which labour and inputs will be sourced locally.

As an indication of the extent to which the Marinus Link project will contribute to these impacts, the CoPS model estimates that during construction 152 FTE job-years to Tasmania's wholesale trade industry and 191 to Victoria's wholesale trade industry are expected to be supported.[52] In terms of gross value added, that is $49 million to Tasmania's wholesale trade industry and $80 million to Victoria's.

*Mitigation*

Over the long term, through the project's long-term procurement pipeline, MLPL's objective is to leverage procurement processes to expand local supply chains and stimulate further business development, spending and investment.

*Performance*

Toward this objective, MLPL is committed to procure goods and services in accordance with its S04 community benefits sharing scheme, S05 industry participation and social inclusion plan[53] to support local businesses, including compliance by suppliers and contractors).

### 6.6.4 Impacts on local social amenity and community infrastructure

*Key issues*

By significantly contributing to a robust regional economy with key export strengths, with opportunities to build and develop a skilled regional workforce, a growing regional services base, and opportunities for investment and expansion in local and regional businesses, Marinus Link could significantly contribute to the social amenity of North West Tasmania and Gippsland. The issue related to the provision of local social amenity and community infrastructure is whether and to what extent existing systems and funding mechanisms are sufficient for building schools, child care, health services and sports facilities.

[52] The CoPS modelling indicates that, following decline of elevated employment levels in North West Tasmania during the construction and development phase, that the employment level stabilises to approximately 2 to 3 jobs above the BaU from 2036. Similarly, following decline of the elevated employment levels in Victoria during the construction and development phase, the employment level during the operational phase stabilises to approximately 2 FTE jobs above the BaU.

[53] These initiatives will be developed through the execution of the EPRs.

*Existing environment*

In rural areas of North West Tasmania and Gippsland, capacity to meet demands for emergency services from the existing population is already constrained let alone demand emerging from an increased population[54]. Further characterisation of the existing environment and status of community infrastructure is contained within the Social Impact Assessments.

*Likely effects*

The technical modelling outputs suggest that the completion and delivery of Marinus Link will generate economic activity across the regions and states, which have the potential to contribute to a higher standard of living, wages and employment opportunities. Such economic activity also generates local rates, infrastructure contributions and state tax revenues, which are in part used for the provision and construction of community infrastructure (such as libraries, parks, child care centres, etc.). Industries engaged in such development and construction of community infrastructure can be characterised as a component of downstream economic activities, as referenced in Section 4.2. For example, modelling estimates that the economic activity generated is expected to increase local government revenues (i.e., rates) between 2025 and 2050: a cumulative total of $39 million in Victoria and $17 million in Tasmania. It is likely that a portion of such public revenues would be used to meet growing need for community and social infrastructure. However, the influx of new workers and their families to Gippsland and North West Tasmania will place pressure on the existing system and network of community and social infrastructure. Such a situation could create access constraints and challenges in the delivery of such services for residents if not managed.

Among other anticipated benefits to the community are potential lower energy and telecommunications costs. In terms of lower energy (electricity) costs for consumers, the Marinus Link assists in securing cost-effective Tasmanian dispatchable generation as the national energy market transitions. The capacity introduced by Marinus Link could assist to exert downward pressure on wholesale electricity prices by facilitating the replacement of marginal and coal-powered generators with additional dispatchable capacity. Under the current circumstances of high and escalating energy costs, downward pressure is a relevant and material benefit to residents and the community. In terms of telecommunications, the Marinus Link will also expand opportunities for optical fibre routes across the Bass Strait, supporting greater telecommunication diversity and security between Tasmania and mainland Australia. Such an outcome may also translate into opportunities for local innovators and entrepreneurs.

*Mitigation*

MLPL is committed to putting in place S01 social impact management plan to mitigate the impact of Marinus Link's workforce on demand for health and emergency services.

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[54] According to the Victorian Social Impact Assessment, both Victorian LGAs have fewer medical and dental practitioners per capita than the State. Consultation with health service providers further highlighted the issue and that there are challenges with attracting allied health professionals such as physiotherapists, occupational therapists, and podiatrists.

*Performance*

The Tasmanian Social Impact Assessment recommended EPRs (as part of S01 social impact management plan) to mitigate impact of Marinus Link's workforce on demand for health and emergency services[55].

### 6.6.5 Community demographic impacts

*Key issues*

Given Marinus Link is a maritime project, professionals and tradespeople with experience in maritime settings will be required. Examples include maritime safety staff, marine preservation advisors, maritime construction and engineering experts, maritime logistics, and transportation specialists. Concerns have been raised about the skill capacity of the residential workforce to meet the project demand for workers[56].

*Existing environment*

Over recent decades economic restructuring, including declining employment in sectors like manufacturing, has seen divergent economic outcomes between regional areas, like North West Tasmania and Gippsland, and Australia's capital cities. High-paying jobs have been concentrated in large cities like Melbourne, Sydney and Brisbane, which have also experienced the most population growth and investment. Investments in renewable energy projects present an opportunity for regional communities such as these.

In the absence of any affirmative action undertaken by the industry sector or state government, First Nations people, women and youth will continue to experience high levels of unemployment in the region, despite the significant opportunities presented by the cumulative increase in demand for skilled labour from this and the other energy-related projects[57].

*Likely effects*

Economic modelling indicates that employment opportunities will be created through the construction and operational phases of the Marinus Link project across a range of industry categories and occupational classifications. The construction phase will lead to employment for technicians and trades workers (e.g., electricians, architectural, building and surveying technicians, welders and metal fitters and machinists), labourers and machinery operators. Other opportunities include professionals (e.g., electrical engineers), tradespeople (e.g., electricians), managers and clerical and administration for operation. Such economic opportunities, which were discussed also in Section 6.5.2, present themselves as positive outcomes for the local and regional community insofar as they materialise as jobs and skills training for current and future residents.

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[55] Tasmanian Social Impact Assessment
[56] Victorian Social Impact Assessment
[57] Victorian Social Impact Assessment

*Mitigation*

Marinus Link acknowledges existing social issues, including local employment opportunities, particularly for younger people. Marinus Link has a focus on delivering high-quality jobs, not simply a high number of jobs. MLPL is committed to putting in place S05 industry participation and social inclusion plan[58] to identify efforts and actions to increase the economic opportunities for young people, which include taking advantage of the estimated employment resulting from the one-time (construction-related) and ongoing (operational) direct and indirect job impacts.

*Performance*

Through both the S05 industry participation and social inclusion plan and the S04 community benefits sharing scheme, MLPL seeks to enhance employment and social benefits for the local demographics. Such investment (e.g., in community wealth building) is likely to generate flow-on social and community benefits.

### 6.6.6 Impacts on land values, and demand for land and housing

*Key issues*

Land use surrounding Marinus Link comprises primarily agricultural and forestry land uses, with some commercial, residential, tourism and utility land uses. The key issues surrounding impacts on land value and the demand for land and housing relate to the continuation, temporary or permanent disruption of Potential impacts requiring assessment include impacts to the continuation of existing land uses and character, including agricultural, commercial, residential, and recreational values[59].

General issues related to land values are highlighted in numerous technical reports, including the Victorian and Tasmanian Social Impact Assessments, the Planning and Land Use Impact Assessment, the Agricultural and Forestry Technical Report and the Marine Ecology and Resource Use Impact Assessment. Some of the issues raised in these technical reports, e.g., specifically related to land currently in productive agricultural use, as well as the acquisition of and compensation for land currently in productive agricultural use (discussed in Section 6.6.1).

However, as the construction and operation of the Marinus Link project relate to land value for valuation, taxation and/or development purposes, content and discussion related to demand for land for housing from both Victorian and Tasmanian Social Impact Assessments indicate that the Marinus Link workforce may augment demand for rental housing in the area and exacerbate existing rental availability and affordability issues, disproportionally affecting low-income households[60].

The fundamental issue underlying such increased demand conditions, i.e., higher willingness to pay in rental rates or sales prices, is an escalation in the expectation (among land owners) of land value. In property development, growth and demand pressures in a market with limited inventory can lead to lower vacancy rates (e.g., among existing rental inventories), increased appetite or pressure to develop new inventory, which in turn (and factoring all relevant development costs) can lead to the escalation in

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[58] Victorian Social Impact Assessment and Tasmanian Social Impact Assessment. These initiatives will be developed through the execution of the EPRs.
[59] Planning and Land Use Impact Assessment Report
[60] Heybridge (Tasmanian) Social Impact Assessment and Victorian Social Impact Assessment

underlying (residual) land values. Increases in the expectation of land value often take place more quickly than decreases in the expectation of land value. As such, following short periods of elevated demand (such as might occur during construction of the Marinus Link project), in which sales prices and rental rates reflect heightened demand conditions, land values may remain at elevated levels for some time, creating a temporary situation in which further housing development is challenged as a result of continued high land costs and reduced demand pressures (which translate as lower willingness to pay in sales prices and rents).

*Existing environment*

The discussion of existing environment for land values and the demand for land for housing can be divided into two categories: direct implications on use and value of land; and indirect implications of the use and value of land.

In terms of direct implications on the use and value of land, the Planning and Land Use Impact Assessment Report documents that the Marinus Link project survey area traverses 342 land parcels, affecting 113 freehold owners, six land managers, and 20 licence holders, across the approximate 90 km project. Many of the affected titles are subject to powerline, carriageway, drainage, water supply, and gas transmission easements[61]. The Planning and Land Use Impact Assessment identifies a number of temporary changes to existing land uses and a range of short-term environmental impacts, through visual amenity impacts, noise, dust, traffic etc. In locations closer to townships such as Baromi, Buffalo, Dumbalk, the impact on land use due to construction is likely to be greater as the land uses are more residential in nature where amenity impacts from construction may affect enjoyment and attractiveness of residential dwellings and tourism facilities. The report concluded that these impacts are temporary in duration and limited in nature[62].

During operations, maintenance activities associated with Marinus Link would require periodic access to the cable easement as agreed with landholders and involve entry onto land for inspection on approximately an annual to biannual basis. Some elements of the project would require the permanent acquisition of land, including the proposed converter station at either Driffield or Hazelwood, as well as a land-based transition station at Waratah Bay if required. In the case of the potential converter station at Driffield this would imply that the land use for forestry activities will cease and would be changed to use as a utility installation for the functional lifespan of the project. If the station were to be placed in Hazelwood, the current use and occupation of the property[63] would be ceased[64].

As it relates to the preceding references to construction and operational phase impacts to the use of land, and as noted in the discussion referencing other technical reports, Section 6.6.1 indicates that land owners whose property will be acquired or even temporarily impacted will be compensated. Compensation for land under such circumstances is typically reflective of market values.

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[61] Planning and Land Use Impact Assessment Report
[62] Planning and Land Use Impact Assessment Report
[63] A large portion of the proposed site at Hazelwood is currently used for a single dwelling associated with dry land cropping.
[64] Planning and Land Use Impact Assessment Report

In terms of indirect implications on the use and value of land, SGS's in-house housing demand model[65] projects that the North West Tasmania will need an additional 3,928 dwellings by 2040 to accommodate changing and growing demographics. This total increase represents an increase of 8.3% to the existing housing inventory, equivalent to an increase of 196 dwellings per annum. These forecasts are based on population forecasts from the Tasmanian State Government (high scenario[66]). Analysis of historical ABS data show that between 2006 and 2021, the housing inventory in North West Tasmania increased by 473 per annum.

In Gippsland, SGS's housing demand model projects that an additional 26,214 dwellings will be needed to accommodate growth and changes in the region's demographics to 2040, representing an increase of 16.9% over the existing housing inventory, equivalent to an increase of 1,748 dwellings per annum. These forecasts are based on population forecasts from the Victorian State Government (medium scenario). Analysis of historical ABS data shows that between 2006 and 2021, the housing inventory of Gippsland increased by 2,243 per annum.

*Likely effects*

In terms of the likely effects on land value and the demand for land for housing, the indirect implications on the use and value of land relate to housing demand generated in excess of the business-as-usual scenario modelled and discussed in Chapter 6. The following characterises the likely effects related to housing demand and land value (as a result) during construction:

- Employment levels during construction are substantially elevated from their BaU levels.
- Elevated housing demand levels are likely to emerge from elevated employment levels.
- A portion of the employment may be sourced locally (construction phase workers and their households already residing locally). These households, if owners, may experience an escalation in their home values. If renting, however, these households may experience an escalation in their rental rates.
- A portion of employment may be sourced from outside the respective regions and choose to relocate (construction phase workers and their households not currently residing locally). These households, whether they choose to relocate and rent or purchase a home, will represent increased demand for limited housing supply, creating more competition in the market, which has the potential to increase willingness to pay for prices and rents. The manifestation of such heightened demand pressures translates often directly into, but limited to, increased land values.
- A portion of the employment may be sourced from outside respective regions and choose not to relocate (construction phase workers and their households continuing to reside outside the respective regions).
- As discussed above, elevated levels of housing demand can translate to escalated housing prices, rents and potentially higher land values.

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[65] SGS's housing demand projections are provided as context and represent a business-as-usual scenario. They do not incorporate the structural economic (i.e., industry level) shifts that have been modelled by CoPS to represent housing demand emanating from such implied structural economic differences.
[66] It is SGS's professional judgement that the high scenario for population growth should be used in Tasmania. The state has consistently tracked at or above the high scenario in recent years.

- If the development and home-building industry is not capable of accommodating and meeting the demand of such growth pressures, and if the planning system is unable to accommodate elevated levels of development approvals in a timely manner, land values are likely to escalate, contributing to higher costs of development, which necessitate higher sales prices and rents.
- Further effects could materialise in the form of housing stress (i.e., households spending more than 30% of their gross income on housing), which also represents a decrease in consumer surplus spending, which indirectly benefits local business in discretionary household spending categories, such as clothing, retail, food and beverage, etc. The quantification of such impacts, however, fell outside the scope of SGS and CoP's technical modelling.

During the operational phase:

- Employment levels during the operational phase of the Marinus Link are moderately higher (approximately 15 FTE jobs per annum) than the BaU.
- Housing demand will emerge from this moderately higher-than BaU employment level.
- It can be assumed, as with the construction phase that a portion of these FTE jobs will be sourced from workers (and their households) residing locally.
- A portion of these FTE jobs and their households may choose to relocate to the respective regions.
- A portion of these FTE jobs may be filled by workers (and their households) residing non-locally.
- Upward pressures on housing prices and rents are unlikely to be as strong during the operational phase as during the construction phase of the Marinus Link.

*Mitigation*

How Marinus Link is delivered, and its impact on housing costs will be a critical consideration. As such, Marinus Link is exploring opportunities to reduce pressure on local housing markets.. Other supporting reports, such as identified in the Social Impact Assessment, may also assist in identifying the need for and strategies to abate or minimise other risks, including residual risks associated with the mitigation of construction or operational phase impacts.

*Performance*

MLPL is committed to putting in place S02 workforce and accommodation strategy to address the potential social impact of the Marinus Link workforce and accommodation requirements[67]. The Planning and Land Use Impact Assessment Report has also recommended environmental performance requirements to minimise and manage land use planning-related impacts[68].

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[67] Victorian Social Impact Assessment

[68] Planning and Land Use Impact Assessment Report. The relevant EPRs include LUP01 Minimise land use impacts through project design, LUP02 Minimise disruption due to property and easement acquisition, LUP03 Minimise land use impacts during and post construction and LUP04 Avoid and minimise impact on services and utilities.

#### 6.6.7 Local, State and Federal Government rate, taxation, and royalty revenues

Based on the outputs of the technical modelling, Marinus Link is projected also to generate public taxation receipts for various levels of government (Figure 16). According to estimates from the CoPS model, compared to a situation where Marinus Link is not developed, between 2025 and 2050:

- Local governments in Tasmania and Victoria are expected to collect an additional $17 million and $39 from increased rates revenues, respectively.
- The Tasmanian State Government is expected to collect an estimated $91 million. This tax revenue includes property and payroll taxes and stamp duties.
- The Victorian State Government is expected to collect an estimated $232 million.
- The Australian Federal Government is expected to collect an estimated $383 million. This tax revenue largely stems from taxation on the provision of goods and services and income taxes on individuals.

Offsetting the any generation of public taxation receipts might be the provision of one-time or ongoing subsidies or services that are to be relied up for the construction or operation of Marinus Link. Information regarding such incentives or subsidies was neither known to SGS or MLPL at the time of the EIA preparation and therefore not considered in the analysis.

**FIGURE 16: TOTAL ADDED TAXATION REVENUE, 2025-2050 ($ MILLIONS)**


Source: SGS Economics & Planning and Centre of Policy Studies

## 6.7 Environmental Performance Requirements

Table 10 lists the relevant environmental performance requirements cited in this report.

**TABLE 10: ENVIRONMENTAL PERFORMANCE REQUIREMENTS**

| EPR ID | Environmental Performance Requirement | Source |
|---|---|---|
| S01 | Develop and implement a social impact management plan | Victorian Social Impact Assessment and Tasmanian Social Impact Assessment |
| S02 | Develop and implement a workforce and accommodation strategy | Victorian Social Impact Assessment and Tasmanian Social Impact Assessment |
| S04 | Develop and implement a community benefits sharing scheme | Victorian Social Impact Assessment and Tasmanian Social Impact Assessment |
| S05 | Develop and implement an industry participation plan | Victorian Social Impact Assessment and Tasmanian Social Impact Assessment |
| A01 | Complete property condition surveys prior to construction | Agricultural and Forestry Technical Report |
| A02 | Develop and implement property management plans to avoid or minimise impacts on agricultural and forestry properties | Agricultural and Forestry Technical Report |
| LUP01 | Minimise land use impacts through design | Land Use and Planning and Impact Assessment Report (Victoria) |
| LUP02 | Minimise disruption due to property and easement acquisition | Land Use and Planning and Impact Assessment Report (Victoria) |
| LUP03 | Minimise land use impacts during and post construction | Land Use and Planning and Impact Assessment Report (Victoria) |
| LUP04 | Avoid and minimise impact on services and utilities | Land Use and Planning and Impact Assessment Report (Victoria) |

Source: SGS Economics and Planning (2024)

# 7. Conclusion

The quantitative EIA has estimated the economic outcomes that are associated with:

1. The capital expenditure for the construction of the Marinus Link
2. The ongoing expenditure for the operation of the Marinus Link
3. The induced capital expenditure for windfarm and pumped hydro investments
4. The ongoing expenditure for the operation of the induced windfarm and pumped hydro investments.

The EIA finds there are considerable economic impacts from Marinus Link, in terms of the economic value-added and employment in the regional economies of North West Tasmania and Gippsland, but also the states of Tasmania and Victoria.

Over the 25-year construction and operation period assessed (2025-2050):

- Capital expenditure for constructing Marinus Link generates $351 million in direct and indirect economic activity to the North West Tasmania economy and $642 million to the Gippsland economy over a five-year period. This includes direct and flow-on spending related to the supply chains for constructing Marinus Link. When measuring impacts across the state, the Marinus Link project generates $681 million in direct and indirect economic activity to the Tasmanian economy (inclusive of the North West) and $1.4 billion to the Victorian economy (inclusive of Gippsland).
- The operation and maintenance of the Marinus Link generates $306 million in direct and indirect economic activity to the North West Tasmania economy and $361 million to the Gippsland economy over a twenty-year period, which includes the direct expenditure spent by Marinus Link and the flow-on impacts as that money circulates around the regional economies. When measuring impacts across the state, the Marinus Link project generates $679 million in direct and indirect economic activity to the Tasmanian economy (inclusive of the North West) and $981 million to the Victorian economy (inclusive of Gippsland).
- The construction and operation of induced renewable energy projects (windfarm and pumped hydro investments) in Tasmania are estimated to generate an additional $2.1 billion in direct and indirect economic activity to the North West Tasmania economy, and $4.4 billion to the Tasmanian economy (inclusive of the North West).

This value-added to the economy creates significant local and state employment across various sectors, including construction, professional services, retail, manufacturing and accommodation and food services. In total:

- The construction phase for Marinus Link creates 1,297 full-time equivalent (FTE) job-years in the North West Tasmania economy and 2,159 Gippsland over the five year construction period. Peak employment comes in 2027, when 430 FTE job-years are created in North West Tasmania and 671 in Gippsland. Extending the impact to the state level, construction adds 2,661 job-years to the Tasmanian economy (inclusive of the North West) and 5,247 job-years to the Victorian economy (inclusive of Gippsland) over the five year construction period.

- The ongoing expenditure for the operation of the Marinus Link adds 306 FTE job-years to the North West Tasmania economy and 388 to the Gippsland economy between 2030 and 2050. This corresponds to 15 job-years supported each year in North West Tasmania and 18 in Gippsland. Extending the impact to the state level, the operation of Marinus Link adds 494 job-years to the Tasmanian economy (inclusive of the North West) and 592 to the Victorian economy (inclusive of Gippsland).
- Spending related to construction and operation of the induced renewable energy projects in Tasmania generates an estimated 5,051 job-years to the North West Tasmania economy, and 11,705 to the Tasmanian economy (inclusive of the North West). This equates to an average of 509 job-years each year in Tasmania between 2028 and 2050.

Additionally, Marinus Link provides economic benefits through the following:

- Increased employment opportunities for First Nations communities in North West Tasmania and Gippsland.
- Long-lasting and secure employment opportunities allow skills and training opportunities for residents of the two regions across a range of skilled and occupational categories, such as labourers to engineers. There might also be jobs created in related industries who benefit from the economic activity, including retail, administrative services and accommodation and food services.
- Significant economic opportunities for local business are supported by the development of the Marinus Link and induced renewable energy project investments. Industries such as professional and technical services, engineering and local manufacturing are anticipated to be among the top benefiting sectors. This is important for the fact that a cluster of engineering businesses are already established in North West Tasmania who may be further supported by these projects.
- Social benefits through a more prosperous local community, new investments in community infrastructure, downward pressure on electricity prices and greater telecommunication diversity and security.
- There is expected to be significant public tax revenue benefits (estimated at $762 million in total from 2025 to 2050) from the economic activity generated by Marinus Link, which should flow to local, state and the Australian Government.

Some economic impacts will need to be managed to mitigate potential negative externalities. Two identified potential negative externalities and considerations for their mitigation include:

- Demand for labour primarily during construction phases of the Marinus Link and induced investments creates competition with ongoing labour supply needs in support of the regions' agriculture, forestry and fishing sectors. During the five-year construction phase, businesses in agriculture, forestry and fishing may find attracting and retaining workers more difficult. In North West Tasmania in particular, there may be worker shortages during this time.
- Following on from efforts to increase the regional workforces (and thus resident population) during construction of Marinus Link and induced investments, increased pressure on the housing markets in North West Tasmania and Gippsland is likely to occur. The increased housing demand will place upward pressure on housing prices and rents in already supply- constrained markets. As such, an internal Marinus Link working group on housing was commenced and a housing strategy on Marinus Link's role and actions will be developed for Tasmania and Victoria to mitigate the

increased pressure on housing markets in North West Tasmania and Gippsland caused by the influx of workers during construction phase. Specifically, Marinus Link is exploring opportunities to reduce pressure on local housing markets through the direct provision of worker housing (which then can be potentially dedicated to respective local governments and operated in perpetuity under agreements with Community Housing Providers) after construction of Marinus Link is completed.

An important mitigating strategy for both the workforce and housing market pressures will be a coordinated and sequenced approach to the roll-out of the construction of Marinus Link. This helps smooth out the shock to the economy and increasing the duration of the economic stimulus and its flow-on effects. Such an approach will also enable the local economy and workforce to absorb the optimal number of jobs locally.

In general, this characterisation of mitigation measures should be cross-referenced and incorporated with other identified mitigation measures in other reports as listed in Table 7.

Overall, from an economic perspective, Marinus Link will deliver significant outcomes to the regional economies of North West Tasmania and Gippsland, and Tasmania and Victoria. The mitigation of any potential negative externalities will also result in greater possible economic and social benefits to local communities.

#### CANBERRA / NGAMBRI / NGUNNAWAL

Level 2, 28-36 Ainslie Avenue
Canberra ACT 2601
+61 2 6257 4525
sgsact@sgsep.com.au

#### HOBART/ NIPALUNA

PO Box 123
Franklin TAS 7113
+61 421 372 940
sgstas@sgsep.com.au

#### MELBOURNE / NAARM

Level 14, 222 Exhibition Street
Melbourne VIC 3000
+61 3 8616 0331
sgsvic@sgsep.com.au

#### SYDNEY / WARRANG

Suite 2.01/50 Holt Street
Surry Hills NSW 2010
+61 2 8307 0121
sgsnsw@sgsep.com.au


SGS Economics & Planning

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# Appendix L. Bushfire Impact Assessment

# Marinus Link - Tasmanian Bushfire Impact Assessment

**Marinus Link Pty Ltd**

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1300 646 131
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## DOCUMENT TRACKING

| | |
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| **Project Name** | Marinus Link: Tasmanian Bushfire Impact Assessment |
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# Executive Summary

Marinus Link Pty. Ltd. proposes to construct a high voltage direct current electricity interconnector between Tasmania and Victoria, including a subsea cable and onshore cable (comprised of dual transmission lines) and converter facilities.

The aim of this report is to address the Environmental Impact Statement (EIS) Guidelines of both the *Environmental Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) and as prepared by the Environmental Protection Authority (EPA) Tasmania under the *Environmental Management and Pollution Control Act 1994* (the EMPC Act) for the Tasmanian components of the Marinus Link Project. The scope of the report is limited to the Heybridge Converter Station, being the only above ground project component within Tasmania.

As the project is proposed to be located within three jurisdictions, the Tasmanian Environment Protection Authority (Tasmanian EPA), Victorian Department of Transport and Planning (DTP), and Australian Department of Climate Change, Energy, Environment and Water (DCCEEW) have agreed to coordinate the administration and documentation of the three assessment processes. Two EISs are being prepared to address the Tasmanian EPA requirements for the Heybridge converter station and shore crossing. A separate EIS/EES is being prepared to address the requirements of DTP and DCCEEW.

The core EIS requirement is to "*gain an understanding of the proposal, the need for the proposal, the alternatives, the environment that it could effect, the positive and negative environmental impacts that may occur and the measures that will be taken to maximise positive outcomes, and minimise any adverse environmental impacts, including specific management measures.*"

This report establishes the bushfire assessment framework for the Tasmanian section of the proposed Marinus Link project. It presents the findings of detailed bushfire investigations and an associated Bushfire Impact Assessment (BIA).

The BIA involved the following steps:

- A desktop assessment to identify bushfire impacts which potentially may occur with the Marius Link project. The assessment identifies the bushfire hazard and assets at risk.
- An analysis of the bushfire risk context of the project site at Heybridge. The bushfire risk assessment covers the construction, operational, and decommissioning phases of the project.
- An analysis of the potential bushfire impacts of the project, undertaken based on a 'risk assessment' approach.
- Development of Environmental Performance Requirements (EPR) to mitigate impacts identified during the BIA.
- Identification of mitigation measures to address the identified impacts during the Construction and Operation phase.

From the BIA undertaken of the Heybridge site for the construction, operation, and decommissioning stages of the project, the level of risk was determined as minor or insignificant across all vulnerability risk criteria. This level of risk assigned has taken into consideration the hazard context, fire history and frequency in the landscape, surrounding land use, and the compliance with Environmental Performance Requirements (EPR) that sets out the requirements that need to be achieved to minimise risk impact.

Section 7.8 of this BIA summarises the highest assigned bushfire risk impact for life and property assets at the Heybridge site and at all project stages. The initial risk assessment for the site has determined the overall risk to be minor. With implementation of assigned EPR's to all stages of the project, the highest residual risk was determined to be reduced to insignificant.

Key EPR identified in the BIA in response to the EIS Guidelines identified the need for mitigation measures targeting bushfire ignition management, bulk static water capacity, access, operations maintenance, hazard management and bushfire emergency management planning.

In response to the Commonwealth EIS guidelines and the EPA Tasmanian EIS guideline requirements, the introduction and implementation of EPRs (as identified in Section 7.1 to Section 7.3) will significantly lower the risk of potential impacts from the proposed development to life; property (including human settlement (urban and rural based), and agricultural assets); and environment to be of insignificant risk. This is assessed as an acceptable risk mitigation outcome for the project.

# Glossary and Abbreviations

## Glossary of Terms

| Term | Description |
|---|---|
| Assets | Anything valued by people which includes houses, infrastructure, crops, forests and, in many cases, the environment. |
| Asset Protection Zone | A fuel-reduced area surrounding a built asset or structure which provides a buffer zone and defendable space for fire fighting between a bush fire hazard and an asset as well as mitigation of the severity of bushfire attack on the asset. |
| Bushfire | Unplanned vegetation fire. A generic term which includes grass fires, forest fires and scrub fires both with and without a suppression objective. |
| Bushfire risk | The chance of a bushfire igniting, spreading and causing damage to the community or assets of value. |
| Consequence | The outcome or impact of a bushfire event. |
| Fire break | A fire break is a gap in fuel (vegetation) that reduces the potential for fire to enter or leave an area. Fire breaks may be used for emergency vehicle access. |
| Fire management | All activities associated with the management of fire prone land, including the use of fire to meet land management goals and objectives. |
| Fuel Free Area | An area within the development site which contains highly modified / discontinuous vegetation around asset infrastructure adjoining bushfire prone vegetation. It also provides a defendable space for fire fighting operations. |
| Fuel hazard | Fine fuels in bushland that burn in the continuous flaming zone at the fire's edge. These fuels contribute the most to the fire's rate of spread, flame height and intensity. Typically, they are dead plant material, such as leaves, grass, bark and twigs thinner than 6 mm thick, and live plant material thinner than 3 mm thick. |
| Intensity | The rate of energy release per unit length of fire front usually expressed in kilowatts per metre (Kw/m). |
| Likelihood | The probability of a fire igniting and spreading, and how often this may occur. |

Most terms are taken from the Bushfire Glossary prepared by the Australasian Fire and Emergency Service Authorities Council Limited (AFAC).

## Abbreviations

| Abbreviation | Description |
|---|---|
| APZ | Asset Protection Zone |
| BIA | Bushfire Impact Assessment |
| BPA | Bushfire Prone Area |
| EES | Environmental Effects Statement |
| EIS | Environmental Impact Statement |
| ELA | Eco Logical Australia |
| EMPCA | *Environmental Management and Pollution Control Act 1994* |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* |
| EPA | Environmental Protection Authority Tasmania |
| EPR | Environmental Performance Requirements |
| FBI | Fire Behaviour Index |
| FDR | Fire Danger Rating |
| HDD | Horizontal Directional Drilling |
| HVAC | High Voltage Alternate Current |
| HVDC | High Voltage Direct Current |
| LUPA Act | *Land Use Planning and Approvals Act 1993* |
| MW | Megawatt |
| NEM | National Electricity Market |
| TFS | Tasmanian Fire Service |

# 1. Introduction

Marinus Link (the project) comprises a high voltage direct current (HVDC) electricity interconnector between Tasmania and Victoria, to allow for the continued trading and distribution of electricity within the National Electricity Market (NEM).

The project was referred to the Australian Minister for the Environment on 5 October 2021. On 4 November 2021, a delegate of the Minister for the Environment determined that the proposed action is a controlled action as it has the potential to have a significant impact on the environment and requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) before it can proceed. The delegate determined that the appropriate level of assessment under the EPBC Act is an Environmental Impact Statement (EIS).

On 12 December 2021, the former Victorian Minister for Planning under the *Environment Effects Act 1978* (Vic) (EE Act) determined that the project requires an Environment Effects Statement (EES) under the EE Act, to describe the project's effects on the environment to inform statutory decision making.

In July 2022 a delegate of the Director of the Environmental Protection Authority Tasmania determined that the project be subject to environmental impact assessment by the Board of the Environment Protection Authority (the Board) under the *Environmental Management and Pollution Control Act 1994* (Tas) (EMPCA).

As the project is proposed to be located within three jurisdictions, the Tasmanian Environment Protection Authority (Tasmanian EPA), Victorian Department of Transport and Planning (DTP), and Australian Department of Climate Change, Energy, Environment and Water (DCCEEW) have agreed to coordinate the administration and documentation of the three assessment processes. Two EISs are being prepared to address the Tasmanian EPA requirements for the Heybridge converter station and shore crossing. A separate EIS/EES is being prepared to address the requirements of DTP and DCCEEW.

This report has been prepared by Eco Logical Australia (ELA) for the Tasmanian component of the project, to support the two EISs being prepared for the Heybridge converter station and shore crossing.

## 1.1 Purpose of this Report

The purpose of this report is to assist in addressing the bushfire specific requirements as part of the preparation of an EIS under the EMPCA (Tas) in accordance with the '*Environmental Impact Statement Guidelines Marinus Link Pty Ltd Converter Station for Marinus Link*' issued by the Director of the Environmental Protection Authority Tasmania (EPA Tasmania 2022).

In addition, this report will be assessed against the bushfire requirements prescribed through Clause C13 of the Tasmanian Planning Scheme Provisions and the *Land Use Planning and Approvals Act 1993* (LUPA Act).

These legislation, policy, and guidelines are further covered in Section 3.

## 1.2 Project Overview

Marinus Link is proposed to provide a link between the Tasmanian and the Victorian electricity grids, enabling efficient energy trade, transmission and distribution from a diverse range of generation sources to where it is most needed, and will increase energy capacity and security across the NEM. The project is a proposed 1500 megawatt (MW) HVDC electricity interconnector between Heybridge in northwest Tasmania and the Latrobe Valley in Victoria (Figure 1). Figure 2 presents the project layout for the Heybridge site, which is the only above ground project component within Tasmania.

Marinus Link Pty Ltd is the proponent for the project and is a wholly owned subsidiary of Tasmanian Networks Pty Ltd (TasNetworks). TasNetworks is owned by the State of Tasmania and owns, operates and maintains the electricity transmission and distribution network in Tasmania.

Tasmania has significant renewable energy resource potential, particularly hydroelectric power and wind energy. The potential size of the resource exceeds both the Tasmanian demand and the capacity of the existing Basslink interconnector between Tasmania and Victoria. The growth in renewable energy generation in mainland states and territories participating in the NEM, coupled with the retiring of baseload coal-fired generators, is reducing the availability of dispatchable generation that is available on demand.

Tasmania's existing and potential renewable resources are a valuable source of dispatchable generation that could benefit electricity supply in the NEM. Marinus Link will allow for the continued trading, transmission and distribution of electricity within the NEM. It will also manage the risk to Tasmania of a single interconnector across Bass Strait and complement existing and future interconnectors on mainland Australia. Marinus Link is expected to facilitate the reduction in greenhouse gas emissions at a state and national level.

Interconnectors are a key feature of the future energy landscape. They allow power to flow between different regions to enable the efficient transfer of electricity from renewable energy zones to where the electricity is needed. Interconnectors can increase the resilience of the NEM and make energy more secure, affordable and sustainable for customers. Interconnectors are common around the world including in Australia. They play a critical role in supporting Australia's transition to a clean energy future.

## 1.3 Assessment Context

Assessment of impacts from bushfire events is a key consideration at all levels of government in Australia. The purpose of this BIA is to understand the risk to the project site from potential bushfire occurrence in the surrounding area and the risk from the proposed project to causing a bushfire or affecting bushfire management. The assessment will identify measures in which these risks can be avoided altogether or minimised.

Overall, the bushfire assets requiring protection in this context include:

- Life (human populations);
- Property (human settlement, commercial / industrial buildings and infrastructure); and
- Environment.


**Figure 1: Project Overview**

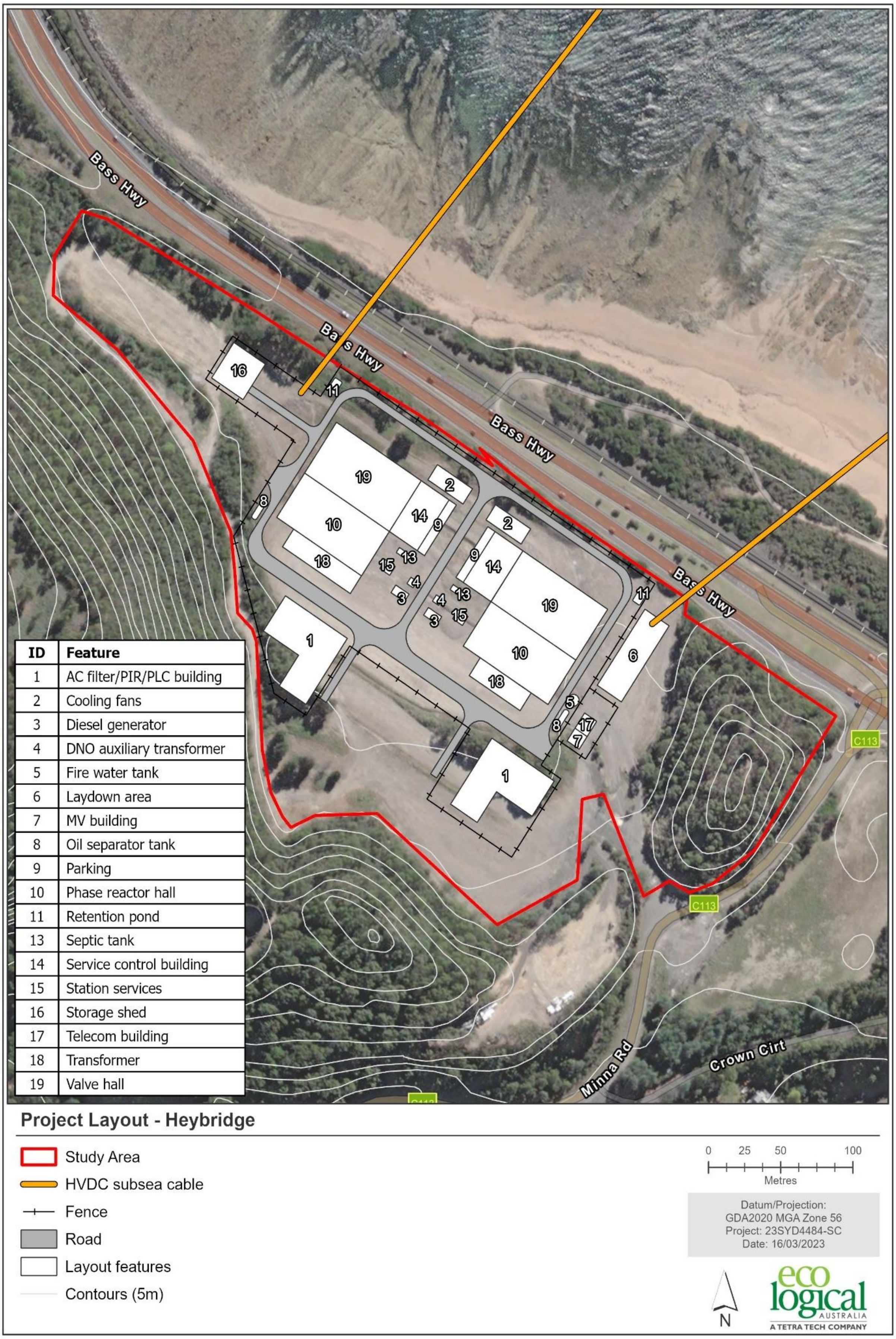



**Figure 2: Proposed Project Layout of the Heybridge Site**

# 2. Assessment Guidelines

Marinus Link triggers the need for assessment and approvals across three jurisdictions: Commonwealth, Victoria and Tasmania. This section outlines the assessment guidelines relevant to bushfire requirements and the linkages to other technical assessments completed for the project.

This Tasmanian BIA addresses the fire risk assessment requirements associated with the project at both the Commonwealth and Tasmanian levels. The report assesses the fire impact of the project using risk and impact assessment methodology as defined in Section 5 and addresses the requirements of the Commonwealth EIS Guidelines (Section 2.1) and the Tasmanian EPA EIS Guidelines (Section 2.2.2 Table 1).

## 2.1 Commonwealth

DCCEEW have published the following EIS guidelines: '*Guidelines for the Content of a Draft Environmental Impact Statement – Environment Protection and Biodiversity Conservation Act 1999* – Marinus Link underground and subsea electricity interconnector cable (EPBC 2021/9053)'.

The sections of the Commonwealth EIS Guidelines relevant to the bushfire assessment for the project study area include:

- Section 5.1 General Impacts:
    - *In discussing potential impacts, consider how the interaction of extreme environmental events and any related safety response may impact on the environment.*

## 2.2 Tasmania

The EPA Tasmania has published two sets of EIS guidelines for the preparation of an EIS for the Marinus Link, one for the converter station and the other for the shore crossing. This report has been prepared using the converter station EIS guidelines as they are more relevant for BIA of the above ground component of the project, being the Heybridge Converter Station.

The converter station EIS guidelines issued by EPA Tasmania (September 2022) outline the specific matters to be assessed across a number of planning, environmental and social disciplines relevant to the project, and to be documented in the EIS for the project.

The EIS guidelines inform the scope of the EIS technical studies and define the EIS evaluation objectives. The EIS evaluation objectives identify the desired outcomes to be achieved and provide a framework for an integrated assessment of the environmental effects of a proposed project.

### 2.2.1 Environmental Impact Statement Evaluation Objective

The EIS evaluation objective contained within the converter station guidelines that is most relevant to this bushfire assessment is:

*"to gain an understanding of the proposal, the need for the proposal, the alternatives, the environment that it could effect, the positive and negative environmental impacts that may occur and the measures that will be taken to maximise positive outcomes, and minimise any adverse environmental impacts, including specific management measures."*

### 2.2.2 Environmental Impact Statement Guidelines

The EIS guideline requires an assessment of the "*fire risk associated with the project*". The relevant sections of the EIS guideline that this BIA has directly addressed are summarised in Table 1.

**Table 1: EIS guideline requirements (Section 6.13***) as relevant to bushfire assessment**

| Aspects to be assessed | Guideline Requirements | Report Section |
|---|---|---|
| Fire Escape and Impact | Consideration of fire within the site, fire escaping from the site and the impact of wildfire originating outside the development and the environmental impacts that could result from such an event. | Section 6 and Section 7 |
| Hazardous chemicals | Whether any hazardous chemicals proposed to be stored or used on site pose a fire risk. | Section 6.1 and Section 7 |
| Fire prevention and response | The objectives and management principles to be adopted to prevent and respond to potential fire events. | Section 7.2 to Section 7.4 |
| Fire response plan | Where a fire response plan is appropriate, it should be fully integrated with other relevant documents, such as a Tasmania Fire Service Local Area Fire Management Plan, a Forestry Tasmania Fire Management Plan and a Wildlife Service Fire Action Plan for relevant districts. | Section 7.5 |

***-Refers to the report section contained within the EIS Guideline Requirements.

### 2.2.3 Linkage To Other Reports

This report is informed by or informs the technical assessments outlined in Table 2.

**Table 2: Linkage of Tasmanian BIA to Other Reports**

| Technical Assessment | Relevance to this assessment |
|---|---|
| Entura Marinus Link Heybridge Converter Station Terrestrial Ecology Baseline and Impact Assessment 2023. | Informs the terrestrial ecology impact assessment outcome of the southern extent of the Marinus Link project at Heybridge as a technical report component of EIS assessment. |
| Katestone-Marinus Link: Climate and Climate Change Assessment 2023. | Informs the bushfire impact assessment outcomes of the Marinus Link project based on key climate issues that have the potential to influence the bushfire risk context. |

# 3. Legislation, Policy and Guidelines

## 3.1 Tasmania

### 3.1.1 Land Use and Planning Approvals Act 1993

The *Land Use and Planning Approvals Act 1993* (LUPA Act) establishes a system under which planning schemes are provided as a regulatory framework in the regulation of land use, development, protection and conservation of land over local government areas within Tasmania.

Planning schemes assist to regulate development and land use by segregating land into specific zones and providing specific objectives and development control standards.

The purpose of this BIA relating to the LUPA Act is to identify the specific bushfire effects on the environment from the proposed development and measures to minimise these impacts. This BIA also identifies the impacts to the Heybridge project site from bushfire and measures to mitigate impact.

### 3.1.2 Tasmanian Planning Scheme Clause C13

Clause C13 of the Tasmanian Planning Scheme being the Bushfire-Prone Areas Code for the State of Tasmania is to ensure that proposed developments are appropriate within bushfire prone areas through provision of appropriate design, siting, utility services, and constructed to reduce the impact of bushfires on human life and property, and cost to the community.

Specifically, Clause 13.5.2 of the Scheme applies to the proposed development in relation to “hazardous chemicals of manifest quantity” given the storage of 5,000 litres of diesel fuel on the site during the construction phase called up in the Tasmanian Work Health and Safety Regulations 2012 (Schedule 11). Compliance requirements for addressing the acceptable solutions and performance criteria of Clause 13.5.2 are presented in Appendix A. Appendix A illustrates the specific requirements to be addressed under Clause 13.5.2 including the preparation of both an emergency management plan and bushfire hazard management plan. These requirements are addressed through EPR’s which are covered in Section 7.2.2, Section 7.3.2 and mitigation measures detailed in Section 7.5.

The proposed temporary 5,000L diesel fuel for construction, and any other flammable liquids required during the operation of the converter station, should be stored in a secure area away from work areas, buildings, and electrical infrastructure in accordance with Australian Standard AS1940:2017 – The storage and handling of flammable and combustible liquids (SA 2017). Where stored and handled correctly in accordance with these regulations the risk of fire or explosion impacting off site is low.

This BIA aims to address these legislative and policy requirements to ensure design compliance; is suitably situated in a low risk fire environment; is appropriately supported by EPRs; and does not contribute to an increased level of fire risk to life, property, and the environment.

### 3.1.3 Burnie Local Provisions Schedule

The Burnie Local Provisions Schedule (BLPS) applies to the Burnie Council area including the Heybridge site. The BLPS does not call up any specific bushfire requirements therefore Clause 13.5.2 of the Tasmanian Planning Scheme is applied as per above.

# 4. Project Description

This section discusses the key component and details of the Project Description and activities that are relevant to the BIA.

## 4.1 Overview

Marinus Link is proposed to be implemented as two 750 MW circuits to meet transmission network operation requirements in Tasmania and Victoria. Each 750 MW circuit will comprise two power cables and a fibre-optic communications cable bundled together in Bass Strait and laid in a horizontal arrangement on land. The two 750MW circuits will be installed in two stages with the western circuit being laid first as part of stage one, and the eastern cable in stage two.

The key project components for each 750 MW circuit, from south to north are:

- HVAC switching station and HVAC-HVDC converter station at Heybridge in Tasmania. This is where the project will connect to the North West Tasmania transmission network being augmented and upgraded by the North West Transmission Developments (NWTD).
- Shore crossing in Tasmania adjacent to the converter station.
- Subsea cable across Bass Strait from Heybridge in Tasmania to Waratah Bay in Victoria.

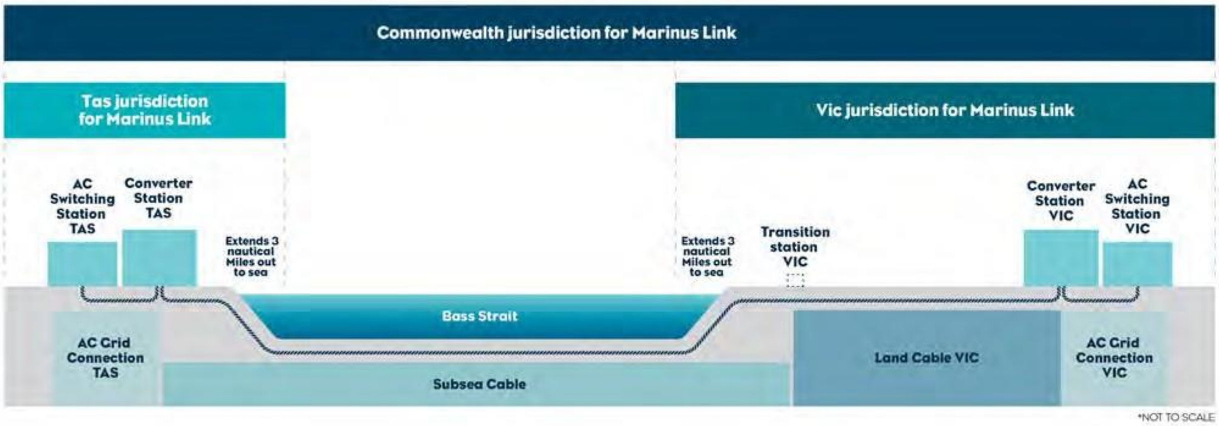
In Tasmania, a converter station is proposed to be located at Heybridge near Burnie. The converter station would facilitate the connection of Marinus Link to the Tasmanian transmission network. There will be two subsea cable landfalls at Heybridge with the cables extending from the converter station across the Bass Strait to Waratah Bay in Victoria. The preferred option for shore crossings is horizontal directional drilling (HDD) to about 10 m water depth where the cables would then be trenched, where geotechnical conditions permit.

Approximately 255 kilometres (km) of subsea HVDC cable would be laid across Bass Strait. The preferred technology for Marinus Link is two 750 megawatt (MW) symmetrical monopoles using ±320 kV, cross-linked polyethylene insulated cables and voltage source converter technology. Each symmetrical monopole is proposed to comprise two identical size power cables and a fibre-optic communications cable bundled together. The cable bundles for each circuit will transition from approximately 300m apart at the HDD (offshore) exit to 2km apart in offshore waters.

This BIA is focused on the Tasmanian section of the project. This report will inform the two EISs being prepared to assess the project’s potential environmental effects in accordance with the legislative requirements of the Commonwealth and Tasmanian governments.

Marinus Link is proposed to be constructed in two stages over approximately five years following the award of works contracts to construct the project. On this basis, stage one of the project is expected to be operational by early 2030 and stage two will follow with final timing to be determined by market demand. The project will be designed for an operational life of at least 40 years.

**Diagram 1: Project components considered under applicable jurisdictions (Marius Link Pty. Ltd. 2022).**




## 4.2 Construction

Construction at the Heybridge site is over approximately 5.5ha and includes two converter stations, a switching station and cabling.

Marinus Link will be constructed in two 750 MW stages, each stage will have three cables bundled together in Bass Strait and laid in a single trench on land. For the land cables, the trench conduits and HDD ducts for both 750 MW links will be installed as part of stage one.

Stage one will involve site establishment and hardstand areas constructed for the HVDC converter station and HVAC switching station sites. It will also involve all site establishment, civil works, trenching and installation of conduits for Marinus Link 1 and Marinus Link 2. The subsea cables will be laid in each stage. This is to ensure that the cable barge is available for any rehabilitation activities that are required throughout the cable testing phase in Stage two.

The works in stage two will primarily be construction of the second HVDC Converter, laying of the subsea Marinus Link 2 cables, completing the testing and commissioning, and any remaining site rehabilitation.

Construction on the Heybridge site includes:

- Site preparation, survey, and vegetation clearing;
- Establishment of construction offices / amenities, and laydown areas;
- Storage of diesel fuel;
- Bulk earthworks for benching of the converter station;
- Civil works for access roads, drainage, building foundations, cable trenches and electrical apparatus and transformer bays;
- Water tank installation;
- Structural steel work for buildings, electrical apparatus and infrastructure;
- Installation of HVDC converter equipment / apparatus;
- Testing of electrical, mechanical and fire fighting systems;
- Commissioning the converter station and switching station; and
- Automated security light installation.

## 4.3 Operation

Marinus Link will operate 24 hours per day, 365 days per year over an anticipated minimum 40-year operational lifespan.

Operation and maintenance activities relevant to this BIA are limited to the servicing, testing and repair of the cables and converter station equipment and infrastructure including scheduled minor and major outages.

## 4.4 Decommissioning

The operational lifespan of the project is a minimum 40 years. At this time Marinus Link will be either decommissioned or upgraded to extend its operational lifespan.

Decommissioning will be planned and carried out in accordance with regulatory requirements at the time. A decommissioning plan in accordance with approvals conditions will be prepared prior to planned end of service and decommissioning of the project.

Requirements at the time will determine the scope of decommissioning activities and impacts. The key objective of decommissioning is to leave a safe, stable and non-polluting environment.

In the event that Marinus Link is decommissioned, all above-ground infrastructure will be removed, the site rehabilitated.

Decommissioning activities required to meet the objective will include, as a minimum, removal of above ground buildings and structures. Remediation of any contamination and reinstatement and rehabilitation of the site will be undertaken to provide a self-supporting landform suitable for the end land use.

Decommissioning and demolition of project infrastructure will implement the waste management hierarchy principles being avoid, minimise, reuse, recycle and appropriately dispose. Waste management will accord with applicable legislation at the time.

Decommissioning activities may include recovery of land and subsea cables. The conduits and shore crossing ducts would be left in-situ as removal may cause significant environmental impact. Subsea cables would be recovered by water jetting or removal of rock mattresses or armouring to free the cables from the seabed.

A decommissioning plan will be prepared to outline how activities would be undertaken and potential impacts managed.

# 5. Assessment Method

This section describes the method used to assess the potential bushfire impacts associated with the project activities, considering the values present within the study area. This assessment method addresses the requirements outlined in the Commonwealth EIS and Tasmanian EIS assessment guidelines for the project (Section 2).

## 5.1 Study Area

The study area is defined as the total area needed to be able to sufficiently characterise and assess bushfire impacts to the existing environmental and social values, within a suitable level of spatial context.

The study area for the Tasmanian BIA report includes the single site situated in the locality of Heybridge combined with the two levels of bushfire assessment analysis undertaken, being:

- **Bushfire Hazard Assessment** – assessment of bushfire fuels (vegetation) and topography at a local scale within a 500m buffer of the project layout; and

- **Bushfire Risk Assessment** – assessment to inform bushfire risk exposure based on the bushfire hazard in combination with fire history, fire weather, fire behaviour potential, fire paths, and assets at risk at a semi-landscape level within a 5km buffer of the project layout.

## 5.2 Baseline Characterisation

The baseline characterisation has involved a critical review of both the bushfire risk and management practices across the study area and surrounds via a desktop assessment of available documentation and GIS analysis of Tasmanian and Commonwealth databases.

A spatial analysis and mapping exercise has been undertaken of identified bushfire hazards, potential bushfire spread, and establishing a risk context for the study site as it relates to the project. Spatial datasets used in this desktop analysis include slope, elevation, vegetation, land use, fire history, and project site layouts as provided by Marinus Link Pty Ltd.

## 5.3 Risk and Impact Assessment

The method of impact assessment adopted for this study is based on a risk assessment approach of likelihood and consequence with regard to potential impacts on life, property and environmental values.

The methodology adopts AS/NZS 31000:2018 'Risk management – Principles and guidelines' whereby a risk classification scheme is developed through qualitative scales of likelihood and of consequence with consideration to the bushfire risk assessment (Section 5.1).

The impact assessment adopted a risk assessment approach. This involved establishing the bushfire risk context to identify values, identification of the hazard, consequence of an event, and the likelihood of impact on values arising from bushfire attack both to and from the project study sites.

This assessment adopted a definition of likelihood based on likelihood of occurrence over the life of the project. The scale of likelihood is shown below and is based on AS/NZS ISO 31000. Values have been allocated to the likelihood descriptors on a scale of 1 to 5 with 1 being extremely rare (extremely unlikely) and 5 being almost certain, as outlined in Table 3 below.

**Table 3: Likelihood Description**

| Likelihood Descriptor | Description |
|---|---|
| Almost certain (5) | The event is expected to occur in most circumstances during the currency of the project. |
| Likely (4) | The event will probably occur in most circumstances during the currency of the project. |
| Possibly (3) | The event might occur at some time over the currency of the project. |
| Unlikely (2) | The event could occur at some time over the currency of the project. |
| Rare (1) | The event may occur only in exceptional circumstances over the currency of the project. |

The scale of consequence is shown in Table 4 below and is based on AS/NZS ISO 31000. Values have been allocated to the consequence descriptors on a scale of 1 to 5 as outlined below and are based on the most probable outcome of a fire event(s).

**Table 4: Consequence Description**

| Consequence Descriptor | Description |
|---|---|
| Catastrophic (5) | Death, huge financial loss, irreversible widespread environmental damage |
| Major (4) | Extensive injury, major financial loss, irreversible local environmental damage |
| High (3) | Medical treatment, high financial loss, Long-term environmental damage |
| Medium (2) | First aid, medium financial loss, Short-term environmental damage |
| Low (1) | No injuries, low financial loss, minor environmental impact |

Rating codes and the level of risk are then calculated by multiplying likelihood and consequence levels with the rating determined as shown in the risk matrix outlined in Table 5 and Table 6 below.

**Table 5: Risk Matrix Rating**

| | | Likelihood | | | | |
|---|---|---|---|---|---|---|
| | | Rare (1) | Unlikely (2) | Possible (3) | Likely (4) | Almost certain (5) |
| Consequence | Low (1) | Insignificant | Insignificant | Insignificant | Insignificant | Minor |
| | Medium (2) | Insignificant | Insignificant | Minor | Minor | Moderate |
| | High (3) | Insignificant | Minor | Minor | Moderate | Major |
| | Major (4) | Insignificant | Minor | Moderate | Major | Extreme |
| | Catastrophic (5) | Minor | Moderate | Major | Extreme | Extreme |

Source: Adapted from AS/NZS ISO 3100:2018

**Table 6 Level of risk**

| Level of risk | Risk rating |
|---|---|
| 0 – 4 | Insignificant |
| 5 – 9 | Minor |
| 10 – 14 | Moderate |
| 15 – 19 | Major |
| 20 – 25 | Extreme |

The risk assessment was compiled with consideration of various risk factors and the baseline conditions. Table 7 below provides an analysis of the risk factors. The risk factors presented are taken into careful consideration when assigning likelihood and consequence values to determine of overall risk impact. Also, in the application of risk assessment impacts to life and property, key vulnerability criteria are also assigned and assessed in conjunction with likelihood and consequence factors. Assigned vulnerability criteria are specified below in Table 8, Table 9, Table 11, Table 12, Table 14 and Table 15.

**Table 7: Analysis of Risk Factors.**

| Risk Factor | Analysis of Risk Factor |
|---|---|
| 1. The likelihood of human and natural fire ignitions, as influenced by time, space and demographics. | Natural ignitions adjoining the study area from events such as lightning strikes are possible but at low likelihood given fuel types, fire weather and low incidence of recorded fire history (Heybridge).<br>Human activities within the subject site make ignitions more likely from activities associated with construction, operation/maintenance and decommissioning, including machinery use, hot works (e.g. grinding, welding) and other activities with potential for fire ignition. |
| 2. The potential spread and severity of a bushfire, as determined by fuel, topography and weather conditions. | Weather conditions, fuel and slope are key factors that can be the primary determinants of the potential for and direction of fire spread. The Heybridge site is surrounded by undulating to steep terrain together with high forest and heathland bushfire hazards. These wooded areas are interspersed with roads, urbanised residential and industrial/commercial areas together with natural features such as the Blythe River and Bass Strait. Beyond these wooded areas to the southwest and southeast are largely agricultural land holdings.<br>The potential for ignition and fire spread from the site is low given the development area will be preserved in a fuel free state.<br>Potential bushfire spread to the site is likely to be greatest from the west from human induced ignition sources with fire spread through wooded vegetation towards the site. However, the fire severity directly surrounding the site is likely to be reduced given pronounced downhill runs. |
| 3. The proximity of assets vulnerable to bushfire and likely bushfire paths. | The project site of Heybridge has vulnerable assets within and proximal to the site, as listed in Section 6.2 below. Bushfires have the potential to spread from any direction but are more likely from the west to south-west aspects and potentially impact onsite and offsite assets.<br>Fire spread from the Heybridge site to nearby assets, particularly those in the township of Heybridge, is mitigated by the Blythe River, Minna and other roads, along with fuel removed or reduced areas. |
| 4. The vulnerability of assets, or their capacity to cope with, and recover from bushfire. | On-site electrical infrastructure assets can incorporate measures to withstand bushfire attack and reduce vulnerability. This includes the development of EPR's to mitigate and reduce vulnerability to this key infrastructure in Section 7.<br>The offsite assets in proximity to the sites as listed in Section 6.2 below are considered vulnerable to fire but have capacity to cope with short to medium term recovery possible. |

### 5.3.1 Cumulative Impact Assessment

The EIS guidelines and EES scoping requirements both include requirements for the assessment of cumulative impacts. Cumulative impacts result from incremental impacts caused by multiple projects occurring at similar times and within proximity to each other.

To identify possible projects that could result in cumulative impacts, the International Finance Corporation (IFC) guidelines on cumulative impacts have been adopted. The IFC guidelines (IFC, 2013) define cumulative impacts as those that 'result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones.'

The approach for identifying projects for assessment of cumulative impacts considers:

Temporal boundary: the timing of the relative construction, operation and decommissioning of other existing developments and/or approved developments that coincides (partially or entirely) with Marinus Link.

Spatial boundary: the location, scale and nature of the other approved or committed projects expected to occur in the same area of influence as Marinus Link. The area of influence is defined at the spatial extent of the impacts a project is expected to have.

Proposed and reasonably foreseeable projects were identified based on their potential to credibly contribute to cumulative impacts due to their temporal and spatial boundaries. Projects were identified based on publicly available information at the time of assessment. The projects considered for cumulative impact assessment in Tasmania are:

- Remaining North West Transmission Developments
- Guilford Windfarm
- Robbins Island Renewable Energy Park
- Jim's Plain Renewable Energy Park
- Robbins Island Road to Hampshire Transmission Line
- Bass Highway upgrades between Deloraine and Devonport
- Bass Highway upgrades between Cooee and Wynard
- Hellyer Windfarm
- Table Cape Luxury Resort
- Youngmans Road Quarry
- Port Latta Windfarm
- Port of Burnie Shiploader Upgrade
- Quaylink – Devonport East Redevelopment.

In assessing other relevant projects within the region that could trigger cumulative impacts, that in combination with required EPRs and associated mitigation measures for each project, there is an extremely low risk of significantly increased impact from bushfire. As such the cumulative impacts are considered to be insignificant and warrant no further consideration within the context of this assessment.

## 5.4 Assumptions and Limitations

For the assessment undertaken, the following assumptions and limitations are recognised:

- The BIA is a desktop analysis utilising all available relevant GIS data available from State and Commonwealth data bases. A desktop assessment is considered sufficient for assessing the risk of bushfire in the region where the project is proposed.
- The BIA is based on the identified study area site and works proposed but does not preclude flexibility to modify site layout or construction or operational approaches.

- The residual risk of bushfire impacts is assumed to be attained whereby all recommended Environmental Performance Requirements (EPR) are effectively implemented at the construction, operational, and decommissioning stages till project termination.

# 6. Baseline Characterisation

This section describes the baseline characterisation of existing features and aspects relevant to the BIA.

## 6.1 Hazards and Risks

This baseline characterisation seeks to identify the assets that are potentially at risk from various fire ignition sources related to the proposed development, the potential bushfire hazards, and the factors that contribute to affecting the overall risk exposure.

Fire sources for consideration include bushfires impacting on the subject site as well as fires originating from within the site caused by anthropogenic sources such as smoking, machinery, vehicles, equipment (e.g. welders, grinders), electrical infrastructure, liquid fuels (e.g. diesel fuel), and other combustible materials.

Factors that effect the level of risk exposure include climate, fuel hazards, topography, fire behaviour potential, fire ignition factors, potential fire spread and fire history. These factors are explored further in following sections.

The perceived worst case bushfire scenarios have been considered adopting these risk factors for the purpose of understanding the level of bushfire risk exposure. Two scenarios are outlined below. They assume bushfire risk EPRs have been implemented for the development.

**Heybridge Site**

Scenario 1

A large landscape scale forest fire starts outside of the project site to the west and escapes into the Blythe River Conservation Area with winds from the west to southwest, with very low fuel moisture content in forest fuels. The fire progresses to the east and the head fire impacts on the subject site assets and infrastructure. The likelihood of such a fire occurrence is low, given the low incidence of recorded wildfire history (See Section 6.5.4), and disruptions to fire progression from both adjoining areas of interspersed urban development and also existing road network infrastructure. However, it is still possible for significant fire behaviour and attack on the site. Despite the low likelihood of bushfire impact, the risk warrants mitigation.

Scenario 2

An anthropogenic ignition occurs on or adjoining the site and leads to fire development and spread in unmanaged forest and heath vegetation on a day, with a gusting northwest wind and at a time when ground and aerial fuels have a low fuel moisture content. The fire spreads to the southeast and jumps the Blythe River, impacting on the residential and other built assets within Heybridge as well as environmental and cultural assets within the adjoining Blythe River Conservation Area.

The risk of a major fire spreading from the study site is very low, based on the low likelihood of ignition given the management of fuel within the site and ignition mitigation strategies, good suppression opportunities (i.e. onsite fire suppression resources and fire station located in nearby Heybridge township), impedances to fire development and spread (i.e. fuel breaks and reduced fuel areas). Despite the low likelihood of bushfire impact, the risk warrants mitigation.

## 6.2 Assets at Risk

The following assets for the study site at Heybridge are located on site or surrounding the proposed development and could be at risk from bushfire:

- **Heybridge Site:**
  - HVAC 220kV Switching Station
  - HVAC 220kV filter banks
  - Converter transformers and coolers
  - Main building including reactor hall, valve hall and HVDC hall
  - Two-storey service and control building
  - Spare parts building and workshop
  - Telecoms building
  - Fire fighting water tank
  - Station security fencing and gates
  - Two 1500 kVA diesel generators with above ground fuel storage of 5,000L

- **Adjoining Heybridge Site and Surrounds:**
  - Human settlements in Wivenhoe, Chasm Creek, Heybridge, and Sulphur Creek.
  - Agricultural lands with dispersed rural residential assets, sheds, and boundary fencing
  - Tourist accommodation facilities
  - Blythe River Conservation Area

All of these assets could potentially be at risk from a bushfire that may propagate from within the site, or from an external fire threat.

## 6.3 Fire Fighter and Public Safety

The uses of the general area surrounding the site are vacant forested areas, dispersed residential holdings, commercial / industrial facilities, tourism facilities, and some agricultural lands. There will be no public access permitted to the site.

The fire-fighters likely to respond to a bushfire within the site would be from the Heybridge Tasmanian Fire Service (TFS) Station being approximately 1 km from the site. Other TFS stations in adjoining areas are located within the townships of Burnie, Penguin, and Sheffield.

The bushfire risks to fire-fighter safety when attending a fire in forest and / or heath fuels applies both on and off the site respectively including exposure to smoke, embers, radiant heat, and direct flame contact.

The additional risks to fire-fighter safety associated with a fire burning within the site are:

- Electrocution from physical contact with energised electrical infrastructure or from conduction through air, water or materials in contact with the infrastructure;
- Inhalation of potentially toxic fumes and smoke from any plastic or rubber components such as cables or other building / structure components on site involved in fire; and
- Fire and explosion from the storage of onsite diesel fuels.

## 6.4 Fire Ignition Risks

The main potential sources of fire ignition in off-site locations to potentially impact on the site include:

- farm machinery;
- lightning strikes;
- escape from legal and illegal burning operations; and
- other anthropogenic causes (arson, cigarettes, motor vehicle accidents, slashing machinery, earthmoving plant, angle grinders, and welders).

Construction and maintenance activities on the site and operational use of the onsite infrastructure and decommissioning activities could also present potential sources of ignition from the site, including:

- Fires as a result of electrical or mechanical faults;
- The use of or inappropriate storage of flammable fuels;
- Utilisation of machinery and equipment;
- Land management activities (e.g. fire break maintenance, vegetation management);
- Construction or maintenance activities (e.g. welding, grinding and other ignition generating works); and
- Other anthropogenic sources (e.g. from discarded cigarette butts, cooking fires, fire starts from vehicles or accidents, arson etc.).

## 6.5 Bushfire Risk Factors

### 6.5.1 Fire Weather and Climate

Fire weather strongly influences the likelihood of ignition and how often fires that are ignited will be uncontrollable. The bushfire season is declared annually by the Tasmanian Fire Service Chief Officer and generally commences on the 1 October and concludes on the 31 March the following year, however these dates can be modified depending on the season and conditions.

The Heybridge study site experiences mild to warm summers with average maximum temperatures of 20.2 to 21.7°C and with winter months having an average maximum temperature range of 12.8 to 13.5°C. The average long term annual rainfall for Heybridge is 979.1 mm (Elders Weather 2023). The greatest potential for bushfire events is associated with a bushfire season which coincides with strong west to south-west winds, together with low rainfall and drought conditions.

Fire weather is generally considered in terms of fire behaviour and reported as a Fire Danger Rating (FDR). The new Australian Fire Danger Rating System adopted on the 1st September 2022 calculates, forecasts and reports fire danger using up-to-date fuel state data, spatial and satellite data, weather data, science, and technology (AFAC 2022). It uses decades of research incorporated into eight fire behaviour models to calculate the Fire Behaviour Index (FBI) which adopts values between 0 to 100. The FBI is used to identify potential fire behaviour in finer detail and assist in better decision making within the four Fire Danger Ratings. The higher the FBI the more dangerous the fire behaviour and therefore fire danger risk. The four FDR categories are displayed in Diagram 2. Forecast FDR are determined by the Bureau of Meteorology (http://www.bom.gov.au/tas/forecasts/fire-danger-ratings.shtml) and are displayed by FDR signs, typically near roadsides.

**Diagram 2: Fire Danger Ratings**


### 6.5.2 Fuel Hazard

The area surrounding the Heybridge site is largely used for rural land uses that include forest, agricultural landholdings, isolated dwellings together with dispersed industrial / commercial development. To the north of the site has a limited fuel corridor that adjoins directly onto non-hazard areas of Tioxide Beach and Bass Strait. The subject site itself is mostly cleared (Figure 3). The fuel hazard around the site is largely a mixture of forest and heathland, interspersed with cleared or fuel reduced areas (Figure 4). Much of the forest adjoining the site has been fragmented by surrounding areas of intensive human settlement and road networks together with natural features including the Blythe River. These manmade and natural features have the capacity to disrupt continuous potential fire runs, especially on days of milder FDR, as well as to increase available fire suppression and containment options for fire fighting authorities.

Further, Figure 5 depicts the vegetation types in reference to the TASVEG 4.0 fire attributes layer from LIST map (Tasmanian Government 2018). This shows the majority of surrounding area within 500 m of the subject land with forest and woodland vegetation being of a high flammability and a low ecological sensitivity.

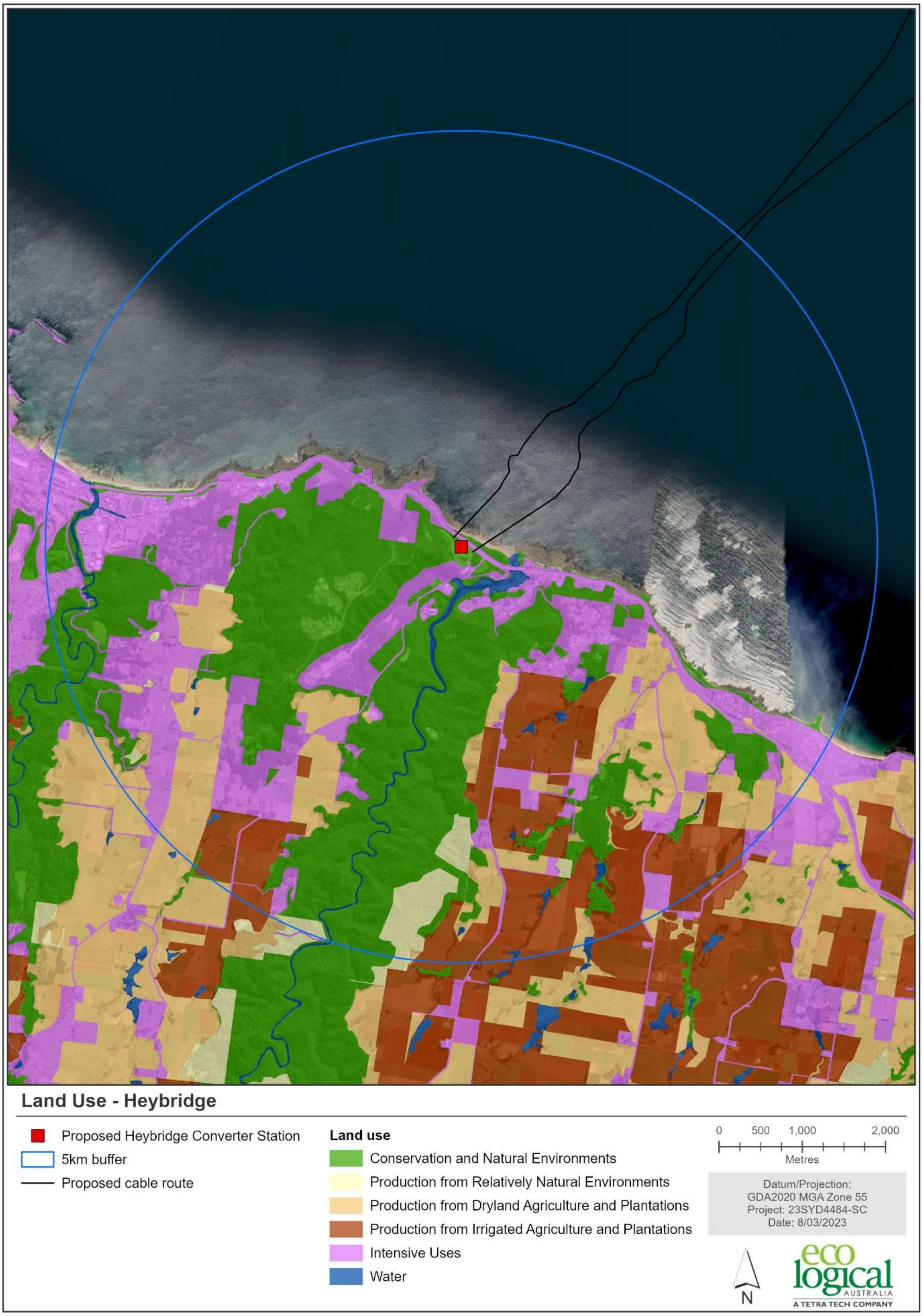



**Figure 3: Land Use Surrounding the Heybridge Site (DNR&E 2022)**

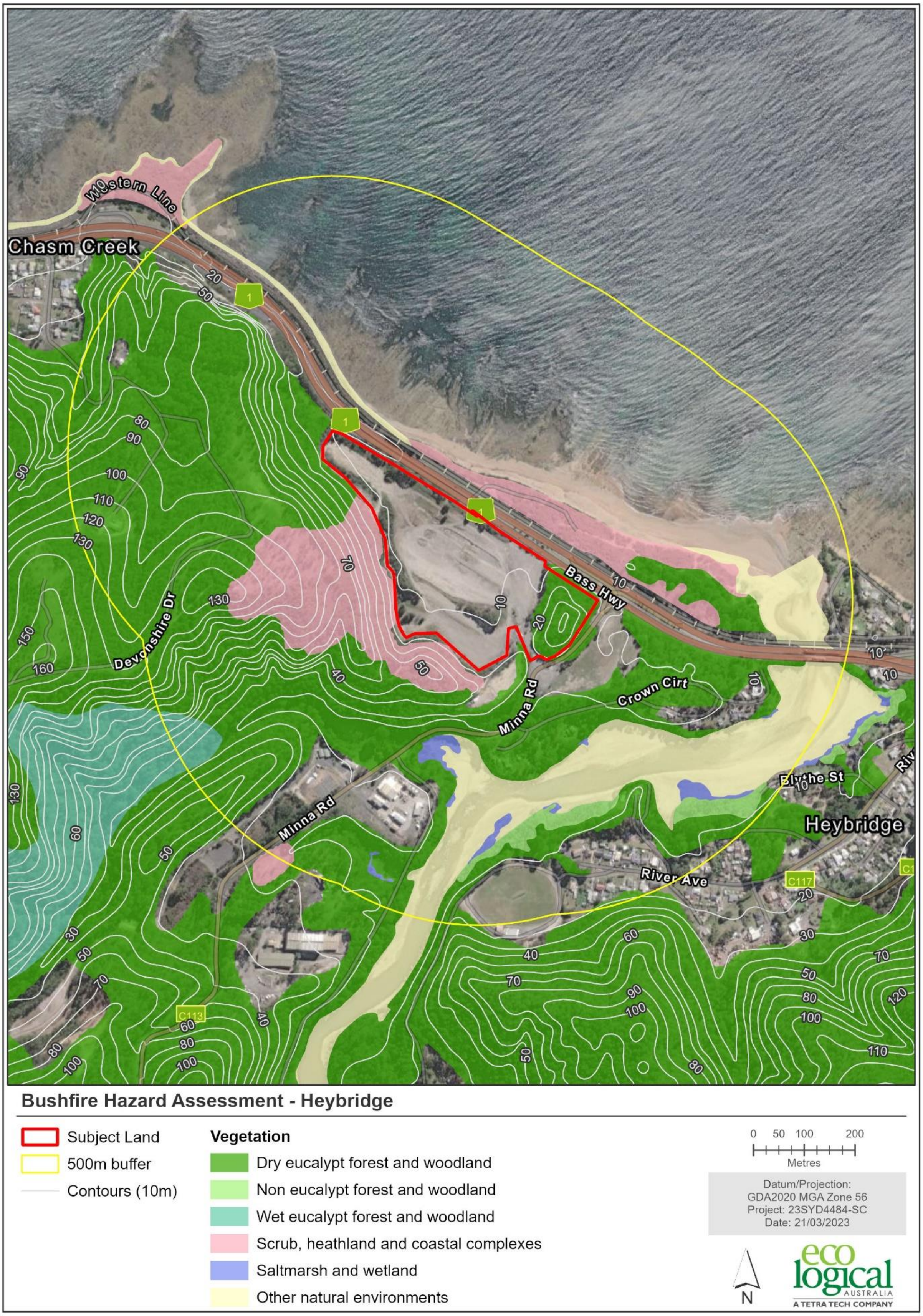



**Figure 4: Bushfire Hazard Assessment Heybridge Site**

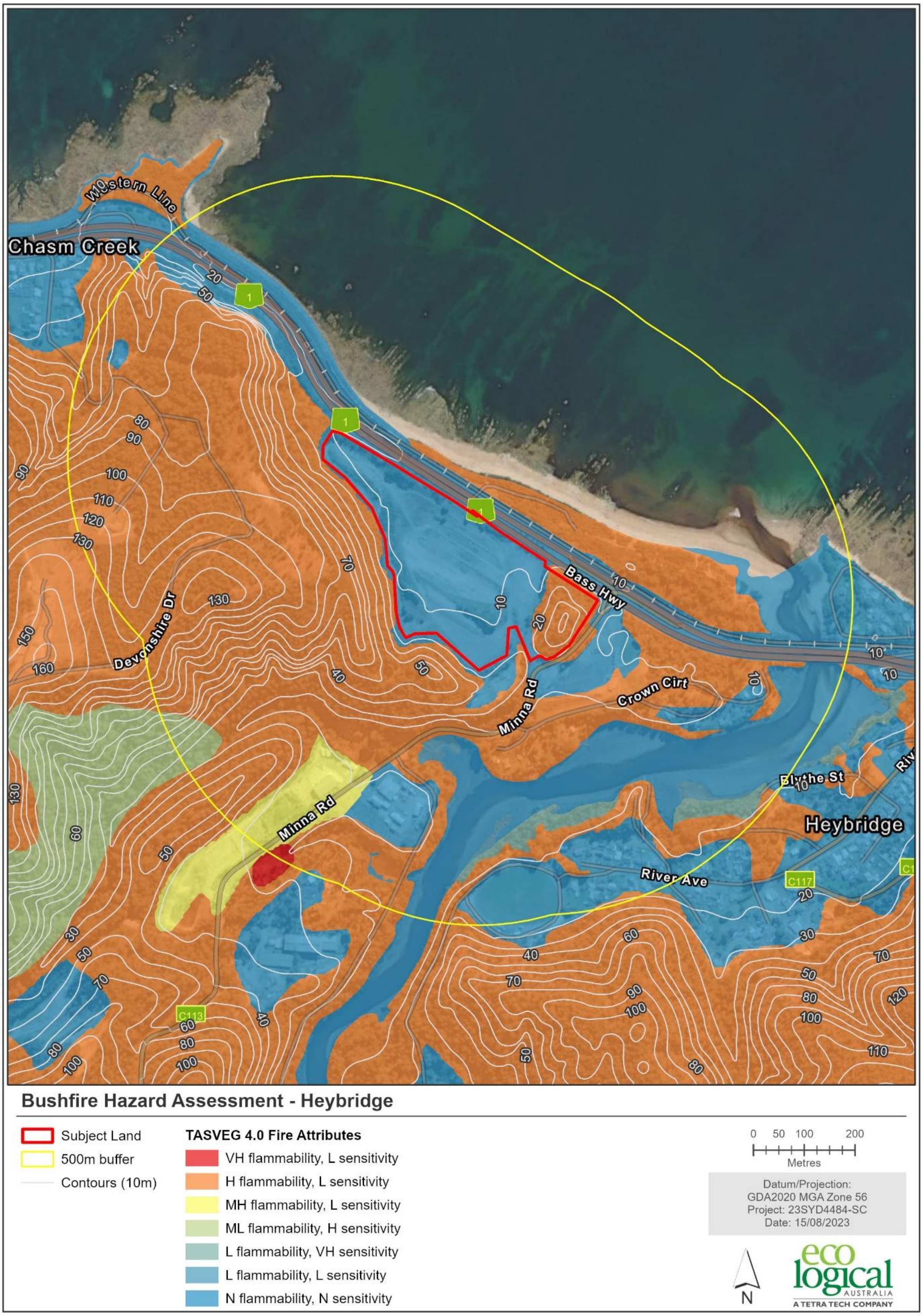



**Figure 5: Bushfire Hazard Assessment using TASVEG 4.0 Fire Attributes**

### 6.5.3 Topography

The slope of the land within 5km of the site is shown in Figure 6 and is identified as undulating to steep terrain. The elevation of the site for Heybridge is 10 m above sea level as shown in Figure 4 above. Terrain surrounding the site is mostly flat to the north, and undulating to the west, south, and east. Fire spread and the severity of impact on the site is likely to be largely reduced due to downhill fire runs surrounding the site to built assets.

### 6.5.4 Fire History

Mapping of available bushfire history within 5 km of the project sites is shown in Figure 7. Overall there is very minimal mapped fire history proximal to the Heybridge site. There is two prescribed burns mapped, one in the 2017/2018 fire season (April 2018) located within the Blythe River Conservation Area and contained by the Blythe River, and the other being a small prescribed burn in the Chasm Creek area in the 2022/2023 fire season (DNR&E 2024). The mapped record of bushfires within 5 km of the project site is very limited, with only two fires recorded as occurring within the 2004/2005 fire season (2005) and the 2013/2014 fire season (2014) respectively and inconsequential in size.

Whilst the compiled bushfire history mapping would not contain all bushfire occurrences, the collated fire history generally indicates a very low number of large bushfire events in the locality of the Heybridge site.

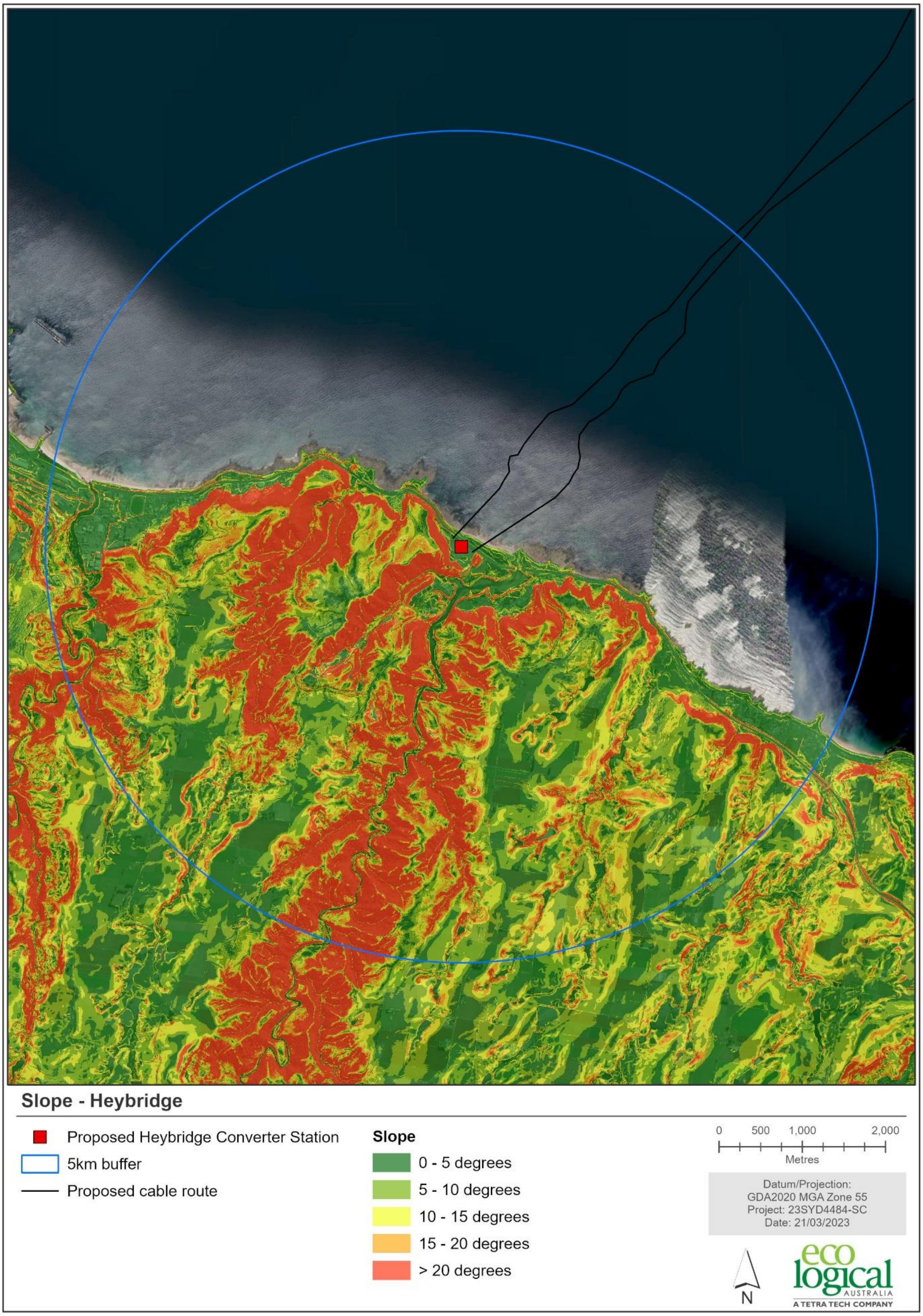



**Figure 6: Slope map for Heybridge**

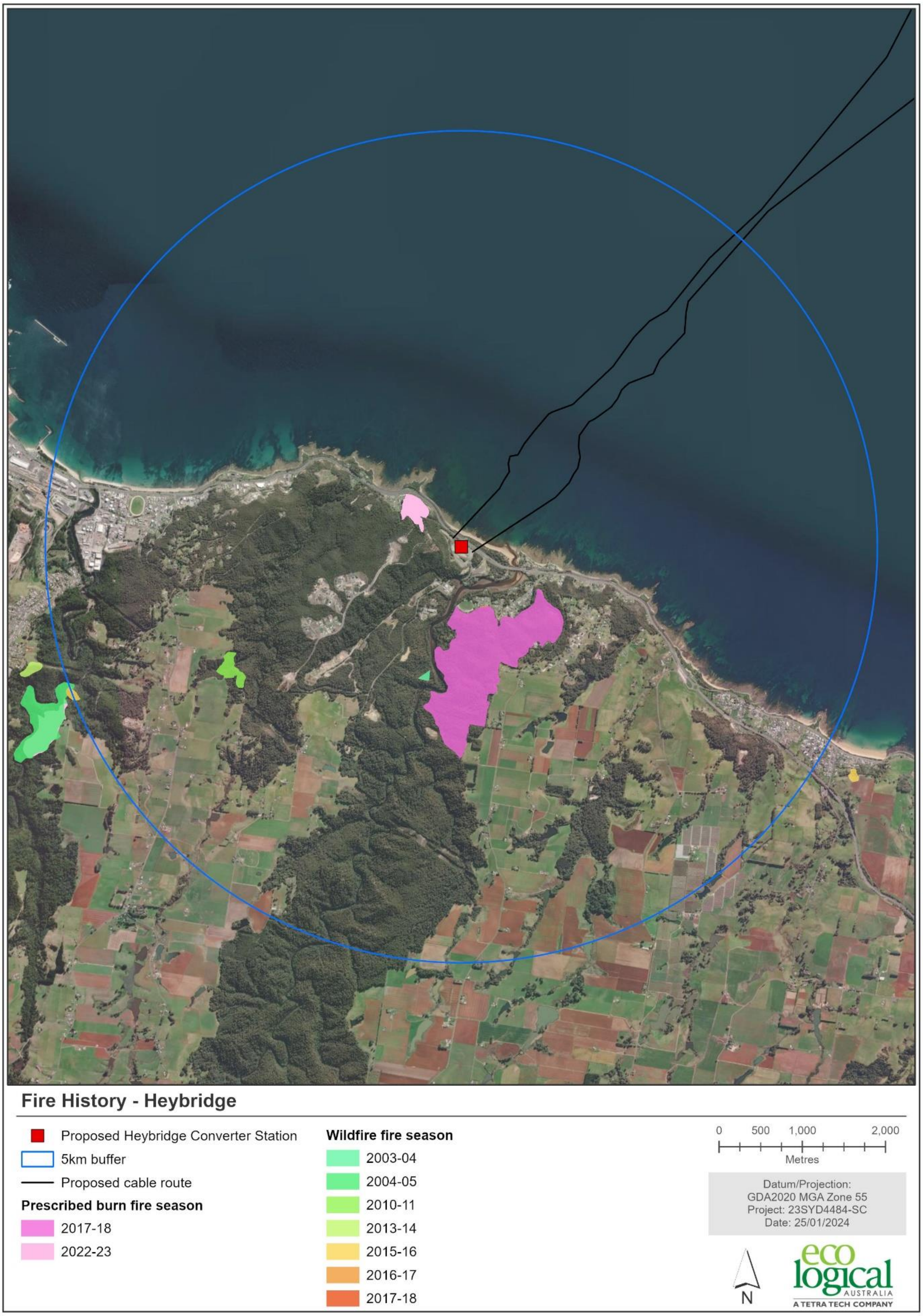



**Figure 7: Fire History Heybridge (DNR&E 2024)**

## 6.6 Summary of Bushfire Risk Context

Overall, for the study site of Heybridge, taking into consideration assets at risk, fuel types, terrain, ignition potential, fire weather, fire history, land use, mitigation measures and available fire suppression resources, it is considered that there is a relatively low likelihood of a fire starting on-site and spreading to cause significant impact to life and damage to assets.

The likelihood of fire attack on the subject site itself is also moderated, given the limited number and small scale of the recorded fire history; disruption of potential fire paths; bushfire hazard type, particularly downhill fire runs to the site, which would lessen fire severity from the more likely spread direction of the western sectors; along with the observability and availability of local fire suppression resources from the nearby Heybridge, Burnie, Penguin, and Sheffield Tasmanian Fire Service stations.

# 7. Impact Assessment

This section presents the results of the risk assessments undertaken for the construction, operational, and decommissioning phases of the project, for the Heybridge site.

## 7.1 Impact Pathways

The impact pathway determined for the project firstly takes into account the presence of bushfire hazard in close proximity to a potential fire ignition source occurring from the Heybridge site. Secondly, it considers the presence of a bushfire starting externally from a potential ignition source and then impacting on the Heybridge site itself.

Once a fire has developed either from the site or external to the site, consideration is then given to the assessment of the likely fire spread potential under adverse fire weather conditions with subsequent impact on surrounding assets (offsite) or on the Heybridge site as an infrastructure asset (onsite) identified to be at risk from bushfire attack.

## 7.2 Construction

### 7.2.1 Potential Bushfire Risk Impacts

The potential bushfire impacts to life and property during the construction phase are outlined in the vulnerability criteria presented in the risk assessment tables below.

#### *7.2.1.1 Heybridge Site*

Bushfire risk to life and property during the construction stage of the Heybridge site are shown in Table 8 and Table 9. This bushfire risk to both life and property is assessed considering both fire impacts offsite and onsite impact on the Heybridge site.

##### 7.2.1.1.1 Offsite Impacts

Given the relatively fuel free state of the site, adoption of ignition management procedures on site (grinding, welding, smoking, hand held machinery, vehicles etc), low number and geographically dispersed human population within residential, commercial and industrial areas proximal to the site; along with non-hazard areas such as major road networks, natural geographical features (Blythe River and Bass Strait) and cleared or fuel reduced areas; together with the dispersed rural residential settlements within or adjoining low hazard agricultural landholdings; the likelihood and consequence ratings of the impact to life is much reduced. The risk of impact to life from the Heybridge site has therefore been determined to be ranging from insignificant to minor (Table 9).

Similarly to the risk to life, given the location of low hazard or non-hazard areas adjoining property assets the likelihood of widespread fire propagation across the landscape and the consequence of significant impact to property is reduced. The risk of impact to property assets (including in urban, industrial and rural areas) from the site of Heybridge has thus been determined as insignificant to minor (Table 10).

##### 7.2.1.1.2 Onsite Impacts

Given that construction workers on site will be largely located within established and maintained fuel free areas, potentially affected by downhill lower intensity fire runs directly adjoining the site, along with adjoining non-hazard areas that may disrupt fire spread, such as major road networks, natural geographical features (Blythe River and Bass Strait) or other fuel reduced areas, the likelihood and consequence of significant impact to life is much reduced. The risk of life to the Heybridge site has therefore been determined to be ranging from insignificant to minor (Table 8).

Similarly to the risk to life, given downhill fire runs directly to the site, the entire development site being fuel free, the presence of other fuel free areas (roads and water bodies), and the location of low hazard or non-hazard areas on adjoining properties, the likelihood of widespread fire propagation across the landscape and the consequence of significant impact on the Heybridge site infrastructure is reduced. The risk of impact to this infrastructure assets being the Heybridge site has thus been determined as insignificant to minor (Table 11).

There also exists capacity of the local Tasmania Fire Service stations located in Heybridge, Burnie, Penguin, and Sheffield to provide fire response to fire outbreaks to the Marinus Link site of Heybridge to mitigate onsite fire impacts to this infrastructure.

**Table 8: Bushfire Risk Assessment-Life (Offsite and Onsite Impacts)**

| Vulnerability Criteria | Consequence (A) | Likelihood (B) | Level of Risk (A x B) | Risk Rating |
|---|---|---|---|---|
| Populated area where the combination of threat and vulnerability expose a community to a significant likelihood of fatalities and major injuries. | 5 | 1 | 5 | Minor |
| Less likely to be fatalities or major injuries due to the presence of attributes which afford some protection. | 4 | 1 | 4 | Insignificant |
| Loss of life or major injury highly unlikely. Medical/hospital treatment may be required. | 3 | 2 | 6 | Minor |
| Minor injuries only – first aid treatment. No major injuries or fatalities likely. | 2 | 2 | 4 | Insignificant |
| No injuries or fatalities likely. | 1 | 3 | 3 | Insignificant |

**Table 9: Bushfire Risk Assessment-Property (Offsite and Onsite Impacts)**

| Vulnerability Criteria | Consequence (A) | Likelihood (B) | Level of Risk (A x B) | Risk Rating |
|---|---|---|---|---|
| Extensive and widespread loss of property. Major impact across a large part of the community and region. Long term external assistance required to recover. | 5 | 1 | 5 | Minor |
| Localised damage to property. Short-term external assistance required to recover. | 4 | 1 | 4 | Insignificant |
| Short-term damage to individual assets. No external assistance required to recover. | 3 | 2 | 6 | Minor |
| Inconsequential or no damage to property. Little or no disruptions to the community. | 1 | 2 | 2 | Insignificant |

### 7.2.2 Environmental Performance Requirements

The following Environmental Performance Requirements (EPR) in Table 10 are proposed during the construction stage to minimise the level of potential bushfire risks. Mitigation measures associated with these EPRs are discussed in Section 7.5.

**Table 10: Bushfire Mitigation Environmental Performance Requirements – Construction Stage**

| ID | Environmental Performance Requirement | Project Stage |
|---|---|---|
| **BF01** | **Develop and implement measures to avoid and manage ignition of fires during construction** | Construction |
| **BF02** | **Provide onsite firefighting water capacity** | Construction |
| **BF03** | **Prepare and implement a Bushfire Emergency Management Plan (BEMP)** | Construction |
| **BF04** | **Prepare a Bushfire Hazard Management Plan** | Construction |

### 7.2.3 Residual Impacts

In line with the EPRs, activity or location specific mitigation measures will be required to be developed and incorporated into the design to ensure appropriate mitigation is achieved during the construction phase.

For the Heybridge site, the assessment of residual risk to both life and property following the introduction of EPRs reduces the residual risk from minor to insignificant.

The residual risk reduction is reliant on effective development and implementation of all identified EPR's for the construction phase detailed in Table 10.

## 7.3 Operation

### 7.3.1 Potential Bushfire Risk Impacts

The potential bushfire impacts to life and property during the operation phase are outlined in the vulnerability criteria presented in the risk assessment tables below.

#### *7.3.1.1 Heybridge Site*

Bushfire risk to life and property for the operation stage of the Heybridge site are shown in Table 11 and Table 12. This bushfire risk to both life and property is assessed considering both fire impacts offsite and onsite impact on the Heybridge site.

##### 7.3.1.1.1 Offsite Impacts

The risk of impact to life for the Heybridge site has been determined to be ranging from insignificant to minor (Table 11) due to:

- the fuel free state of the site;
- adoption of ignition management procedures onsite (covering grinding, welding, smoking, hand held machinery, vehicles, storage of flammable liquids etc);
- relatively low quantity and geographic distribution of human population within residential / commercial / industrial areas
- non hazard areas adjoining forested vegetation such as major road networks; and

- natural geographical features (Blythe River and Bass Strait) together with the other dispersed rural residential human settlements within adjoining low hazard agricultural land holdings.

Considering all these factors the likelihood and consequence ratings impacts on life is much reduced.

The risk of impact to property assets (including urban areas and more rural agricultural areas) for the site of Heybridge has been determined as insignificant to minor (Table 12).

Similarly, as with the above life assets, given the location of low hazard or non-hazard areas adjoining property assets the likelihood of widespread fire propagation across the landscape and the consequence of significant impact to property is reduced.

#### 7.3.1.1.2 Onsite Impacts

Given the presence of maintenance workers on site largely located entirely within established and maintained fuel free areas, downhill lower intensity fire runs directly at the site, along with adjoining non-hazard areas such as major road networks, natural geographical features (Blythe River and Bass Strait) or other fuel reduced areas, the likelihood and consequence of significant impact to life is much reduced. The risk of life to the Heybridge site has therefore been determined to be ranging from insignificant to minor (Table 8).

Similarly to the risk to life, given downhill fire runs directly to the site, the entire development site is fuel free, presence of other fuel free areas (roads and water bodies), and the location of low hazard or non-hazard areas on adjoining property assets, the likelihood of widespread fire propagation across the landscape and the consequence of significant impact on the Heybridge site infrastructure is reduced. The risk of impact to this infrastructure assets being the Heybridge site has thus been determined as insignificant to minor (Table 13).

There also exists capacity of the local Tasmania Fire Service stations located in Heybridge, Burnie, Penguin, and Sheffield to provide fire response to fire outbreaks not only across the Marinus Link site of Heybridge but extending to provide adequate fire coverage to the nearby proposed North West Transmission 220kV Developments project (TasNetworks Pty Ltd 2021) to mitigate on site fire impacts to this infrastructure.

**Table 11: Bushfire Risk Assessment-Life (Offsite and Onsite Impacts)**

| Vulnerability Criteria | Consequence (A) | Likelihood (B) | Level of Risk (A x B) | Risk Rating |
|---|---|---|---|---|
| Populated area where the combination of threat and vulnerability expose a community to a significant likelihood of fatalities and major injuries. | 5 | 1 | 5 | Minor |
| Less likely to be fatalities or major injuries due to the presence of attributes which afford some protection. | 4 | 1 | 4 | Insignificant |
| Loss of life or major injury highly unlikely. Medical/hospital treatment may be required. | 3 | 1 | 3 | Insignificant |
| Minor injuries only – first aid treatment. No major injuries or fatalities likely. | 2 | 1 | 2 | Insignificant |
| No injuries or fatalities likely. | 1 | 1 | 1 | Insignificant |

**Table 12: Bushfire Risk Assessment-Property (Offsite and Onsite Impacts)**

| Vulnerability Criteria | Consequence (A) | Likelihood (B) | Level of Risk (A x B) | Risk Rating |
|---|---|---|---|---|
| Extensive and widespread loss of property. Major impact across a large part of the community and region. Long term external assistance required to recover. | 5 | 1 | 5 | Minor |
| Localised damage to property. Short-term external assistance required to recover. | 3 | 1 | 3 | Insignificant |
| Short-term damage to individual assets. No external assistance required to recover. | 2 | 1 | 2 | Insignificant |
| Inconsequential or no damage to property. Little or no disruptions to the community. | 1 | 1 | 1 | Insignificant |

### 7.3.2 Environmental Performance Requirements

The following EPRs in Table 13 are proposed during the operation stage to minimise the level of potential bushfire risks. Mitigation measures associated with these EPRs are discussed in Section 7.5.

**Table 13: Bushfire Mitigation Environmental Performance Requirements – Operations Stage**

| ID | Environmental Performance Requirement | Project Stage |
|---|---|---|
| **BF02** | **Provide onsite firefighting water capacity** | Operation |
| **BF03** | **Prepare and implement a Bushfire Emergency Management Plan (BEMP)** | Operation |
| **BF04** | **Prepare a Bushfire Hazard Management Plan** | Operation |
| **BF05** | **Develop and implement measures to avoid and manage ignition risks during operation** | Operation |

### 7.3.3 Residual Impacts

In line with the EPRs, activity or location specific mitigation measures will be required to be developed and incorporated into the design to ensure appropriate mitigation is achieved during the operational phase.

For the Heybridge site, the assessment of residual risk to both life and property following the introduction of EPRs reduces the residual risk from minor to insignificant. The residual risk reduction is reliant on effective development and implementation of all identified EPR’s for the operations phase in Table 13.

## 7.4 Decommissioning

### 7.4.1 Potential Bushfire Risk Impacts

The potential bushfire impacts to life and property during the decommissioning phase are outlined in the vulnerability criteria presented in the risk assessment tables below.

#### *7.4.1.1 Heybridge Site*

Bushfire risk to life and property for the decommissioning stage of the Heybridge site are shown in Table 14 and Table 15. This bushfire risk to both life and property is assessed considering both fire impacts offsite and onsite impact on the Heybridge site.

##### 7.4.1.1.1 Offsite Impacts

The risk of impact to life for the Heybridge site has been determined to be ranging from insignificant to minor (Table 14). Given the relatively low geographical distribution of human population within urban based residential /commercial / industrial areas with non-hazard areas adjoining forest such as major road networks, natural geographical features (Blythe River and Bass Strait) together with the other dispersed rural residential human settlements within adjoining low hazard agricultural landholdings; the likelihood and consequence of significant impact to life is much reduced.

The risk of impact to property assets (including urban areas and more rural agricultural areas) for the site of Heybridge has been determined as insignificant to minor (Table 15).

Similarly, as with the above life assets, given the fuel free state of the site, adoption of ignition management procedures on site (grinding, welding, smoking, hand held machinery, vehicles etc), location of low hazard or non-hazard areas adjoining property assets the likelihood of widespread fire propagation across the landscape considered in combination with the consequence, the impact to property is reduced.

##### 7.4.1.1.2 Onsite Impacts

Given the presence of construction workers on site largely located entirely within established and maintained fuel free areas, downhill lower intensity fire runs directly at the site, along with adjoining non-hazard areas such as major road networks, natural geographical features (Blythe River and Bass Strait) or other fuel reduced areas, the likelihood and consequence of significant impact to life is much reduced. The risk of life to the Heybridge site has therefore been determined to be ranging from insignificant to minor (Table 14).

Similarly to the risk to life, given downhill fire runs directly to the site, the entire development site is fuel free, presence of other fuel free areas (roads and water bodies), and the location of low hazard or non-hazard areas on adjoining property assets, the likelihood of widespread fire propagation across the landscape and the consequence of significant impact on the Heybridge site infrastructure is reduced. The risk of impact to this infrastructure assets being the Heybridge site has thus been determined as insignificant to minor (Table 15).

There also exists capacity of the local Tasmania Fire Service stations located in Heybridge, Burnie, Penguin, and Sheffield to provide fire response to fire outbreaks not only across the Marinus Link site of Heybridge but extending to provide adequate fire coverage to the nearby proposed North West Transmission 220kV Developments project (TasNetworks Pty Ltd 2021) to mitigate onsite fire impacts to this infrastructure.

**Table 14: Bushfire Risk Assessment-Life (Offsite and Onsite Impacts).**

| Vulnerability Criteria | Consequence (A) | Likelihood (B) | Level of Risk (A x B) | Risk Rating |
|---|---|---|---|---|
| Populated area where the combination of threat and vulnerability expose a community to a significant likelihood of fatalities and major injuries. | 5 | 1 | 5 | Minor |
| Less likely to be fatalities or major injuries due to the presence of attributes which afford some protection. | 4 | 1 | 4 | Insignificant |
| Loss of life or major injury highly unlikely. Medical/hospital treatment may be required. | 3 | 1 | 3 | Insignificant |
| Minor injuries only – first aid treatment. No major injuries or fatalities likely. | 2 | 1 | 3 | Insignificant |
| No injuries or fatalities likely. | 1 | 2 | 2 | Insignificant |

**Table 15: Bushfire Risk Assessment-Property (Built Assets within Urbanised Areas / Rural Residential & Agricultural Lands) (Offsite and Onsite Impacts).**

| Vulnerability Criteria | Consequence (A) | Likelihood (B) | Level of Risk (A x B) | Risk Rating |
|---|---|---|---|---|
| Extensive and widespread loss of property. Major impact across a large part of the community and region. Long term external assistance required to recover. | 5 | 1 | 5 | Minor |
| Localised damage to property. Short-term external assistance required to recover. | 5 | 1 | 5 | Minor |
| Short-term damage to individual assets. No external assistance required to recover. | 3 | 1 | 3 | Insignificant |
| Inconsequential or no damage to property. Little or no disruptions to the community. | 1 | 2 | 2 | Insignificant |

### 7.4.2 Environmental Performance Requirements

A land decommissioning management plan will be prepared to outline how decommissioning activities would be undertaken and the potential impacts managed. This will be located within the EIS documentation.

## 7.5 Mitigation Measures

The mitigation measures to address the EPRs established in response to the identified impacts during the Construction and Operation phase are set out in Table 16.

The successful implementation of the identified mitigation measures outlined below are reliant on the undertaking of appropriate inspection and review outcomes as identified in Section 7.7.

**Table 16: Bushfire Risk Mitigation Measures**

| ID | Mitigation Measures | Project Stage |
|---|---|---|
| **BF01** | **EPR: Develop and implement measures to avoid and manage ignition of fires during construction**<br><br>**Mitigation Measures:** Prior to commencement of project works, develop a CEMP to:<br>• Restrict activities with ignition risk in the open on Total Fire Ban Days.<br>• Ensure activities with ignition risk undertaken in the open on other days are accompanied by a fire extinguisher.<br>• Maintain vegetative fuels and other combustibles to low levels (i.e. grass slashed to <100mm height) within the site prior to and during the bushfire danger period.<br>• Maintain vehicles, plant and machinery in accordance with relevant specifications to prevent fire ignition from their operation.<br>• Mitigate ignition risks from electrical infrastructure by ensuring design and constructions meets applicable standards and guidelines.<br>• Establish and maintain vehicle access to the site and surrounds for fire suppression activities by fire fighting authorities. | Construction |
| **BF02** | **EPR: Provide onsite firefighting water capacity**<br><br>**Mitigation Measures:**<br>Prior to commencement of project works, provide dedicated onsite water supply tanks or alternative water sources for firefighting, including:<br>• Sufficient water capacity to undertake adequate fire suppression as per the provisions of AS2419.1-2021: Fire hydrant installations, Table2.2.5(D) for open yards.<br>• Tank(s) that are non-combustible and incorporate appropriate fire fighting fittings, for emergency services to access the water supply.<br>• Maintaining clear access to tanks or water sources for fire fighting vehicles. | Construction / Operation |
| **BF03** | **EPR: Prepare and implement a Bushfire Emergency Management Plan (BEMP)**<br><br>**Mitigation Measures:**<br>As a subplan to the project's Emergency Response Plan, prepare and implement a BEMP that includes, but is not limited to:<br>• Description of the site and facility<br>• References all relevant emergency procedures and information, including contact details<br>• Details bushfire emergency preparedness arrangements and response procedures<br>• Documents control and coordination arrangements and responsibilities<br>• Details all shelter in place and offsite evacuation procedures<br>• Documents requirements for personnel induction, training, plan review and liaison with external stakeholders.<br>The BEMP should be prepared to be consistent with (to the extent required) the *Bushfire Emergency Planning Guideline* (TFS 2021) and endorsed by the TFS or an accredited person. | Construction / Operation |

| ID | Mitigation Measures | Project Stage |
|---|---|---|
| BF04 | **EPR: Prepare a Bushfire Hazard Management Plan**<br><br>**Mitigation Measures:**<br>• Prepare a Bushfire Hazard Management Plan in accordance with the Tasmanian Planning Scheme, which is certified by the TFS or an accredited person.<br>• All hazardous goods to be stored in accordance with relevant Australian Standards. | Construction / Operation |
| BF05 | **EPR: Develop and implement measures to avoid and manage ignition risks during operation**<br><br>**Mitigation Measures:**<br>Develop an SEMP to:<br>• Restrict activities with ignition risk in the open on Total Fire Ban Days.<br>• Ensure activities with ignition risk undertaken in the open on other days to be accompanied by a fire extinguisher.<br>• Maintain converter station infrastructure according to relevant standards.<br>• Maintain fire fighting systems and water tank capacity at the converter stations.<br>• Ensure storage and use of hazardous material on site is in accordance with relevant Australian Standards and other requirements.<br>• Maintain vehicle access to the site and surrounds for fire suppression activities by fire fighting authorities.<br>• Operate electrical infrastructure to minimise ignition risk and maintain monitoring and management systems (emergencies, fault management, system monitoring, fire detection and suppression).<br>• Train personnel in site procedures and appropriate use of equipment. | Operation |

## 7.6 Cumulative Impacts

The cumulative impact assessment method is outlined in Section 5.3.1.

The potential bushfire impacts of the project before the implementation of EPRs discussed in Section 7.2 to 7.4 varies from insignificant to minor risk to life and property over the construction, operation and decommissioning stages. With the introduction of EPRs for all stages of the development the residual risk is reduced overall to be insignificant.

There also exists capacity of local TFS brigades to provide fire response to fire outbreaks across the Project site and broader region from the localities of Burnie, Penguin and Sheffield.

In assessing other relevant projects within the region that could trigger cumulative impacts that in combination with required EPRs and associated mitigation measures for each project there is an extremely low risk of simultaneous fire propagation within the landscape. As such the cumulative impacts are considered to be insignificant and warrant no further consideration within the context of this assessment.

## 7.7 Inspection and Review

The requirements for the inspection and review of residual impacts at each of the construction and operations stages of the project are indicated in Table 17.

**Table 17: Inspection and review requirements at various stages of the project for identified EPRs**

| Project Stage | Inspection or Compliance Requirement | Review Period |
|---|---|---|
| Construction | • Bushfire Ignition Management Plan (BIMP) is prepared.<br>• Fuel management establishment and maintenance activities within each of the designated sites.<br>• Installation of electrical infrastructure meets Australian Standard requirements to reduce unwanted ignition potential.<br>• Installation, testing and certification of water tank, water supply and other suppression resources for fire fighting.<br>• Installation of vehicle access roads for fire fighting.<br>• Bushfire Emergency Management Plan (BEMP) is prepared.<br>• Bushfire Hazard Management Plan (BHMP) is prepared in accordance with the Tasmanian Planning Scheme.<br>• Asset Protection Zone separation of infrastructure from bushfire hazard<br>• Infrastructure designed to incorporate fire resistant materials and prevent ignitions or damage or failure from fire.<br>• Onsite personnel training in fire fighting. | • BIMP in place prior to commencement of construction phase and reviewed annually.<br>• Fuels managed to required specification prior to commencement of infrastructure construction and maintained throughout. Review quarterly<br>• Water supply and suppression resources installed prior to primary construction phase.<br>• Access road constructed prior to primary construction phase.<br>• BEMP is prepared prior to commencement of construction phase and reviewed annually.<br>• BHMP is prepared prior to commencement of the construction phase and reviewed annually.<br>• Asset Protection Zone in place prior to infrastructure construction commencing.<br>• Infrastructure certified at construction stage.<br>• Fire fighting personnel certified prior to construction phase. |
| Operation | • Maintain water tank and water supply for fire fighting.<br>• Maintain access road in a trafficable condition and free from obstructions.<br>• Operations maintenance of onsite facilities.<br>• Fuel management on the facility site.<br>• Review and update of all bushfire and emergency plans. | • Water supply infrastructure inspected monthly during fire season.<br>• Access road inspected generally once annually but monthly during fire season.<br>• Operational facilities inspected annually or on spot maintenance basis.<br>• Fuel management reviewed quarterly and actioned as needed.<br>• All bushfire and emergency plans updated annually and given full review every 5 years. |

## 7.8 Summary of Impacts

A summary of the impact assessment from bushfire against the risk assessment criteria is presented in Table 18. The potential risk and risk ratings depicted in Table 18 have been assigned from the highest derived risk level identified in the impact assessment undertaken in Section 7.2 to Section 7.4. This entailed assigning the highest derived initial risk rating obtained in each of the risk impact vulnerability tables across the Heybridge site and for all project stages for life and property assets.

The initial impact assessment of fire impact to and from the site has been determined as minor. This assessment finding was made on the basis of the bushfire risk factors, the baseline hazard and the location, nature, exposure and vulnerability of assets at risk.

With adoption of all the assigned EPR's over all of the project stages this results in a residual risk which is determined to be insignificant. This assessment finding was made after reducing the risk multiplication factor of both the likelihood and consequence ratings each by a factor of 1 in respect of the expected reduction following application of EPRs and associated mitigation measures.

**Table 18: Summary of Risk Assessment and Impacts**

| Affected Value | Potential Risk of Harm | Project Phase | Likelihood Rating | Consequence Rating | Risk Rating | EPRs & Mitigation Measures | Residual Likelihood Rating | Residual Consequence Rating | Residual Risk Rating |
|---|---|---|---|---|---|---|---|---|---|
| Life - Heybridge | Minor | Construction | 2 | 3 | Minor (6) | BF01, BF02, BF03, and BF04 | 1 | 2 | Insignificant (2) |
| Property - Heybridge | Minor | Construction | 2 | 3 | Minor (6) | BF01, BF02, BF03 and BF04 | 1 | 2 | Insignificant (2) |
| Life - Heybridge | Minor | Operation | 1 | 5 | Minor (5) | BF02, BF03, BF04, and BF05 | 1 | 4 | Insignificant (4) |
| Property - Heybridge | Minor | Operation | 1 | 5 | Minor (5) | BF02, BF03, BF04, and BF05 | 1 | 4 | Insignificant (4) |
| Life - Heybridge | Minor | Decommissioning | 1 | 5 | Minor (5) | Land decommissioning plan | 1 | 4 | Insignificant (4) |
| Property -Heybridge | Minor | Decommissioning | 1 | 5 | Minor (5) | Land decommissioning plan | 1 | 4 | Insignificant (4) |

# 8. Conclusion

The purpose of this report is to address the overall Tasmanian EPA Environmental Impact Statement Guidelines as issued by the Director of the Environmental Protection Authority for the Marinus Link project converter station. Specifically, a Bushfire Impact Assessment has been undertaken for the subject site using a risk assessment approach, together with the identification of EPRs to seek further risk reduction opportunities through the provision of suitable bushfire mitigation measures.

Overall, the potential residual risk to ‘at risk assets' of bushfire impacting from the site during the construction, operation and decommissioning stages is considered to be minor to insignificant, given the background bushfire hazard context, landscape profile, siting and EPRs identified.

The EPRs as identified in Section 7.1 to Section 7.3 significantly lower the residual risk of impacts from the proposed development to life and property as summarised in Section 7.8.

Key EPRs identified from this assessment incorporate mitigation measures targeting bushfire ignition management, bulk static water capacity, access, operations maintenance, hazard management and bushfire emergency management planning.

Through adoption of the inspection and review schedule in Section 7.7 (based on the identified mitigation measures in Section 7.5) this should see a reduction of residual risk to be insignificant for the study site of Heybridge.

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# Appendix A - Tasmanian Planning Scheme-Hazardous Uses

The objective that applies in Clause 13.5.2 of the Tasmanian Planning Scheme is that "*hazardous uses can only be located on land within a bushfire -prone area where tolerable risks are achieved through mitigation measures that take into account the specific characteristics of both the hazardous use and the bushfire hazard.*" This is addressed in Table 19 below.

**Table 19: Clause 13.5.2 Tasmanian Planning Scheme Requirements relating to Hazardous Uses**

| Acceptable Solutions | Performance Criteria | Compliance Notes |
|---|---|---|
| **A1**<br>No Acceptable Solution | **P1**<br>A hazardous use must only be located in a bush-fire prone area if a tolerable risk from bushfire can be achieved and maintained, having regard to:<br>a) the location, characteristics, nature and scale of the use;<br>b) whether there is an overriding benefit to the community;<br>c) whether there is no suitable alternative lower-risk site;<br>d) the emergency management strategy (hazardous use) and bushfire management plan;<br>e) other advice, if any from the TFS. | The hazardous use of the site relates to the proposed storage of 5,000L of diesel fuel. The fuel tank and associated generators are located centrally within the site, separated from bushfire hazards and the proposed onsite buildings and assets. The fuel storage will need to be in accordance with applicable Australian Standards and other applicable requirements.<br>The site will facilitate distribution of electricity on the National Energy Market from Tasmania to the Mainland.<br>The current Heybridge site is required to support the undersea cabling to the mainland and is to be situated on previous disused industrial site. This site itself has bushfire protection advantages, with downhill fire runs lessening potential severity of any bushfire attack. Further, there is reduced exposure to bushfire attack on three sides (north, east and south) lessening the likelihood of fire attack.<br>An emergency management strategy and bushfire management plan to be prepared in accordance with A2 and A3 below. |
| **A2**<br>An emergency management strategy (hazardous use) endorsed by the TFS or accredited person. | **P2**<br>No performance criterion. | Inclusion of an emergency management strategy for hazardous use to be included in an Emergency Management Plan for the site for endorsement by the TFS or accredited person. |
| **A3**<br>A bushfire hazard management plan that contains appropriate bushfire protection measures that is certified by the TFS or an accredited person. | **P3**<br>No performance criterion. | Preparation of a bushfire hazard management plan that contains bushfire protection measures that can be certified by the TFS or accredited person. |

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# Appendix M. Traffic and Transport Impact Assessment

# Marinus Link Project

# Environmental Impact Statement (Tasmania)

# Technical Report – Traffic & Transport

PREPARED FOR MARINUS LINK PTY LTD | November 2024

We design with community in mind

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|---|---|---|---|---|---|---|
| | | | Prepared by | Checked by | Reviewed by | Approved by |
| 0 | 19/11/2024 | Finalised Report | JS | JS | SD | SD |

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DESIGN WITH COMMUNITY IN MIND

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# Executive summary

This traffic and transport technical report is an attachment to Marinus Link's (the project's) Environmental Impact Statement (EIS)/Environment Effects Statement (EES). It has been used to inform the EIS/EES required for the project, assesses the Tasmanian component of the project and defines the environmental performance requirements (EPRs) necessary to meet the EIS/EES objectives and requirements.

## Overview

The project is a 1500 megawatt (MW) high voltage direct current (HVDC) electricity interconnector between North West Tasmania and the Latrobe Valley in Victoria. The project will be implemented as two 750 MW circuits rather than a single 1500 MW circuit to meet transmission network operation (availability and reliability) requirements in Tasmania and Victoria. The project is proposed to be executed in two stages, each being one 750 MW HVDC circuit between Tasmania and Victoria.

The key project components for each 750 MW circuit are, from south to north are:

- HVAC switching station and HVAC-HVDC converter station at Heybridge in Tasmania. This is where the project will connect to the North West Tasmania transmission network being augmented and upgraded by the North West Transmission Developments (NWTD).
- Shore crossing in Tasmania adjacent to the converter station.
- Subsea cable across Bass Strait from Heybridge in Tasmania to Waratah Bay in Victoria.
- Shore crossing at Waratah Bay approximately 3 km west of Sandy Point.
- Transition station where the subsea cables will connect to the land cables in Victoria.
- Land cables in Victoria from the transition station to the converter station site in the Driffield or Hazelwood areas.
- HVAC-HVDC converter station and expansion of the Hazelwood Terminal Station in Victoria, where the project will connect to the existing Victorian transmission network and located approximately 90 km inland.

This report provides an assessment of the transport impacts associated with the construction, operation and decommissioning phases of the project for the Tasmanian components of the project. It defines the EPRs) necessary to meet the project objectives relating to transport and traffic management.

## Method

The methodology used to assess the transport impacts of the project is aligned with the EIS guidelines. The assessment process which has been undertaken is as follows:

- Establishment of project context, including review of the design, initial EPRs and legislation, policy and strategies.
- Determining the study area to establish the baseline conditions, including collection of existing traffic data and site observations.
- Development of anticipated transport routes to access the site/s.
- Identification of potential impacts of the project for its construction, operation and decommissioning phases.
- Identify design and mitigation measures to avoid, mitigate, limit impact of the project.
- Assess the residual impact of the project following implementation of the measures identified.
- Undertake a safety assessment of the proposed works.
- Assess cumulative impacts of other potential projects during the construction phase of the project.
- Develop the EPRs and determine residual risk.
- Development of final proposed EPRs.

## Baseline Characterisation

An assessment of the existing transport conditions was undertaken and found:

- The proposed converter station will be constructed in the township of Heybridge, accessible via the Bass Highway. The shore crossing will occur underneath the Bass Highway, from the converter station site.

- With the exception of the transformer transporter, the existing B-double road network is adequate for use by all other project generated traffic
- Sight distance at all key intersections has been assessed and is generally adequate. In instances where sight distance is below minimum standards, adequate warning to drivers via signage is provided.
- Arterial roads, highways and freeways are able to accommodate the movement of large vehicles. They are regularly maintained to ensure the road surface is in adequate condition to accommodate these vehicles. As such, these roads have been assessed as being able to accommodate the project generated construction traffic volumes.
- There have been six crashes within the project area over the last five years, with only one crash resulting in injury.
- The project will have minimal interactions with public transport services, with school bus route details subject to change each year, but considered within the assessment.
- The project will have limited interactions with active transport facilities.

### Impact Assessment Key Findings and Cumulative Impacts

Through the review of the baseline characteristics, a series of values were identified on which to assess the impact of the project. These are as follows:

<u>Value 1: Road Network Capacity</u>

An assessment has been completed of the performance of the road network in the surrounding area of the project during its construction. Completing this assessment entailed identifying the level of traffic generated by the various construction activities and the path of travel that vehicles will take to the site.

The following attributes of value 1 were utilised in the assessment:

- The capacity of the arterial road network.
- Intersection capacity assessment.
- Connectivity of the road network, and provision of alternative routes.

<u>Value 2: Safe Road Performance, Condition and Design</u>

Analysis has been undertaken to assess the safe performance, road condition, design and operation of the road network that forms a part of the study area.

The following attributes of value 2 were assessed:

- The condition of the road pavement.
- Swept path analysis to assess the current road geometry.
- A review of historic crash data to identify any crash patterns or higher risk locations within the network.
- Sight distance review to identify any problem intersections.
- Operational safety considerations.

<u>Value 3: Public and Active Transport</u>

Analysis has been undertaken to assess the impact of the project on the public transport network and active transport infrastructure that forms a part of the study area.

The following attributes of value 3 were utilised in the assessment:

- The public transport network, including the following:
  - The train network.
  - The bus network.
  - School buses.
- Active transport infrastructure surrounding the site, including:
  - Dedicated cycling infrastructure.
  - Footpaths.

## Environmental Performance Requirements

Through the significance assessment undertaken, which had consideration for the identified values, a summary of the Environmental Performance Requirements(EPRs) are as follows:

- EPR T01 – Develop a transport Management Plan
  Prior to commencement of project works, develop a transport management plan/s to document how disruption to affected local land uses, traffic, car parking, public transport (rail and bus), pedestrian and cycle movements and existing public facilities will be managed during all stages of construction. The transport management plan/s may be split into locations / areas where appropriate or aligned with construction methodology.
- EPR T02 - Design transport infrastructure to maintain safety in operation
  Design all roadworks, construction staging and site access arrangements as stipulated in the transport management plan (EPR T01) to meet relevant design standards and provide for safe movement of construction and operational vehicles.

## Results of Significance Assessment

The outcome of the assessments undertaken found that the project will result in a number of impacts to the transport network, with varying levels of significance. Prior to the implementation of any mitigating works, there were six impacts that were deemed to be "Major", three "High", two "Moderate", nine "Low" and eight "Very Low".

Upon the implementation of the mitigating measures and EPR's, the maximum significance was determined to be "Moderate" with seven found to be "Moderate", nine "Low" and twelve "Very Low".

## Conclusion

The project's transport impacts are largely limited to the construction phase. Having regard to the assessment of the impacts contained within this report, which respond to the EIS guidelines and requirements, a number of EPR's have been recommended. The implementation of these EPR's in the delivery of this project will manage the impact that the project has on the transport network and comply with the requirements of the EIS guidelines. A full assessment of the impacts which have led to the recommendations are detailed within Section 8 of this report.

Based on this assessment and following the implementation of measures to comply with EPRS, there are no high or major residual impacts. Through the implementation of traffic management plans, consultation with stakeholders and local community representatives / residents and some infrastructure upgrades, the projects transport impact is considered to not be detrimental to the environment. The EPRs and expected mitigation measures, that will be implemented to comply with EPRs, are standard in context with transport impacts and reduce of the overall project impact.

# Glossary and Abbreviations

| Term | Description |
|---|---|
| converter station | installation where alternating current is converted to direct current and vice versa. |
| environment effects statement | report presenting the environmental, socioeconomic and cultural impacts of a proposed development. |
| environmental impact statement | a report presenting the environmental impacts of a proposed development (Tasmania). |
| environmental management plan | procedures for managing environmental, socioeconomic and cultural impacts of a proposed development. |
| environmental management system | the management of an organisation's environmental programs in a comprehensive and systematic manner. |
| environmental value | an aspect of the environment in which we live that is esteemed, desirable or useful. A quality or physical characteristic of the environment that is conducive to ecological health or public amenity and safety. |
| landholder | the owner, lessee or occupant of land. In relation to Crown land, the nominated land manager. |
| landowner | the registered proprietor of a parcel or parcels of freehold land. |
| land-sea joint | point at which subsea cables are joined to land cables, either in a pit or buried in-situ. |
| life cycle | the course of development of a project from inception to design to construction to operation to closure. |
| preferred route | transmission route incorporating landholder and community feedback taken through the environment and planning approvals process. |
| project area | the area potentially disturbed by construction, operation and decommissioning activities. |
| proposed route | transmission line route identified in route selection and released to landholders and communities for comment. The proposed route incorporating landholder and community feedback becomes the preferred route. |
| subsea cable | cable manufactured for laying on and burial in the seabed. |
| substation | electrical infrastructure designed to manage load on a transmission network. Comprises a switching station with transformers for changing the voltage of attached transmission circuits, either by stepping up or stepping down the voltage. |
| upgrade | (in relation to a transmission network) works to enlarge the transmission network or increase its capacity to transmit electricity, also known as augmentation. |

| Term | Description |
| --- | --- |
| AADT | Annual Average Daily Traffic |
| ABS | Australian Bureau of Statistics |
| AC | Alternating Current |
| ATC | Automatic Traffic Count |
| AV | Articulated Vehicle |
| DC | Direct Current |
| DSG | Department of State Growth |
| DTP | Department of Transport and Planning |
| EDD | Extended Design Domain |
| EES | Environment Effects Statement |
| EIS | Environmental Impact Statement |
| EPA | Environment Protection Authority |
| HDD | Horizontal directional drill |
| HH | Heavy Haulage |
| HV | Heavy Vehicle |
| HVAC | High voltage alternating current |
| HVDC | High Voltage Direct Current |
| LOS | Level of Service |
| LV | Light Vehicle |
| MLPL | Marinus Link Pty Ltd |
| MW | Megawatt |
| NEM | National Electricity Market |
| NHVR | National Heavy Vehicle Regulator |
| NWTD | North West Transmission Developments |
| TMP | Transport Management Plan |
| VPD | Vehicles per day |

# 1 Introduction

The proposed Marinus Link (the project) comprises a high voltage direct current (HVDC) electricity interconnector between Tasmania and Victoria, to allow for the continued trading and distribution of electricity within the National Electricity Market (NEM).

The project was referred to the Australian Minister for the Environment 5 October 2021. On 4 November 2021, a delegate of the Minister for the Environment determined that the proposed action is a controlled action as it has the potential to have a significant impact on the environment and requires assessment and approval under the Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) (EPBC Act) before it can proceed. The delegate determined that the appropriate level of assessment under the EPBC Act is an environmental impact statement (EIS).

In July 2022 a delegate of the Director of the Environment Protection Authority Tasmania determined that the project be subject to environmental impact assessment by the Board of the Environment Protection Authority (the Board) under the *Environmental Management and Pollution Control Act 1994* (Tas) (EMPCA).

On 12 December 2021, the former Victorian Minister for Planning under the *Environment Effects Act 1978* (Vic) (EE Act) determined that the project requires an environment effects statement (EES) under the EE Act, to describe the project's effects on the environment to inform statutory decision making.

As the project is proposed to be located within three jurisdictions, the Tasmanian Environment Protection Authority (Tasmanian EPA), Victorian Department of Transport and Planning (DTP), and Australian Department of Climate Change, Energy, Environment and Water (DCCEEW) have agreed to coordinate the administration and documentation of the three assessment processes. Two EISs are being prepared to address the Tasmanian EPA requirements for the Heybridge converter station and shore crossing. A separate EIS/EES is being prepared to address the requirements of DTP and DCCEEW.

## 1.1 Purpose of this Report

This technical report presents the assessment of the terrestrial traffic and transport impacts associated with the project during its construction, operation and decommission phases. It defines the Environmental Performance Requirements (EPRs) required to meet the study objectives, as outlined within the EIS guidelines (Section 2.2).

This report describes the existing conditions within the study area (Section 6) which informs the assessment of traffic and transport impacts (Section 7). Input was provided where required from other specialist consultants.

## 1.2 Project Overview

The project is a proposed 1500 megawatt (MW) HVDC electricity interconnector between Heybridge in north west Tasmania and the Latrobe Valley in Victoria (Figure 1-1, Figure 1-2). The project will provide a second link between the Tasmanian renewable energy resources and the Victorian electricity grids enabling efficient energy trade, transmission and distribution from a diverse range of generation sources to where it is most needed, and will increase energy capacity and security across the NEM.

Marinus Link Pty Ltd (MLPL) is the proponent for the project and is a wholly owned subsidiary of Tasmanian Networks Pty Ltd (TasNetworks). TasNetworks is owned by the State of Tasmania and owns, operates and maintains the electricity transmission and distribution network in Tasmania.

Tasmania has significant renewable energy resource potential, particularly hydroelectric power and wind energy. The potential size of the resource exceeds both the Tasmanian demand and the capacity of the existing Basslink interconnector between Tasmania and Victoria. The growth in renewable energy generation in mainland states and territories participating in the NEM, coupled with the retiring of baseload coal-fired generators, is reducing the availability of dispatchable generation that is available on demand.

Tasmania's existing and potential renewable resources are a valuable source of dispatchable generation that could benefit electricity supply in the NEM. The project will allow for the continued trading, transmission and distribution of electricity within the NEM. It will also manage the risk to Tasmania of a single interconnector across Bass Strait and complement existing and future interconnectors on mainland Australia. The project is expected to facilitate the reduction in greenhouse gas emissions at a state and national level.

Interconnectors are a key feature of the future energy landscape. They allow power to flow between different regions to enable the efficient transfer of electricity from renewable energy generation zones to where the electricity is needed. Interconnectors can increase the resilience of the NEM and make energy more secure, affordable and sustainable for customers. Interconnectors are common around the world including in Australia. They play a critical role in supporting Australia's transition to a clean energy future.

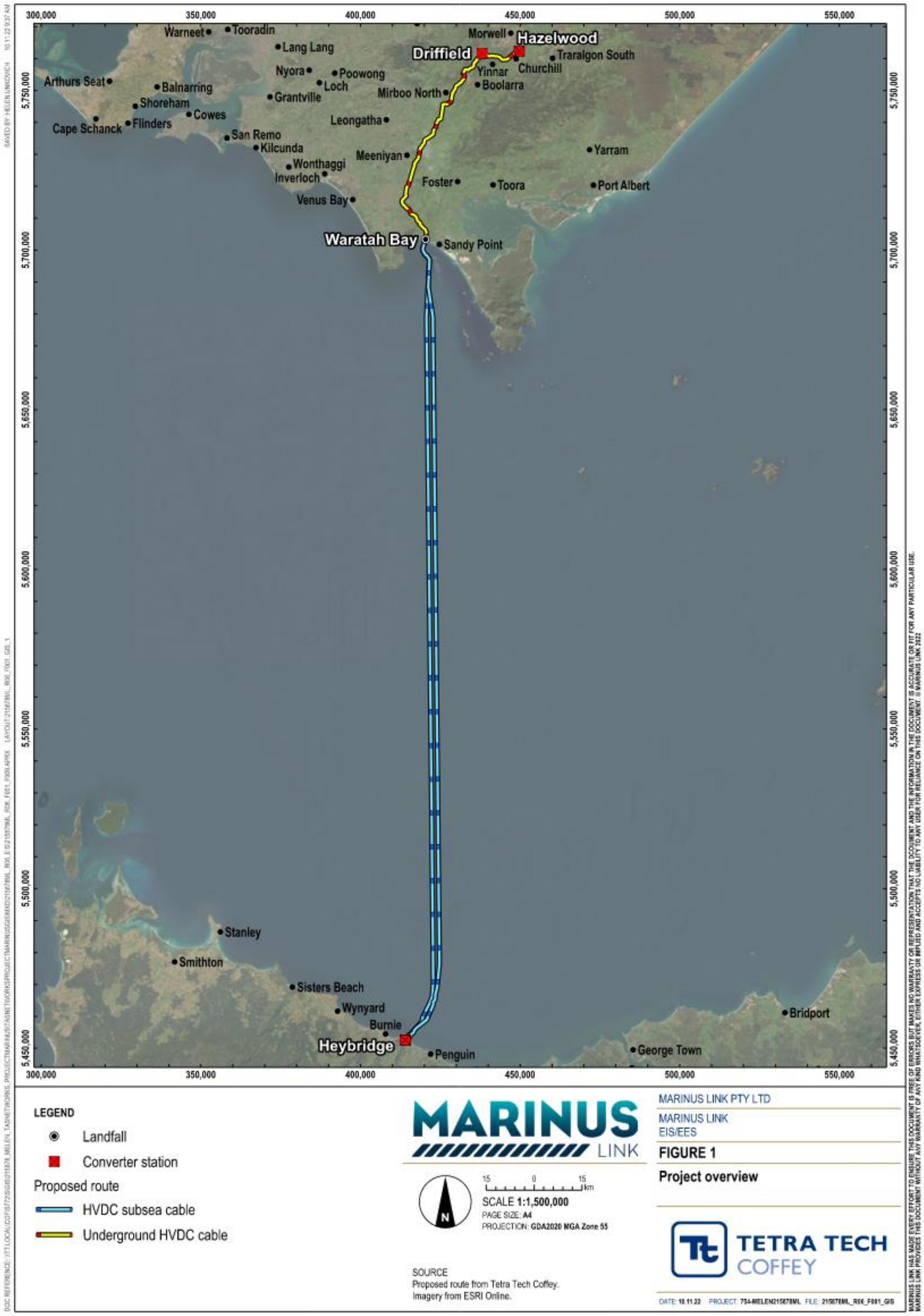



Figure 1-1: Project Overview

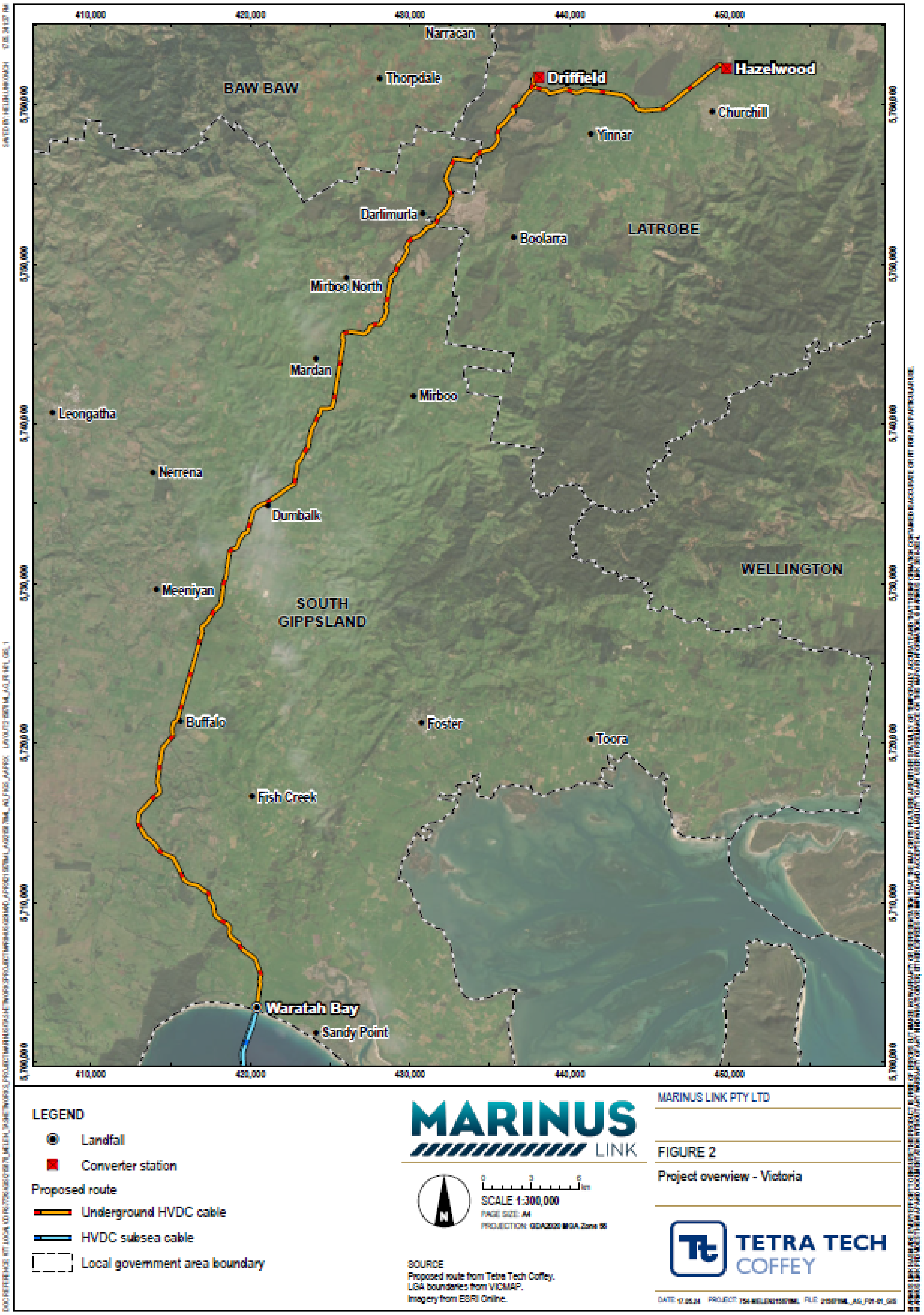



Figure 1-2: Project overview - Victoria

## 1.3 Assessment Context

This report has been prepared to assess the impact that the project will have on the transport network in Tasmania. Typically, a transport impact assessment will assess the volume of traffic generated by the proposed project to ensure that the road network will continue to operate acceptably under capacity. It will also consider if any transport infrastructure has been suitably designed and will meet the expected needs of the use. These assessments consider all modes of transport.

This transport assessment forms a critical part of the overall EIS and has considered the construction, operation and decommissioning stages of the project. Whilst the ongoing operational nature of the completed project and its infrastructure will have minimal transport impact, the assessment largely focuses on the construction stage of the project. This is where the transport elements most prominent throughout the life of the project.

## 1.4 Report Structure

A summary of the structure of this report is outlined below in Figure 1-3.

**Assessment Guidelines**

The preparation of an EIS is subject to a number of requirements as mandated by the state and commonwealth governments. These guidelines have been summarised to articulate the requirements that this report has been prepared to address.

**Legislation, Policy and Guidelines**

This section provides an overview of the key legislation, policy and guidelines that forms the framework that guides the development of the project. Some of these documents, particularly legislation, outline procedures and processes that require compliance. Other documents, particularly policy and guidelines, include quantifiable objectives that the project can be aligned with.

**Project Description**

The key components and details of the project that are relevant to this assessment. This section outlines the key characteristics of the project that have been utilised in the technical studies below.

**Method**

This section outlines the methodology for the preparation of this report. The assessments conducted within this report have been conducted to align with the EIS structure and assessment methodology.

The 'Significance Assessment' methodology has been undertaken by various technical consultants in the preparation of this EIS, and adapted to suit the discipline specific reqiurements of a traffic and transport assessment

**Baseline Characterisation**

An explanation of the existing conditions for the study area has been undertaken. This includes a review of the existing road network, traffic count surveys, a pavement assessment, review of historic crash data and summary of infrastructure for alternative modes of transport such as bus routes, and walking and cycling paths

**Impact Assessment**

A 'significance assessment' has been undertaken on the impacts that are expected to occur as a result of the project on the transport network. This section outlines the technical studies that have been undertaken to identify the expected impacts, identification of any required mitigating works inorder to address these impacts, and ultimately the final impact that the project will have on the existing environ

**Summary of Impacts**

A summary of the results of the significance assessment undertaken, and the resultant EPRs that were identified to address the expected impacts

Figure 1-3: Structure of this Report

# 2 Assessment Guidelines

This section outlines the assessment guidelines relevant to traffic and transport and the linkages to other technical studies completed for the project. Two separate EISs are being prepared to address the EIS guidelines published by EPA Tasmania for the Heybridge converter station and shore crossing.

## 2.1 Commonwealth

The project was referred under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) to the Commonwealth Minister for the Environment in October 2021. A delegate for the former Minister for the Environment determined on 4 November 2021 that the project is a controlled action requiring assessment and approval, as it is likely to have a significant impact on the following matters of national environmental significance, which are protected under Part 3 of the EPBC Act:

- listed threatened species and communities
- listed migratory species; and
- Commonwealth marine areas

The transport related items outlined within *Marinus Link underground and subsea electricity interconnector cable (EPBC 2021/9053)* are outlined in Table 2.1 below, noting only relevant sections of the document have been reproduced and presented.

Table 2.1: Commonwealth Government EPBC 2021/9053 Requirements

| Aspects to be assessed | Requirement | Report Section |
|---|---|---|
| 4. Description of Action | Details of all associated works/activities, including but not limited to vessel movements, maintenance activities, and transport requirements and access routes throughout different stages of development, commissioning, and operation. | Section 4.2<br>Section 4.3 |
| 5 Relevant Impacts | The assessment of impacts should address impacts from activities within construction, commissioning, operational, and decommissioning stages including but not limited to vessel movement, maintenance activities, and access routes through different stages of development. | Section 7.1 (Construction)<br>Section 7.2 (Operation)<br>Section 7.3 (Decommissioning) |
| 5.1 General Impacts | Likely impacts, including direct, indirect, and facilitated, to be addressed in the EIS include but should not be limited to:<br>• discuss potential impacts which may arise through the transportation, storage and use of dangerous goods (if any), fuels and chemicals, such as accidental spills<br>• in discussing potential impacts, consider how the interaction of extreme environmental events and any related safety response may impact on the environment. | Section 7.1.6<br>Section 7.1.7<br>Section 7.1.8<br>Section 7.1.9<br>Section 7.1.10 |
| 5.11 Cumulative Impacts | The assessment of cumulative impacts must include:<br>• review and analysis of residual impacts of the proposed development and of other known proposals where there may be a spatial or temporal overlap. | Section 7.4 |
| 6 Proposed Avoidance and Mitigation measures | The EIS must provide information on proposed environmental performance requirements (EPRs), and any specific avoidance, management, and mitigation measures to deal with the relevant impacts of the proposed action on MNES, including those required by other Commonwealth, State, and local government approvals. | Section 7.1.3<br>Section 7.1.4<br>Section 7.1.8<br>Section 7.1.9<br>Section 7.1.12<br>Section 7.1.13<br>Section 8.2 |

## 2.2 Tasmania

The guidelines for the EIS released by the Board of the Tasmanian EPA set out specific environmental matters to be investigated and documented in the project's EIS, and have informed the scope of the EIS technical studies. The EIS guidelines detail a series of evaluation objectives, and have been detailed in two separate guideline documents, one for the

Heybridge shore crossing, the other for the Heybridge converter station. These objectives nominate the desired outcomes sought in managing the potential impacts of constructing, operating and decommissioning the project.

The key issues and objectives relevant to traffic and transport are outlined below, which can be found in Section 6.14 of the converter station EIS scoping guidelines and Section 10.14 of the Heybridge shore crossing EIS scoping guidelines:

*"Discuss potential environmental impacts of the proposal on any significant off-site or infrastructure facilities (including increased use of existing infrastructure, such as roads, ports and quarries), identify measures to avoid and mitigate any possible adverse impacts and assess the overall impacts following implementation of the proposed avoidance and mitigation measures.*

*Identify roads and other infrastructure to be used by vehicles for the proposal (during both construction and operation). Potential environmental impacts associated with construction and use of such infrastructure should be assessed."*

These matters have been addressed throughout this report. To assist in addressing each of the key items within the above objectives, the following tables are provided for reference:

Table 2.2: Tasmanian EPA EIS Guideline Key Issues

| Item | Requirement | Report Section |
|---|---|---|
| 1 | Discuss potential environmental impacts of the proposal on any significant off-site or infrastructure facilities (including increased use of existing infrastructure, such as roads, ports and quarries) | Section 7.1.1<br>Section 7.1.6<br>Section 7.1.11 |
| 2 | Identify measures to avoid and mitigate any possible adverse impacts | Section 7.1.3<br>Section 7.1.8<br>Section 7.1.13 |
| 3 | Assess the overall impacts following implementation of the proposed avoidance and mitigation measures. | Section 7.1.5<br>Section 7.1.10<br>Section 7.1.15 |

## 2.3 Victoria

The Victorian component is subject to the same Commonwealth assessment and will be detailed in a separate report to the Tasmanian EIS volume. The transport impacts associated with the Victorian section of the project is subject to a separate EES assessment and is detailed within a separate report.

## 2.4 Linkages to other reports

This report is informed by or informs the technical studies outlined in Table 2.3.

Table 2.3: Other Consultant Reports Informed by this Report

| Technical studies | Relevance to this assessment |
|---|---|
| Noise and Vibration (terrestrial) | This assessment provides forecast traffic volumes in the project study area which may inform the noise and vibration assessment. |
| Terrestrial Ecology | Road widening and intersection works may entail the removal of native vegetation and have been considered in the terrestrial ecology assessment. |

# 3 Legislation, Policy and Guidelines

The relevant legislation, policies and guidelines for traffic and transport matters that have been considered during the preparation of this report are outlined in Table 3.1.

Table 3.1: Background Policy Review

| Legislation | Key Policies and Strategies | Implication for this project |
| --- | --- | --- |
| **State Legislative Documents** | | |
| *Transport Act 1981 (Tas)* | The *Transport Act 1981* establishes the Transport Commission and gives it statutory powers and functions including the power to regulate and control all or any means of transport by road, water or air within Tasmania | The Act is the legislative framework by which the state controls and administers the road network that will be utilised by the framework. Government authorities are engaged with throughout the lifecycle of planning through to construction. |
| *Dangerous Goods (Road and Rail Transport) Act 2010 (Tas)* | The Dangerous Goods Act 2010 provides the framework to regulate the transport of dangerous goods by road and rail in order to promote public safety and protect property and the environment | The project must comply with the Act. Strategies should be in place to ensure that project work and planning meets all Dangerous Goods Ace Regulations listed in the Act. |
| **State Strategic Policy** | | |
| *Cradle Coast Integrated Transport Strategy, 2006* | The Cradle Coast Integrated Transport Strategy was developed by the state and local councils as a guiding document for transport in the region.<br>The objective of the document is:<br>"A seamless, cost effective and efficient system for moving people, goods and resources operating within broader networks that:<br>• improves interaction and physical connectivity;<br>• enables communities and industries to meet their transport needs; and<br>• enhances the Region's and Tasmania's economic development, and social and environmental wellbeing." | The document outlines future infrastructure requirements and strategic transport planning for the future direction of the region. The project will not impact the implementation of the strategies objectives. |
| *Tasmanian Walking & Cycling for Active Transport Strategy (2010)* | To create a safe, accessible and well connected transport system that encourages more people to walk and cycle as part of their everyday journeys.<br>The vision supports the priority areas of the Tasmanian Urban Passenger Transport Framework to<br>• Reduce Greenhouse emissions<br>• Create liveable an accessible communities<br>• Increase travel reliability\<br>• Encourage healthy, active communities<br>Integrated transport and land use planning | The project will identify any impacts to active transport paths within the study area which are impacted by the project and develop strategies to limit impacts. |
| *North West Coastal Pathway Plan (2010)* | The North West Coastal Pathway Plan provides guidance for local councils, State Government agencies and the wider community in regard to the development and operation of the shared pathway between Wynyard and Latrobe. | The project will identify any impacts to the proposed scope of this plan. |
| *Tasmanian Integrated Freight Strategy, 2016* | Strategy prepared by the Tasmanian government to address the states freight challenges. A number of objectives, principles and key actions are identified. | Much of the construction materials required for the construction activities will be delivered from outside the state, arriving at the ports. This guiding strategy will influence the freight delivered for project construction. |
| *Bass Highway Cooee to Wynyard Planning Study, May 2019* | The Department of State Growth undertook a planning study, funded by the Commonwealth Government, along the Bass Highway between Cooee and Wynyard. The results of this study is a corridor improvement plan. | The project will identify any impacts to the proposed scope of this plan. |

| Legislation | Key Policies and Strategies | Implication for this project |
|---|---|---|
| *Transport Access Strategy* | Sets out the Tasmanian Government's approach to providing better integrated and coordinated land-based passenger transport services for all Tasmanians.<br><br>The strategy has the following priorities: Living closer, working together, connected transport system, better integration, closing transport gaps, innovative pricing, improved infrastructure. | The project will identify any impacts to the proposed scope of this plan. |
| **Burnie City Council Strategic Policy** | | |
| *Council Plan 2022-2025* | To represent and make informed decisions in the best interests of the Burnie community over the long term | Strategic document. The project will identify any impacts to the proposed scope of this plan. |
| *Road Network Strategy, 2016* | Key outcome areas of the Strategy are:<br>• Facilitating well-connected and appropriate freight routes including HPV / HML and Over Size and Over Mass Vehicles to support economic activity in the local and wider region.<br>• Adopting and implementing a Road Network Hierarchy.<br>• Prioritising and implementing works to address network deficiencies and supporting development opportunities.<br>• Facilitating greater access to, and linkages within, the road network for pedestrians and cyclists. | The project construction activities will be in accordance with the recommendations of the strategy |
| **Central Coast Council Strategic Policy** | | |
| *Central Coast Strategic Plan 2014-2024* | A 10-year time horizon with overarching strategic direction and priorities. It also provides the context and resources for turning strategy into action | The project will identify any impacts to the proposed scope of this plan. |
| *Central Coast Council Cycling Strategy, 2021* | A plan to support the growing culture of cycling in the municipality, with infrastructure recommendations. | The project will identify any impacts to the proposed scope of this plan. |

# 4 Project Description

## 4.1 Overview

The project is proposed to be implemented as two 750 MW circuits to meet transmission network operation requirements in Tasmania and Victoria. Each 750 MW circuit will comprise two power cables and a fibre-optic communications cable bundled together in Bass Strait and laid in a horizontal arrangement on land. The two 750 MW circuits will be installed in two stages with the western circuit being laid first as part of stage one, and the eastern cable in stage two.

The key project components for each 750 MW circuit, from south to north are:

- HVAC switching station and HVAC-HVDC converter station at Heybridge in Tasmania. This is where the project will connect to the North West Tasmania transmission network being augmented and upgraded by the North West Transmission Developments (NWTD).
- Shore crossing in Tasmania adjacent to the converter station.
- Subsea cable across Bass Strait from Heybridge in Tasmania to Waratah Bay in Victoria.

In Tasmania, a converter station is proposed to be located at Heybridge near Burnie. The converter station will facilitate the connection of the project to the Tasmanian transmission network. There will be two subsea cable landfalls at Heybridge with the cables extending from the converter station across Bass Strait to Waratah Bay in Victoria. The preferred option for shore crossings is horizontal directional drilling (HDD) to about 10 m water depth where the cables will then be trenched, where geotechnical conditions permit.

Approximately 255 kilometres (km) of subsea HVDC cable will be laid across Bass Strait. The preferred technology for the project is two 750 megawatt (MW) symmetrical monopoles using ±320 kV, cross-linked polyethylene insulated cables and voltage source converter technology. Each symmetrical monopole is proposed to comprise two identical size power cables and a fibre-optic communications cable bundled together. The cable bundles for each circuit will transition from approximately 300 m apart at the HDD (offshore) exit to 2 km apart in offshore waters.

This assessment is focused on the Tasmanian terrestrial and shore crossing section of the project. This report will inform the two EISs being prepared to assess the project's potential environmental effects in accordance with the legislative requirements of the Commonwealth and Tasmanian governments (see Figure 4.1).

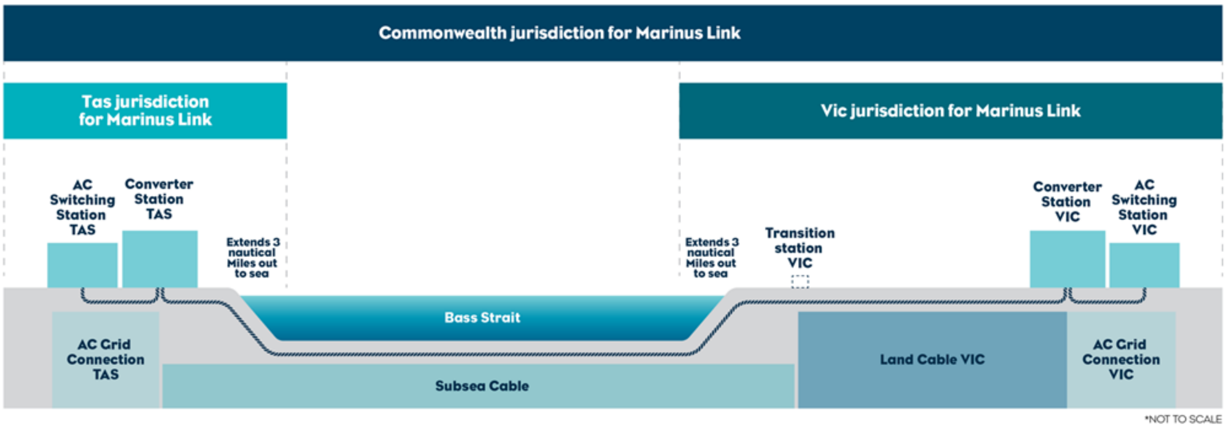



Figure 4-1: Project Components Considered Under Applicable Jurisdictions (Marinus Link Pty Ltd 2022, Consultation Plan)

The project is proposed to be constructed in two stages over approximately five years following the award of works contracts to construct the project. On this basis, stage one of the project is expected to be operational by 2030 and stage two will follow with final timing to be determined by market demand. The project will be designed for an operational life of at least 40 years.

## 4.2 Construction

For the purposes of this assessment, the construction methodology has been broken up into two separate stages:

- Tasmanian Shore Crossing
  Horizontal boring methods will be utilised to cross the Tasmanian coastline to approximately 10m water depth.

- **Converter Station/(s)**
  The construction of the converter station at the end of the cable. This converter station will be located in Heybridge and will include the delivery of the transformer by an approximately 130m long vehicle.

This construction methodology has been further outlined in the sections below, and forms the basis of the assessments conducted in this report.

## 4.2.1 Tasmanian Shore Crossing

### 4.2.1.1 Tasmanian Shore Crossing Description

In Tasmania, the shore crossing will be in Heybridge, approximately 6 km east of Burnie. The shore crossing will be constructed using Horizontal Directional Drill (HDD) and will extend approximately 800 m to 1200 m offshore out to 10 m water depth. The subsea cables and land cables will be connected close to the Tasmanian coast. The land-sea cable joint will be installed at the HDD drill pad location in Heybridge. The site will be accessible via Minna Road, at the same access point as the converter station.

The HDD construction process will occur over eight to 12 months. Each HDD will drilled continuously 24 hours per day, 7 day per week.

### 4.2.1.2 Tasmanian Shore Crossing Construction Traffic Generation

Information and assumptions in regard to the construction of the Tasmanian shore crossing and its associated traffic generation have been outlined below:

- HDD Drilling at the shore crossing will occur over six months.
- HDD boring will be a 24 hour / 7 day per week construction activity. Two, 12 hour employee shifts will occur each day, from 7AM to 7PM and 7PM to 7AM.
- It is expected that a maximum of six light vehicles and eight heavy vehicles will be required on-site during set up.
- It is assumed that the construction vehicles generated will arrive in the morning during site set up and remain on-site during construction
- It is assumed that 10 employee vehicles will arrive and depart during each shift change over.
- It is assumed that some employees will come / go over the course of the day from the site (i.e. for deliveries, lunch etc.). Therefore it is assumed the workers will generate an average of 3 vehicle movements per day.

The above information has been summarised in Table 4.1 below.

Table 4.1: Tasmanian Shore Crossing Traffic Volume Summary

| Time Period | Heavy Vehicles (Construction) | Light Vehicles (Construction) | Light Vehicles (Employees) | Total Vehicles |
|---|---|---|---|---|
| Peak Hour | 8 movements | 6 movements | 20 movements | 34 movements |
| Daily | 8 movements | 6 movements | 60 movements | 74 movements |

## 4.2.2 Converter Station

### 4.2.2.1 Converter Station Description

The Tasmanian converter station will be located in Heybridge on Tasmania's north coast, the location of which is shown in Figure 4-2


Figure 4-2: Converter Station Location

The Heybridge converter station will connect the subsea cables to the Tasmanian 220 kV HVAC network. The overhead steel lattice gantries will terminate at the site, connect to a switching station which is connected to the converter stations.

The Heybridge converter station is accessed via the Bass Highway at Minna Road which has a seagull intersection layout. Access will be a sealed, two-lane access road . Internal roads will also be constructed within the converter station site to provide access between buildings.

The construction of the converter station will also include the delivery of transformers to the site. The transport arrangements for this piece of equipment are significant in size, consisting of a vehicle approximately 130m long and 650 tonnes. This arrangement is further discussed in Section 4.2.3.2 and shown in more details in Appendix D .

### 4.2.2.2 Converter Station Traffic Generation

Information and assumptions regarding the construction of the converter station have been outlined below:

- Construction will occur over a 35-month time frame.
- Construction activities will occur six days per week, from 7:00AM to 4:00PM.

Construction heavy vehicle traffic generation assumptions are outline in Table 4.2 below.

Table 4.2: Converter Station Construction Traffic Volume Summary

| Movements per quarter | 2025 | | | | 2026 | | | | 2027 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 |
| Stage 1 | | 353 | 619 | 267 | 300 | 367 | 357 | 264 | | |
| Stage 2 | | | 512 | 512 | 159 | 159 | 169 | 239 | 229 | 209 |
| Switching Station | | | | 100 | 240 | 300 | 300 | 300 | 240 | 120 |
| Total Movements = 4,715 | | | | | | | | | | |

- The peak quarterly traffic volumes identified in Table 4.2 is 1,131 vehicles. Assuming this volume of traffic is evenly distributed across a three-month period 15 daily vehicle movements will result. However, it is noted that construction vehicles are expected to be concentrated during certain periods (such as earthworks near the beginning of construction). For the purposes of this assessment, it is assumed a maximum of 30 vehicles will arrive on a single day (30 inbound movements and 30 outbound movements). All vehicles are expected to arrive in the morning and depart in the evening.
- The number of employees expected on-site each day is outlined in Figure 4-3 below. This figure indicates a peak of 180 employees on-site. This results 180 movements inbound at the start of the day and 180 movements outbound at the end of the day.

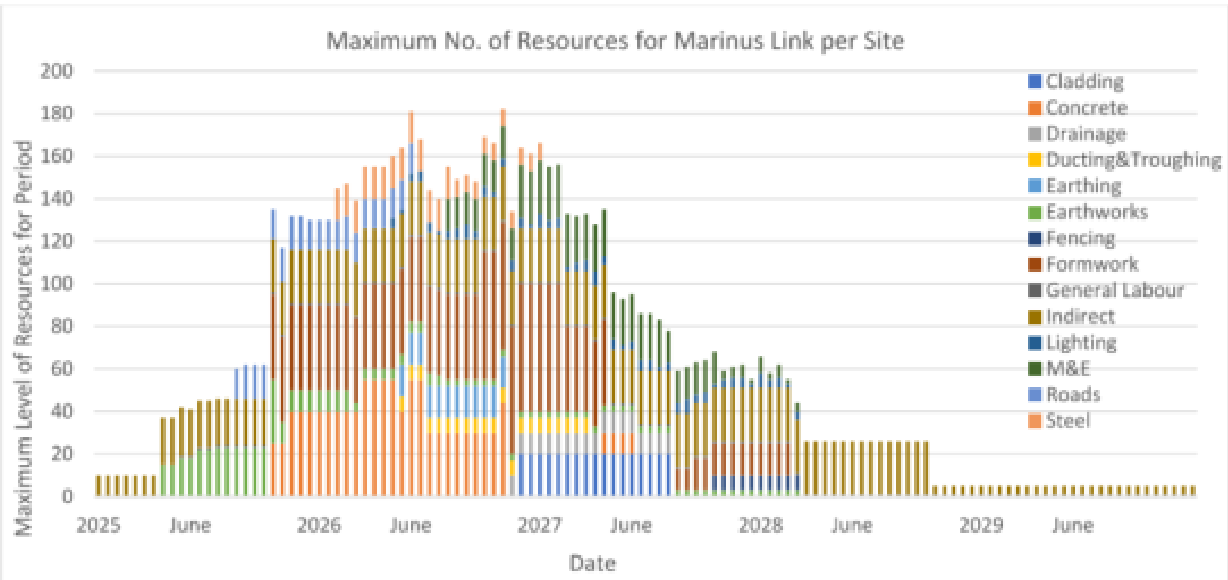



Figure 4-3: Converter Station Construction Daily Workforce

- It is assumed the workers will generate an average of 2 vehicle movements per day. Noting, maximum traffic volumes generated by staff, which gave been used in this assessment, are considered to be conservative due to the small number of times in which the peak occurs across the entirety of the program.
- The need for construction works to leave the site during their shift is considered to be low, due to the size of the construction activity, the number of workers on-site and the associated amenity which is likely to be provided for a construction activity of this scale. As such, the rate of two movements per staff member is considered reasonable.

The above assumptions have been summarised in Table 4.3 below.

Table 4.3: Converter Station Traffic Volume Summary

| Time Period | Heavy Vehicles (Construction) | Light Vehicles (Employees) | Total Vehicles |
|---|---|---|---|
| Peak Hour | 30 movements | 180 movements | 210 movements |
| Daily | 60 movements | 360 movements | 420 movements |

It is noted that the above assessment summarises the expected traffic generation volumes for the construction of the converter station at either Driffield or Hazelwood. Assessments will be completed considering the required treatments at either site.

## 4.2.3 Vehicle Types Used for Construction

### 4.2.3.1 Core Construction Activities

A variety of heavy vehicles are expected to be accessing the shore crossing site and converter station as a part of the construction activities. This will include, but not be limited to the following:

- 12-18 tonne capacity tip truck
- 8m$^3$ capacity concrete mixer
- 100t mobile crane
- Franna crane
- Water truck
- Hydrovac excavator
- A flat-bed truck will be used to deliver construction equipment such as a cherry picker, excavators, vibrator rollers, HDD drilling rigs and more.

For the purposes of this assessment it has been assumed that all vehicles accessing each of the construction sites will be less than or equivalent in size to a 19m articulated vehicle (AV). Where swept path assessments are required, a 19m AV has been utilised to determine the spatial requirements. Further detail is outlined in Section 7.1.6.2 and 7.1.8.2.

### 4.2.3.2 Transformer Transport Vehicle

The construction of the converter station will entail the delivery of a number of transformers. This activity has been specifically assessed from the other construction activities due to the use of a bespoke vehicular arrangement which will include the use of a vehicle that is approximately 130m long, 6m in height and approximately 650 tonnes. The arrangement of this vehicle is detailed in the figure below. This is also attached in Appendix D in greater detail.

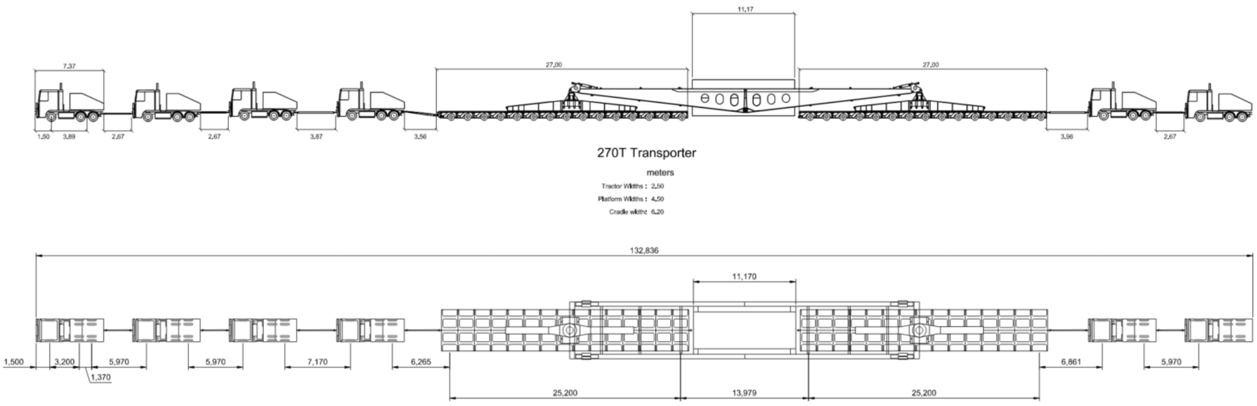



Figure 4-4: Transformer Transporter Vehicle

Separate turning movement assessments have been conducted of the path of travel that this vehicle will take to access the converter station from the Port of Burnie. Further detail is outlined in Section 7.1.6.2 and 7.1.8.2.

## 4.2.4 Construction Vehicle Travel Paths

The paths of travel to the site have been determined. These considered a number of factors, such as pre determined heavy vehicle routes as found on the Department of State Growth (DSG) transport services website, a review of the existing road conditions through the site inspection as well as the most logical and short path of travel.

These have been grouped as follows:

- Construction Haulage – The path of travel of construction vehicles to the site. It has been assumed that all construction vehicles will be arriving to the region from either Burnie or Devonport (primarily from the ports in either township)
- Workforce – The path of travel for the workforce of employees that is required to complete the construction activities. Employees will travel to / from the site from the townships in the surrounding area

- **Transporter Transformer –** The path of travel of the over dimensional transformer transporter from the Port of Melbourne to the converter station sites.

When determining the paths of travel for heavy vehicles, roads identified on the DSG transport services website were preferenced. These maps show the pre-approved and assessed heavy road networks as determined by DSG and can be assumed to be accessible by the large construction vehicles that are required. The following heavy vehicle maps were reviewed and utilized:

- **B-Double (26m) Network:** Tasmania's arterial and municipal roads for Class 2 B-Doubles that are up to 26m in length. For the purposes of this assessment it was assumed that all roads on the B-Double road network are accessible by vehicles up to and including a B-double in size.
- **Load Carrying Vehicles Network:** Tasmania's Class 1 load carrying vehicles network is for oversize vehicles. This includes vehicles up to 5.5m in width, 5.0m in height and 30.0m in length. This road network was deemed to be the most accessible, with a greater level of accessibility than the B-Double network.
- **Height Clearance Under Overhead Structures:** The map of overhead structures on the road network, utilized to identify any roads with low hanging infrastructure that may impact the access requirements of the transformer transport vehicle.

#### 4.2.4.1 Heavy Vehicles

For the purposes of this assessment it has been assumed that all construction related heavy vehicle traffic volumes will be arriving to the construction sites from either Burnie (west of the site), Devonport or Launceston (East of the site). These paths of travel will both primarily use the Bass Highway, turning into the site at the Minna Road intersection. It is expected that vehicles will be travelling from Burnie, where possible, given its close proximity to the site, however given Launceston and Devonport are larger townships a 50:50 east/west distribution has been assumed.

The travel paths determined are outlined in Figure 4-5

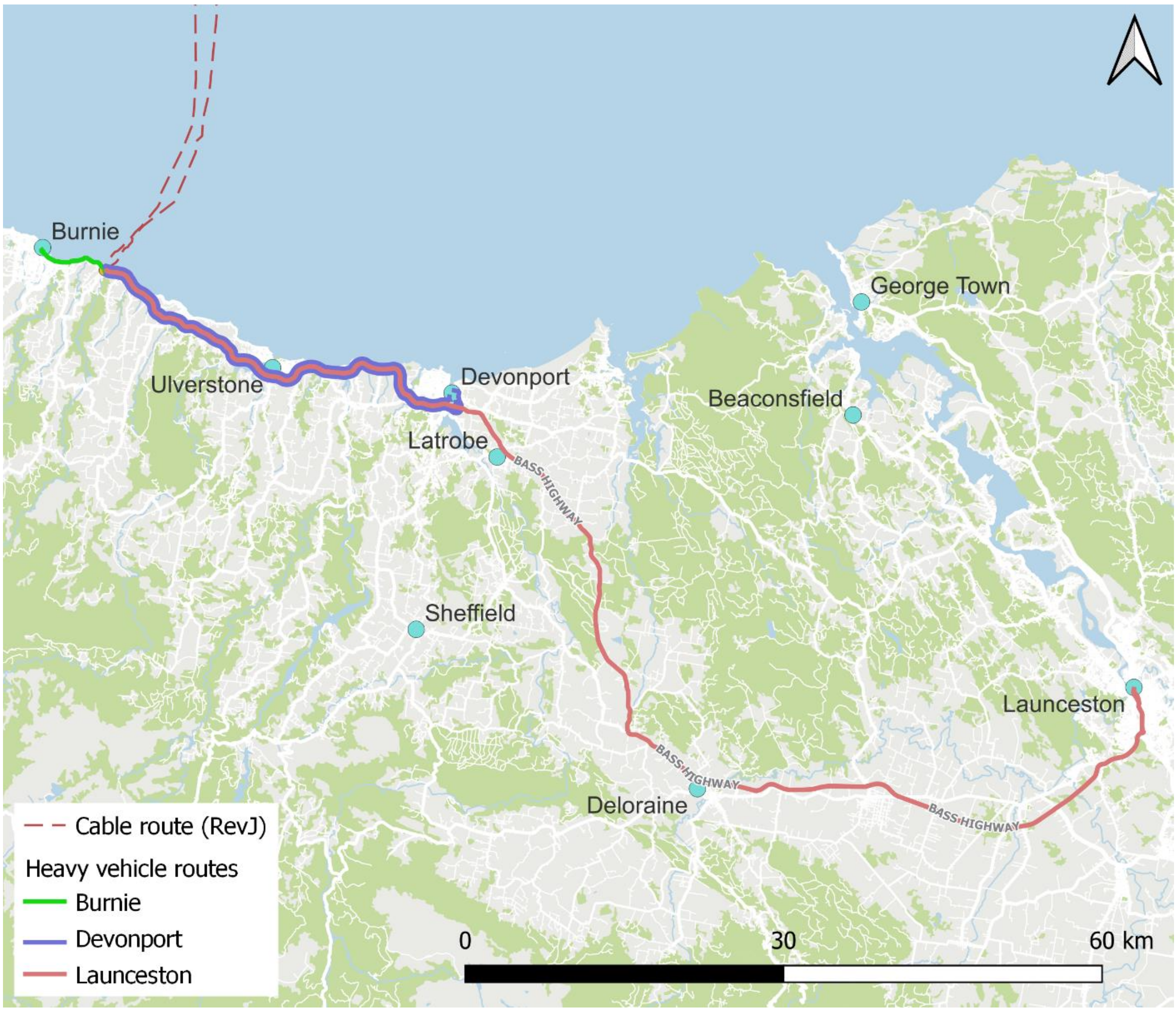



Figure 4-5: Heavy Vehicle Paths of Travel Using the Bass Highway

#### 4.2.4.2 Personnel/ Light Vehicles from Surrounding Area

Personnel for the construction activities will be sourced from a variety of local, state, interstate and international resources. It was assumed that any employees that were not locally located will be given accommodation within the surrounding townships. Given that all employees will be residing within the local area during construction, the paths of travel for all employees to the work sites were determined based on the townships population.

The population of the surrounding local government areas were therefore identified using ABS data from the 2016 Census. These are outlined in Table 4.4, with their locations presented in Figure 4-6.

Table 4.4: Local Government Municipalities in the Surrounding Area

| Local Government Municipality | Population |
|---|---|
| Circular Head | 8,114 |
| Waratah-Wynyard | 14,164 |
| Burnie | 19,862 |
| Central Coast | 22,299 |
| Kentish | 6,713 |
| Devonport | 25,886 |
| Latrobe | 12,076 |
| West Tamar | 24,688 |
| George Town | 6,962 |
| Launceston | 70,331 |
| Dorset | 6,748 |
| Meander Valley | 20,505 |

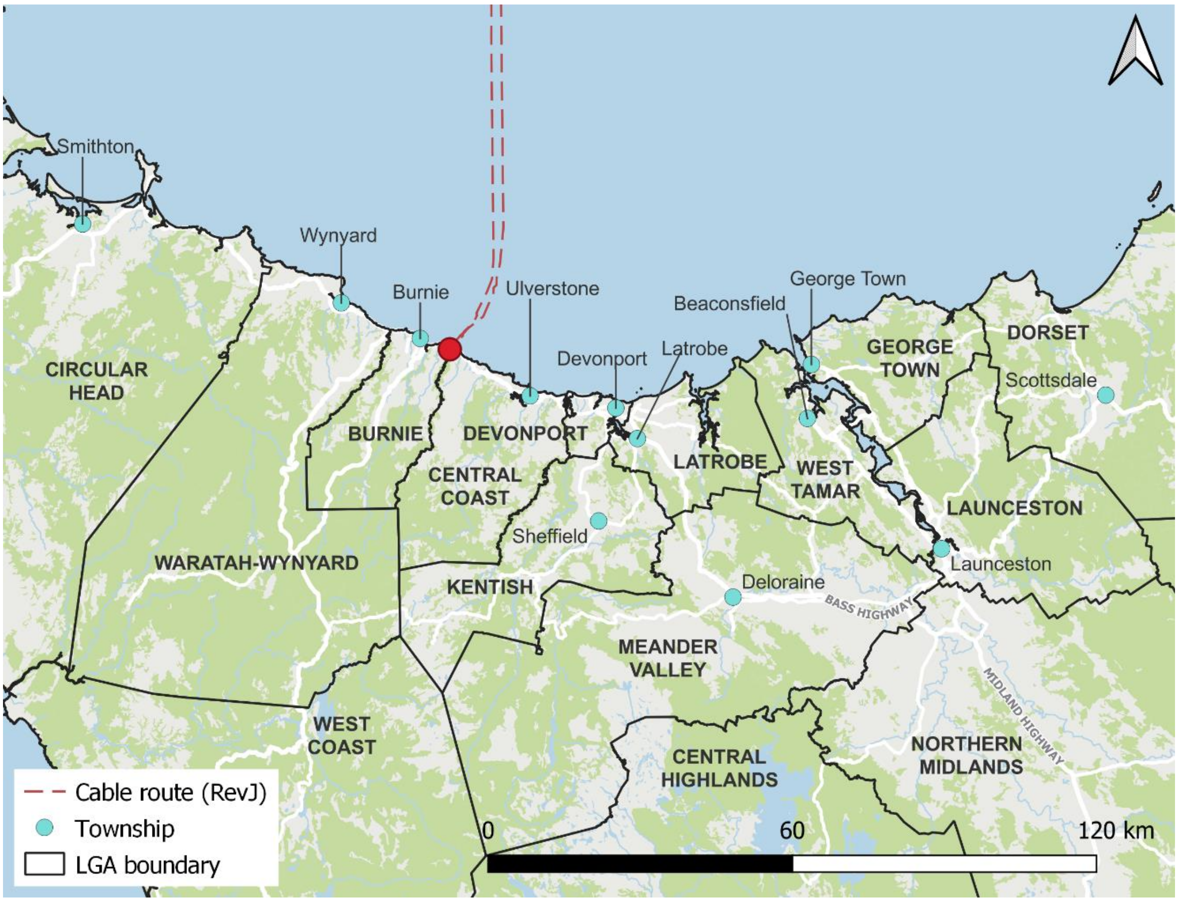



Figure 4-6: Local Government Municipalities in the Surrounding Area

The municipalities were then grouped by their location when compared to the Heybridge site, to identify the direction of travel and distribution. The percentage of total residents within the municipalities was utilised to determine the percentage split of employees to the site from that general direction.

Table 4.5: Grouping of Local Government Municipalities in the Surrounding Area

| Location | List of Municipalities | Total Population | Percentage of Combined Population |
|---|---|---|---|
| West | Circular Head, Waratah-Wynard, Burnie | 42,140 | 18% |
| East | Central Coast (Tas.), Kentish, Devonport, Latrobe (Tas.), West Tamar, George Town, Launceston, Dorset, Meander Valley | 196,208 | 82% |

The groupings of townships identified above, as well as the percentage population that lives in each town forms the basis of the paths of travel that employees are expected to take to the locations identified above. These paths of travel have been determined and are identified below.

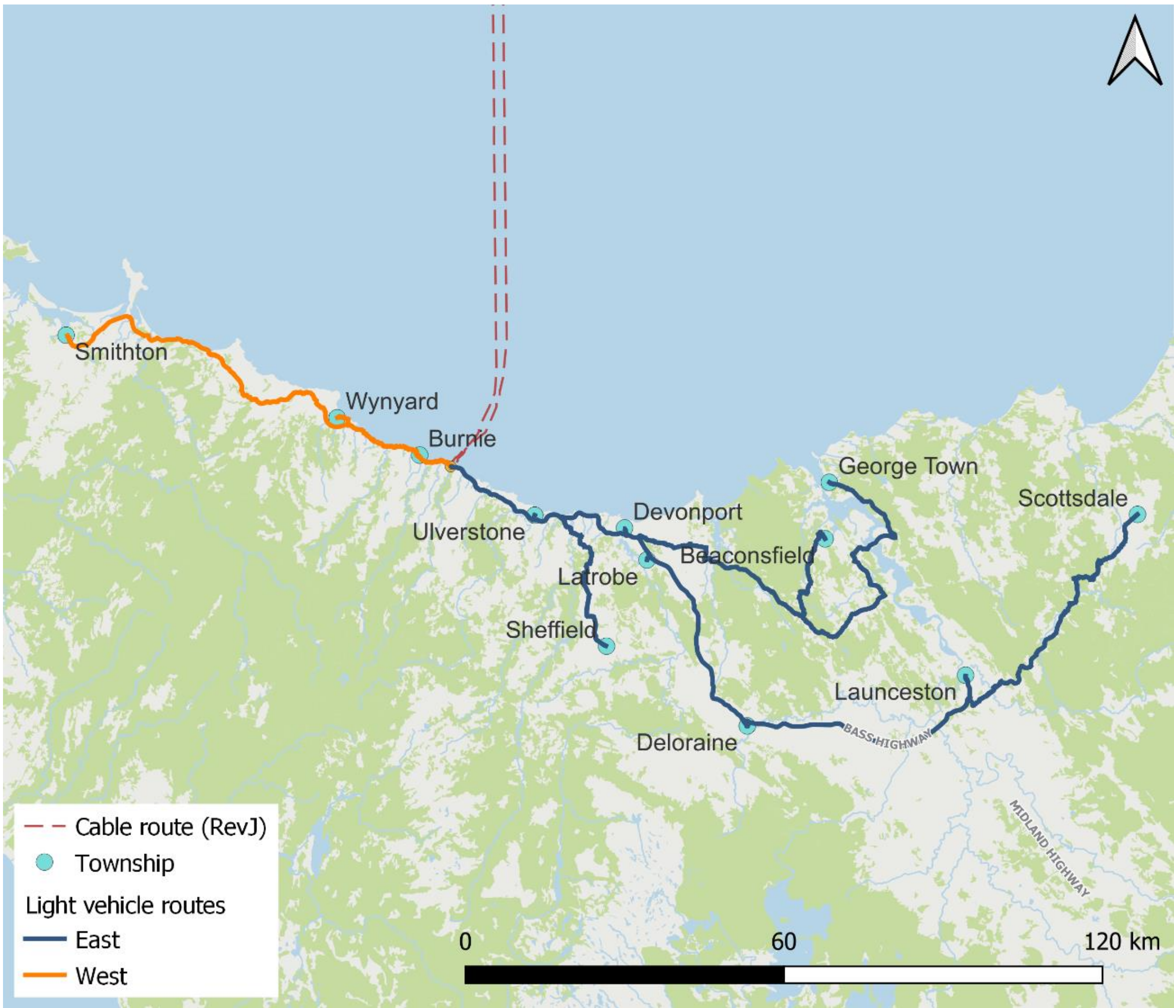



Figure 4-7: Light Vehicle Paths of Travel

#### 4.2.4.3 Transformer Transport Path of Travel

As stated above in Section 4.2.2 the construction of the converter station entails the arrival of the transformer transport vehicle. Information provided by MLPL indicates that the transformer will arrive at either the Port of Burnie or Port of Devonport to then be delivered to the site.

The travel paths for this vehicle were determined utilising the Load Carrying Vehicles Network and the Height Clearance Under Overhead Structures maps as outlined above on the DSG website. A review of these maps, as well as an inspection of the infrastructure along the Bass Highway found that the transformer is recommended to be delivered to the Port of Burnie. This is due to the following:

- The travel distance is less between the site and the Port of Burnie. This will reduce disruption to the road network caused by the large, slow moving vehicle and decrease the labour cost
- Roundabouts exist along the Bass Highway (such as that immediately to the east of the site in Heybridge) that will need to be traversed by the large vehicle. Roundabouts do not exist between the site and Burnie
- There are a number of bridges over the Bass Highway between the site and Devonport with height clearances of 5.0m and less
- Consultation with DSG highlighted that the Port of Burnie is utilised for the delivery of wind turbine blades for wind farms in the region, indicating it is accessible to very large vehicles.
- There are a number of bridges between the site and the Port of Burnie which require further assessment as to their structural integrity and capacity to accommodate a vehicle of this size and mass (refer stakeholder feedback provided via the Department of State Growth in Section 5.7)

The path of travel utilised by the transformer transport is shown in Figure 4-8.


Figure 4-8: Paths of Travel from the Port of Burnie by the Transformer Transport

## 4.3 Operation

The project will operate 24 hours, 7 days a week as a continuous connection between Tasmania and the mainland. It is anticipated to have a minimum 40-year operational lifespan.

During its active lifespan, the operational and maintenance activities that are expected include the following:

- Routine inspections of the shore crossing land cable easement for potential operational and maintenance issues, including:
  - unauthorised activities and structures.
  - land stability.

- rehabilitation issues.
- weed infestations resulting from construction activities.
- cover at watercourse crossings.

- Periodic inspection of the subsea cables by remotely operated vehicles.
- Remote monitoring of shipping activity near the subsea cables for potential anchoring issues.
- Servicing, testing and repair of the subsea and land cables, and converter stations equipment and infrastructure including scheduled minor and major outages.

In addition to the above, the converter station will have personnel during normal working hours, with small numbers of personnel attending each day.

All aspects of the project will require periodic maintenance.

## 4.4 Decommissioning

The operational lifespan of the project is a minimum 40 years. At this time the project will be either decommissioned or upgraded to extend its operational lifespan.

Decommissioning will be planned and carried out in accordance with regulatory and landowner or land manager requirements at the time. A decommissioning plan in accordance with approvals conditions will be prepared prior to planned end of service and decommissioning of the project.

Requirements at the time will determine the scope of decommissioning activities and impacts. The key objective of decommissioning is to leave a safe, stable and non-polluting environment, and minimise impacts during the removal of infrastructure.

In the event that the project is decommissioned, all above-ground infrastructure will be removed, and associated land returned to the previous land use or as agreed with the landowner or land manager.

Decommissioning activities required to meet the objective will include, as a minimum, removal of above ground buildings and structures. Remediation of any contamination and reinstatement and rehabilitation of the site will be undertaken to provide a self-supporting landform suitable for the end land use.

Decommissioning and demolition of project infrastructure will implement the waste management hierarchy principles being avoid, minimise, reuse, recycle and appropriately dispose. Waste management will accord with applicable legislation at the time.

Decommissioning activities may include recovery of land cables and removal of land cable joint pits. Recovery of land cables would involve opening the cable joint pits and pulling the land cables out of the conduits, spoiling them onto cable drums and transporting them to metal recyclers for recovery of component materials. The conduits and shore crossing ducts would be left in-situ as removal would cause significant environmental impact.

The concrete cable joint pits would be broken down to at least one metre below ground level and buried in-situ or excavated and removed.

A decommissioning plan will be prepared to outline how activities will be undertaken and potential impacts managed.

# 5 Assessment Method

## 5.1 Overview

This section outlines the methodology for the preparation of this report. The assessments conducted within this report have been conducted to align with the EIS structure and assessment methodology.

The process undertaken to complete this assessment as it relates to traffic and transport is outlined in Figure 5-1 below.

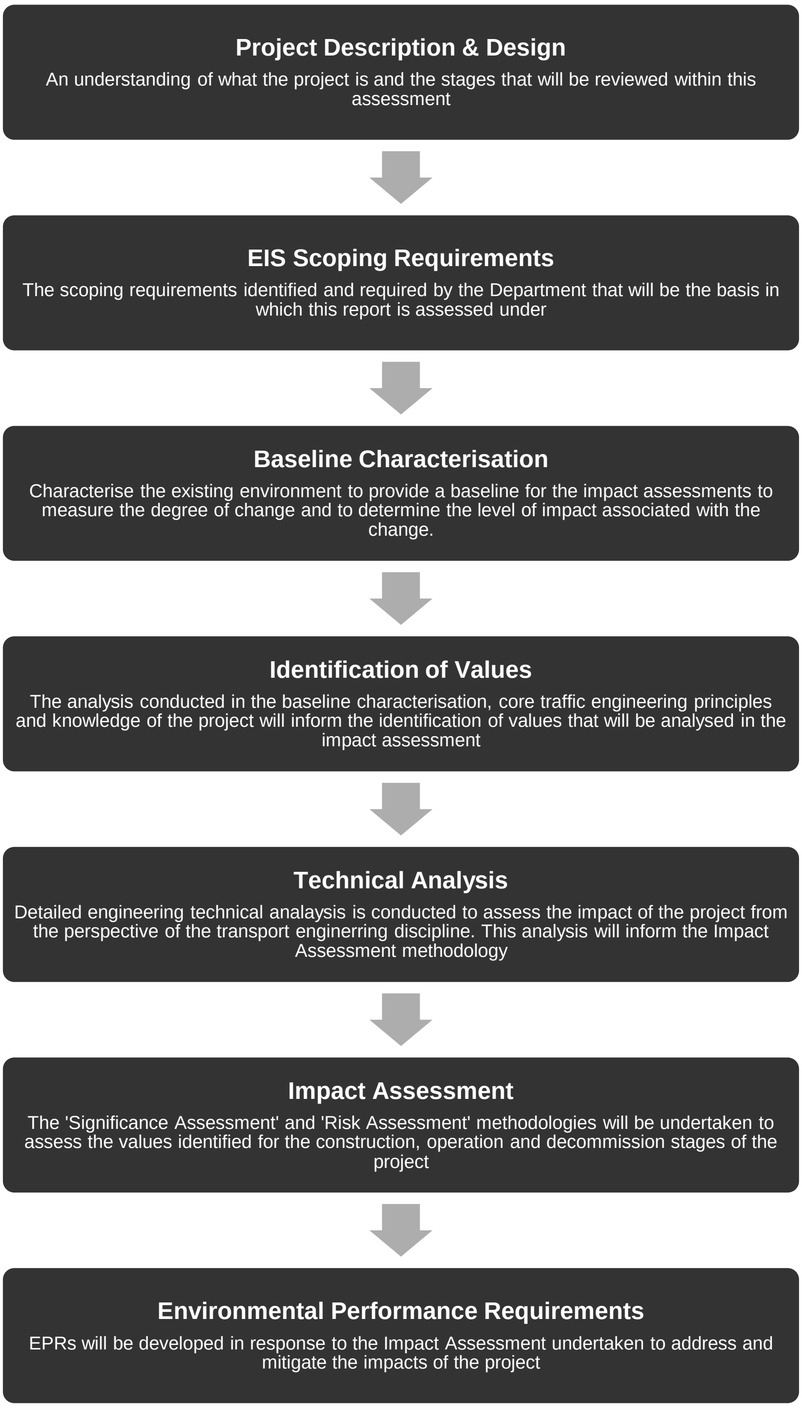



Figure 5-1: EIS Methodology

## 5.2 Study Area

This report assesses the road network in the immediate surrounding area of the construction site and to Burnie and Devonport. This includes Minna Road and the Bass Highway on the converter station sites frontages.

This report will assess the existing condition of the roads within the immediate surrounds, and determine any infrastructure upgrades that may be required to service the access needs of the project.

The approximate extents of the study area assessed within this report are shown in Figure 5-2.

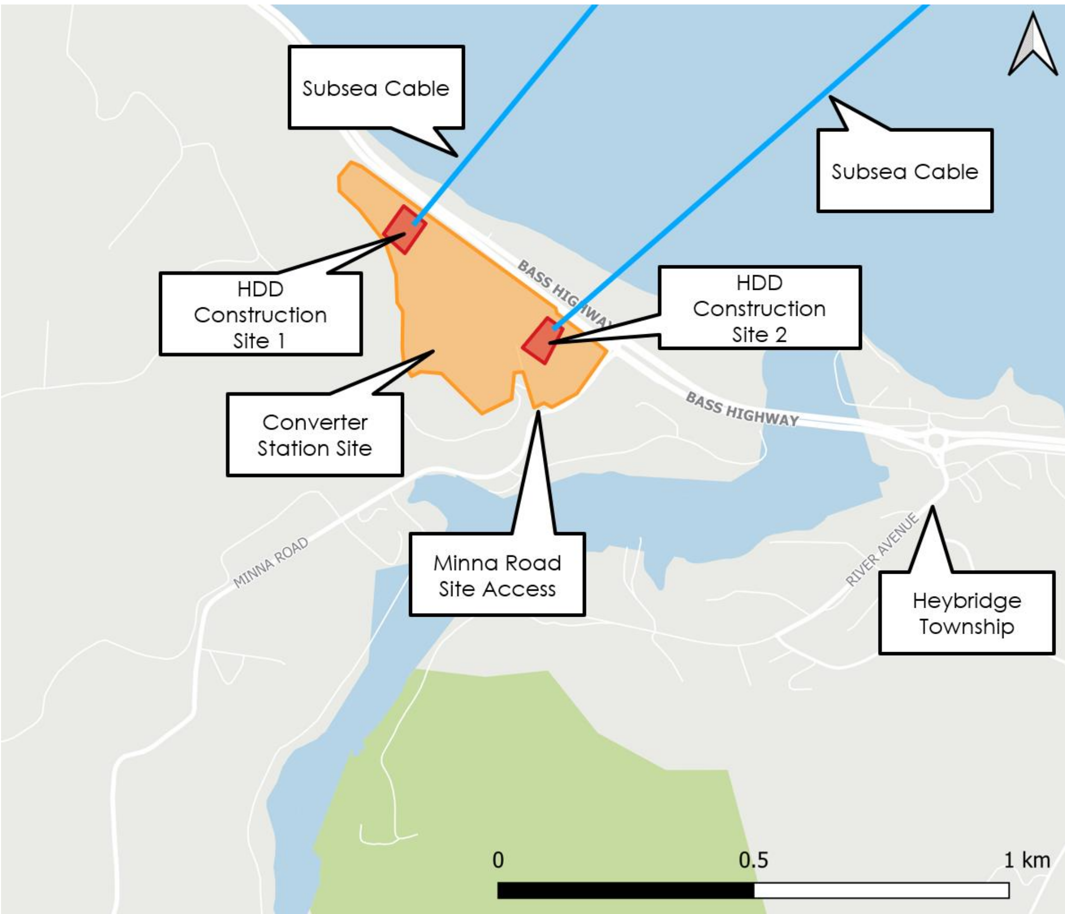



Figure 5-2: Assessment Study Area

## 5.3 Existing conditions

The baseline characterisation was utililsed to gain an understanding of the existing conditions and operation of the transport network within the immediate surrounds of the project. This includes the preparation of an extensive background review, including conducting the following activities:

- a site inspection of the road network surrounding the project extents.
- the collection of existing conditions traffic count data surveys.
- a review of required traffic engineering literature and resources.
- data collection of publicly available channels / resources.
- a review of alternative modes of transport, such as the public transport network and walking and cycling tracks.

The impact assessment will rely upon, in many cases, a comparison to the existing operational performance of the transport network in the area.

## 5.4 Identification of Baseline Values & Attributes

The baseline characterization / existing conditions review as outlined above was utilized to identify the 'values' that were assessed as a part of the impact assessment. The values alongside their attributes were identified based on core transport engineering principles, as well as a knowledge and understanding of the project.

The values and attributes identified are outlined below in Table 5.1.

Table 5.1: Values and Attributes

| Value | Attribute |
|---|---|
| **Road Network Capacity**<br>The operational performance of the road network with regard to its theoretical capacity and existing operation. This value recognizes how the road network is performing, whether a substantial change is to occur from its existing operational performance | Arterial Road Network Capacity |
| | Intersection Capacity |
| | Road connectivity and provision of alternative routes |
| **Safe Road Performance, Condition and Design**<br>The design and operation of the road network, ensuring that it is provided in a safe manner that is compliant with relevant industry standards and guidelines. | Safe condition of bridges and culverts |
| | Provision of adequate road geometry |
| | Review of crash history |
| | Intersection safe sight distance assessment |
| | Height clearance requirements of transformer transporter |
| | Safe operation and management of construction activities |
| **Public and Active Transport**<br>The continued operation of the public transport network, as well as the active transport infrastructure in the surrounding area. This includes V/Line trains, local bus services, school buses, recreational rail trails and public footpaths. | Operation of public transport services and infrastructure |
| | Operation of active transport infrastructure |

The values were identified based on the analysis conducted within Section 6.3.

## 5.5 Impact Assessment Technical Analysis

Prior to the completion of the impact assessment, detailed traffic engineering assessment was required to complete the technical analysis and identify the impacts of the project. This assessment was undertaken with consideration of the three stages of the project lifecycle; construction, operation and decommission. This analysis aligns with the values identified, with the impacts subsequently assessed utilizing the significance assessment.

The analysis undertaken includes typical traffic engineering analysis to identify the impact of the project, such as those outlined below:

- traffic generation estimates;
- identification of travel routes;
- road capacity assessments;
- turning lane warrant intersection assessments;
- swept paths;
- safe sight distance;
- pavement conditions;
- road safety and crash history review;
- review of surrounding public transport and active transport.

The technical analysis conducted is outlined in Section 7 of this report, completed to align with the appropriate value.

## 5.6 Impact Assessment

The impacts that were identified as a part of the technical analysis were assessed using the significance impact assessment methodologies: This approach considers the significance of an impact on the value by evaluating the magnitude of an impact and the sensitivity of the value to change. This is the primary method of impact assessment to be used for the project.

The key steps to the impact assessment methodologies are set out below.


Figure 5-3: Impact Assessment Methodology

## 5.6.1 Significance Assessment Methodology

One approach to impact assessment is to assess the significance of impacts by considering the sensitivity of the value and magnitude of the impact. This approach assumes the identified impacts will occur, as this conservative method enables a more comprehensive understanding and assessment of the likely impacts of a project. It focuses attention on the mitigation and management of potential impacts through the identification and development of effective design responses and environmental controls.

The process of undertaking this assessment is detailed in Figure 5-3 above, with the criteria that were determined to assess each value outlined below.

### 5.6.1.1 Sensitivity Criteria

The sensitivity criteria are outlined in Table 5.2.

Table 5.2:Sensitivity Criteria

| Sensitivity Level | Value 1 – Road Network Capacity Sensitivity Criteria | Value 2 – Safe Road Performance, Condition & Design Sensitivity Criteria | Value 3 – Public & Active Transport Sensitivity Criteria |
|---|---|---|---|
| Very High | • Current traffic volumes exceed the road's design capacity<br>• There are no viable alternatives for access and road closures will cut off access to a township, private properties, significant tourist location.<br>• Future access proposed to heavily trafficked road (>10,000 vpd) | • B-double approved route with high increase in traffic<br>• The road and intersection geometry cannot accommodate large vehicles with major non-conforming infrastructure<br>• Very high road crash history (or potential to)<br>• A highly sensitive use is accessed directly from a B-double approved route | • High frequency rail services<br>• Active transport infrastructure heavily utilised by commuters |
| High | • Current traffic volumes are equivalent to the road's design capacity<br>• Alternative routes with significant detours exist and will limit access to a township, private properties, significant tourist location.<br>• Future access proposed to moderately-to-highly trafficked road (<10,000 vpd) | • B-double route with moderate increase in traffic<br>• The road and intersection geometry is highly constrained with non-conforming infrastructure<br>• High road crash history (or potential to)<br>• A moderately sensitive use is accessed directly from a B-double approved route | • Low frequency rail services<br>• Active transport infrastructure moderately utilised by commuters |
| Medium | • Current traffic volumes are approaching the road's design capacity<br>• Alternative routes with moderate detours exist and will partially limit access to a township, private properties, significant tourist location.<br>• Future access proposed to moderately trafficked road (<3,000 vpd) | • Non-approved B-double route with high increase in traffic<br>• The road and intersection geometry is moderately constrained with non-conforming infrastructure<br>• Moderate road crash history (or potential to)<br>• A highly sensitive use is accessed directly from a non-approved B-double approved route | • High frequency bus services<br>• Recreational paths which are a tourism attractor |

| Sensitivity Level | Value 1 – Road Network Capacity Sensitivity Criteria | Value 2 – Safe Road Performance, Condition & Design Sensitivity Criteria | Value 3 – Public & Active Transport Sensitivity Criteria |
|---|---|---|---|
| Low | • Current traffic volumes are comfortably below the road's design capacity<br>• Alternative routes with minor detours exist and will not limit access to a township, private properties, significant tourist location.<br>• Future access proposed to lightly trafficked road (<1,500 vpd) | • Non-approved B-double route with moderate increase in traffic<br>• The road and intersection geometry is slightly constrained with some non-conforming infrastructure<br>• Low road crash history (or potential to)<br>• A moderately sensitive use is accessed directly from a non-approved B-double approved route | • Low frequency bus services<br>• Recreational paths used by locals |
| Very Low | • Current traffic volumes are significantly below the road's design capacity<br>• Suitable alternative routes exist for roads effected by the project.<br>• No future access proposed | • Residential property access road with any increase in traffic<br>• The road and intersection geometry is not constrained and has conforming infrastructure<br>• Low road crash history (or potential to)<br>• No sensitive land uses are accessed directly from the road | • Minor disruption to public transport services<br>• Minimal active transport infrastructure |

#### 5.6.1.2 Magnitude

The following magnitude criteria outlined in Table 5.3 were determined for each value.

Table 5.3:Magnitude Criteria

| Magnitude Level | Value 1 – Road Network Capacity Magnitude Criteria | Value 2 – Safe Road Performance, Condition & Design Magnitude Criteria | Value 3 – Public & Active Transport Magnitude Criteria |
|---|---|---|---|
| Severe | • Extreme delays caused<br>• Impacts >10,000 people with severe travel time impacts<br>• Constraints and disruption occurs permanently or longer than 1 year<br>• significant percentage increase in traffic | • Extensive pavement damage across road network requiring major upgrades to road surfaces<br>• Significant disruptive works required (clearing of habitat, major services, road closures, major infrastructure)<br>• One or more fatality<br>• There is a significant increase in safety risk as a result of the project operations | • Permanent closures to rail services<br>• Permanent closure of active transport links used by commuters |
| Major | • Major delays caused<br>• Impacts <5,000 people with major travel time impacts<br>• Constraints and disruption occurs for 6 – 12 months<br>• Major percentage increase in traffic | • Major pavement damage requiring upgrades to pavement surfaces<br>• Major disruptive works required (clearing of habitat, major services, road closures, major infrastructure)<br>• Serious injuries to multiple people<br>• There is a major increase in safety risk as a result of the project operations | • Major delays to rail services<br>• Major detours of active transport links used by commuters or permanent closure of active transport links which are tourist attractors or recreational paths |

| Magnitude Level | Value 1 – Road Network Capacity Magnitude Criteria | Value 2 – Safe Road Performance, Condition & Design Magnitude Criteria | Value 3 – Public & Active Transport Magnitude Criteria |
|---|---|---|---|
| Moderate | • Moderate delays caused<br>• Impacts <1,000 people with moderate travel time impacts<br>• Constraints and disruption occurs for between 1 – 6 months<br>• Moderate percentage increase in traffic | • Moderate pavement damage requiring remediation works and minor upgrades to pavement surfaces<br>• Serious injuries to 1 or more people<br>• There is a moderate increase in safety risk as a result of the project operations | • Moderate delays to bus services or major delays to bus services<br>• Major detours of active transport links which are tourist attractors or local recreational paths |
| Minor | • Minor delays caused<br>• Impacts <500 people with minor travel time impacts<br>• Constraints and disruption occurs for between 1 week – 1 month<br>• Minor percentage increase in traffic | • Minor pavement damage requiring remediation works<br>• Minor injuries<br>• There is a minor increase in safety risk as a result of the project operations | • Moderate delays to bus services<br>• Minordetours of active transport links which are tourist attractors or local recreational paths |
| Negligible | • Negligible delays caused<br>• Impacts <100 people with negligible travel time impacts<br>• Constraints and disruption occurs for less than a week<br>• Negligible percentage increase in traffic | • Negligible pavement damage<br>• There is no / negligible increase in safety risk as a result of the project operations | • Negligible / no impact to public transport<br>• No / minor impacts to local active transport links |

#### 5.6.1.3 Assessment of Significance

The significance of impacts on a value is determined by the sensitivity of the value itself and the magnitude of the change it experiences as outlined in the above sections. Table 5.4 shows how, using the criteria described above, the significance of impacts is determined. This approach adopts a five-by-five matrix.

Table 5.4: Assessment of Significance of Impact

| Magnitude of Impact | Sensitivity of Value | | | | |
|---|---|---|---|---|---|
| | Very High | High | Moderate | Low | Very Low |
| Severe | Major | Major | Major | High | Moderate |
| Major | Major | Major | High | Moderate | Low |
| Moderate | High | High | Moderate | Low | Low |
| Minor | Moderate | Moderate | Low | Low | Very Low |
| Negligible | Moderate | Low | Low | Very Low | Very Low |

A description of the significance of an impact derived using Table 5.4 is set out in Table 5.5.

Table 5.5: Assessment of Significance of Impact

| Significance of Impact | Description |
|---|---|
| Major impact | Occurs when impacts will cause irreversible or permanent change to the road and / or active transport networks or creates a significant safety risk. Avoidance through appropriate design responses is the only effective mitigation. |
| High impact | Occurs when the proposed activities are likely to cause unmanageable transport volumes on the existing road and / or active transport networks or creates a high safety risk. While management of unavoidable impacts is possible, avoidance through appropriate design responses is preferred to preserve existing levels of capacity or safety. |
| Moderate impact | Occurs where, although reasonably resilient to increased transport volumes on the existing road network or impact to the active transport network would be degraded, the value would be degraded due to it's scale of impacts or susceptibility to further change. The abundance of the value ensures it is adequately represented in the region, and that replacement, if required, is achievable. |
| Low impact | Occurs where a value is of local importance and temporary and transient changes will not adversely affect its viability provided standard controls and management measures are implemented. |
| Very low impact | A degraded (very low sensitivity) value exposed to minor changes (negligible magnitude impact) will not result in any noticeable change in its intrinsic value and hence the proposed activities will have negligible or no effects on the road and / or active transport networks. This typically occurs where the activities occur in industrial or highly disturbed areas. |

Upon completion of the above steps for each of the identified values, the EPRs will be developed and applied to mitigate the significance of the impact of each value.

The assessment of the significance of the impacts is outlined in Section 7 of this report for each value. The assessment of Value 1 is shown in Table 7.6 and Table 7.8, Value 2 in Table 7.12 and Table 7.15 and Value 3 in Table 7.17 and Table 7.19.

### 5.6.2 Mitigation Measures

In order to address the impacts of the project on the environment in the surrounding area, mitigation measures have been considered that could be implemented to comply with EPRs. These mitigation measures will address the various impacts that the development will likely have, and result in a number of different works, which are outlined below:

- Infrastructure upgrades.
- Temporary traffic management.

### 5.6.3 Cumulative Impacts

The EIS guidelines and EES scoping requirements both include requirements for the assessment of cumulative impacts. Cumulative impacts result from incremental impacts caused by multiple projects occurring at similar times and within proximity to each other.

To identify possible projects that could result in cumulative impacts, the International Finance Corporation (IFC) guidelines on cumulative impacts have been adopted. The IFC guidelines (IFC, 2013) define cumulative impacts as those that 'result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones.'

The approach for identifying projects for assessment of cumulative impacts considers:

Temporal boundary: the timing of the relative construction, operation and decommissioning of other existing developments and/or approved developments that coincides (partially or entirely) with Marinus Link.

Spatial boundary: the location, scale and nature of the other approved or committed projects expected to occur in the same area of influence as Marinus Link. The area of influence is defined at the spatial extent of the impacts a project is expected to have.

Proposed and reasonably foreseeable projects were identified based on their potential to credibly contribute to cumulative impacts due to their temporal and spatial boundaries. Projects were identified based on publicly available information at the time of assessment. The projects considered for cumulative impact assessment in Tasmania are:

- Remaining North West Transmission Developments
- Guilford Wind farm
- Robbins Island Renewable Energy Park
- Jim's Plain Renewable Energy Park
- Robbins Island Road to Hampshire Transmission Line
- Bass Highway upgrades between Deloraine and Devonport
- Bass Highway upgrades between Cooee and Wynard
- Hellyer Wind farm
- Table Cape Luxury Resort
- Youngmans Road Quarry
- Port Latta Wind farm
- Port of Burnie Shiploader Upgrade
- Quaylink – Devonport East Redevelopment.

Any other projects occurring in the surrounding area that are not included in the above summary were excluded either due to their scale (they were considered small enough to have minimal impact) or proximity (deemed to be far enough away) to Marinus Link. It is noted that this list of projects was assembled to the best of our knowledge of the works in the surrounding area, and is not considered to be comprehensive.

The cumulative assessment entailed a review of publicly available information for each of the identified projects, including the construction time period, as well as expected traffic generation (if available). Commentary was provided regarding whether the impacts during the construction, operation and decommissioning phases of Marinus Link will accumulate with these projects, and any considerations or mitigating works that may be required.

### 5.6.4 Environmental Performance Requirements

Environmental Performance Requirements set out the environmental outcomes that must be achieved during design, construction, operation and decommissioning of the project without defining how the outcome is to be achieved. The objective is for contractors to determine the best way to achieve EPRs and manage impacts whilst developing and optimising their design solutions.

Compliance with the EPRs is intended to mitigate the impacts and the risk of harm to the environmental, social and cultural values to within reasonable limits having regard to contextual factors and the practical delivery of the project. The EPRs will address the impacts identified in the significance assessment presented in this report.

EPRs have been developed to respond to the results of the impact assessment and the possible mitigations that could be implemented to address the impacts.

The development of the EPRs is outlined in Section 7 of this report for each value. The EPRs developed for Value 1 are shown in Section 7.1.4, for Value 2 are shown in Section 7.1.9 and for Value 3 are shown in Section 7.1.14. EPRs are then summarised in Section 8.2.

### 5.6.5 Residual Impacts

Residual impacts are the potential impacts remaining after the application of EPRs.

The extent to which potential impacts have been reduced is determined by undertaking an assessment of the significance of the residual impacts. This is a measure of the effectiveness of the EPRs in reducing the magnitude of the potential impacts, as the sensitivity of the value does not change.

The assessment of the residual application of the assessment criteria is outlined in Section 7 of this report for each value. The assessment of Value 1 is shown in Section 7.1.5, Value 2 in Section 7.1.10 and Value 3 in Section 7.1.15.

## 5.7 Stakeholder engagement

Stakeholder consultation has been undertaken in the preparation of this report. This has been outlined in Table 5.6.

Table 5.6: Stakeholder Consultation Undertaken

| Stakeholder | Engagement activity and timing | Discussion topics |
|---|---|---|
| Burnie City Council | Consultation meeting 18/11/2022 | Initial consultation with Burnie City Council to understand initial feedback on the project methodology<br>1. Main concern is movement of transformer transporter<br>2. Recommend transformer transporter travel from Port of Burnie<br>3. Expect transformer transporter to occur outside peak periods<br>4. Large vehicles such as for wind farms have had difficulty exiting Port of Burnie<br>5. Semi-trailer vehicles approved to travel on Minna Road<br>6. Small level of residential development occurring in surrounding area |
| Department of State Growth | Consultation Meeting 12/12/2022 | Initial consultation with Department of State Growth to understand initial feedback on the project methodology<br>1. DSG have been liaising with MLPL for a number of months to date<br>2. Recommendation to use Port of Burnie for transformer transport<br>3. A number of bridges on path of travel to Heybridge, review still required<br>4. If Port of Devonport is to be used, significant lead times will occur (approx. 4-5 year process)<br>5. Possible limitation of port capacity. Port of Burnie preferred<br>6. Minna Rd is part of the B-double road network, and assumed to be generally accessible to large vehicles<br>7. Ensure worker car parking does not impact road network, contain within site |
| National Heavy Vehicle Regulator | To be completed and timing to be confirmed | 1. The path of travel for the transformer transport<br>2. Traffic management requirements for the transformer transport.<br>3. Access constraints of bridges and road infrastructure |

## 5.8 Assumptions and Limitations

### Construction Methodology

- Information in regard to the methodology of the different construction stages of the project was provided by MLPL. Detailed assumptions for the determination of the traffic generation expected by the construction activities are outlined in the traffic generation section of this report in section 4.2.

### Travel Routes

- The travel routes for construction vehicles travelling to the site were assumed to be travelling from either Burnie or Devonport.
- Distribution of employees arriving to the site is based on the population of the surrounding local government areas.
- Heavy construction vehicles will utilise the 26m B-Double road network where possible. This ensures vehicles associated with the project which are smaller than a B-double are able to utilise the pre-approved roads.

### Transformer Transporter

- Transformer transporter will utilize the Class 1 load carrying vehicles road network where possible.
- The transformer will arrive at the Port of Burnie. The transformer transporter will travel from the Port of Burnie to the site.
- The transformer transporter will utilize the vehicle identified in Appendix D .

### Swept Paths

- DSG approved B-double road network is assumed to be able to accommodate the physical requirements for a semi-trailer. Semi-trailer swept paths are therefore not required to be completed on these roads.

### Pavement Analysis

- Due to the higher level of pavement composition along arterial roads, they are of an adequate standard to accommodate the project generated traffic and vehicle types.

# 6 Existing conditions

## 6.1 Overview

This section assesses the existing transport conditions in the study area, using information including traffic volumes, on-site observations and a review of network conditions for all transport modes. It also summarises any constraints which have been considered within the assessment.

This has been undertaken to identify the values that will be assessed as a part of the impact assessment. These values have been summarised in Section 6.4.

## 6.2 Site Context

The Tasmanian section of the project corridor consists of a 1.5ha site located just off the north coast of Tasmania in the township of Heybridge. This site sits within the municipality of Burnie, 6km to the east of the township of Burnie and 30km to the west of Devonport.

The site is accessible via Minna Road, which is immediately accessible to / from the Bass Highway, that connects across the northern coast of Tasmania

As stated above, this report has been prepared for the Tasmanian section of the project, which includes the construction of the converter station as well as the shore crossing.

The location and surrounding context of the project alignment is outlined in Figure 6-1.

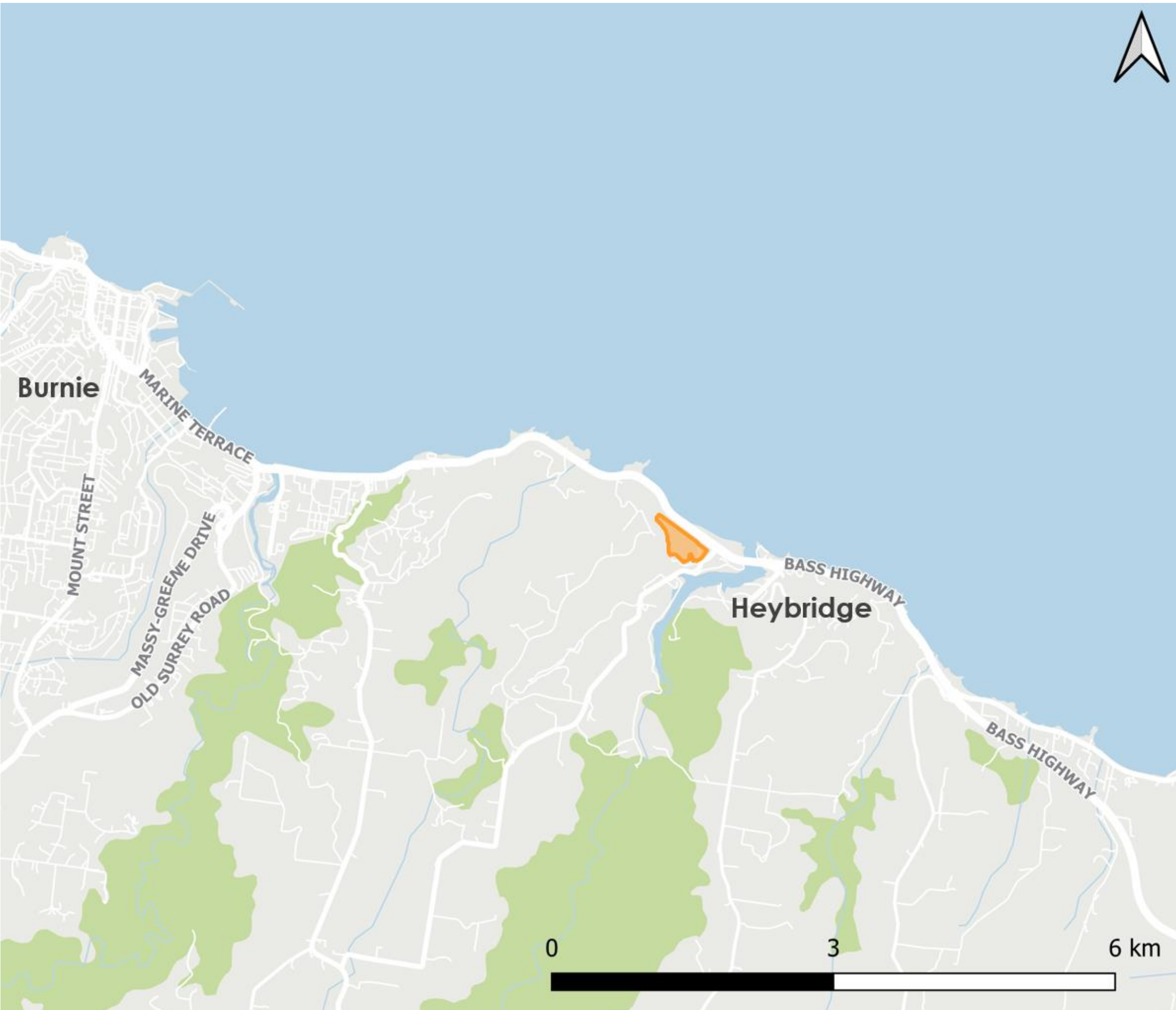



Figure 6-1: Marinus Link Tasmania Surrounding Context

## 6.3 Identification and Description of Relevant Values

### 6.3.1 Road Network

A detailed summary of the surrounding road network and context has been provided in Table 6.4 and Table 6.5 below. These tables detail the results of the site inspection and background data review of the road network that surrounds the project corridor. This road network will be relied upon for the construction of the project, as well as maintenance during its operation and the ultimate decommission.

In the preparation of this road network review, a number of references and data sources were relied upon to compile the information required. These resources have been outlined below.

#### 6.3.1.1 Site Inspection

A comprehensive site inspection was undertaken of the surrounding road network on Wednesday 9th November 2022. During the site inspection, the following activities were undertaken on roads and intersections throughout the surrounding road network:

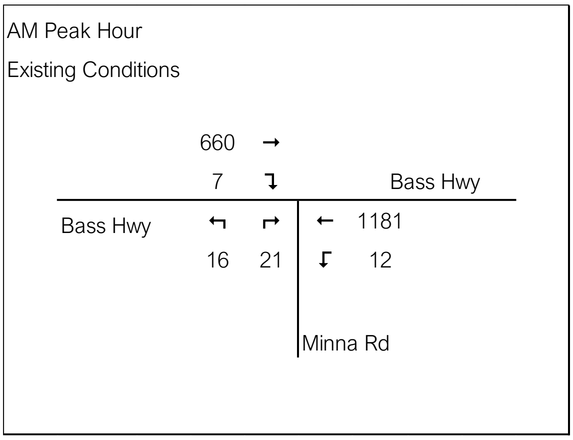
- photos and videos to record the existing conditions of the road network.
- measurements of road cross sections
- sight distance assessment review at key intersections.
- observational review of traffic behaviors.
- review of site constraints along the project travel routes / intersections.
- recording of pavement conditions along the project travel routes to allow further assessment by specialist geotechnical / pavement engineers.

#### 6.3.1.2 Traffic Surveys

Traffic surveys were commissioned throughout the study area to gain an understanding of the existing traffic volumes. These surveys were undertaken using Automatic Traffic Count (ATC ) tube counts and video cameras over a week long period of time between 8th November 2022 to 14th November 2022. The surveys undertaken are summarised in Table 6.1, with the turning movement counts shown in Figure 6-2 to Figure 6-5

**Table 6.1: Summary of Traffic Surveys Undertaken**

| # | Road | Location | Average 2-way Traffic Volumes | | |
|---|---|---|---|---|---|
| | | | AM Peak Hour | PM Peak Hour | Daily |
| 1 | Bass Highway [1] | Adjacent to the proposed converter station site | 460 | 478 | 19,673 |
| 2 | Minna Road | Adjacent to the site access point | 64 | 71 | 798 |
| 3 | Tarleton Street | Between Riverview Avenue and Bass Highway | 766 | 935 | 10,621 |
| 4 | Wright Street | Between Anchor Drive and Torquay Road | 421 | 467 | 5,275 |



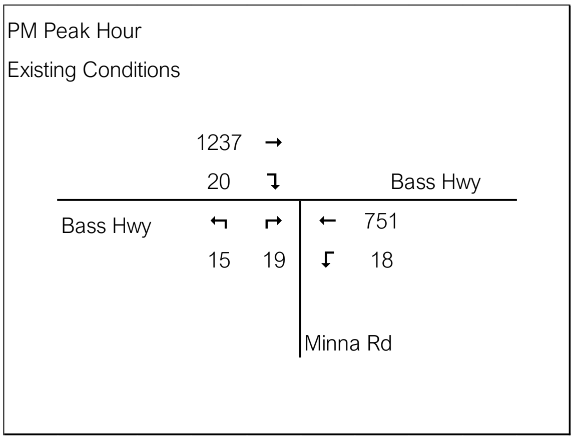
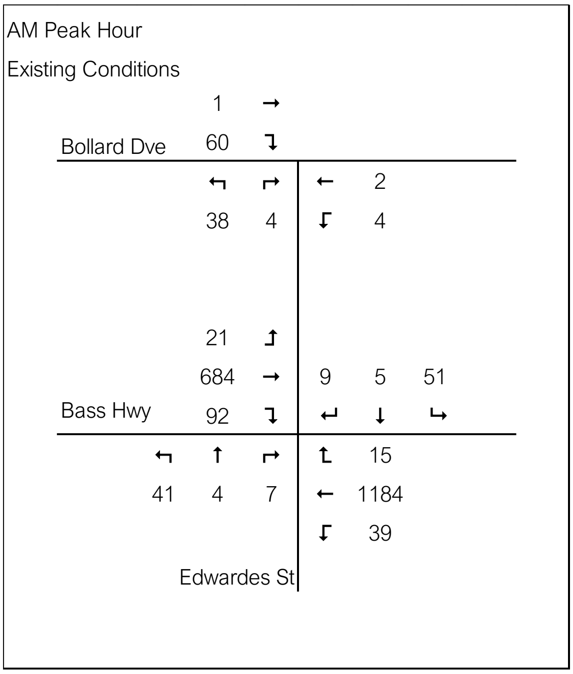




Figure 6-2: Survey Results: Bass Highway / Minna Road AM Peak

Figure 6-3: Survey Results: Bass Highway / Minna Road PM Peak



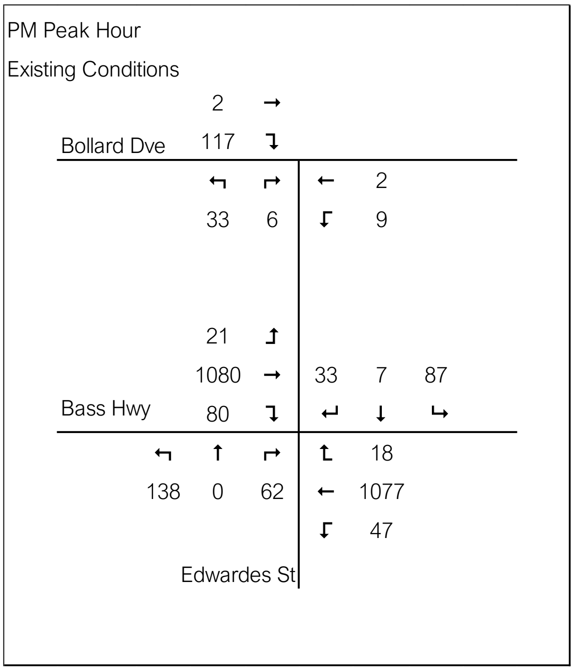




Figure 6-4: Survey Results: Bass Highway / Edwardes Street / Bollard Drive AM Peak

Figure 6-5: Survey Results: Bass Highway / Edwardes Street / Bollard Drive PM Peak

It is noted, a number of the roads that have been surveyed are expected to experience fluctuations in the volume of traffic they experience at different times of the year. This is most notably expected to occur in summer during holiday periods and long weekends along roads which are used to access tourist destinations. As it relates to the project, this is particularly relevant along the Bass Highway. The traffic surveys undertaken are expected to represent typical operating conditions for the roads surveyed.

#### 6.3.1.3 Road Classifications & Capacity

All roads within the study area under review have been classified in accordance with common traffic engineering guidelines. Lower order roads have been classified using *Austroads Guide to Road Design*: *Part 3,* Section 4.2.6 in order to determine their theoretical capacity. This resource outlines the Annual Average Daily Traffic (AADT) capacity constraints in vehicles per day (vpd) of rural roads based on the roads geometry. This is outlined in Table 6.2.

Table 6.2: Single Carriageway Rural Road Widths – *Austroads Guide to Road Design Part 3* – 4.2.6

| Element | Design AADT | | | | |
|---|---|---|---|---|---|
| | 1 – 150 vpd | 150-500 vpd | 500-1,000 vpd | 1,000-3,000 vpd | >3,000 vpd |
| Traffic Lanes | 3.7 (1 x 3.7m) | 6.2 (2 x 3.1m) | 6.2-7.0 (2 x 3.1m/3.5m) | 7.0 (2 x 3.5m) | 7.0 (2 x 3.5m) |
| Total shoulder | 2.5m | 1.5m | 1.5m | 2.0m | 2.5m |
| Minimum shoulder seal | 0m | 0.5m | 0.5m | 1.0m | 1.5m |
| Total carriageway | 8.7m | 9.2m | 9.2m-10.0m | 11.0m | 12.0m |

In order to classify the capacity for all roads within the study area that traffic is expected to be generated on, the cross sections were measured during the site inspection and compared with the classifications as outlined above.

It is noted, Austroads recognizes that there are many two-lane rural roads throughout Australia that have been constructed in the past that do not strictly meet the above requirements. It is often impractical and not cost effective to conduct 'sliver' widening (i.e. minor widening to existing road pavements), and therefore minimum road width dimensions are outlined in Table 6.3, that can be applied to existing corridors.

Table 6.3: Minimum Extended Design Domain (EDD) Widths for Two-Lane, Two-Way Rural Roads – *Austroads Guide to Road Design Part 3* – A.2.2

| Element | Design AADT | | | |
|---|---|---|---|---|
| | 150-500 vpd | 500-1,000 vpd | 1,000-3,000 vpd | >3,000 vpd |
| Traffic Lanes | 6.2 (2 x 3.1m) | 6.2-7.0 (2 x 3.1m/3.5m) | 7.0 (2 x 3.5m) | 7.0 (2 x 3.5m) |
| Shoulders | 0.85m (1.0m) | 0.85m (1.0m) | 1.25m (1.5m) | 1.75m (2.0m) |
| Total carriageway | 7.9m (8.2m) | 7.9m (8.2m)-8.7m (9.0m) | 9.5m (10.0m) | 10.5m (11.0m) |

For the purposes of this assessment, the traffic capacities as outlined in Table 6.2 have been used to classify each of the roads that are expected to be utilized during the construction of the cable route. The traffic capacities outlined in Table 6.3 have been utilized where appropriate.

In addition to the above, an approximate capacity for highways has been determined. Reference was made to *Austroads Guide to Traffic Management: Part 2, Section 8.2.1* which provides the following guidance:

"For the purpose of designing grade-separated junctions and interchanges, the maximum flow per lane for motorways must be taken as 1800 vehicles per hour (vph). These flows do not represent the maximum hourly throughputs but flows greater than these will usually be associated with decreasing levels of service and safety."

As a typical traffic engineering 'rule of thumb' a two way, two lane road with minimal side friction has a daily capacity threshold of 18,000 vehicles per day. For a four lane highway, this capacity doubles 36,000 vehicles per day.

For the purposes of this assessment, the traffic capacity as outlined above has been utilized for the highways in the study area.

#### 6.3.1.4 DoT Heavy Vehicle Networks

The surrounding road network was reviewed against the heavy vehicle map networks on the Department of State Growth transport website. These network maps display the roads that have been assessed for heavy vehicle access and will inform the selection of travel routes to the site during construction. The following heavy vehicle networks were reviewed:

- **B-Double (26m) Network:** Tasmania's arterial and municipal roads for Class 2 B-Doubles that are up to 26m in length. For the purposes of this assessment it was assumed that all roads on the B-Double road network are accessible by vehicles up to and including a B-double in size.
- **Load Carrying Vehicles Network:** Tasmania's Class 1 load carrying vehicles network is for oversize vehicles. This includes vehicles up to 5.5m in width, 5.0m in height and 30.0m in length. This road network was deemed to be the most accessible, with a greater level of accessibility than the B-Double network.
- **Height Clearance Under Overhead Structures:** The map of overhead structures on the road network, utilized to identify any roads with low hanging infrastructure that may impact the access requirements of the transformer transport vehicle.

Source: https://www.transport.tas.gov.au/vehicles_and_vehicle_inspections/heavy_vehicles/Heavy_vehicle_access

#### 6.3.1.5 DSG Open Data Traffic Surveys

Additional traffic volume data was sourced from DSG publicly available database of traffic surveys. This database contains a wealth of different traffic volume counts for arterial roads throughout Tasmania. The resources reviewed as a part of this assessment that were sourced from DSG publicly available data are outlined below:

- Two way Annual Average Daily Traffic (AADT) volumes.
- Heavy Vehicle Percentage splits.
- Average yearly growth rates.

Source: https://geocounts.com/traffic/au/tas/

#### 6.3.1.6 Summary of Roads and Intersections

A summary of the above data collection is displayed in Table 6.4 and Table 6.5. The classification items within the table are defined as follows:

- description – The name of the road.
- road classification – The DSG classification of the road section.
- speed limit – The enforced speed limit on the section of road.
- road measurements
  - carriageway – The width of the carriageway and the number of lanes
  - shoulder – The width of the shoulder.
- road capacity – The theoretical capacities based upon Austroads guidelines.
- road characteristics – Description of the carriageway and shoulder surfaces.
- vehicles per day – Surveyed AADT values at each section of road.
- historic growth rate – Growth rates on each road sourced from Department of Transport data.
- heavy vehicle percentage (HV%) – Percentage of heavy vehicles identified from the traffic surveys.
- sight distance – Initial observational assessment of the available site distance.

Table 6.4: Road Network

| ID | Description | Road Classification | Speed Limit (kph) | Road Measurements | Road Capacity | Road Characteristics | Vehicles Per Day (VPD) | Historic Growth Rate | HV% |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Bass Highway | National / State Highway | 90 | Total carriageway width = 37m<br>Total lane width = 7m one way (2 x 3.5m)<br>Shoulder width = 3.7m | >40,000 | State significant highway with two lanes in each direction.<br>Emergency stopping lane shoulders.<br>No active transport infrastructure. | 19,673 | 2% | 10% |
| 2 | Minna Road | Sub Arterial Road | 100 | Total carriageway width = 7.8m<br>Total lane width = 3.9m (2 x 3.9m)<br>Shoulder width = 2m | >3,000 | Sealed road with single lane in each direction.<br>Gravel shoulder with topographic barriers.<br>No active transport infrastructure. | 798 | N/A | 14% |
| 3 | Edwardes Street | Arterial Road | 50 | Total carriageway width = 20m<br>Total lane width = 20m (2 x 10m)<br>Shoulder width = 0m | >3,000 | Access between Bass Highway and Port of Burnie.<br>wide lanes for truck turning movements.<br>Pedestrian infrastructure crossing at traffic lights along Bass Highway. | 1,355 | N/A | 25% |
| 4 | Tarleton Street | Arterial Road | 60 | Total carriageway width = 12m<br>Total lane width = 12m (2 x 6m)<br>Shoulder width = 0m | >3,000 | Sealed road with single lane in each direction.<br>Footpaths on western frontage | 10,621 | N/A | 7% |
| 5 | Wright Street | Arterial Road | 50 | Total carriageway width = 8m<br>Total lane width = 8m (2 x 4m)<br>Shoulder width = 0m | >3,000 | Sealed road with single lane in each direction.<br>Footpaths on eastern frontage. | 5,275 | N/A | 17% |

Table 6.5: Intersections

| ID | Intersection | Intersection Arrangement | Sight Distance | Intersection Characteristics |
|---|---|---|---|---|
| 1 | Minna Road / Site Access Point | T-intersection | Curves and topography limits sight distance from minor road | The intersection is sealed with fading line marking |
| 2 | Bass Highway / Minna Road | 'Seagull' T-intersection. Give way from minor road | No issues with sight distance | The intersection is sealed with road markings and signage. No issues identified. |
| 3 | Bass Highway / Edwardes Street | Signalised X-intersection | No issues with sight distance | The intersection is sealed with signals and line marking |

## 6.3.2 Bridges and Culverts

As stated earlier in this report, the transport routes of travel to be used by heavy vehicles are contained on the Bass Highway, where the infrastructure is designed for the movement of vehicles such as B-doubles or other larger trucks / vehicles. As stated in Section 4.2.4.3, it has been assumed that the transformer transporter will be travelling to the site from the Port of Burnie. One of the reasons for this decision was the number of bridges that are on the longer path of travel from Devonport.

Notwithstanding, there are four bridges between the site and the Port of Burnie which are to be crossed by the transformer transporter vehicle. It is recommended that these bridges are assessed to determine they can adequately accommodate the large vehicle.

It is noted that in the event of any road closures on the Bass Highway, a route review of the path of travel will need to be undertaken to identify whether any bridges exist along this travel path that need further assessment. This is particularly relevant for the transformer transporter, or for when any cable drums to be delivered to the site.

## 6.3.3 Vehicle Crashes

An analysis was undertaken of crashes on all vehicle routes for the latest five-year period available (2018 - 2022). This assessment was undertaken for the Bass Highway and Minna Road within the vicinity of the site to capture all proximate crash data along the road network proposed to be used by project generated traffic.

The location of crashes is shown in Figure 6-6.


Figure 6-6: Vehicle Crashes and Travel Routes

During this period, there were six crashes within the study area, five of which occurred on the Bass Highway and did not result in any injury. The remaining crash was on Minna Road and resulted in a minor injury

A summary of the identified crashes is outlined in the table below

Table 6.6: Summary of reported crashes – 2018 to 2022

| Date | Location | Crash Type | Severity |
|---|---|---|---|
| 12-01-18 | Bass Highway, Heybridge, Burnie | 184 - Out of control on carriageway | Property Damage Only |
| 23-02-18 | Bass Highway, Heybridge, Burnie | 173 - Right off carriageway into object or parked vehicle | Property Damage Only |
| 23-02-18 | Bass Highway, Heybridge, Burnie | 171 - Left off carriageway into object or parked vehicle | Property Damage Only |
| 15-05-18 | Bass Highway, Heybridge, Burnie | 173 - Right off carriageway into object or parked vehicle | Property Damage Only |
| 15-02-21 | Bass Highway, Heybridge, Burnie | 179 - Other straight | Property Damage Only |
| 20-09-20 | Minna Road, Heybridge, Burnie | 189 - Other curve | Minor |

## 6.3.4 Rail

The western rail line is located on the northern side of the Bass Highway in the immediate vicinity of the site. This is a single track rail line used for freight services connecting Burnie to Devonport. No passenger rail services are currently operational along the western rail line.

The arrangement of the western rail line in the vicinity of the site is shown in Figure 6-7 and Figure 6-8.

Figure 6-7: Western Rail Line Immediately Adjacent the Site Facing East

Figure 6-8: Western Rail Line Immediately Adjacent the Site Facing West

## 6.3.5 Buses

Public bus services are available in the Burnie, a short drive from the site in Heybridge. These services run at a low frequency and generally either provide access to the centre of the township for the local residents, or a broader function connecting towns. On the Bass Highway along the frontage of the site operates the 708 bus and the 190 bus. These services operate at a low frequency. The 190 bus has a stop on the other side of Blythe River, a short walk from the site.

A map showing these bus services is shown in Figure 6-9

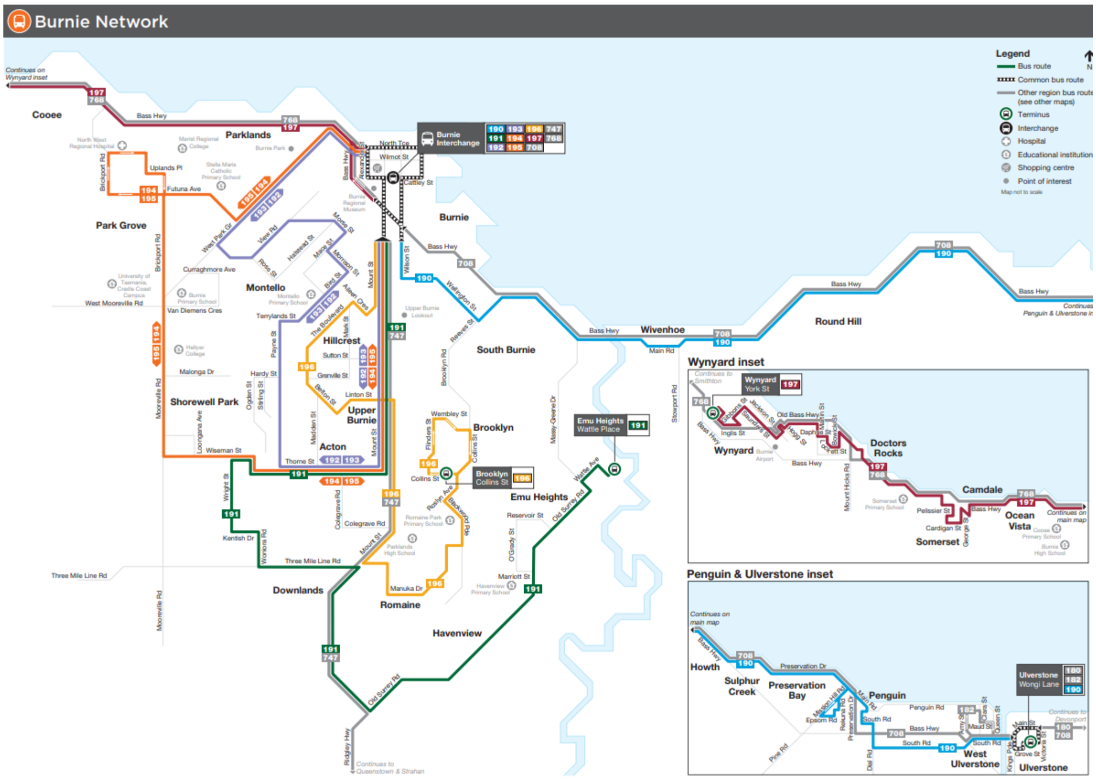



Figure 6-9: Bus Services in Burnie

It is noted that in addition to the above public bus routes that school bus services will be operating in the area. Further consultation will be required with Council to determine these school bus routes, noting that these are subject to change based on the residences of the children being picked up each year.

## 6.3.6 Public Transport Accessibility & Use

The above indicates that the site has minimal access to public transport services.

## 6.3.7 Active Transport

Given the location of the site and immediate surrounds, there is a lack of formal pedestrian footpaths and cycle tracks.

## 6.4 Summary of Relevant Values

The items outlined in the existing conditions form the basis of the values that will be assessed as a part of the impact assessment as outlined below. Consideration of the above material was utilized to identify the values, alongside more detailed attributes.

The values identified for this assessment are outlined below.

### Road Network Capacity

The operational performance of the road network with regard to its theoretical capacity and existing operation. This value recognizes how the road network is performing, whether a substantial change is to occur from its existing operational performance

### Safe Road Performance, Condition and Design

The design and operation of the road network, ensuring that it is provided in a safe manner that is compliant with relevant industry standards and guidelines.

### Public and Active Transport

The continued operation of the public transport network, as well as the active transport infrastructure in the surrounding area. This includes regional freight trains, local bus services, school buses, recreational trails and public footpaths.

# 7 Impact Assessment

The following section outlines the impact assessment undertaken for the values identified above in Section 6.4. This process has been undertaken to align with the significance assessment, as detailed in Section 5 of this report.

To robustly assess each value, the values were divided into several attributes of the respective value.

This process has been conducted below.

## 7.1 Construction Impact Assessment

### 7.1.1 Value 1 – Road Network Capacity

An assessment has been completed of the performance of the road network in the surrounding area of the project during its construction. Completing this assessment entailed identifying the level of traffic generated by the various construction activities and the path of travel that vehicles will take to the site.

Upon completion of the above works, the following attributes were defined in the assessment of Value 1:

Table 7.1: Values and Attributes

| Value | Attribute |
|---|---|
| Road Network Capacity<br>The operational performance of the road network with regard to its theoretical capacity and existing operation. This value recognizes how the road network is performing, whether a substantial change is to occur from its existing operational performance | Road Network Capacity |
| | Intersection Capacity |
| | Road connectivity and provision of alternative routes |

#### 7.1.1.1 Assessment of Attributes

The sections below outline capacity based assessments undertaken for all the roads impacted by the project. Using Austroads guidance alongside the development traffic generation and surveyed traffic volumes, assessments of the potential impact the project could have on the local road network during construction has been assessed and potential mitigation measures identified.

The assessment has been split based on the attributes identified above.

#### 7.1.1.2 Attribute 1: Arterial Road Network Capacity

The capacity assessment of the arterial road network was determined by undertaking a midblock AADT assessment with reference made to the Austroads guidance as identified in section 6.3.1.3 of this report. The theoretical capacity for the roads in the immediate surrounds of the site impacted by development traffic has been calculated using the information identified in this section. Theoretical capacity is informed by industry standard documentation and approach.

Whilst the theoretical capacities identify the maximum daily traffic movement each road can support, the existing daily traffic movements are also required to assess the impact of development traffic on the road network. Therefore, reference was also made to the traffic surveys undertaken from as discussed in Section 6.3.1.2 of this report.

For the traffic data collected to be used in our assessment, 5 years of traffic growth has been applied to represent the traffic conditions at the expected year of completion. Growth factors were extracted from the DSG open data as detailed in Table 6.4. It is noted that for Minna Road, growth rate information was not available, the same growth rate was applied as found on Bass Highway. It is noted that this is a highly conservative assumption given their different road types and expected usage.

The daily traffic generation on each road was then applied to the 2027 traffic volumes to calculate the expected 2027 traffic flows at each road including development generated traffic. The resulting volumes were then compared to the theoretical capacities to assess which roads will be operating above or below capacity.

The results highlighted that both Minna Road and the Bass Highway will continue to operate well below capacity with the addition of development generated traffic.

Table 7.2: Midblock Capacity Assessment Results

| Road | Theoretical Capacity | Surveyed AADT Flow | Growth Factor | Maximum Daily Traffic Generation | Projected AADT Flow | Capacity Check |
|---|---|---|---|---|---|---|
| Bass Highway | 36,000 | 19,673 | 0.02 | 494 | 20,167 | Under Capacity |
| Minna Road | >3000 | 798 | 0.02 | 494 | 1,292 | Under Capacity |

An assumed maximum capacity of 10,000 vehicles per day was applied to roads with the theoretical capacity classification of >3000 vehicles per day.

#### 7.1.1.3 Attribute 2: Intersection Capacity

To determine the operating capacity of the intersections immediately surrounding the site that will experience an uplift in traffic, SIDRA Intersection 9 has been utilised. SIDRA is a computer-based modelling package which calculates intersection performance.

The commonly used measure of intersection performance is referred to as the *Degree of Saturation (DOS)*. The DOS represents the flow-to-capacity ratio for the most critical movement on each leg of the intersection.

For unsignalised intersections, a DOS of 0.90 has been typically considered the 'ideal' limit, beyond which queues and delays increase disproportionately. This is shown in Table 7.3 below

Table 7.3: SIDRA Intersection Adopts the following criteria for Level of Service Assessment

| Level of Service | | Intersection Degree of Saturation (DOS) | | |
|---|---|---|---|---|
| | | Unsignalised Intersection | Signalised Intersection | Roundabout |
| A | Excellent | <=0.60 | <=0.60 | <=0.60 |
| B | Very Good | 0.60-0.70 | 0.60-0.70 | 0.60-0.70 |
| C | Good | 0.70-0.80 | 0.70-0.90 | 0.70-0.85 |
| D | Acceptable | 0.80-0.90 | 0.90-0.95 | 0.85-0.95 |
| E | Poor | 0.90-1.00 | 0.95-1.00 | 0.95-1.00 |
| F | Very Poor | >=1.0 | >=1.0 | >=1.0 |

For the purposes of this assessment, the existing conditions and worst case construction traffic volumes have been modelled in SIDRA to gain an understanding of the change in traffic performance as a result of the development. The existing conditions assessment has been undertaken on the 5-year traffic growth volumes.

The results of this assessment are shown in Table 7.4 below for the existing conditions and Table 7.5 for the during construction scenarios. The input traffic volumes are shown in Appendix E , with the full results shown in Appendix F .

Table 7.4: Existing Conditions SIDRA Intersection Modelling Results

| Peak Hour | Intersection | Approach | DOS | Average Delay (Seconds) | 95th Percentile Queue (Metre) |
|---|---|---|---|---|---|
| AM Peak Hour | Bass Highway / Minna Road (North) | Median Storage (South) | 0.02 | 2 sec | 0m |
| | | Bass Highway (West) | 0.21 | 0 sec | 0m |
| | | **Intersection** | **0.21** | **0 sec** | **0m** |
| | Bass Highway / Minna Road (South) | Minna Road (South) | 0.30 | 40 sec | 6m |
| | | Bass Highway (East) | 0.38 | 0 sec | 0m |
| | | Median Storage (North) | 0.04 | 14 sec | 1m |
| | | **Intersection** | **0.38** | **1 sec** | **6m** |
| | Minna Road / Site Access Point | *Intersection not assessed in existing conditions as it is not operational* | | | |
| PM Peak Hour | Bass Highway / Minna Road (North) | Median Storage (South) | 0.01 | 3 sec | 0m |
| | | Bass Highway (West) | 0.40 | 0 sec | 0m |
| | | **Intersection** | **0.40** | **0 sec** | **0m** |
| | Bass Highway / Minna Road (South) | Minna Road (South) | 0.08 | 16 sec | 2m |
| | | Bass Highway (East) | 0.24 | 0 sec | 0m |
| | | Median Storage (North) | 0.05 | 7 sec | 1m |
| | | **Intersection** | **0.24** | **1 sec** | **2m** |
| | Minna Road / Site Access Point | *Intersection not assessed in existing conditions as it is not operational* | | | |

Table 7.5: During Construction SIDRA Intersection Modelling Results

| Peak Hour | Intersection | Approach | DOS | Average Delay (Seconds) | 95th Percentile Queue (Metre) |
|---|---|---|---|---|---|
| AM Peak Hour | Bass Highway / Minna Road (North) | Median Storage (South) | 0.02 | 2 sec | 0m |
| | | Bass Highway (West) | 0.21 | 1 sec | 0m |
| | | **Intersection** | **0.21** | **1 sec** | **0m** |
| | Bass Highway / Minna Road (South) | Minna Road (South) | 0.36 | 49 sec | 10m |
| | | Bass Highway (East) | 0.38 | 1 sec | 0m |
| | | Median Storage (North) | 0.42 | 29 sec | 12m |
| | | **Intersection** | **0.42** | **4 sec** | **12m** |
| | Minna Road / Site Access Point | Minna Road (South) | 0.03 | 0 sec | 0m |
| | | Minna Road (North) | 0.18 | 6 sec | 8m |
| | | Site Access (West) | 0.00 | 10 sec | 0m |
| | | **Intersection** | **0.18** | **5 sec** | **8m** |
| PM Peak Hour | Bass Highway / Minna Road (North) | Median Storage (South) | 0.12 | 3 sec | 0m |
| | | Bass Highway (West) | 0.40 | 0 sec | 0m |
| | | **Intersection** | **0.40** | **1 sec** | **0m** |
| | Bass Highway / Minna Road (South) | Minna Road (South) | 0.79 | 35 sec | 44m |
| | | Bass Highway (East) | 0.24 | 0 sec | 0m |
| | | Median Storage (North) | 0.05 | 7 sec | 1m |
| | | **Intersection** | **0.79** | **8 sec** | **44m** |
| | Minna Road / Site Access Point | Minna Road (South) | 0.02 | 0 sec | 0m |
| | | Minna Road (North) | 0.03 | 0 sec | 0m |
| | | Site Access (West) | 0.18 | 9 sec | 7m |
| | | **Intersection** | **0.18** | **7 sec** | **7m** |

The results of the above assessment found the following:

- The intersection of Bass Highway / Minna Road operates well under its existing arrangements, with a maximum DOS of 0.40 found for the eastbound movements along the Bass Highway in the PM Peak.
- The Minna Road approach experiences moderate levels of delay, with an average delay of 40 seconds found in the AM peak.
- In the during construction scenarios, delay increases at the Minna Road approach, however the intersection continues to operate well under capacity.
- A maximum DOS of 0.79 was found for the Minna Road approach in the PM peak, primarily consisting of right turning vehicles from the site.
- The site access point operates well under its capacity in the AM and PM peak hours

It is noted that the above assessments have assumed that the peak hour traffic volumes generated by the site are occurring at the same time as the road network peak. As identified in section 4.2, construction activities are expected to arrive at 7AM, which is before the recorded road network peak hour.

#### 7.1.1.4 Attribute 3: Road Connectivity and Provision of Alternative Routes

All vehicles accessing the site are expected to approach via Bass Highway, turning at Minna Road. In the event of any road closures along Bass Highway, detours are generally available, noting that these add sizable increases in travel time. The site can also be accessed via Minna Road to the south.

### 7.1.2 Value 1 - EIS Significance Impact Assessment

The analysis and commentary presented above has established the likely traffic performance impacts. The impacts outlined above have been categorised in accordance with the significance assessment methodology outlined in section 5.6 with Table 5.2 and Table 5.3 identifying the criteria that has been used to assess each impact.

The significance assessment for value 1, prior to the implementation of any mitigating works, has been summarised in Table 7.6 below.

Table 7.6: Value 1 Initial Significance Assessment

| Value | Attribute | Standard Mitigation | Impact | Description | Inherent Significance Assessment | | |
|---|---|---|---|---|---|---|---|
| | | | | | Sensitivity | Magnitude | Significance |
| Road Network Capacity | Arterial road link capacity | Nil | No arterial roads identified will exceed their capacity | No arterial roads identified will exceed or approach capacity.<br>Total traffic generation is small percentage of arterial road capacity. | Low | Negligible | Very Low |
| Road Network Capacity | Impacted Intersections | Nil | Intersections not operationally impacted with appropriate intersection treatment existing | There are two intersections primarily impacted by site generated traffic to access the site.<br>The intersections will operate in accordance with industry standards. | Moderate | Minor | Low |
| Road Network Capacity | Connectivity | Nil | Bass Highway is a primary Highway utilized by the Tasmanian north coast | Significant detours will occur to the local public if the Bass Highway were to be closed.<br>No roads are proposed to be closed as a result of the project. | Very High | Negligible | Moderate |

## 7.1.3 Value 1 – Mitigation Works

The attributes identified above have then been further assessed to identify possible mitigating works.

As stated above, it has been assumed that the construction workforce will be residing in the local townships surrounding the area and travelling to the site. It is possible that during construction, a workers camp will be set up to consolidate traffic movements, travelling workers to the site on a bus. For the purposes of this traffic assessment, it has been assumed that this will not be occurring, however in the event that this option is pursued by the contractor, a reduced traffic volume and overall traffic impact will be experienced on the road network.

#### 7.1.3.1 Attribute 1: Arterial Road Network Capacity

The assessment conducted above determined that no arterial roads within the study area will exceed their theoretical capacity during peak operational time periods. Therefore, no mitigation works are required to increase the road network capacity. Continuous inspections should occur during construction to ensure the road network is operating as expected.

#### 7.1.3.2 Attribute 2: Intersection Capacity

The assessment conducted above determined that no intersections within the study area will exceed their theoretical capacity during peak operational time periods. Therefore, no mitigation works are required to increase the intersection capacity. Continuous inspections should occur during construction to ensure the road network is operating as expected.

#### 7.1.3.3 Attribute 3: Road Connectivity and Provision of Alternative Routes

No road closures are proposed as a result of the construction works. Therefore, no alternative routes expected to be required for the project.

In the event that a road closure is required due to unforeseen circumstances, other options should first be explored. If no alternative options are deemed acceptable, thorough consultation should be undertaken with affected parties and relevant authorities.

## 7.1.4 Value 1 - Environmental Performance Requirements

The following EPRs outlined in Table 7.7 have been informed by the possible mitigation and management measures summarised in the impact assessment. These mitigation measures are discussed to outline how the EPRs could be implemented. The EPRs have also been developed with consideration of industry standards and relevant legislation, guidelines and policies. The location of where these items are represented in the final EPRs outlined in Section 8.2 has been provided.

Table 7.7: Value 1 EPRs

| # | EPR Identified | # Reference to final EPR’s |
|---|---|---|
| 1 | The performance of the road network and intersections utilised by the project should be monitored to ensure they continue to operate within their capacity. | EPR T01-2 |
| 2 | Public roads will not be closed during construction. | EPR T01-15 |
| 3 | In the event that traffic volumes exceed those found within this report, an additional assessment should be undertaken to determine If adequate capacity exists within the road network or if additional mitigation measures are required to accommodate the change. | EPR T01-17 |

## 7.1.5 Value 1 – Residual Impacts

Upon the implementation of the mitigating works, some residual impacts will still remain. These have been outlined in the following sections

#### 7.1.5.1 Attribute 1: Arterial Road Network Capacity

The assessment conducted above determined that no arterial roads within the study area will exceed their theoretical capacity during peak operational time periods. The level of traffic generated by the site should be scrutinised by the contractor to ensure the performance is in line with expectations, and no unforeseen traffic capacity issues occur. Assessment should be undertaken in the event of unexpected additional traffic generated by construction activities.

Addressed in EPR T01-2

#### 7.1.5.2 Attribute 2: Intersection Capacity

The assessment conducted above determined that no intersections within the study area will exceed their capacity during peak operational periods. The level of traffic generated by the site should be monitored by the contractor, with assessment undertaken in the event of unexpected additional traffic generated by construction activities.

Addressed in EPR T01-17

#### 7.1.5.3 Attribute 3: Road Connectivity and Provision of Alternative Routes

No roads are proposed to be closed as a result of construction activities.

Addressed in EPR T01-15, EPR T02

The revised significance assessment for value 1 with mitigating works has been summarised in Table 7.8 below.

Table 7.8: Value 1 Revised Significance Assessment

| Value | Attribute | Standard Mitigation | Impact | Impact Assessment | | | Mitigating Works | Residual Impact | Residual Impact Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Impact Significance | | | Sensitivity | Magnitude | Residual Impact Significance |
| Road Network Capacity | Arterial road link capacity | Nil | No arterial roads identified will exceed their capacity | Low | Negligible | Very Low | Nil | Inspections required to ensure road network performing as expected. Further assessment to be undertaken in event of unexpected traffic volumes. | Low | Negligible | Very Low |
| Road Network Capacity | Impacted Intersections | Nil | Intersections not operationally impacted with appropriate intersection treatment existing | Moderate | Minor | Low | Nil | Inspections required to ensure intersections of Bass Highway / Minna Road and Minna Road / site access are performing as expected. Further assessment to be undertaken in event of unexpected traffic volumes. | Moderate | Minor | Low |
| Road Network Capacity | Connectivity | Nil | Bass Highway is a primary Highway utilized by the Tasmanian north coast | Very High | Negligible | Moderate | Nil | No roads are proposed to be closed as a result of the project. If road closures are required due to unforeseen events, consultation with authorities should be undertaken to minimise disruption. | Very High | Negligible | Moderate |

## 7.1.6 Value 2 – Safe Road Performance, Condition and Design

Analysis has been undertaken to assess the safe performance, road condition, design and operation of the road network that forms a part of the study area.

Upon completion of the above works, the following attributes were defined in the assessment of Value 2:

Table 7.9: Values and Attributes

| Value | Attribute |
|---|---|
| **Safe Road Performance, Condition and Design**<br>The design and operation of the road network, ensuring that it is provided in a safe manner that is compliant with relevant industry standards and guidelines. | Safe condition of bridges and culverts |
| | Provision of adequate road geometry |
| | Review of crash history |
| | Intersection safe sight distance assessment |
| | Height clearance requirements of transformer transporter |
| | Safe operation and management of construction activities |

#### 7.1.6.1 Attribute 1: Safe Condition of Bridges and Culverts

As identified in Section 6.3.2, there are a number of bridges within the study area that have an operational mass limit. This information has been provided by MLPL, in consultation with DSG. It is expected that all bridges within the study can accommodate vehicles up to an including a 19m semi-trailer, given they are all contained within the approved B-double road network. Any reviews required are in regard to the transformer transporter.

The appropriate reviews for the capacity limits of these bridges, and any works required to them is ongoing, with reviews being undertaken by MLPL. These reviews should be undertaken by a suitably qualified engineer in order to confirm they are in an appropriate condition for the expected vehicles that will be generated by the project.

#### 7.1.6.2 Attribute 2: Adequate Road Geometry

### Swept Path Assessment Methodology

Swept paths have been undertaken at critical locations to understand whether any works may be required to accommodate the access requirements for large vehicles. As stated above in section 4.2.3.1, it has been assumed that the largest vehicle that will access the locations that have been identified is a 19m semi-trailer (excluding the transformer transporter).

For the purposes of this assessment, it was assumed that all roads classified on the B-double road network are accessible by a 19m-semi-trailer. Therefore, the swept path assessments were triggered where a semi-trailer is required to turn from the B-double road on to a lower order road.

As a separate analysis to the above, swept paths have also been undertaken for the bespoke transformer transport at all critical locations between the Bass Highway and the converter stations.

In any location where physical works may be required to be completed to modify the existing road geometry to accommodate the vehicle through an intersection, a detailed investigation of existing underground and overhead services / utilities is required to be completed. In the instances where services / utilities are impacted, authority requirements and consent must be sought prior to modifications to intersection geometry. Where possible, impacts should be identified during the design phase.

### 19m Semi Trailer Swept Paths at Required Intersections

As stated above, it has been assumed that all roads designated on the DSG B-double road network are capable of accommodating the turning movement requirements for a 19m semi-trailer. These intersections were therefore excluded from this assessment. An assessment was therefore undertaken at the proposed site access point from Bass Highway to Minna Road, the results of which are shown in Appendix B This assessment demonstrates that no additional works are required to gain access to the site.

### Transformer Transport Swept Paths

In addition to the swept path assessments as outlined above, assessments have been undertaken for the bespoke transformer transport vehicle for its path of travel from the Port of Burnie to the converter station site.

The locations where swept paths were undertaken are identified with reference numbers in Figure 7-1 below.


Figure 7-1: Transformer Transport Swept Path Assessment Locations

The swept paths undertaken are shown in Appendix C , with a summary of the results found shown in Table 7.10 indicating whether works may be required to accommodate the turning movements of the transformer transporter.

Table 7.10: Transformer Transport Swept Path Assessment Results

| # | Location | Swept Path Assessed | Outcome |
|---|---|---|---|
| 1 | Port of Burnie | Internal movement in the Port of Burnie, inbound and outbound | Works to the roundabout in the Port of Burnie to provide a trafficable surface through the roundabout. |
| 2 | Bass Highway / Edwardes Street / Bollard Drive | Right turn from Bollard Drive into Edwardes Drive, then a left turn into Bass Highway<br><br>Bass Highway, right turn into Edwardes Street, left turn into Bollard Drive | Works to enable the vehicle to drive over the kerb at the slip lane turning left onto the bass highway.<br><br>Path will travel over median to right hand side of Bass Highway to travel through slip lane provided from Edwardes Street northern approach. Minor works to drive over kerbing. |
| 3 | Bass Highway / Minna Road | Right turn movement into Minna Road from the Bass Highway<br><br>Left turn movement from Minna Road onto the Bass Highway | Works to drive over kerbing in median of Bass Highway, and Road island on Minna Road approach and remove signage.<br><br>Minor works to drive over grass in median and verges. |

| # | Location | Swept Path Assessed | Outcome |
|---|---|---|---|
| 4 | Minna Road / Site access point | Right turn movement into the site and left turn movement from the site at Minna Road | Driving over shoulders of Minna Road.<br>Possible land clearing and excavation works to the hill on the northern frontage of Minna Road. |

It is noted that the transport of this vehicle will require constant traffic management, with many swept path movements entailing the vehicle blocking two lanes of traffic. When this movement is occurring, access to individual properties may be restricted temporarily.

As outlined above in regard to the 19m semi-trailer swept paths, the above assessment outlines recommendations based on the currently known converter station location. This assessment will change if the ultimate arrangements of the project and transformer transport vehicle are different to those assessed.

#### 7.1.6.3 Attribute 3: Crash Stats Review

A review of the historic crash data for the study area was conducted in Section 6.3.2 above. This background review found that there were six crashes within a five-year period in the surrounding area, five of which did not cause injury.

This review did not find an evident crash trend in the study area. There is always an inherent risk of increasing the number of crashes by increasing the volume of traffic on any road however, given the low values of percentage impact at higher risk locations, we can conclude that there is no material increase in the likelihood of crashes during the construction phase as a result of the project.

#### 7.1.6.4 Attribute 4: Sight Distance Assessment

Both an on-site and desktop assessment were undertaken for the proposed site access point to Minna Road to determine whether a further, more detailed, assessment was required to identify the existing achievable sight distances and what measures could be installed to improve the safety of said intersections.

To conduct detailed assessments of intersection sight distances, reference was made *to Austroads Guide to Road Design Part 4a: Section 3.2 Sight Distance Requirements for Vehicles at Intersections*. This section of the guideline identifies the Approach Sight Distance (ASD) requirements on minor arm approaches and the Safe Intersection Sight Distance (SISD) requirements on major arm approaches; diagrams detailing both measurements taken from the Austroads guidelines are detailed in Figure 7-2 below.

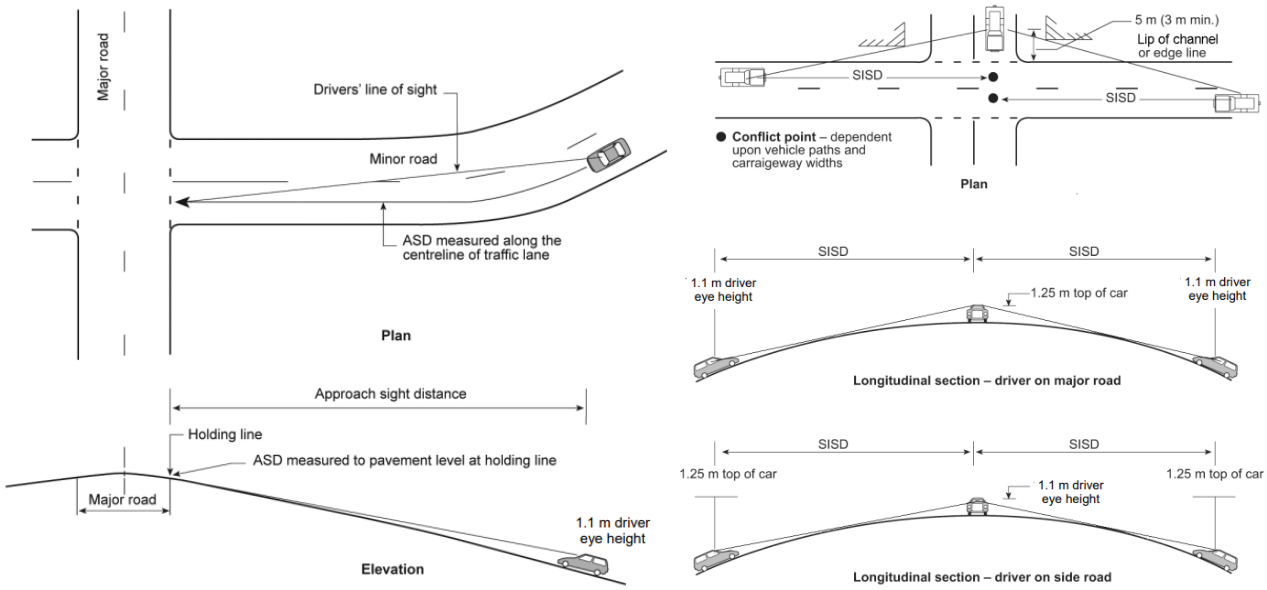



Figure 7-2: Application of Approach Sight Distance (ASD) and Safe Intersection Sight Distance (SISD)

The results of this assessment is detailed in Table 7.11

Table 7.11: Sight Distance Assessment Results

| ID | Intersection | Approach | Sight Distance | Existing Measures |
|---|---|---|---|---|
| 11 | Minna Road / Site Access Point | Site Access Point (minor arm) | ASD is achieved | There are curves in the road in both directions on the major carriageway which limit the available sight distance as well as vegetation and topography. The intersection currently has appropriate signage to identify the curves in the road and the location of the intersection. |
| | | Minna Road (south) | SISD is not achieved | |
| | | Minna Road (north) | SISD is not achieved | |

#### 7.1.6.5 Attribute 5: Height Clearance Requirements of Transformer Transporter

The transformer transporter is a 6m high vehicle. A review should be undertaken of the path of travel of the transformer transporter for overhead obstructions such as power lines. An indicative observation from the site visit identified low hanging power lines over Minna Road.

#### 7.1.6.6 Attribute 6: Safe Operation

There are a number of operational items that have had consideration to ensure the construction traffic generated by the site will operate in a safe environment. It is noted that given the majority of the path of travel to the site are contained upon the Bass Highway, many of the following operational considerations will be minimal in nature. If, however, any detours in traffic paths are required during construction due to road closures along the Bass Highway, additional consideration will be required to the matters identified below to ensure safe operational standards are implemented.

These have been outlined below.

**Pavement Assessment**

A pavement assessment was not conducted on the external road network. This is due to the road network that is expected to be relied upon for vehicles travelling to the site is contained on higher order arterial roads that are regularly maintained and designed to be utilized by heavy vehicles.

**Crash Risk Due to Poor Road Lighting at Night**

Any construction related activities occurring at night will require the provision of appropriate road lighting to improve road safety. The core construction activities that occur at night is the HDD shore crossing works, which will generate heavy movements during the 24/7 operation.

**Provision of Adequate Quality Intersection Treatments**

Intersections utilized by the site should be provided to adequate standard, including clear signage and line marking. This is most notable at the site access point to Minna Road.

**General Driver Safety**

The construction of the project will involve an increase in the number of heavy movements on the road network, including 19m semi-trailers. This increase in traffic for the life of the construction process is an important consideration. Management and monitoring is typically enforced to address key issues such as driver fatigue, fitness for work, employee inductions, familiarization of vehicles and the road network.

**Movement of Transformer Transporter**

The transformer transporter is an over dimensional vehicle, and will utilize the load carrying vehicles network, as outlined in Section 4.2.4.3. The routes utilized have been developed in conjunction with the Department of State Growth, Council and the Heavy Vehicle Regulator.

**Safety Risk of Pedestrians in Townships within the Study Area**

Pedestrian activity within the study area and along the construction traffic routes is primarily limited to the townships. The heavy movements through townships are primarily constrained to the Bass Highway and are therefore operating in line with expectation and existing use.

Vehicle movements may occur through smaller townships in the event of a road closure on the Bass Highway. When construction vehicles pass through these locations there is potentially an increased risk of crashes with a more significant consequence due to the increased number of pedestrians that are present within the townships.

### Safety Risk Around Schools

There are a number of schools and kindergartens within the townships that construction vehicles will be travelling through to access the site. These paths of travel, however, remain on the Bass Highway, which does not contain direct access points to schools.

If any detours are required during construction activities, a review of schools along the detour route should be conducted. When construction vehicles pass by schools there is potentially an increased risk of crashes with a more significant consequence, particularly given the high number of children within the road network during pick-up and drop-off time periods.

### Unforeseen Safety Risks

There are a number of road upgrades which are recommended throughout this report. These intersection works should be constructed to the same or better standard than existing. Any new intersections are to be designed and constructed with regard to Austroads guidelines and the requirements and standards of the responsible authority; this includes new intersections at access roads to the project alignment. Any new road works will be subject to road authority review and approval.

### Transportation of Hazardous Goods

The transportation of any hazardous goods may be required as part of the construction phase of this project. This may be required to support specific construction activities throughout the completion of the projects delivery phase.

## 7.1.7 Value 2 – EIS Significance Impact Assessment

The analysis and commentary presented above has established the likely traffic performance impacts. The impacts outlined above have been summarised in accordance with the significance assessment methodology outlined in section 5.6 with Table 5.2 and Table 5.3 identifying the criteria that has been used to assess each impact.

The significance assessment for value 2 prior to the implementation of any mitigating works has been summarised in Table 7.12.

Table 7.12: Value 2 Initial Significance Assessment

| Value | Attribute | Standard Mitigation | Impact | Description | Inherent Significance Assessment | | |
|---|---|---|---|---|---|---|---|
| | | | | | Sensitivity | Magnitude | Significance |
| Safe Road Performance, Condition & Design | Safe condition of bridges and culverts | Nil | Bridges and culverts may not be in an appropriate condition for the movement of the transformer transporter | There are a number of bridges on the path of travel between the Port of Burnie and the site.<br>The bridges on the Bass Highway may not be designed for the transformer transporter. | Moderate | Major | High |
| Safe Road Performance, Condition & Design | Adequate road geometry | Nil | Semi-trailer access via the surrounding road network | The paths of travel to the site are contained on the DSG approved B-double road network.<br>It is assumed the DSG approved road network can accommodate the construction vehicles accessing the site. | Low | Minor | Low |
| Safe Road Performance, Condition & Design | Adequate road geometry | Nil | Semi-trailer access to the site | The existing site access point is designed to be accessible to large vehicles.<br>19m semi-trailers can access the site. | Very Low | Negligible | Very Low |
| Safe Road Performance, Condition & Design | Adequate road geometry | Nil | The movement of the transformer transporter generally throughout the road network will travel down the centre of the road and travel at a slow speed. | Roads are not designed for vehicles of this size in standard operation.<br>The transformer transporter will travel down the centre of the road, heavily delaying traffic. This will require traffic management and may restrict access to private property temporarily | High | Major | Major |

| Value | Attribute | Standard Mitigation | Impact | Description | Inherent Significance Assessment | | |
|---|---|---|---|---|---|---|---|
| | | | | | Sensitivity | Magnitude | Significance |
| Safe Road Performance, Condition & Design | Adequate road geometry | Nil | The transformer transporter may require works and removal of minor road furniture to access the site at the following locations:<br>• Port of Burnie<br>• Bass Highway / Edwardes Street / Bollard Drive<br>• Bass Highway / Minna Road<br>• Minna Road / Site Access Point | The road network at these locations poorly accommodates the transformer transporter.<br>The transformer transporter cannot conduct these movements. | High | Major | Major |
| Safe Road Performance, Condition & Design | Historic Crash Safety Review | Nil | Increased crash risk on the external road network surrounding the site | No noted crash trend.<br>The traffic generated by the site is not expected to increase the safety risk. | Moderate | Negligible | Low |
| Safe Road Performance, Condition & Design | Provision of safe sight distance at intersections | Nil | Increased safety risk at the Minna Road site access point with sight distance constraints, noting warning signage is provided. | Poor sight distance, with warning signage provided.<br>Traffic generated at intersection with warning signage. | Low | Negligible | Very Low |
| Safe Road Performance, Condition & Design | Height clearance requirements of transformer transporter | Nil | Low hanging power lines may present an obstruction on the path of travel of the transformer transporter | Low hanging power lines<br>The path of travel of the transformer transporter may impact low hanging power lines | High | Major | Major |
| Safe Road Performance, Condition & Design | Safe Operation | Nil | Roads may require resurfacing / remediation works. | The road network on the paths of travel to the site are high capacity freight routes, designed to accommodate heavy vehicles.<br>The traffic generated will increase wear and tear on the road network. | Low | Moderate | Low |

| Value | Attribute | Standard Mitigation | Impact | Description | Inherent Significance Assessment | | |
|---|---|---|---|---|---|---|---|
| | | | | | Sensitivity | Magnitude | Significance |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Increased crash risk due to poor road lighting for HDD at night | Provision of road lighting at the Minna Road access point .<br>Vehicle movements generated with insufficient lighting provided. | Moderate | High | Moderate |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Provision of adequate quality intersection treatments, notably at the Minna Road site access point. | Infrastructure treatments utilised by construction traffic should be up to an appropriate quality as required by the standards<br>Traffic generated on intersections with poor line marking. | Low | Moderate | Low |
| Safe Road Performance, Condition & Design | Safe operation | Nil | General driver safety | General driver behaviour and crash risk. | Low | Major | Moderate |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Safety impact of movement of transformer transporter | Roads are not designed for vehicles of this size in standard operation.<br>The transformer transporter will travel down the centre of the road, heavily delaying traffic. | High | Major | Major |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Safety risk of pedestrians in townships with increased truck movements | Roads used to access the site travel past townships on the Highway.<br>Heavy vehicle movements through townships contained on highways. | Very Low | Major | Low |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Safety risk around Schools – identify schools / townships | Roads used to access the site are contained to the highway.<br>Heavy vehicle movements during school pick-up. | Very low | Major | Low |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Unforeseen safety risk | Diverted roads should be constructed to the same or better standard than the original. | Very Low | Major | Low |

| Value | Attribute | Standard Mitigation | Impact | Description | Inherent Significance Assessment | | |
|---|---|---|---|---|---|---|---|
| | | | | | Sensitivity | Magnitude | Significance |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Transportation of Hazardous Goods | Movement of hazardous goods materials to support the construction phase. | High | Severe | Major |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Peak Seasonal Events | Increase in the number of unfamiliar drivers onto the road network during seasonal holiday periods. | Low | Negligible | Very Low |

## 7.1.8 Value 2 – Mitigation Works

The attributes identified above have then been further assessed to identify possible mitigating works.

### 7.1.8.1 Attribute 1: Safe Condition of Bridges and Culverts

It is recommended that the ultimate travel routes are reviewed to identify bridges and culverts that will be traversed by the transformer transporter. This process should be undertaken in consultation with road authorities. These pieces of road infrastructure should be assessed by a suitably qualified civil engineer to confirm they are in an acceptable and appropriate state for the vehicles that will be generated by the construction activities.

### 7.1.8.2 Attribute 2: Adequate Road Geometry

No additional road works were identified to accommodate 19m semi-trailers accessing the site. Should any unforeseen large sized vehicles required access during the construction period, separate assessment will be required to ensure access can be achieved.

Table 7.13 outlines the works required to accommodate the transformer transporter, with the results of the swept path assessments undertaken outlined in Appendix C

Table 7.13: Road Works Required to Accommodate Transformer Transport Movements

| # | Location | Swept Path Assessed | Results |
|---|---|---|---|
| 1 | Port of Burnie | Internal movement in the Port of Burnie | Works required to the roundabout in the Port of Burnie to provide a trafficable surface through the roundabout |
| 2 | Bass Highway / Edwardes Street / Bollard Drive | Right turn from Bollard Drive into Edwardes Drive, then a left turn into Bass Highway<br><br>Right turn from Bass Highway into Edwardes Drive, then a left turn into Bollard Drive. | Works required to enable the vehicle to drive over the kerb at the slip lane turning left onto the bass highway.<br><br>The path of travel will cross the central median, travelling onto the to right hand side of Bass Highway. Vehicle will to travel through slip lane provided from Edwardes Street northern approach. Minor works required to drive over kerbing. |
| 3 | Bass Highway / Minna Road | Right turn movement into Minna Road from the Bass Highway | Works required to drive over the kerbing in the central median of the Bass Highway, and the road island on the Minna Road approach. Signage to be removed.<br><br>Minor works to drive over grass in median and verges. |
| 4 | Minna Road / Site access point | Right turn movement into the site from Minna Road | The vehicle will drive over shoulders of Minna Road. Possible earthworks required to hill on the northern frontage of Minna Road. |

The movement of the transformer transporter will require traffic management personnel to supervise for the entirety of the process. This will include operations to block traffic during periods of time when the transformer transporter is travelling down the centre of the carriageway, or completing turning movements. Moving warnings will be provided for approaching vehicles that a large, slow moving vehicle is on the approach. This may also result in temporary restrictions to property access. It is recommended engagement with a transport operator who can complete the movement of the transformer is consulted as early as possible to ensure all project requirements and risks, as they see it, are identified. Ongoing early consultation with the HVR and DSG is required to ensure all approvals are obtained prior to the proposed operation.

### 7.1.8.3 Attribute 3: Crash Stats Review

Inductions will be provided to workers transporting goods to and from the site of any identified locations with an existing safety risk. It is noted that the traffic generated by construction activities is not expected to increase the safety risk at these locations.

In order to mitigate the risk of fatigue in the workforce when driving to/from the construction site, a number of measures can be put in place, such as:

- Implementing a plan to limit the length of personnel shifts.
- Comply with industry standards with regard to providing breaks when driving long distances.
- Provide on-site facilities to accommodate breaks for drivers.

It is recommended to continuously monitor the performance of the road network, identify any crashes that might occur on the identified road network by other vehicles and investigate the reasoning of crashes that occur by construction vehicles.

#### 7.1.8.4 Attribute 4: Sight Distance Assessment

Warning signage is already provided at these intersections to warn drivers of visibility issues at intersections with restricted sight distance. No mitigating works required.

#### 7.1.8.5 Attribute 5: Height Clearance Requirements of Transformer Transporter

If any low hanging overhead power lines are identified that present a safety risk for the movement of the transformer transporter, management strategies should be put in place during the movement of this vehicle.

#### 7.1.8.6 Attribute 6: Safe Operation

**Pavement Assessment**

It is recommended that the individual construction site access / local road should be assessed by a suitably qualified pavement engineer and existing defects should be rectified to prevent further damage and delays to the project. Should any pavement fail during the construction period, as a result of project traffic, the contractor should liaise with the relevant road authority to ensure they are informed.

**Crash Risk Due to Poor Road Lighting at Night**

Temporary construction road lighting to be provided by the contractor at access intersections during HDD operations to provide adequate lighting. A review of existing lighting conditions and lighting requirements to be conducted by the contractor.

**Provision of Adequate Quality Intersection Treatments**

Improve the line marking at the Minna Road site access point to be clear in directing traffic. Monitor intersections utilized by the construction activities to ensure they are up to an appropriate standard.

**General driver safety**

Management and monitoring is typically enforced to address key issues such as driver fatigue, fitness for work, employee inductions, familiarization of vehicles and the road network. The Traffic Management Plans (TMPs) will address the following in regard to general driver safety:

- measures to manage shift length of personnel.
- compliance with industry standards with regard to providing breaks when driving long distances.
- provision of on-site facilities to accommodate breaks for drivers.
- inspection of workplace rosters and work-time records on regular occasions.
- consultation with drivers on issues throughout construction.
- monitor and review process to ensure compliance with TMPs.
- possibility to set up a workforce campsite where workers are transported to the site by bus.

**Movement of Transformer Transporter**

The movement of the transformer transporter will require permanent traffic management personnel to supervise. This will include operations to block traffic during periods of time when the transformer transporter is travelling down the centre of the carriageway, or completing turning movements. Moving warnings will be provided for approaching vehicles that a large, slow moving vehicle is on the approach.

**Safety Risk of Pedestrians in Townships within the Study Area**

The contractor should be in contact with representatives of the local townships (Council and or relevant community groups) that will experience a large increase in heavy vehicle movements in the event of any road closures that cause traffic to be redistributed off the Bass Highway. This is to identify if any events are occurring which will attract larger-than-normal pedestrian volumes. If events are scheduled, the contractor should adjust the proposed operation to manage / limit / prevent any increased project traffic through these locations.

#### Unforeseen Safety Risks

Infrastructure treatments should be inspected to ensure they comply with relevant standards.

#### Transportation of Hazardous Goods

The transportation of any hazardous goods / materials shall be done so in adherence to any standard requirements by the road authority as it relates to that specific material.

#### Peak Seasonal Events

Management of construction operations should be considered during peak seasonal weekends, such as the Christmas/New Year break, Australia Day and Easter to minimise project generated traffic on roads likely to be used by tourists / unfamiliar drivers.

### 7.1.9 Value 2 – Environmental Performance Requirements

The following EPRs outlined in Table 7.14 have been informed by the mitigation and management measures summarised in the impact assessment. These mitigation measures are discussed to outline how the EPRs could be implemented. The EPRs have also been developed with consideration of industry standards and relevant legislation, guidelines and policies. The location of where these items are represented in the final EPRs outlined in Section 8.2 has been provided.

Table 7.14: Value 2 EPRs

| # | EPR Identified | # Reference to final EPR's |
|---|---|---|
| 1 | Ensure the bridges that will be crossed by heavy vehicles to the site are in a suitable condition before and during construction | EPR T02-8 |
| 2 | Complete road works to accommodate the turning movement requirements of the transformer transporter as outlined in the swept path assessment. | EPR T01 |
| 3 | Continuous traffic management to control and supervise the movements of the transformer transporter. | EPR T01-18 |
| 4 | TMPs<br>Prepare and implement a traffic management plan that addresses and documents the approach for the following:<br>• Provide appropriate upgrades and pavement regrading in line with the recommendations of a suitably qualified pavement engineer during construction if required.<br>• Mitigate the risk of driver fatigue<br>• Provide adequate height clearance for the transformer transporter path of travel<br>• provide guidance to comply with relevant industry standards<br>• provide guidance on driver schedules<br>• avoid travel past schools during pick-up / drop-off<br>• minimise travel through townships during local events<br>• manage the safe transportation of any hazardous goods / materials<br>• reduce construction operations during peak seasonal events such as long weekends | EPR T01 |
| 5 | Provide adequate temporary road lighting over night during HDD operations | EPR T01-12 |
| 6 | Inspections of infrastructure treatments to ensure they comply with industry standards such as Austroads guide to road design, Australian Standards, DSG design guidance and relevant local government standard drawings. | EPR T02-6 |

## 7.1.10 Value 2 – Residual Impacts

Upon the implementation of the mitigating works, some residual impacts will still remain. These have been outlined in the following sections.

### 7.1.10.1 Attribute 1: Safe Condition of Bridges and Culverts

The condition of bridges and culverts along the travel routes will require continuous inspections during construction activities to ensure its continued acceptable operating condition.

Addressed in EPR T02-8

### 7.1.10.2 Attribute 2: Adequate Road Geometry

The project assessment has considered vehicles up to a 19m semi-trailer or equivalent (excluding the transformer transporter). Physical requirements associated with the use of a larger vehicle have not been undertaken, with analysis required if larger vehicles will be utilised.

The dimensions of the transformer transporter should be confirmed prior to the movement occurring to ensure that the designs prepared meet the spatial requirements.

Traffic delays will occur as a result of the movement of the transformer transporter as it will move at a slow speed, under continuous traffic management.

Addressed in EPR T01-8, EPR T02-9

### 7.1.10.3 Attribute 3: Crash Stats Review

The generation of vehicle movements will inherently carry a crash risk on the road network.

Addresser in EPR T01-13

### 7.1.10.4 Attribute 4: Sight Distance Assessment

Intersections will continue to operate as per existing arrangements

### 7.1.10.5 Attribute 5: Height Clearance Requirements of Transformer Transporter

Works will be undertaken to ensure the transformer transporter can traverse the required path of travel.

Addressed in EPR T01-8

### 7.1.10.6 Attribute 6: Safe Operation

The proposed mitigation measures aim to reduce the safety risk associated with the construction activities for the project, however, there is always possibility for human error or other unforeseen circumstances or events. As such, an inherent safety risk will remain following the implementation of the mitigation measure associated with each element of this attribute.

Addressed in EPR T01 ,EPR T02.

The revised significance assessment for value 2 with mitigating works has been summarised in Table 7.15 below.

Table 7.15: Value 2 Revised Significance Assessment

| Value | Attribute | Standard Mitigation | Impact | Impact Assessment | | | Mitigating Works | Residual Impact | Residual Impact Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Impact Significance | | | Sensitivity | Magnitude | Residual Impact Significance |
| **Safe Road Performance, Condition & Design** | Safe condition of bridges and culverts | Nil | Bridges and culverts may not be in an appropriate condition for the movement of the transformer transporter | Moderate | Major | High | Bridges and culverts should be upgraded to align with the recommendations of a suitably qualified civil engineer. | Bridges and culverts will require continuous inspections. | Moderate | Negligible | Low |
| **Safe Road Performance, Condition & Design** | Adequate road geometry | Nil | Semi-trailer access via the surrounding road network | Low | Minor | Low | Nil | If larger vehicles are required during construction, additional assessment required | Low | Minor | Low |
| **Safe Road Performance, Condition & Design** | Adequate road geometry | Nil | Semi-trailer access to the site | Very Low | Negligible | Very Low | Nil | If larger vehicles are required during construction, additional assessment required | Very Low | Negligible | Very Low |

| Value | Attribute | Standard Mitigation | Impact | Impact Assessment | | | Mitigating Works | Residual Impact | Residual Impact Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Impact Significance | | | Sensitivity | Magnitude | Residual Impact Significance |
| **Safe Road Performance, Condition & Design** | Adequate road geometry | Nil | The movement of the transformer transporter generally throughout the road network will travel down the centre of the road and travel at a slow speed. | High | Major | Major | Traffic management throughout the movement of the transformer transporter | The dimensions of the transformer transporter should be confirmed prior to the movement.<br>Traffic delays to external road network during movement of transformer transporter as well as the potential for temporary restrictions to private property | High | Negligible | Low |

| Value | Attribute | Standard Mitigation | Impact | Impact Assessment | | | Mitigating Works | Residual Impact | Residual Impact Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Impact Significance | | | Sensitivity | Magnitude | Residual Impact Significance |
| Safe Road Performance, Condition & Design | Adequate road geometry | Nil | The transformer transporter may require works to access the site at the following locations:<br>• Port of Burnie<br>• Bass hwy / Edwardes St / Bollard Drv<br>• Bass Hwy / Minna Rd<br>• Minna Rd / Site Access Point | High | Major | Major | Provision of widened trafficable surface on locations identified. | Clearing of land, vegetation and furniture. | High | Minor | Moderate |
| Safe Road Performance, Condition & Design | Historic Crash Safety Review | Nil | Increased crash risk on the external road network surrounding the site | Moderate | Negligible | Low | Implement TMPs to ensure safe operational standards for drivers and monitor construction activities. | Inherent residual crash risk | Moderate | Negligible | Low |

| Value | Attribute | Standard Mitigation | Impact | Impact Assessment | | | Mitigating Works | Residual Impact | Residual Impact Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Impact Significance | | | Sensitivity | Magnitude | Residual Impact Significance |
| Safe Road Performance, Condition & Design | Provision of safe sight distance at intersections | Nil | Increased safety risk at the Minna Road site access point with sight distance constraints, noting warning signage is provided: | Low | Negligible | Very Low | Nil | Residual safety risk. | Low | Negligible | Very Low |
| Safe Road Performance, Condition & Design | Height clearance requirements of transformer transporter | Nil | Low hanging power lines may present an obstruction on the path of travel of the transformer transporter | High | Major | Major | Develop a strategy to raise the height of low hanging power lines during the movement of the transformer transporter. | Works will be undertaken to ensure the transformer transporter can traverse the required path of travel. | High | Minor | Moderate |
| Safe Road Performance, Condition & Design | Road pavement condition | Nil | Roads may require resurfacing / remediation works. | Low | Moderate | Low | Roads should be upgraded to align with the requirements of a suitably qualified pavement engineer. | Pavement will require continuous inspections. | Low | Negligible | Very Low |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Increased crash risk due to poor road lighting for HDD at night | High | Major | Major | Provision of temporary construction lighting at required intersections | Lighting to be provided to sufficiently meet the appropriate standards | High | Minor | Moderate |

| Value | Attribute | Standard Mitigation | Impact | Impact Assessment | | | Mitigating Works | Residual Impact | Residual Impact Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Impact Significance | | | Sensitivity | Magnitude | Residual Impact Significance |
| **Safe Road Performance, Condition & Design** | Safe operation | Nil | Provision of adequate quality intersection treatments, notably at the Minna Road site access point. | Low | Moderate | Low | Provide updated line marking at the Minna Road site access point. Monitor the road network utilised by the site to ensure up to an adequate standard. | Linemarking will require continuous inspections. | Low | Minor | Low |
| **Safe Road Performance, Condition & Design** | Safe operation | Nil | General driver safety | Low | Major | Moderate | Implement TMPs to ensure safe operational standards for drivers and monitor construction activities.<br><br>Survey drivers on regular basis | General driver safety | Low | Major | Moderate |
| **Safe Road Performance, Condition & Design** | Safe operation | Nil | Safety impact of movement of transformer transporter | High | Major | Major | Traffic management throughout the movement of the transformer transporter | Traffic management in high speed road environments.<br><br>Delays to external road network during movement of transformer transporter | High | Minor | Moderate |

| Value | Attribute | Standard Mitigation | Impact | Impact Assessment | | | Mitigating Works | Residual Impact | Residual Impact Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Impact Significance | | | Sensitivity | Magnitude | Residual Impact Significance |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Safety risk of pedestrians in townships with increased truck movements | Very Low | Major | Low | Vehicle movements contained to highways and not in pedestrianised areas | Truck movements through townships as a result of detours | Very Low | Minor | Very Low |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Safety risk around Schools – identify schools / townships | Very low | Major | Low | Vehicle movements contained to highways and not directly past schools | Avoid travel past schools during pick-up / drop-off if detours occur | Very Low | Minor | Very Low |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Unforeseen safety risk | Very Low | Major | Low | Ensure infrastructure built to standards | Nil | Very Low | Major | Low |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Transportation of Hazardous Goods | High | Major | Major | The transportation of any hazardous goods / materials shall be done so in adherence to any standard requirements by the road authority as it relates to that specific material. | Compliance with road authority guidelines and material specific management measures results in a standardised level of risk commensurate with the activity required to be completed. | High | Minor | Moderate |

| Value | Attribute | Standard Mitigation | Impact | Impact Assessment | | | Mitigating Works | Residual Impact | Residual Impact Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Impact Significance | | | Sensitivity | Magnitude | Residual Impact Significanc e |
| **Safe Road Performance, Condition & Design** | Safe operation | Nil | Peak Seasonal Events | Low | Negligible | Very Low | Reduced construction operations during peak seasonal event such as long weekends. | Increase in the number of unfamiliar drivers onto the road network during seasonal holiday periods. | Low | Negligible | Very Low |

## 7.1.11 Value 3 – Public and Active Transport

Analysis has been undertaken to assess the impact of the project on the public transport network and active transport infrastructure that forms a part of the study area.

The following attributes were defined in the assessment of Value 3:

Table 7.16: Values and Attributes

| Value | Attribute |
|---|---|
| Public and Active Transport<br>The continued operation of the public transport network, as well as the active transport infrastructure in the surrounding area. This includes V/Line trains, local bus services, school buses, recreational rail trails and public footpaths. | Operation of public transport services and infrastructure |
| | Operation of active transport infrastructure |

#### 7.1.11.1 Attribute 1: Public Transport

**Rail**

As outlined above in Section 6.3.4, the proposed construction vehicle access routes do not cross any active train lines. There is therefore no impact to any rail services as a result of the proposed works.

**Bus**

The public bus routes within the surrounding area of the converter station are identified in Section 6.3.5.

The proposed paths of travel to the converter station that are expected to be utilised by construction vehicles will pass through a number of townships with regular public bus services. It is not expected that these services will be impacted by the movement of large vehicles, given the heavy vehicle movements will predominantly be confined to major arterial roads / highways and heavy vehicle routes within these townships.

It is noted that the path of travel of the transformer transporter travels along the Bass Highway, which has the 190 and 708 bus routes. Consultation is expected to occur by the construction contractor in developing the TMPs with the public transport operators to ensure the impact on these routes are minimised.

**School Bus**

It is expected that the construction of the converter station will result in heavy construction vehicles being generated on roads that are utilised by school buses to pick up children in rural areas. Given the nature of these movements being targeted at picking up from specific households, these school bus movements are subject to change over time, and the current school bus movements will likely have changed when construction activities commence.

#### 7.1.11.2 Attribute 2: Active Transport

**Dedicated Cycling Infrastructure**

Dedicated cycling infrastructure is minimal within the area surrounding the converter station, given that the site is primarily surrounded by major highways and high speed arterial roads.

The proposed works will not impact any cycling infrastructure.

**Footpaths**

Footpaths on the roads surrounding the converter station site are minimal, given that the site is primarily surrounded by major highways and high speed arterial roads.

The proposed works will not impact any footpaths.

## 7.1.12 Value 3 – EIS Significance Impact Assessment

The analysis and commentary presented above has established the likely impacts to the public transport and active transport networks. The impacts outlined above have been summarised in accordance with the significance assessment methodology outlined in section 5.6 with Table 5.2 and Table 5.3 identifying the criteria that has been used to assess each impact.

The significance assessment for value 3 prior to the implementation of any mitigating works has been summarised in Table 7.17 below.

Table 7.17: Value 3 Initial Significance Assessment

| Value | Attribute | Standard Mitigation | Impact | Description | Inherent Significance Assessment | | |
|---|---|---|---|---|---|---|---|
| | | | | | Sensitivity | Magnitude | Significance |
| Public & Active Transport | Public Transport | Nil | Impact on train services. | No rail lines are in the study area.<br>No rail lines are impacted by the project. | Very Low | Negligible | Very Low |
| Public & Active Transport | Public Transport | Nil | Impact on public bus services. | Low frequency bus routes are in towns along travel routes.<br>The traffic generated by the project is not expected to impact public bus routes. | Low | Negligible | Very Low |
| Public & Active Transport | Public Transport | Nil | Impact on public bus services by the transformer transporter. | Low frequency bus routes are in towns along travel routes.<br>The transformer transporter will travel at a low speed and take up multiple lanes of traffic on roads utilised by public buses. | Low | Minor | Low |
| Public & Active Transport | Public Transport | Nil | Impact on school bus routes. | School buses may be present on travel routes by construction vehicles.<br>Construction vehicles may pass school buses and waiting children. | High | Moderate | High |
| Public & Active Transport | Active Transport | Nil | Impact on dedicated cycling infrastructure. | There is minimal cycling infrastructure present within the study area.<br>Construction vehicles may pass some cycling infrastructure. | Very Low | Negligible | Very Low |
| Public & Active Transport | Active Transport | Nil | Impact on footpaths. | There are minimal footpaths present within the study area.<br>Construction vehicles may pass some footpaths. | Very Low | Negligible | Very Low |

## 7.1.13 Value 3 – Mitigation Works

The attributes identified above have then been further assessed to identify mitigating works.

#### 7.1.13.1 Attribute 1: Public Transport

**Rail**

The proposed converter station construction vehicle access routes do not cross any currently active train lines. No mitigating works are required.

**Bus**

The construction vehicles generated by the construction of the cable are not expected to have a material impact on the public bus network. No mitigating works are required.

The movement of the transformer transporter will be planned in consultation with the heavy vehicle regulator, DSG and public transport operators to minimise disruption.

**School Bus**

Prior to the beginning of construction of the project, consultation should be undertaken with relevant councils / schools / bus operators to identify whether any school bus routes currently operate along the paths of travel to the project alignment that are being utilised by heavy construction vehicles.

If any school bus routes do align with the expected heavy vehicles paths, it is recommended that the project considers that the movement of these vehicles be restricted to occur outside of the typical school bus operating hours (7AM to 9AM and 2:30PM to 4:30PM).

#### 7.1.13.2 Attribute 2: Active Transport

**Dedicated Cycling Infrastructure**

On-road cycle lanes will be unimpacted by the construction of the converter station and shore crossing due to roads being crossed using HDD methodology. No mitigating works are required.

**Footpaths**

No footpaths will be impacted by construction activities.

## 7.1.14 Value 3 – Environmental Performance Requirements

The following EPRs outlined in Table 7.18 have been informed by the mitigation and management measures summarised in the impact assessment. These mitigation measures are discussed to outline how the EPRs could be implemented. The EPRs have also been developed with consideration of industry standards and relevant legislation, guidelines and policies. The location of where these items are represented in the final EPRs outlined in Section 8.2 has been provided.

Table 7.18: Value 3 EPRs

| # | EPR Identified | # Reference to final EPR's |
|---|---|---|
| 1 | Identify any school bus routes along the construction routes. Movement of heavy vehicles travelling along these routes to be considered to be restricted to occur outside of the typical school bus operating hours (7AM to 9AM and 2:30PM to 4:30PM). | EPR T01-4 |
| 2 | Consultation by the contractor with public transport operators in regard to the movement of the transformer transporter to mitigate the impact of this movement on public transport services. This should occur during the preparation of the TMPs. | EPR T01-19, EPR T02-2 |

## 7.1.15 Value 3 – Residual Impacts

Upon the implementation of the mitigating works, some residual impacts will still remain. These have been outlined in the following sections.

### 7.1.15.1 Attribute 1: Public Transport

**Rail**

The proposed converter station vehicle access routes do not cross any currently active train lines. There is no residual impact to the rail network.

**Bus**

The proposed converter station vehicle access routes are not expected to have a material residual impact on the public bus network.

The movement of the transformer transporter will be planned and conducted to minimise any disruption to public transport routes.

Addressed in EPR T01-19, EPR T02-2

**School Bus**

If heavy construction vehicles will not travel on school bus routes during pick-up / drop-off time periods, there is no residual impacts.

Addressed in EPR T01-4

### 7.1.15.2 Attribute 2: Active Transport

The proposed converter station vehicle access routes do not cross any cycle paths or footpaths. Active transport infrastructure is therefore not impacted.

The revised significance assessment for Value 3 with mitigating works has been summarised in Table 7.19 below.

Table 7.19: Value 3 Revised Significance Assessment

| Value | Attribute | Standard Mitigation | Impact | Significance Assessment | | | Mitigating Works | Residual Impact | Residual Significance Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Significance Impact | | | Sensitivity | Magnitude | Residual Significance Impact |
| Public & Active Transport | Public Transport | Nil | Impact on train services. | Very Low | Negligible | Very Low | Nil | No rail lines are in the study area. | Very Low | Negligible | Very Low |
| Public & Active Transport | Public Transport | Nil | Impact on public bus services. | Low | Negligible | Very Low | Nil | The traffic generated by the project is not expected to impact public bus routes. | Low | Negligible | Very Low |
| Public & Active Transport | Public Transport | Nil | Impact on public bus services by the transformer transporter. | Low | Minor | Low | The transformer transporter will travel at a time when public buses are infrequent | Transformer transporter will travel at a low speed and take up multiple lanes of traffic on roads utilised by public buses | Very Low | Negligible | Very Low |
| Public & Active Transport | Public Transport | Nil | Impact on school bus routes. | High | Moderate | High | Heavy construction vehicles will not travel on school bus routes during pick-up / drop-off times | Continuous engagement to ensure any changes to school bus routes is known. | High | Negligible | Low |
| Public & Active Transport | Active Transport | Nil | Impact on dedicated cycling infrastructure. | Very Low | Minor | Very Low | Consultation with council to determine mitigating measures. | No cycle paths in the study area | Very Low | Minor | Very Low |
| Public & Active Transport | Active Transport | Nil | Impact on footpaths. | Low | Minor | Very Low | Consultation with local residents. | No footpaths in the study area | Low | Minor | Very Low |

## 7.2 Operation

The converter stations will not be manned 24/7 and only attended during normal working hours.

Operation and maintenance vehicles entering and exiting the converter station site per day will be a maximum of five light vehicles per day (for operational personnel). On some days it may be as low as two vehicles per day. There will also be planned outages up to twice a year which will involve 15-20 employees for up to 2 weeks

The traffic accessibility requirements are minor, and are not expected to compromise the safety, function or operation of the surrounding road network.

The intersection upgrades which are proposed to be delivered for the construction stage of the project can be retained and utilised for the ongoing operation of the site/s.

## 7.3 Decommissioning

The operational lifespan of the project is a minimum 40 years. At this time the project will be either decommissioned or upgraded to extend its operational lifespan.

Decommissioning will be planned and carried out in accordance with regulatory requirements at the time. A decommissioning plan in accordance with approvals conditions will be prepared prior to planned end of service and decommissioning of the project.

Requirements at the time will determine the scope of decommissioning activities and impacts. The key objective of decommissioning is to leave a safe, stable and non-polluting environment.

In the event that the project is decommissioned, all above-ground infrastructure will be removed, the site rehabilitated.

Decommissioning activities required to meet the objective will include, as a minimum, removal of above ground buildings and structures. Remediation of any contamination and reinstatement and rehabilitation of the site will be undertaken to provide a self-supporting landform suitable for the end land use.

Decommissioning and demolition of project infrastructure will implement the waste management hierarchy principles being avoid, minimise, reuse, recycle and appropriately dispose. Waste management will accord with applicable legislation at the time.

Decommissioning activities may include recovery of land and subsea cables. The conduits and shore crossing ducts would be left in-situ as removal would cause significant environmental impact. Subsea cables would be recovered by water jetting or removal of rock mattresses or armouring to free the cables from the seabed.

A decommissioning plan will be prepared to outline how activities will be undertaken and potential impacts managed.

The decommissioning of the converter station is expected to involve lesser levels of traffic generation than those that occur during construction, as assessed within this report.

The historic traffic growth as found in Section 6.3.1.6 indicates that the growth in traffic volumes in the future is not substantial.

## 7.4 Cumulative Impacts

There are a number of projects in the immediate surrounds of the subject site that may have an impact on the construction of the project. A number of these projects are outlined below in Figure 7-3 and Table 7.20.

Figure 7-3: Projects in the Surrounding Area

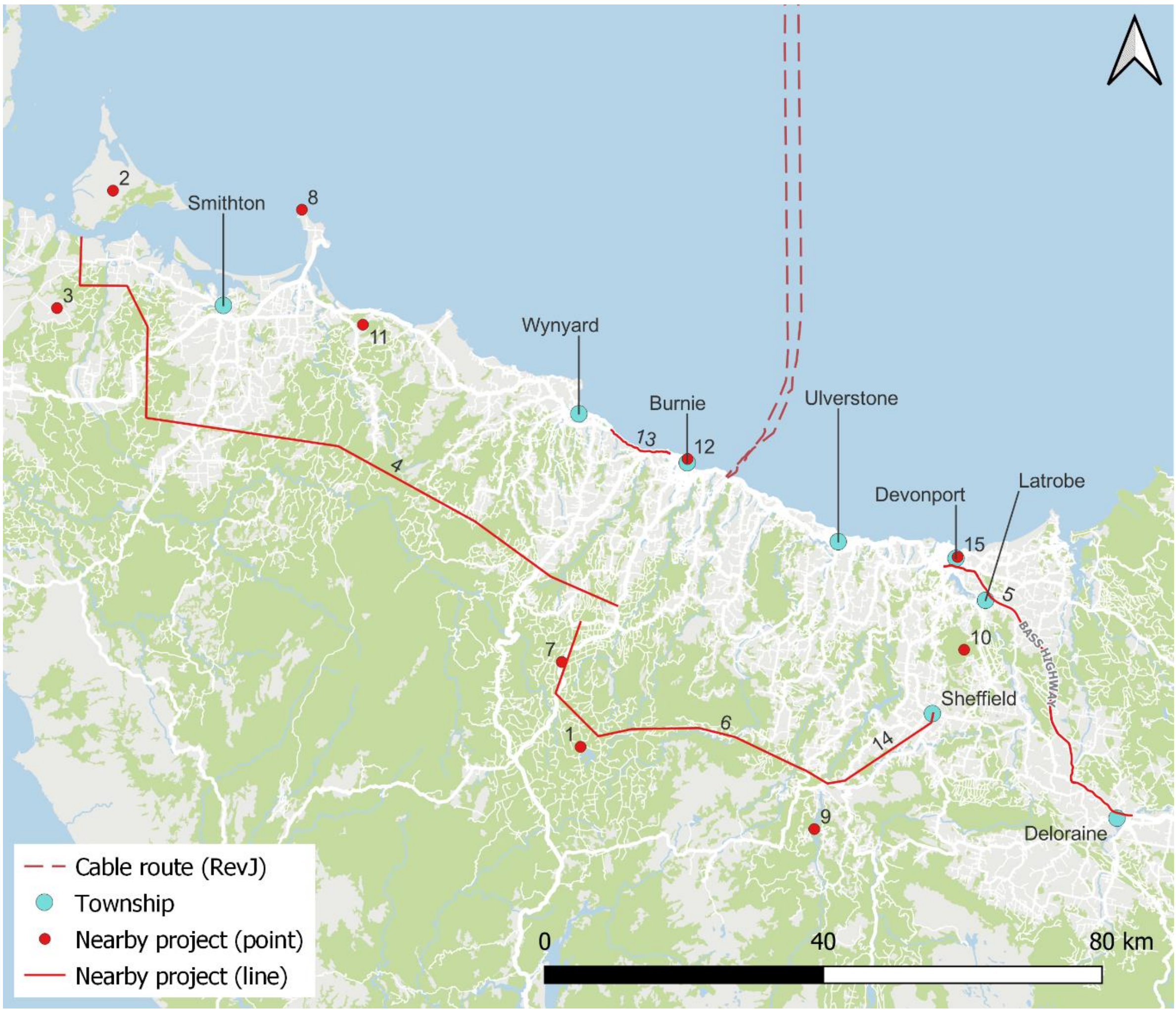



Table 7.20: Projects in the Surrounding Area

| # | Proposal / proponent | Description | Location | Timing | Comment on Transport Impact |
|---|---|---|---|---|---|
| 1 | Guilford Wind Farm | Wind farm in Guildford with up to 80 wind turbines<br>Generation of up to 450 megawatts (MW) of wind energy<br>Estimated capital: $50 million | 7 km northeast of Waratah and 15 km south of Hampshire | Current status: Notice of intent submitted September 2020<br>Deemed a controlled action by DAWE in September 2021<br>Construction to commence: 2024 | Traffic volumes from Port of Burnie, likely turning west on Bass Highway to access site.<br>Minimal cumulative traffic impacts due to distance between sites.<br>Any substantive cumulative impact will occur on the Bass Highway, with a high capacity. |
| 2 | Robbins Island Renewable Energy Park | Wind farm on Robbins Island with up to 122 wind turbines<br>Generation of up to 900 MW of wind energy<br>Estimated construction value: $1.2 billion<br>Construction workforce: 250 personnel | Robbins Island, northwest coast of Tasmania | Current status: Approved by the Commonwealth Government and assessment by the EPA underway<br>Construction to commence: 2023-2025 | Traffic volumes from Port of Burnie, likely turning west on Bass Highway to access site.<br>Minimal cumulative traffic impacts due to distance between sites.<br>Any substantive cumulative impact will occur on the Bass Highway, with a high capacity. |

| # | Proposal / proponent | Description | Location | Timing | Comment on Transport Impact |
|---|---|---|---|---|---|
| 3 | Jim's Plain Renewable Energy Park | Wind farm in Jim's Plain with up to 31 wind turbines and possible solar generation<br><br>Generation of up to 200 MW of wind energy and up to 40 MW of solar energy<br><br>Capital investment: $350 million.<br><br>Construction workforce: over 150 personnel<br><br>Operations workforce: 15 personnel | 23 km west of Smithton | Current status: Approved by the Council and State and Commonwealth governments in 2020<br><br>Construction to commence: 2023 | Traffic volumes from Port of Burnie, likely turning west on Bass Highway to access site.<br><br>Minimal cumulative traffic impacts due to distance between sites.<br><br>Any substantive cumulative impact will occur on the Bass Highway, with a high capacity. |
| 4 | Robbins Island Road to Hampshire Transmission Line | A new 220 kV overhead transmission line (OHTL) spanning 115 km, estimated to have 245 towers.<br><br>Connects Jim's Plain and Robbins Island Renewable Energy Parks transmission infrastructure to Tasmanian transmission network.<br><br>Construction workforce: up to 100 personnel over 24 months | Between Robbins Island Rd at West Montagu and Hampshire | Current status: Detailed planning/environmental approvals phase underway.<br><br>Commonwealth Government determined the project to be a controlled action under the EPBC Act in September 2020.<br><br>Construction to commence: 2023 | Traffic volumes from Port of Burnie, likely turning west on Bass Highway to access site.<br><br>Minimal cumulative traffic impacts due to distance between sites.<br><br>Any substantive cumulative impact will occur on the Bass Highway, with a high capacity. |
| 5 | Bass Highway, targeted upgrades between Deloraine and Devonport | Targeted highway upgrades between Deloraine and Devonport.<br><br>Roads of strategic importance<br><br>Estimated project cost: $50 million | Targeted areas along Bass Highway between Deloraine and Devonport | Current status: In planning<br><br>Construction expected to commence: late 2023<br><br>Expected completion: 2027 | Delays and road closures may impact vehicles travelling to the site from the east.<br><br>Possible detours during construction. |
| 6 | Staverton to Hampshire Hills Transmission Line | A component of the North West Transmission Developments, comprising a new 60-km-long new 220 kV OHTL between a new switching station at Staverton and Hampshire Hills<br><br>Supports new and existing renewable energy developments in North West Tasmania, including Marinus Link.<br><br>Estimated project cost: $220 million | Between Staverton and Hampshire Hills | Current status: Planning and approvals phase in progress<br><br>Construction expected to commence: 2024 | Traffic volumes from the Port of Burnie will travel past the Heybridge site along the Bass Highway.<br><br>Any substantive cumulative impact will occur on the Bass Highway, with a high capacity. |

| # | Proposal / proponent | Description | Location | Timing | Comment on Transport Impact |
|---|---|---|---|---|---|
| 7 | Hellyer Wind Farm | Wind farm with up to 48 wind turbines<br>Generation of up to 300 MW of wind energy | 8.5km southwest of Hampshire | Current status: Design phase.<br>Notice of intent issued.<br>Tasmanian EPA - EIS Guidelines issued in November 2022 | Traffic volumes from Port of Burnie, likely turning west on Bass Highway to access site.<br>Minimal cumulative traffic impacts due to distance between sites.<br>Any substantive cumulative impact will occur on the Bass Highway, with a high capacity. |
| 8 | Western Plains | Wind farm with up to 12 wind turbines<br>Generation of up to 50.4 MW of wind energy | 4 to 5 km northwest of Stanley | Current status: Work on the Development Proposal and Environmental Management Plan (DPEMP) is continuing. The DPEMP has been drafted in accordance with the Project Specific Guidelines issued for the project by the Environment Protection Authority (EPA Tasmania). The EPA Tasmania recently extended the timeframe for submission to enable completion of the required documentation. | Traffic volumes from Port of Burnie, likely turning west on Bass Highway to access site.<br>Minimal cumulative traffic impacts due to distance between sites.<br>Any substantive cumulative impact will occur on the Bass Highway, with a high capacity. |
| 9 | Lake Cethana Pumped Hydro | Storage and underground pumped hydro power station with associated infrastructure, with up to 600 MW capacity<br>Estimated construction cost: $900 million | 19 km southwest of Sheffield | Current status: Hydro Tasmania will progress with the final feasibility stage<br>Construction likely to commence: 2027 | Traffic volumes from the Port of Burnie will travel past the Heybridge site along the Bass Highway.<br>Any substantive cumulative impact will occur on the Bass Highway, with a high capacity. |
| 10 | Youngmans Road Quarry | Limestone quarry development on old quarry site<br>Average annual production of 72,000 tonnes of limestone | 2.5km northwest of Railton | Current status: EPA approved the development in February 2021.<br>Kentish Council is reviewing the land permit for the proposed development | Traffic volumes from the Port of Burnie will travel past the Heybridge site along the Bass Highway.<br>Any substantive cumulative impact will occur on the Bass Highway, with a high capacity. |

| # | Proposal / proponent | Description | Location | Timing | Comment on Transport Impact |
|---|---|---|---|---|---|
| 11 | Port Latta Wind Farm | Wind farm with up to 7 wind turbines<br>Generation of up to 25 MW of wind energy<br>Construction workforce: 15 people over six months<br>Estimated capital: $50 million | Mawbanna Plain, 2 km southwest of Cowrie Point | Current status: Environmental Assessment Report and EPA decision issued October 2018<br>Website states intent to start construction late 2020, no further updates available | Traffic volumes from Port of Burnie, likely turning west on Bass Highway to access site.<br>Minimal cumulative traffic impacts due to distance between sites.<br>Any substantive cumulative impact will occur on the Bass Highway, with a high capacity. |
| 12 | Port of Burnie Shiploader Upgrade | Minerals shiploader and storage expansion at TasRail's existing Bulk Minerals Export Facility<br>Estimated cost: $64 million<br>Design and construction workforce: 140 personnel | Port of Burnie | Current status: onsite works and detailed design (commenced in April 2022).<br>Commissioning expected to commence: 2023 | The coordination by the contractor to deliver materials for the project will avoid periods of delay for works at the Port of Burnie. |
| 13 | Bass Highway – Cooee to Wynyard | Priority works upgrade along the Bass Highway between Cooee and Wynyard to realign and upgrade approximately 3.2 km of road<br>Estimated cost: $50 million | Bass Highway from the intersection of Brickport Road in Cooee, across the Cam River Bridge, to the intersection of the Old Bass Highway at Doctors Rocks near Wynyard | Current status: Construction (commenced late 2021)<br>Expected completion:2025. | Bass Highway works to the west of the site, and west of Burnie. Does not impact delivery of equipment from Port of Burnie.<br>Workers from the western region maybe delayed in travel to work with Bass Highway works. |
| 14 | Sheffield to Staverton Upgrades | A component of the North West Transmission Developments, comprising modifications to two 18.5-km-long sections of existing 220 kV OHTLs between Staverton and Sheffield.<br>Supports new and existing renewable energy developments in North West Tasmania, including Marinus Link. | Between Staverton and Sheffield | Current status: Planning and approvals phase<br>Construction expected to commence: 2025 | Traffic volumes from the Port of Burnie will travel past the Heybridge site along the Bass Highway.<br>Any substantive cumulative impact will occur on the Bass Highway, with a high capacity. |

| # | Proposal / proponent | Description | Location | Timing | Comment on Transport Impact |
|---|---|---|---|---|---|
| 15 | QuayLink – Devonport East Redevelop-ment | Port terminal upgrade project to support TasPorts in increasing capacity of both freight and passenger ferry services across Bass Strait.<br>Estimated cost: $240 million<br>Design and construction workforce: 1060 direct and indirect jobs in North West Tasmania, and a further 655 broader Tasmanian jobs during construction. | Port of Devonport | Current status: Early works/construction (commenced 2022); approvals phase ongoing.<br>Expected completion: 2027 | Some equipment may arrive to the site via the Port of Devonport during upgrade works. |

Table 7.20 above identified a number of major infrastructure projects that are occurring throughout the Cradle Coast region in Tasmania. This includes road upgrades, wind farms and transmission line works. For the most part, these projects will have a minimal impact on the construction of the project, due to their location. Negligible traffic volumes will intersect on lower order roads throughout the region, with more substantive traffic volumes combining along the Bass Highway, which has a high capacity.

It is expected that a number of the projects outlined above will include the delivery of large pieces of equipment (such as wind turbine blades) from the Port of Burnie. The delivery of the transformer will need to be coordinated with the Port to avoid arriving alongside other large equipment.

# 8 Summary of Impacts

## 8.1 Significance Assessment

Table 8.1: Revised Significance Assessment

| Value | Attribute | Impact | Standard Mitigation | Significance Assessment | | | Mitigating Works | Residual Impact | Residual Significance Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Significance Impact | | | Sensitivity | Magnitude | Residual Significance Impact |
| **Road Network Capacity** | Arterial road link capacity | Nil | No arterial roads identified will exceed their capacity | Low | Negligible | Very Low | Nil | Inspections required to ensure road network performing as expected. Further assessment to be undertaken in event of unexpected traffic volumes. | Low | Negligible | Very Low |
| **Road Network Capacity** | Impacted Intersections | Nil | Intersections not operationally impacted with appropriate intersection treatment existing | Moderate | Minor | Low | Nil | Inspections required to ensure intersections of Bass Highway / Minna Road and Minna Road / site access are performing as expected. Further assessment to be undertaken in event of unexpected traffic volumes. | Moderate | Minor | Low |

| Value | Attribute | Impact | Standard Mitigation | Significance Assessment | | | Mitigating Works | Residual Impact | Residual Significance Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Significance Impact | | | Sensitivity | Magnitude | Residual Significance Impact |
| Road Network Capacity | Connectivity | Nil | Bass Highway is a primary Highway utilized by the Tasmanian north coast | Very High | Negligible | Moderate | Nil | No roads are proposed to be closed as a result of the project. If road closures are required due to unforeseen events, consultation with authorities should be undertaken to minimise disruption. | Very High | Negligible | Moderate |
| Safe Road Performance, Condition & Design | Safe condition of bridges and culverts | Nil | Bridges and culverts may not be in an appropriate condition for the movement of the transformer transporter | Moderate | Major | High | Bridges and culverts should be upgraded to align with the recommendations of a suitably qualified civil engineer. | Bridges and culverts will require continuous inspections. | Moderate | Negligible | Low |
| Safe Road Performance, Condition & Design | Adequate road geometry | Nil | Semi-trailer access via the surrounding road network | Low | Minor | Low | Nil | If larger vehicles are required during construction, additional assessment required | Low | Minor | Low |
| Safe Road Performance, Condition & Design | Adequate road geometry | Nil | Semi-trailer access to the site | Very Low | Negligible | Very Low | Nil | If larger vehicles are required during construction, additional assessment required | Very Low | Negligible | Very Low |

| Value | Attribute | Impact | Standard Mitigation | Significance Assessment | | | Mitigating Works | Residual Impact | Residual Significance Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Significance Impact | | | Sensitivity | Magnitude | Residual Significance Impact |
| **Safe Road Performance, Condition & Design** | Adequate road geometry | Nil | The movement of the transformer transporter generally throughout the road network will travel down the centre of the road and travel at a slow speed. | High | Major | Major | Traffic management throughout the movement of the transformer transporter | The dimensions of the transformer transporter should be confirmed prior to the movement.<br><br>Traffic delays to external road network during movement of transformer transporter as well as the potential for temporary restrictions to private property. | High | Negligible | Low |

| Value | Attribute | Impact | Standard Mitigation | Significance Assessment | | | Mitigating Works | Residual Impact | Residual Significance Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Significance Impact | | | Sensitivity | Magnitude | Residual Significance Impact |
| **Safe Road Performance, Condition & Design** | Adequate road geometry | Nil | The transformer transporter may require works to access the site at the following locations:<br>• Port of Burnie<br>• Bass hwy / Edwardes St / Bollard Drv<br>• Bass Hwy / Minna Rd<br>Minna Rd / Site Access Point | High | Major | Major | Provision of widened trafficable surface on locations identified. | Clearing of land, vegetation and furniture. | High | Minor | Moderate |
| **Safe Road Performance, Condition & Design** | Historic Crash Safety Review | • Nil | Increased crash risk on the external road network surrounding the site | Moderate | Negligible | Low | Implement TMPs to ensure safe operational standards for drivers and monitor construction activities. | Inherent residual crash risk | Moderate | Negligible | Low |

| Value | Attribute | Impact | Standard Mitigation | Significance Assessment | | | Mitigating Works | Residual Impact | Residual Significance Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Significance Impact | | | Sensitivity | Magnitude | Residual Significance Impact |
| Safe Road Performance, Condition & Design | Provision of safe sight distance at intersections | Nil | Increased safety risk at the Minna Road site access point with sight distance constraints, noting warning signage is provided: | Low | Negligible | Very Low | Nil | Residual safety risk. | Low | Negligible | Very Low |
| Safe Road Performance, Condition & Design | Height clearance requirements of transformer transporter | Nil | Low hanging power lines may present an obstruction on the path of travel of the transformer transporter | High | Major | Major | Develop a strategy to raise the height of low hanging power lines during the movement of the transformer transporter. | Works will be undertaken to ensure the transformer transporter can traverse the required path of travel. | High | Minor | Moderate |
| Safe Road Performance, Condition & Design | Road pavement condition | Nil | Roads may require resurfacing / remediation works. | Low | Moderate | Low | Roads should be upgraded to align with the requirements of a suitably qualified pavement engineer. | Pavement will require continuous inspections. | Low | Negligible | Very Low |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Increased crash risk due to poor road lighting for HDD at night | High | Major | Major | Provision of temporary construction lighting at required intersections | Lighting to be provided to sufficiently meet the appropriate standards | High | Minor | Moderate |

| Value | Attribute | Impact | Standard Mitigation | Significance Assessment | | | Mitigating Works | Residual Impact | Residual Significance Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Significance Impact | | | Sensitivity | Magnitude | Residual Significance Impact |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Provision of adequate quality intersection treatments, notably at the Minna Road site access point. | Low | Moderate | Low | Provide updated line marking at the Minna Road site access point. Monitor the road network utilised by the site to ensure up to an adequate standard. | Linemarking will require continuous inspections | Low | Minor | Low |
| Safe Road Performance, Condition & Design | Safe operation | Nil | General driver safety | Low | Major | Moderate | Implement TMPs to ensure safe operational standards for drivers and monitor construction activities.<br><br>Survey drivers on regular basis | General driver safety | Low | Major | Moderate |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Safety impact of movement of transformer transporter | High | Major | Major | Traffic management throughout the movement of the transformer transporter | Traffic management in high speed road environments.<br><br>Delays to external road network during movement of transformer transporter | High | Minor | Moderate |

| Value | Attribute | Impact | Standard Mitigation | Significance Assessment | | | Mitigating Works | Residual Impact | Residual Significance Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Significance Impact | | | Sensitivity | Magnitude | Residual Significance Impact |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Safety risk of pedestrians in townships with increased truck movements | Very Low | Major | Low | Vehicle movements contained to highways and not in pedestrianised areas | Truck movements through townships as a result of detours | Very Low | Minor | Very Low |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Safety risk around Schools – identify schools / townships | Very low | Major | Low | Vehicle movements contained to highways and not directly past schools | Avoid travel past schools during pick-up / drop-off if detours occur | Very Low | Minor | Very Low |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Unforeseen safety risk | Very Low | Major | Low | Ensure infrastructure built to standards | Nil | Very Low | Major | Low |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Transportation of Hazardous Goods | High | Major | Major | The transportation of any hazardous goods / materials shall be done so in adherence to any standard requirements by the road authority as it relates to that specific material. | Compliance with road authority guidelines and material specific management measures results in a standardised level of risk commensurate with the activity required to be completed. | High | Minor | Moderate |

| Value | Attribute | Impact | Standard Mitigation | Significance Assessment | | | Mitigating Works | Residual Impact | Residual Significance Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Significance Impact | | | Sensitivity | Magnitude | Residual Significance Impact |
| Safe Road Performance, Condition & Design | Safe operation | Nil | Peak Seasonal Events | Low | Negligible | Very Low | Reduced construction operations during peak seasonal event such as long weekends. | Increase in the number of unfamiliar drivers onto the road network during seasonal holiday periods. | Low | Negligible | Very Low |
| Safe Road Performance, Condition & Design | Safe condition of bridges and culverts | Nil | Bridges and culverts may not be in an appropriate condition for the movement of the transformer transporter | Moderate | Major | High | Bridges and culverts should be upgraded to align with the recommendations of a suitably qualified civil engineer. | Bridges and culverts will require continuous inspections. | Moderate | Negligible | Low |
| Public & Active Transport | Public Transport | Nil | Impact on train services. | Very Low | Negligible | Very Low | Nil | No rail lines are in the study area. | Very Low | Negligible | Very Low |
| Public & Active Transport | Public Transport | Nil | Impact on public bus services. | Low | Negligible | Very Low | Nil | The traffic generated by the project is not expected to impact public bus routes. | Low | Negligible | Very Low |
| Public & Active Transport | Public Transport | Nil | Impact on public bus services by the transformer transporter. | Low | Minor | Low | The transformer transporter will travel at a time when public buses are infrequent | Transformer transporter will travel at a low speed and take up multiple lanes of traffic on roads utilised by public buses | Very Low | Negligible | Very Low |

| Value | Attribute | Impact | Standard Mitigation | Significance Assessment | | | Mitigating Works | Residual Impact | Residual Significance Assessment | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sensitivity | Magnitude | Significance Impact | | | Sensitivity | Magnitude | Residual Significance Impact |
| Public & Active Transport | Public Transport | Nil | Impact on school bus routes. | High | Moderate | High | Heavy construction vehicles will not travel on school bus routes during pick-up / drop-off times | Continuous engagement to ensure any changes to school bus routes is known. | High | Negligible | Low |
| Public & Active Transport | Active Transport | Nil | Impact on dedicated cycling infrastructure. | Very Low | Minor | Very Low | Consultation with council to determine mitigating measures. | No cycle paths in the study area | Very Low | Minor | Very Low |
| Public & Active Transport | Active Transport | Nil | Impact on footpaths. | Low | Minor | Very Low | Consultation with local residents. | No footpaths in the study area | Low | Minor | Very Low |

## 8.2 Environmental performance requirements

EPRs set out the environmental outcomes that must be achieved during design, construction, operation and decommissioning of the project.

To developed EPRs Stantec have considered industry standards and guidelines, good practice as well as the latest approaches to managing impacts. EPRs are informed by relevant legislation and policy requirements as well as project-specific measures recommended to minimise impacts identified environmental values.

The following EPRs have been informed by the example mitigation measures discussed in the impact assessment. These mitigation measures are discussed to provide an example of how the EPRs could be implemented. The EPRs have also been developed with consideration of industry standards and relevant legislation, guidelines and policies.

| EPR ID | Environmental Performance Requirement | Project Phase |
|---|---|---|
| EPR T01 | **Develop a transport management plan**<br><br>Prior to commencement of project works, develop a transport management plan/s to document how disruption to affected local land uses, traffic, car parking, public transport (rail and bus), pedestrian and cycle movements and existing public facilities will be managed during all stages of construction. The transport management plan/s may be split into locations / areas where appropriate or aligned with construction method.<br>The transport management plan/s must:<br><br>1. Be developed in consultation with relevant road authorities<br>2. Include requirements for maintaining transport capacity and appropriate performance for all travel modes in the peak travel demand periods, particularly at the key intersections of Bass Highway / Minna Road and Minna Road / Site Access.<br>3. Describe measures to manage any temporary or permanent full or partial traffic lane closures or impacts to property access.<br>4. Include requirements for limiting the amount of construction heavy vehicles and haulage during the peak traffic periods with specific regard for sensitive land uses such as schools, school bus routes and during any local public events.<br>5. Include requirements for the delivery or removal of oversize and over mass loads.<br>6. Include a construction parking management plan to provide for adequate parking at appropriate work sites, including containing all worker car parking demands within the construction sites and laydown areas where practicable.<br>7. Outline measures to manage impacts and coordinate activities where necessary with other relevant major projects occurring at the same time.<br>8. Confirm and document the proposed route of the transformer transporter, including accommodation of the height and geometric requirements, and associated impacts, necessary during the transport. This must be informed by consultation with the relevant road authorities.<br>9. Document construction vehicle routes including the transformer travel route and the transport of hazardous goods / materials, and prioritise the use of higher order roads, approaching the study area via the Bass Highway where possible.<br>10. Identify construction vehicle staging areas and/or construction methodologies to minimise potential impacts of truck movements on residents and businesses.<br>11. Describe methods investigated and adopted to reduce impact of project generated traffic i.e. shuttle bus for workers, stagger start / finish times.<br>12. Requirements for the provision of adequate temporary road lighting over night at required intersections to access the construction site during HDD operations.<br>13. Policies to ensure staff comply with relevant industry standards and guidelines with regards to safe practice, including managing driver fatigue. These policies should outline induction requirements for all workers, identifying site specific safe practice, such as identified locations on the road network with a known safety risk.<br>14. Outline measures to manage the project interface with rail trails and provide for the continuous operation / access of the rail trails<br>15. Document how any road closures will be managed to ensure access is maintained, especially on roads that operate as a single point of access for private properties. These measures must be informed by engagement with affected properties, relevant road authorities and emergency services. The design and construction staging approach should aim to not close any public roads during construction, so far as reasonably practicable.<br>16. Outline induction requirements for all workers, identifying site specific safe practice, such as identified locations on the road network with a known safety risk. | Construction |

| | | |
|---|---|---|
| | 17. Outline the inspections to be undertaken to assess the effectiveness of the transport management plans on all modes of transport. Where inspections identify adverse impacts, implement practicable and appropriate mitigation measures.<br>18. Outline the requirements for worksite construction traffic management that are activity and location specific to manage day-to-day activities and the requirements of the transport management plan. This includes the movement of the transformer transporter.<br>19. Include a consultation plan for the engagement with local authorities, impacted landowners and broader community. This consultation will include, but not be limited to:<br>o Informing affected parties of the level of traffic generated by the project construction and any road closures.<br>o Engaging with local road authorities such as City of Burnie and DSG to coordinate construction vehicle movements to avoid school bus routes during their time of operation.<br>o Engaging with road authorities and emergency services about any partial or full road closures.<br>The transport management plan/s must be updated when there are significant changes in construction method, including changes in construction traffic volumes or roads closures that requires further analysis to confirm adequacy and appropriateness of management measures. The transport management plan/s must be implemented throughout construction. | |
| EPR T02 | Design transport infrastructure to maintain safety in operation<br>Design all roadworks, construction staging and site access arrangements as stipulated in the transport management plan (EPR T01) to meet relevant design standards and provide for safe movement of construction and operational vehicles. The project design must:<br>1. Be developed in consultation with the relevant road management authorities.<br>2. Meet all relevant road and transport authority requirements with respect to transport network user safety.<br>3. Be informed by appropriate transport analysis with the objective to maximise performance for all modes where necessary.<br>4. Address the reinstatement of vehicle and pedestrian access that is to be altered during construction, in accordance with relevant road design standards.<br>5. Consider any services relocations and the requirements of services authority approvals.<br>6. Be audited by an independent road safety auditor during the preparation of the design, at design stages to be agreed upon with the relevant road authority. In addition, the project is to agree upon authority requirements as it relates to road safety audits during construction and post construction.<br>7. Be informed by inspection and assessment of existing road and pavement conditions by suitably qualified engineers.<br>8. Provide for appropriate upgrades of pavement, bridges, intersections and other road infrastructure, in line with the recommendations of the road safety audit and condition inspections.<br>9. Meet the requirements for the provision of intersection treatments at locations used for construction. | Design & Construction |

## 8.3 Measures to Comply with EPR's

The implementation of the EPR's outlined above will be achieved through a number of measures. These measures were identified throughout the assessment undertaken in this report, and their implementation will ensure compliance is achieved with the identified EPR's.

Ultimately, the primary outcome of the EPR's, and the tool for the implementation of the identified measures is the preparation of a Transport Management Plan (TMP). The TMP will be prepared by the construction contractor and reviewed and approved by the responsible road and transport authorities. Many of the requirements of the EPR's that the TMP will implement are management measures, such as monitoring road performance, inspecting pavement conditions, outlining requirements for driver safety and identifying travel routes for drivers.

Ultimately, the level of traffic that is expected to be generated by the construction of the site is modest from a traffic engineering perspective. The analysis undertaken in this report contains a number of conservative assumptions (such as all staff arriving within a one hour time frame and assessing the peak traffic generating event), and the traffic ultimately generated on a day to day basis will be lower, as well as being temporary in nature as the primary traffic impacts occur during construction. The site is well located next to the Bass Highway to accommodate the traffic volumes.

In terms of physical infrastructure recommendations in this report, these measures are solely expected to facilitate the movement of the transformer transporter from the port at Burnie to the site. Temporary works are expected to be required to accommodate the movement of this vehicle. The assessment undertaken in this report is indicative in nature, given the exact details of the transformer transporter are to be confirmed at a later date, upon engagement of the building contractor. It is expected that the following measures will be implemented:

- The implementation of temporary traffic management to escort the oversize vehicle. Traffic management plans will be prepared by the construction contractor in consultation with and to the satisfaction of the road and transport authorities
- Temporary road works (including reinstatement following transportation), such as the removal of street signs / road furniture, works to central medians and kerbing as well as raising the height of power lines will need to be undertaken to accommodate the transformer transporter
- Necessary road works at the Minna Road access point on the shoulders of the road, including line marking adjustments and earthworks if required
- Travel times for the transformer transporter will be identified to avoid impact to busy / peak hour times, as well as avoiding impacts to public transport services

# 9 Conclusion

The traffic and transport impacts associated with the construction, operation and decommission of the Heybridge converter station for the project have been assessed in accordance with the Environmental Impact Statement Guidelines, Marinus Link. The study includes a review of the existing conditions, an assessment of the project conditions which informed the transport specific 'values', leading to identification of the project impacts primarily as it relates to the construction stage of the project. These values are summarised as:

- Road network capacity.
- Safe road performance, condition and design.
- Public and active transport.

Having regard for the identified values, EPRs that incorporate some site specific mitigation measures are recommended as it relates to the project impacts. The proposed measures are considered necessary to allow the project to be delivered to ensure:

- disruption to other road users is minimised.
- roads operate within their capacity.
- the road pavement can adequately accommodate the proposed vehicle types and volumes.
- intersection upgrades are delivered at key locations.
- the road network can physically accommodate the proposed vehicle fleet, including large construction vehicles and the transformer transporter.
- the road network maintains safe operation .
- townships and communities within the region are not unreasonably impacted by the project.
- construction activities are safely managed and delivered throughout the construction period.

Based on this assessment, and following the implementation of the proposed EPRs , there are no high or major residual impacts. Through the implementation of traffic management plans, consultation with stakeholders and local community representatives / residents and some infrastructure upgrades the projects transport impact are considered to not be detrimental to the environment. The EPRs and mitigation measures are standard in context with transport impacts and considered suitable to reduce the overall project impact.

# 10 References


- Transport Act 1981, Tasmanian State Government, 1981
- Dangerous Goods (Road and Rail Transport) Act, Tasmanian State Government, 2010
- Cradle Coast Integrated Transport Strategy, Cradle Coast Authority, 2006
- Tasmanian Walking & Cycling for Active Transport Strategy, Department of Infrastructure, Energy and Resources, 2010
- North West Coastal Pathway Plan, Cradle Coast Authority, 2010
- Bass Highway Cooee to Wynyard Planning Study, Department of State Growth, 2019
- Transport Access Strategy, Department of State Growth
- Council plan 2022-2025, Burnie City Council, 2021
- Road Network Strategy, Burnie City Council, 2016
- Central Coast Strategic Plan 2014-2024, Central Coast Council, 2014
- Central Coast Council Cycling Strategy, Central Coast Council, 2021
- Austroads Guide to Road Design: Part 3: Geometric Design (AGRD-03), Austroads, 2021
- Austroads Guide to Pavement Technology Part 5: Pavement Evaluation and Treatment Design (AGPT-05), 2019
- Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management, 2020
- Austroads Guide to Road Design Part 4a: Unsignalised and Signalised Intersections (AGRD-04a), Austroads, 2021
- AS 2890.2:2018 (Australian Standards Off-Street commercial vehicle facilities)
- https://geocounts.com/traffic/au/tas/
- https://www.transport.tas.gov.au/vehicles_and_vehicle_inspections/heavy_vehicles/Heavy_vehicle_access

# Appendices

We design with community in mind

# **Appendix A** Travel Routes


Burnie
George Town
Devonport
Ulverstone
Beaconsfield
Latrobe
BASS HIGHWAY
Sheffield
Launceston
BASS HIGHWAY
Deloraine
BASS HIGHWAY
Cable route (RevJ)
Heavy vehicle routes
Burnie
Devonport
Launceston
0
30
60 km


Smithton
Wynyard
Burnie
Ulverstone
Devonport
Latrobe
Sheffield
Beaconsfield
George Town
Scottsdale
Launceston
Deloraine
BASS HIGHWAY
MIDLAND HIGHWAY
Cable route (RevJ)
Township
Light vehicle routes
East
West
0
60
120 km


Burnie
BASS HIGHWAY
MOUNT STREET
PORT ROAD
MOUNT STREET
MARINE TERRACE
BASS HIGHWAY
BASS HIGHWAY
RIVER ROAD
MASSY-GREENE DRIVE
OLD SURREY ROAD
STOWPORT ROAD
MINNA ROAD
Cable route (RevJ)
Transformer transporter route
0
2
4 km

# **Appendix B** 19m Semi-Trailer Swept Path Assessment


4.20
14.60
1.40
9.50
0.20
1.60
5.40
AV
meters
Tractor Width : 2.50
Trailer Width : 2.50
Tractor Track : 2.50
Trailer Track : 2.50
Lock to Lock Time : 6.0
Steering Angle : 28.3
Articulating Angle : 72.0
SWEPT PATH KEY
VEHICLE CENTRE LINE
VEHICLE TYRE PATH
VEHICLE BODY PATH
500mm CLEARANCE FROM VEHICLE BODY
ASSUMED SPEED 5km/h
BASS
HIGHWAY
MINNA
ROAD

4.20
14.60
1.40
9.50
0.20
1.60
5.40
AV
meters
Tractor Width : 2.50
Trailer Width : 2.50
Tractor Track : 2.50
Trailer Track : 2.50
Lock to Lock Time : 6.0
Steering Angle : 28.3
Articulating Angle : 72.0
SWEPT PATH KEY
VEHICLE CENTRE LINE
VEHICLE TYRE PATH
VEHICLE BODY PATH
500mm CLEARANCE FROM VEHICLE BODY
ASSUMED SPEED 5km/h
BASS
HIGHWAY
MINNA
ROAD

# **Appendix C** Transformer Transport Swept Path Assessment


SWEPT PATH KEY
VEHICLE CENTRE LINE
VEHICLE TYRE PATH
VEHICLE BODY PATH
500mm CLEARANCE FROM VEHICLE BODY
ASSUMED SPEED 5km/h
Transporter
Custom
270
BOLLARD
DRIVE


SWEPT PATH KEY
VEHICLE CENTRE LINE
VEHICLE TYRE PATH
VEHICLE BODY PATH
500mm CLEARANCE FROM VEHICLE BODY
ASSUMED SPEED 5km/h
BOLLARD
DRIVE
BOLLARD
DRIVE
EDWARDES
STREET
MARINE
TERRACE
nearmap

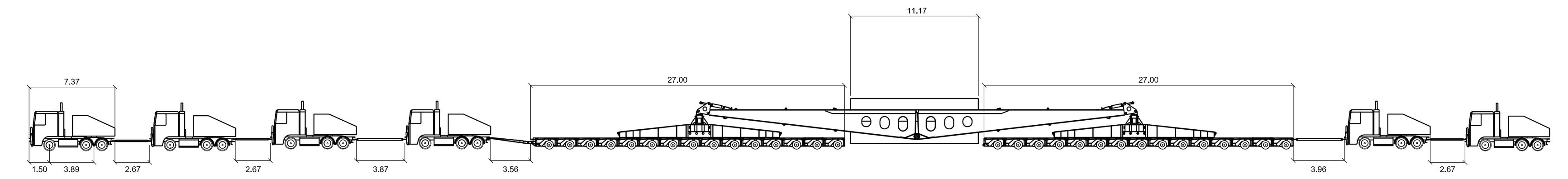

SWEPT PATH KEY
VEHICLE CENTRE LINE
VEHICLE TYRE PATH
VEHICLE BODY PATH
500mm CLEARANCE FROM VEHICLE BODY
ASSUMED SPEED 5km/h
BOLLARD
DRIVE


SWEPT PATH KEY
VEHICLE CENTRE LINE
VEHICLE TYRE PATH
VEHICLE BODY PATH
500mm CLEARANCE FROM VEHICLE BODY
ASSUMED SPEED 5km/h
BOLLARD
DRIVE
BOLLARD
DRIVE
STREET
EDWARDES
MARINE
TERRACE
nearmap


SWEPT PATH KEY
VEHICLE CENTRE LINE
VEHICLE TYRE PATH
VEHICLE BODY PATH
500mm CLEARANCE FROM VEHICLE BODY
ASSUMED SPEED 5km/h
BASS
HIGHWAY
MINNA
ROAD
270t Transporter
Custom

SWEPT PATH KEY
VEHICLE CENTRE LINE
VEHICLE TYRE PATH
VEHICLE BODY PATH
500mm CLEARANCE FROM VEHICLE BODY
ASSUMED SPEED 5km/h
BASS
HIGHWAY
MINNA
ROAD
Transporter

# **Appendix D** Transformer Transport Vehicle Profile



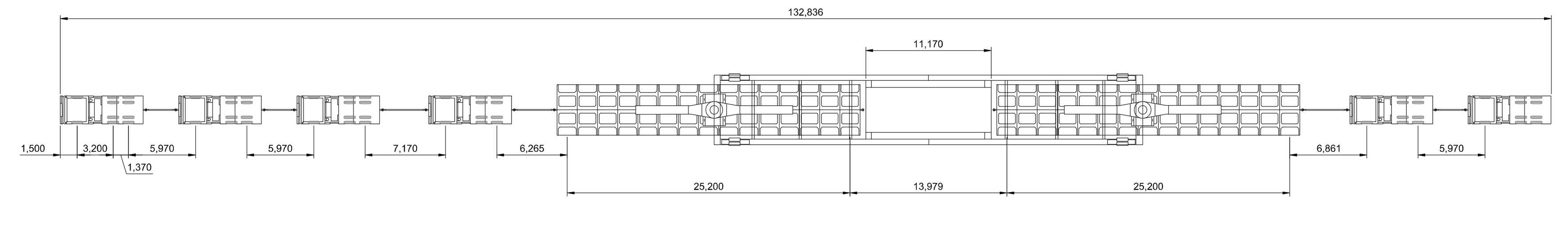

## 270T Transporter

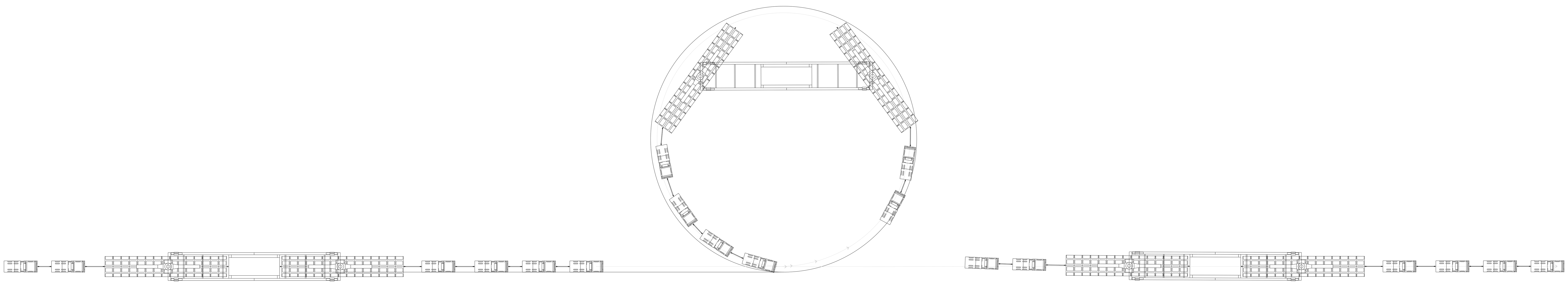
meters

Tractor Widths : 2.50

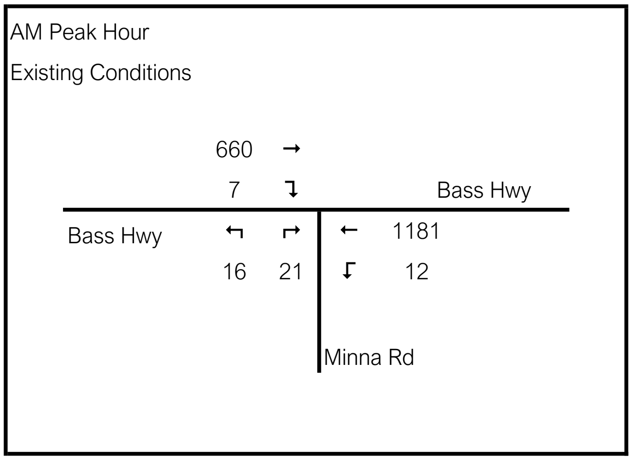
Platform Widths : 4.50

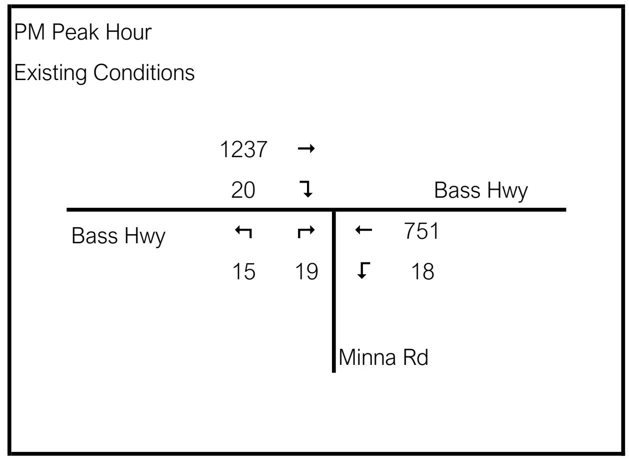
Cradle width: 6.20

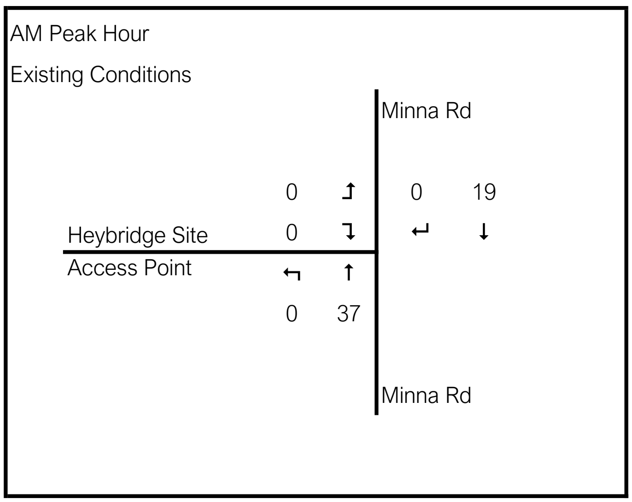


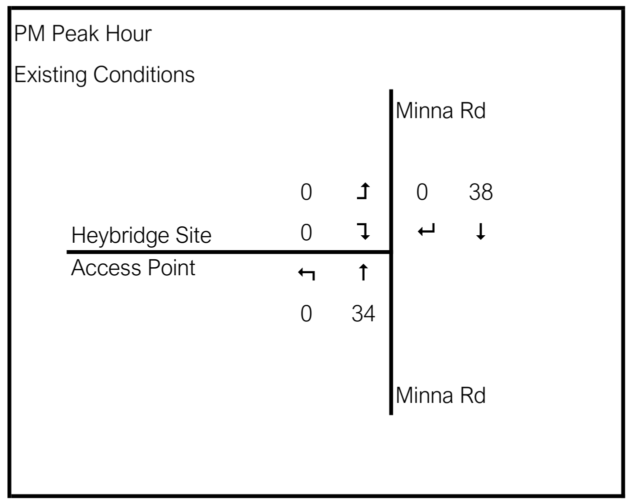



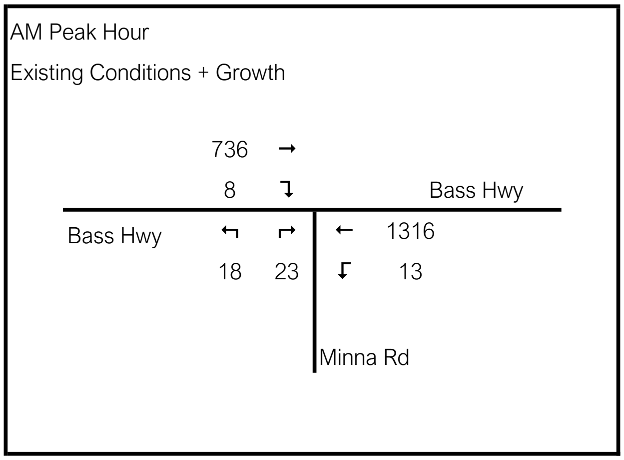
# **Appendix E** SIDRA Input Traffic Volumes

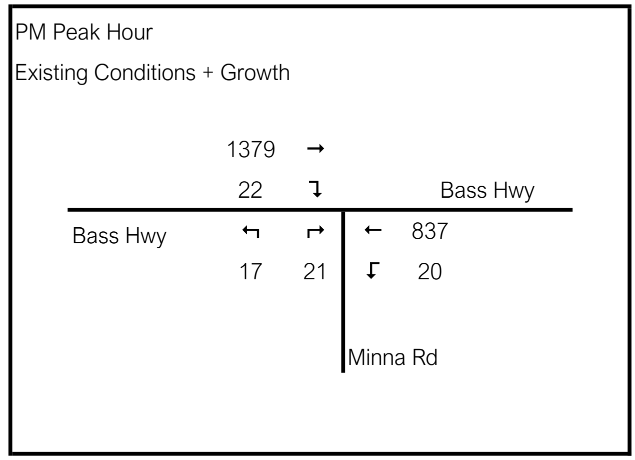

AM Peak Hour
Existing Conditions
660
7
Bass Hwy
Bass Hwy
1181
16
21
12
Minna Rd

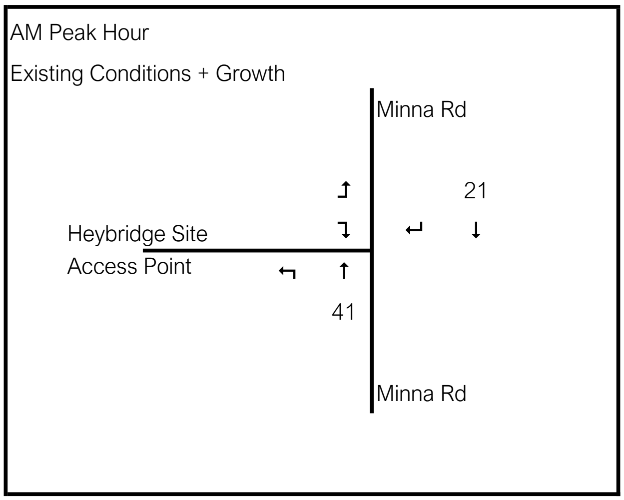

PM Peak Hour
Existing Conditions
1237
20
Bass Hwy
Bass Hwy
751
15
19
18
Minna Rd

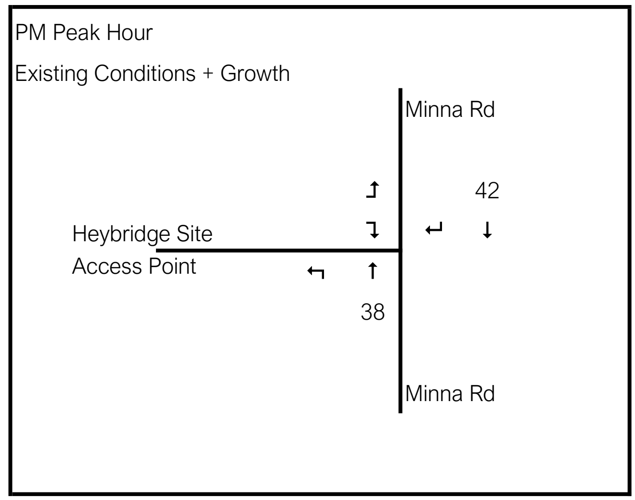

AM Peak Hour
Existing Conditions
Minna Rd
0
0
19
Heybridge Site
0
Access Point
0
37
Minna Rd

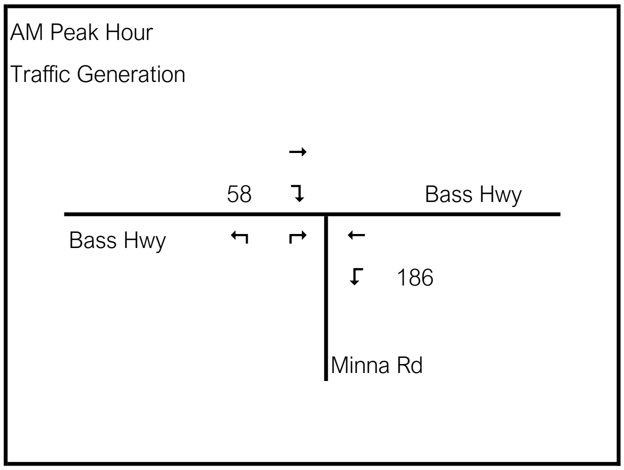

PM Peak Hour
Existing Conditions
Minna Rd
0
0
38
Heybridge Site
0
Access Point
0
34
Minna Rd

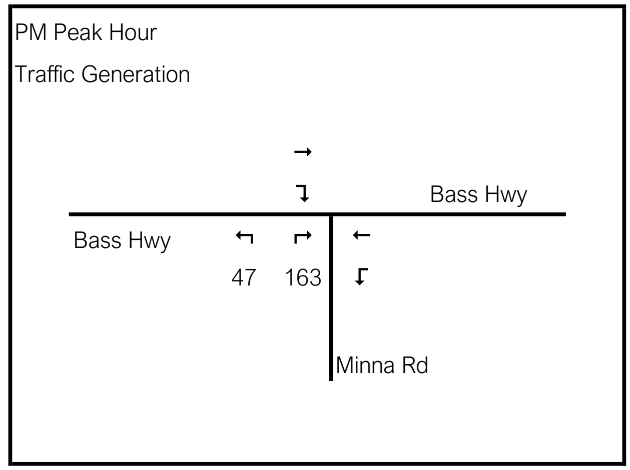

AM Peak Hour
Existing Conditions + Growth
736
8
Bass Hwy
Bass Hwy
1316
18
23
13
Minna Rd

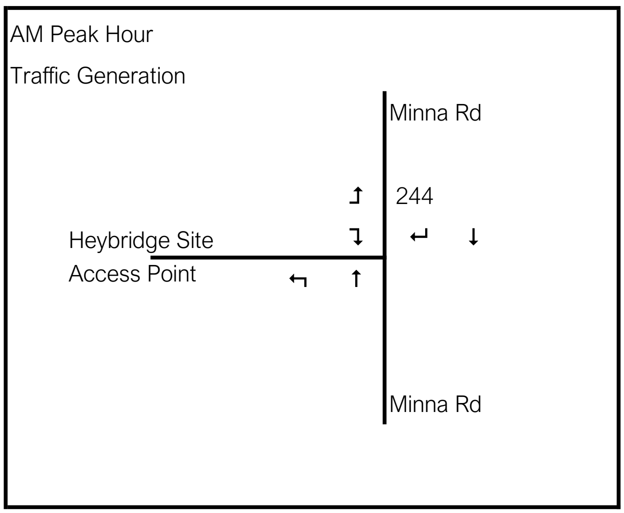

PM Peak Hour
Existing Conditions + Growth
1379
22
Bass Hwy
Bass Hwy
837
17
21
20
Minna Rd

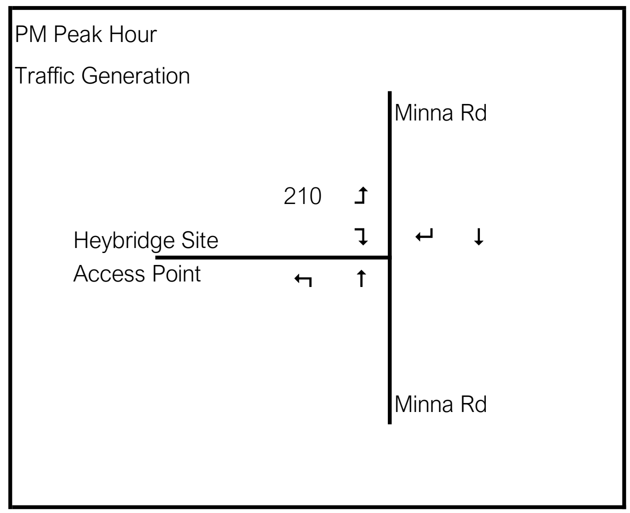

AM Peak Hour
Existing Conditions + Growth
Minna Rd
21
Heybridge Site
Access Point
41
Minna Rd

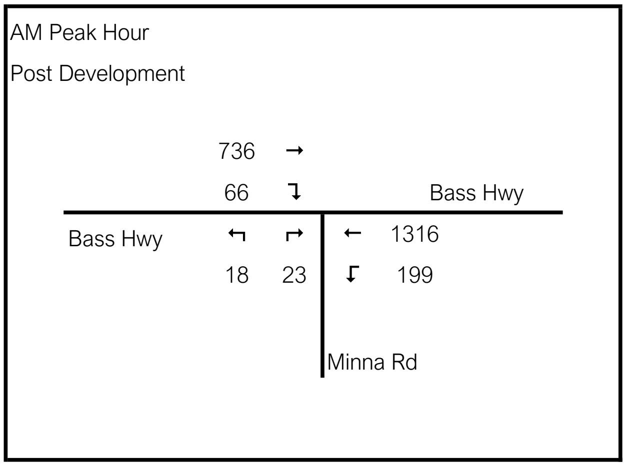

PM Peak Hour
Existing Conditions + Growth
Minna Rd
42
Heybridge Site
Access Point
38
Minna Rd

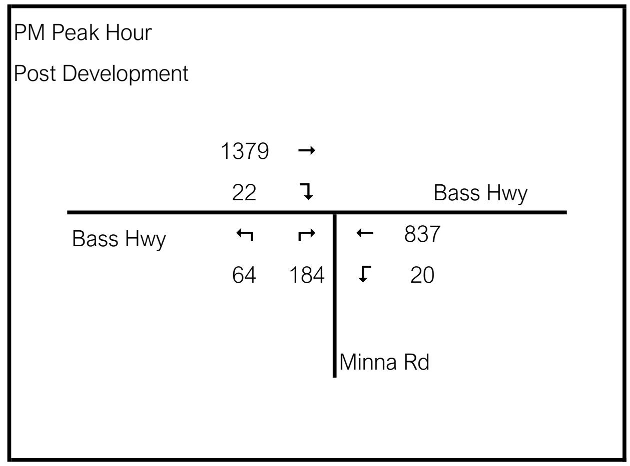

AM Peak Hour
Traffic Generation
58
Bass Hwy
Bass Hwy
186
Minna Rd

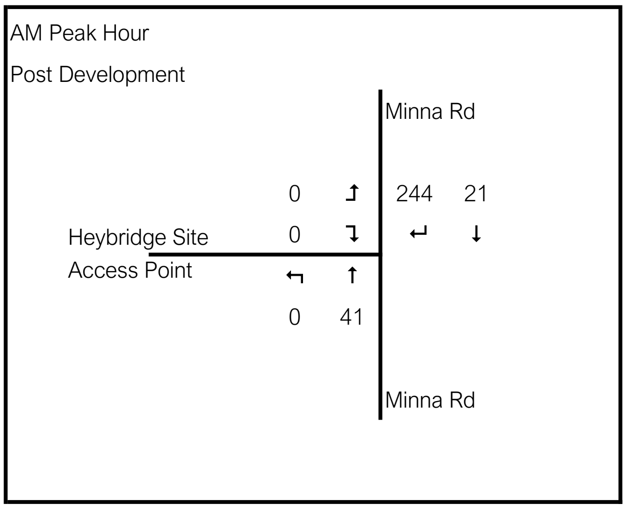

PM Peak Hour
Traffic Generation
Bass Hwy
Bass Hwy
47
163
Minna Rd

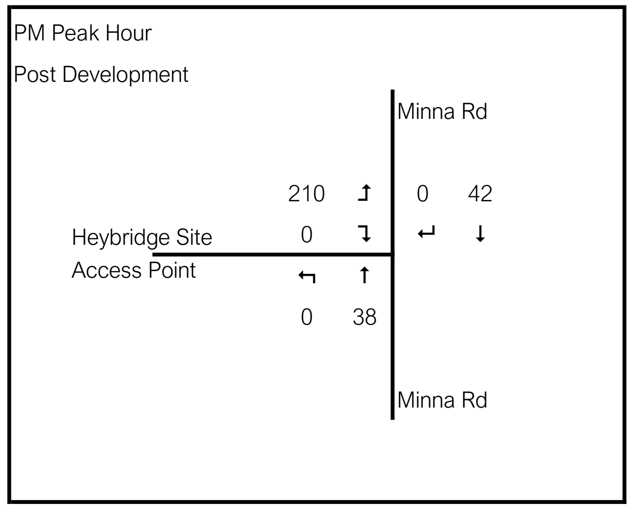

AM Peak Hour
Traffic Generation
Minna Rd
244
Heybridge Site
Access Point
Minna Rd


PM Peak Hour
Traffic Generation
Minna Rd
210
Heybridge Site
Access Point
Minna Rd


AM Peak Hour
Post Development
736
66
Bass Hwy
Bass Hwy
1316
18
23
199
Minna Rd


PM Peak Hour
Post Development
1379
22
Bass Hwy
Bass Hwy
837
64
184
20
Minna Rd


AM Peak Hour
Post Development
Minna Rd
0
244
21
Heybridge Site
Access Point
0
0
41
Minna Rd


PM Peak Hour
Post Development
Minna Rd
210
0
42
Heybridge Site
Access Point
0
0
38
Minna Rd

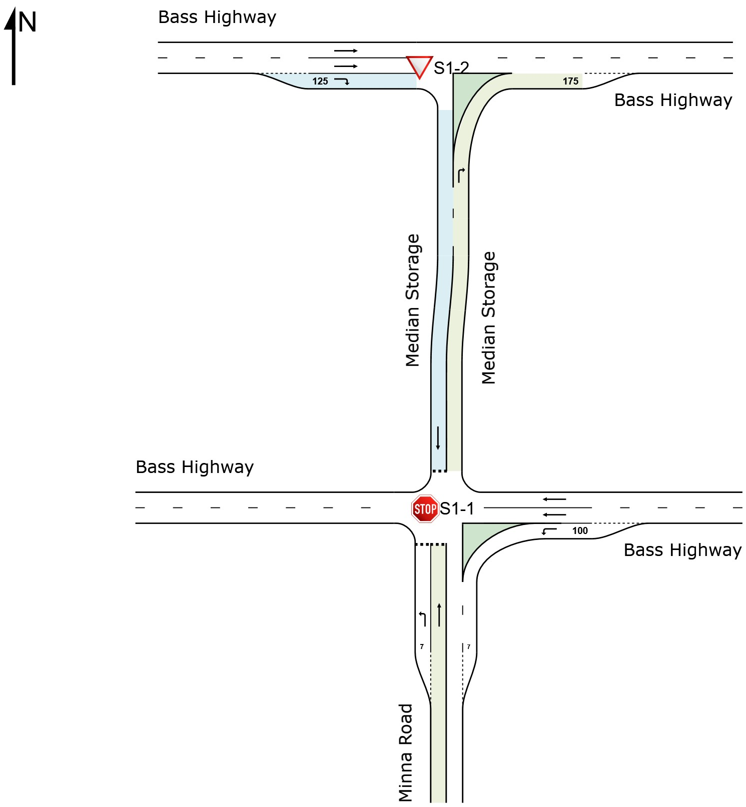
# **Appendix F** SIDRA Results

# NETWORK LAYOUT

## Network: SCTI-C [Bass Highway - GF AM (Network Folder: General)]

Staged Crossing at T Intersection Type C
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



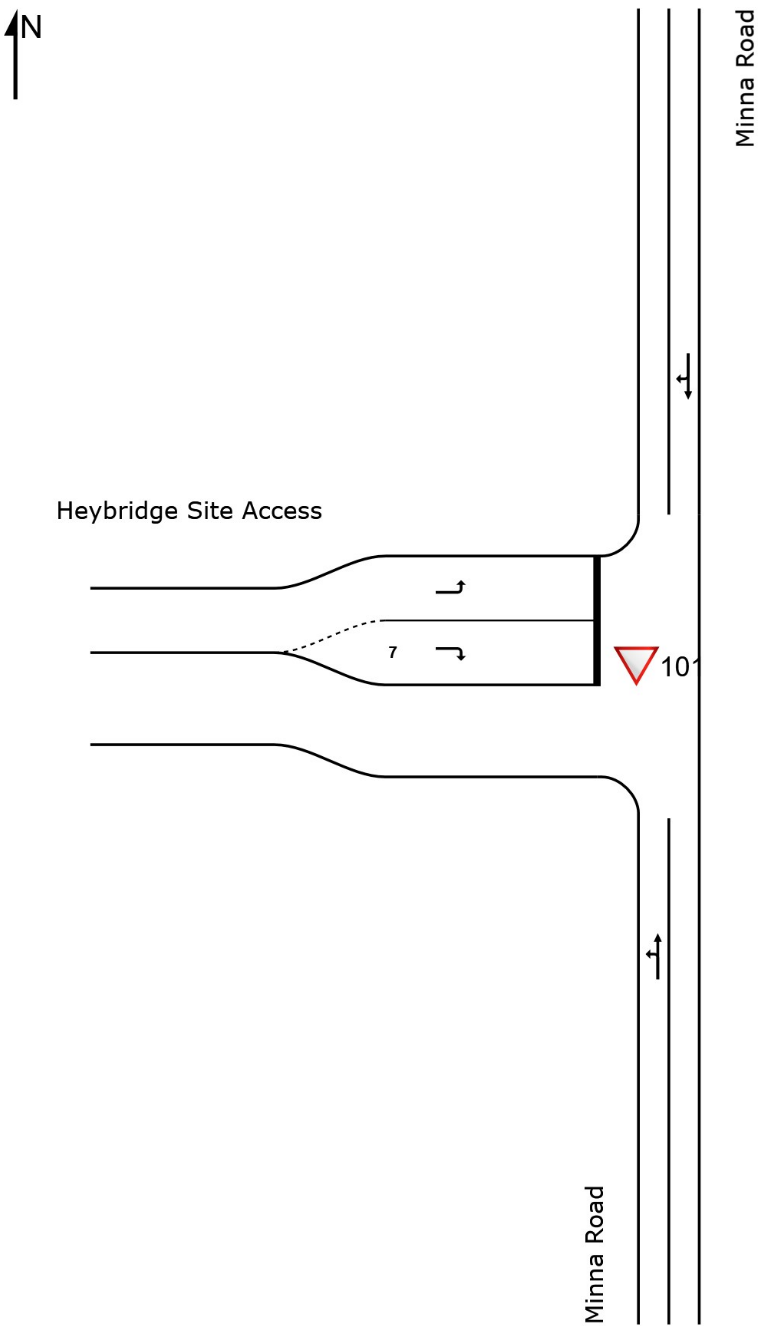

| SITES IN NETWORK | | |
|---|---|---|
| **Site ID** | **CCG ID** | **Site Name** |
| S1-2 | NA | Bass Highway - N GF AM |
| S1-1 | NA | Bass Highway - S GF AM |

# SITE LAYOUT

## Site: 101 [Minna Road - GF AM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



# LANE SUMMARY

## Site: S1-2 [Bass Highway - N GF AM (Site Folder: General)]

Staged Crossing at T Intersection Type C
Site Category: (None)
Give-Way (Two-Way)

| Lane Use and Performance | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DEMAND FLOWS [ Total veh/h | HV ] % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh | Dist ] m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
| South: Median Storage | | | | | | | | | | | | | |
| Lane 1 | 24 | 20.0 | 1625 | 0.015 | 100 | 1.7 | LOS A | 0.0 | 0.0 | Full | 175 | 0.0 | 0.0 |
| Approach | 24 | 20.0 | | 0.015 | | 1.7 | NA | 0.0 | 0.0 | | | | |
| West: Bass Highway | | | | | | | | | | | | | |
| Lane 1 | 387 | 10.0 | 1831 | 0.212 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 387 | 10.0 | 1831 | 0.212 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 3 | 8 | 20.0 | 1625 | 0.005 | 100 | 7.7 | LOS A | 0.0 | 0.0 | Short | 125 | 0.0 | NA |
| Approach | 783 | 10.1 | | 0.212 | | 0.1 | NA | 0.0 | 0.0 | | | | |
| Intersection | 807 | 10.4 | | 0.212 | | 0.2 | NA | 0.0 | 0.0 | | | | |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

| Approach Lane Flows (veh/h) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| South: Median Storage | | | | | | | | |
| Mov. From S To Exit: | R2 E | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
| Lane 1 | 24 | 24 | 20.0 | 1625 | 0.015 | 100 | NA | NA |
| Approach | 24 | 24 | 20.0 | | 0.015 | | | |

| West: Bass Highway | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Mov. From W To Exit: | T1 E | R2 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
| Lane 1 | 387 | - | 387 | 10.0 | 1831 | 0.212 | 100 | NA | NA |
| Lane 2 | 387 | - | 387 | 10.0 | 1831 | 0.212 | 100 | NA | NA |
| Lane 3 | - | 8 | 8 | 20.0 | 1625 | 0.005 | 100 | 0.0 | 2 |
| Approach | 775 | 8 | 783 | 10.1 | | 0.212 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 807 | 10.4 | 0.212 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

## Merge Analysis

| | Exit Lane Number | Short Lane Length m | Percent Opng in Lane % | Opposing Flow Rate veh/h | Opposing Flow Rate pcu/h | Critical Gap sec | Follow-up Headway sec | Lane Flow Rate veh/h | Capacity veh/h | Deg. Satn v/c | Min. Delay sec | Merge Delay sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South Exit: Median Storage<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| East Exit: Bass Highway<br>Merge Type: **Priority** | | | | | | | | | | | | |
| Exit Short Lane | 3 | 175 | 0.0 | 387 | 407 | 3.00 | 2.00 | 24 | 1384 | 0.017 | 0.6 | 0.7 |
| Merge Lane | 2 | - | 100.0 | Merge Lane is not Opposed | | | | 387 | 1800 | 0.215 | 0.0 | 0.0 |


Organisation: STANTEC NEW ZEALAND | Licence: NETWORK / Enterprise | Processed: Tuesday, December 13, 2022 4:23:08 PM
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# LANE SUMMARY

## Site: S1-1 [Bass Highway - S GF AM (Site Folder: General)]

Staged Crossing at T Intersection Type C
Site Category: (None)
Stop (Two-Way)

**Lane Use and Performance**

| | DEMAND FLOWS [ Total | HV ] | Cap. | Deg. Satn | Lane Util. | Aver. Delay | Level of Service | 95% BACK OF QUEUE [ Veh | Dist ] | Lane Config | Lane Length | Cap. Adj. | Prob. Block. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | veh/h | % | veh/h | v/c | % | sec | | | m | | m | % | % |
| South: Minna Road | | | | | | | | | | | | | |
| Lane 1 | 19 | 20.0 | 621 | 0.030 | 100 | 12.7 | LOS B | 0.1 | 0.9 | Short | 7 | 0.0 | NA |
| Lane 2 | 24 | 20.0 | 82 | 0.297 | 100 | 61.1 | LOS F | 1.0 | 7.8 | Full | 500 | 0.0 | 0.0 |
| Approach | 43 | 20.0 | | 0.297 | | 39.8 | LOS E | 1.0 | 7.8 | | | | |
| East: Bass Highway | | | | | | | | | | | | | |
| Lane 1 | 14 | 20.0 | 1625 | 0.008 | 100 | 8.6 | LOS A | 0.0 | 0.0 | Short | 100 | 0.0 | NA |
| Lane 2 | 693 | 10.0 | 1831 | 0.378 | 100 | 0.1 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 3 | 693 | 10.0 | 1831 | 0.378 | 100 | 0.1 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 1399 | 10.1 | | 0.378 | | 0.2 | NA | 0.0 | 0.0 | | | | |
| North: Median Storage | | | | | | | | | | | | | |
| Lane 1 | 8 | 20.0 | 220 | 0.038 | 100 | 16.4 | LOS C | 0.1 | 0.9 | Full | 7 | 0.0 | 0.0 |
| Approach | 8 | 20.0 | | 0.038 | | 16.4 | LOS C | 0.1 | 0.9 | | | | |
| Intersection | 1451 | 10.4 | | 0.378 | | 1.4 | NA | 1.0 | 7.8 | | | | |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**Approach Lane Flows (veh/h)**

South: Minna Road

| Mov. From S To Exit: | L2 W | T1 N | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 19 | - | 19 | 20.0 | 621 | 0.030 | 100 | 0.0 | 2 |
| Lane 2 | - | 24 | 24 | 20.0 | 82 | 0.297 | 100 | NA | NA |
| Approach | 19 | 24 | 43 | 20.0 | | 0.297 | | | |

East: Bass Highway

| Mov. From E To Exit: | L2 S | T1 W | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 14 | - | 14 | 20.0 | 1625 | 0.008 | 100 | 0.0 | 2 |
| Lane 2 | - | 693 | 693 | 10.0 | 1831 | 0.378 | 100 | NA | NA |
| Lane 3 | - | 693 | 693 | 10.0 | 1831 | 0.378 | 100 | NA | NA |
| Approach | 14 | 1385 | 1399 | 10.1 | | 0.378 | | | |

| North: Median Storage | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Mov. From N To Exit: | T1 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
| Lane 1 | 8 | 8 | 20.0 | 220 | 0.038 | 100 | NA | NA |
| Approach | 8 | 8 | 20.0 | | 0.038 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 1451 | 10.4 | 0.378 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

## Merge Analysis

| | Exit Lane Number | Short Lane Length m | Percent Opng in Lane % | Opposing Flow Rate veh/h | pcu/h | Critical Gap sec | Follow-up Headway sec | Lane Flow Rate veh/h | Capacity veh/h | Deg. Satn v/c | Min. Delay sec | Merge Delay sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South Exit: Minna Road<br>Merge Type: **Priority** | | | | | | | | | | | | |
| Exit Short Lane | 1 | 7 | 0.0 | 8 | 9 | 3.00 | 2.00 | 14 | 1791 | 0.008 | 0.0 | 0.0 |
| Merge Lane | 2 | - | 100.0 | Merge Lane is not Opposed | | | | 8 | 1800 | 0.005 | 0.0 | 0.0 |
| North Exit: Median Storage<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| West Exit: Bass Highway<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| Full Length Lane | 2 | Merge Analysis not applied. | | | | | | | | | | |

# LANE SUMMARY

## Site: S1-2 [Bass Highway - N GF PM (Site Folder: General)]

Staged Crossing at T Intersection Type C
Site Category: (None)
Give-Way (Two-Way)

**Lane Use and Performance**

| | DEMAND FLOWS [ Total veh/h | HV ] % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh | Dist ] m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Median Storage | | | | | | | | | | | | | |
| Lane 1 | 22 | 20.0 | 1625 | 0.014 | 100 | 2.8 | LOS A | 0.0 | 0.0 | Full | 175 | 0.0 | 0.0 |
| Approach | 22 | 20.0 | | 0.014 | | 2.8 | NA | 0.0 | 0.0 | | | | |
| West: Bass Highway | | | | | | | | | | | | | |
| Lane 1 | 726 | 10.0 | 1831 | 0.396 | 100 | 0.1 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 726 | 10.0 | 1831 | 0.396 | 100 | 0.1 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 3 | 23 | 20.0 | 1625 | 0.014 | 100 | 7.7 | LOS A | 0.0 | 0.0 | Short | 125 | 0.0 | NA |
| Approach | 1475 | 10.2 | | 0.396 | | 0.2 | NA | 0.0 | 0.0 | | | | |
| Intersection | 1497 | 10.3 | | 0.396 | | 0.2 | NA | 0.0 | 0.0 | | | | |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**Approach Lane Flows (veh/h)**

South: Median Storage

| Mov. From S To Exit: | R2 E | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|
| Lane 1 | 22 | 22 | 20.0 | 1625 | 0.014 | 100 | NA | NA |
| Approach | 22 | 22 | 20.0 | | 0.014 | | | |

West: Bass Highway

| Mov. From W To Exit: | T1 E | R2 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 726 | - | 726 | 10.0 | 1831 | 0.396 | 100 | NA | NA |
| Lane 2 | 726 | - | 726 | 10.0 | 1831 | 0.396 | 100 | NA | NA |
| Lane 3 | - | 23 | 23 | 20.0 | 1625 | 0.014 | 100 | 0.0 | 2 |
| Approach | 1452 | 23 | 1475 | 10.2 | | 0.396 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 1497 | 10.3 | 0.396 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

## Merge Analysis

| | Exit Lane Number | Short Lane Length m | Percent Opng in Lane % | Opposing Flow Rate veh/h | Opposing Flow Rate pcu/h | Critical Gap sec | Follow-up Headway sec | Lane Flow Rate veh/h | Capacity veh/h | Deg. Satn v/c | Min. Delay sec | Merge Delay sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South Exit: Median Storage<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| East Exit: Bass Highway<br>Merge Type: **Priority** | | | | | | | | | | | | |
| Exit Short Lane | 3 | 175 | 0.0 | 726 | 762 | 3.00 | 2.00 | 22 | 1009 | 0.022 | 1.6 | 1.8 |
| Merge Lane | 2 | - | 100.0 | Merge Lane is not Opposed | | | | 726 | 1800 | 0.403 | 0.0 | 0.0 |

# LANE SUMMARY

## Site: S1-1 [Bass Highway - S GF PM (Site Folder: General)]

Staged Crossing at T Intersection Type C
Site Category: (None)
Stop (Two-Way)

**Lane Use and Performance**

| | DEMAND FLOWS [ Total veh/h | HV ] % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh | Dist ] m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: A1 | | | | | | | | | | | | | |
| Lane 1 | 18 | 20.0 | 910 | 0.020 | 100 | 10.4 | LOS B | 0.1 | 0.6 | Short | 7 | 0.0 | NA |
| Lane 2 | 22 | 20.0 | 262 | 0.084 | 100 | 20.8 | LOS C | 0.3 | 2.4 | Full | 500 | 0.0 | 0.0 |
| Approach | 40 | 20.0 | | 0.084 | | 16.2 | LOS C | 0.3 | 2.4 | | | | |
| East: B1-1 | | | | | | | | | | | | | |
| Lane 1 | 21 | 20.0 | 1625 | 0.013 | 100 | 8.6 | LOS A | 0.0 | 0.0 | Short | 100 | 0.0 | NA |
| Lane 2 | 441 | 10.0 | 1831 | 0.241 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 3 | 441 | 10.0 | 1831 | 0.241 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 902 | 10.2 | | 0.241 | | 0.2 | NA | 0.0 | 0.0 | | | | |
| North: Median Storage | | | | | | | | | | | | | |
| Lane 1 | 23 | 20.0 | 492 | 0.047 | 100 | 7.3 | LOS A | 0.2 | 1.3 | Full | 7 | 0.0 | 0.0 |
| Approach | 23 | 20.0 | | 0.047 | | 7.3 | LOS A | 0.2 | 1.3 | | | | |
| Intersection | 965 | 10.9 | | 0.241 | | 1.1 | NA | 0.3 | 2.4 | | | | |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**Approach Lane Flows (veh/h)**

South: A1

| Mov. From S To Exit: | L2 W | T1 N | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 18 | - | 18 | 20.0 | 910 | 0.020 | 100 | 0.0 | 2 |
| Lane 2 | - | 22 | 22 | 20.0 | 262 | 0.084 | 100 | NA | NA |
| Approach | 18 | 22 | 40 | 20.0 | | 0.084 | | | |

East: B1-1

| Mov. From E To Exit: | L2 S | T1 W | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 21 | - | 21 | 20.0 | 1625 | 0.013 | 100 | 0.0 | 2 |
| Lane 2 | - | 441 | 441 | 10.0 | 1831 | 0.241 | 100 | NA | NA |
| Lane 3 | - | 441 | 441 | 10.0 | 1831 | 0.241 | 100 | NA | NA |
| Approach | 21 | 881 | 902 | 10.2 | | 0.241 | | | |

| North: Median Storage | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Mov. From N To Exit: | T1 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
| Lane 1 | 23 | 23 | 20.0 | 492 | 0.047 | 100 | NA | NA |
| Approach | 23 | 23 | 20.0 | | 0.047 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 965 | 10.9 | 0.241 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

## Merge Analysis

| | Exit Lane Number | Short Lane Length m | Percent Opng in Lane % | Opposing Flow Rate veh/h | Opposing Flow Rate pcu/h | Critical Gap sec | Follow-up Headway sec | Lane Flow Rate veh/h | Capacity veh/h | Deg. Satn v/c | Min. Delay sec | Merge Delay sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South Exit: A1<br>Merge Type: **Priority** | | | | | | | | | | | | |
| Exit Short Lane | 1 | 7 | 0.0 | 23 | 25 | 3.00 | 2.00 | 21 | 1774 | 0.012 | 0.0 | 0.0 |
| Merge Lane | 2 | - | 100.0 | Merge Lane is not Opposed | | | | 23 | 1800 | 0.013 | 0.0 | 0.0 |
| North Exit: Median Storage<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| West Exit: B2-1<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| Full Length Lane | 2 | Merge Analysis not applied. | | | | | | | | | | |

# LANE SUMMARY

## Site: S1-2 [Bass Highway - N Post Dev AM (Site Folder: General)]

Staged Crossing at T Intersection Type C
Site Category: (None)
Give-Way (Two-Way)

**Lane Use and Performance**

| | DEMAND FLOWS [ Total veh/h | HV ] % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh | Dist ] m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Median Storage | | | | | | | | | | | | | |
| Lane 1 | 24 | 20.0 | 1625 | 0.015 | 100 | 1.7 | LOS A | 0.0 | 0.0 | Full | 175 | 0.0 | 0.0 |
| Approach | 24 | 20.0 | | 0.015 | | 1.7 | NA | 0.0 | 0.0 | | | | |
| West: Bass Highway | | | | | | | | | | | | | |
| Lane 1 | 387 | 10.0 | 1831 | 0.212 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 387 | 10.0 | 1831 | 0.212 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 3 | 69 | 20.0 | 1625 | 0.043 | 100 | 7.7 | LOS A | 0.0 | 0.0 | Short | 125 | 0.0 | NA |
| Approach | 844 | 10.8 | | 0.212 | | 0.7 | NA | 0.0 | 0.0 | | | | |
| Intersection | 868 | 11.1 | | 0.212 | | 0.7 | NA | 0.0 | 0.0 | | | | |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**Approach Lane Flows (veh/h)**

South: Median Storage

| Mov. From S To Exit: | R2 E | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|
| Lane 1 | 24 | 24 | 20.0 | 1625 | 0.015 | 100 | NA | NA |
| Approach | 24 | 24 | 20.0 | | 0.015 | | | |

West: Bass Highway

| Mov. From W To Exit: | T1 E | R2 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 387 | - | 387 | 10.0 | 1831 | 0.212 | 100 | NA | NA |
| Lane 2 | 387 | - | 387 | 10.0 | 1831 | 0.212 | 100 | NA | NA |
| Lane 3 | - | 69 | 69 | 20.0 | 1625 | 0.043 | 100 | 0.0 | 2 |
| Approach | 775 | 69 | 844 | 10.8 | | 0.212 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 868 | 11.1 | 0.212 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

## Merge Analysis

| | Exit Lane Number | Short Lane Length m | Percent Opng in Lane % | Opposing Flow Rate veh/h | Opposing Flow Rate pcu/h | Critical Gap sec | Follow-up Headway sec | Lane Flow Rate veh/h | Capacity veh/h | Deg. Satn v/c | Min. Delay sec | Merge Delay sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South Exit: Median Storage<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| East Exit: Bass Highway<br>Merge Type: **Priority** | | | | | | | | | | | | |
| Exit Short Lane | 3 | 175 | 0.0 | 387 | 407 | 3.00 | 2.00 | 24 | 1384 | 0.017 | 0.6 | 0.7 |
| Merge Lane | 2 | - | 100.0 | Merge Lane is not Opposed | | | | 387 | 1800 | 0.215 | 0.0 | 0.0 |

# LANE SUMMARY

## Site: S1-1 [Bass Highway - S Post Dev AM (Site Folder: General)]

Staged Crossing at T Intersection Type C
Site Category: (None)
Stop (Two-Way)

**Lane Use and Performance**

| | DEMAND FLOWS [ Total | HV ] | Cap. | Deg. Satn | Lane Util. | Aver. Delay | Level of Service | 95% BACK OF QUEUE [ Veh | Dist ] | Lane Config | Lane Length | Cap. Adj. | Prob. Block. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | veh/h | % | veh/h | v/c | % | sec | | | m | | m | % | % |
| South: A1 | | | | | | | | | | | | | |
| Lane 1 | 19 | 20.0 | 621 | 0.030 | 100 | 12.7 | LOS B | 0.1 | 0.9 | Short | 7 | 0.0 | NA |
| Lane 2 | 24 | 20.0 | 67 | 0.362 | 100 | 77.0 | LOS F | 1.2 | 9.5 | Full | 500 | 0.0 | 0.0 |
| Approach | 43 | 20.0 | | 0.362 | | 48.8 | LOS E | 1.2 | 9.5 | | | | |
| East: B1-1 | | | | | | | | | | | | | |
| Lane 1 | 209 | 20.0 | 1625 | 0.129 | 100 | 8.7 | LOS A | 0.0 | 0.0 | Short | 100 | 0.0 | NA |
| Lane 2 | 693 | 10.0 | 1831 | 0.378 | 100 | 0.1 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 3 | 693 | 10.0 | 1831 | 0.378 | 100 | 0.1 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 1595 | 11.3 | | 0.378 | | 1.2 | NA | 0.0 | 0.0 | | | | |
| North: Median Storage | | | | | | | | | | | | | |
| Lane 1 | 69 | 20.0 | 165 | 0.422 | 100 | 29.4 | LOS D | 1.4 | 11.8 | Full | 7 | 0.0 | 23.5 |
| Approach | 69 | 20.0 | | 0.422 | | 29.4 | LOS D | 1.4 | 11.8 | | | | |
| Intersection | 1707 | 11.9 | | 0.422 | | 3.6 | NA | 1.4 | 11.8 | | | | |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**Approach Lane Flows (veh/h)**

South: A1

| Mov. From S To Exit: | L2 W | T1 N | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 19 | - | 19 | 20.0 | 621 | 0.030 | 100 | 0.0 | 2 |
| Lane 2 | - | 24 | 24 | 20.0 | 67 | 0.362 | 100 | NA | NA |
| Approach | 19 | 24 | 43 | 20.0 | | 0.362 | | | |

East: B1-1

| Mov. From E To Exit: | L2 S | T1 W | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 209 | - | 209 | 20.0 | 1625 | 0.129 | 100 | 0.0 | 2 |
| Lane 2 | - | 693 | 693 | 10.0 | 1831 | 0.378 | 100 | NA | NA |
| Lane 3 | - | 693 | 693 | 10.0 | 1831 | 0.378 | 100 | NA | NA |

| Mov. From N To Exit: | T1 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|
| Approach | 209 | 1385 | 1595 | 11.3 | 0.378 | | | |
| North: Median Storage | | | | | | | | |
| Lane 1 | 69 | 69 | 20.0 | 165 | 0.422 | 100 | NA | NA |
| Approach | 69 | 69 | 20.0 | | 0.422 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 1707 | 11.9 | 0.422 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

**Merge Analysis**

| | Exit Lane Number | Short Lane Length m | Percent Opng in Lane % | Opposing Flow Rate veh/h | Opposing Flow Rate pcu/h | Critical Gap sec | Follow-up Headway sec | Lane Flow Rate veh/h | Capacity veh/h | Deg. Satn v/c | Min. Delay sec | Merge Delay sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South Exit: A1<br>Merge Type: **Priority** | | | | | | | | | | | | |
| Exit Short Lane | 1 | 7 | 0.0 | 69 | 76 | 3.00 | 2.00 | 209 | 1723 | 0.122 | 0.1 | 0.1 |
| Merge Lane | 2 | - | 100.0 | Merge Lane is not Opposed | | | | 69 | 1800 | 0.039 | 0.0 | 0.0 |
| North Exit: Median Storage<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| West Exit: B2-1<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| Full Length Lane | 2 | Merge Analysis not applied. | | | | | | | | | | |

# LANE SUMMARY

## Site: S1-2 [Bass Highway - N Post Dev PM (Site Folder: General)]

Staged Crossing at T Intersection Type C
Site Category: (None)
Give-Way (Two-Way)

**Lane Use and Performance**

| | DEMAND FLOWS [ Total veh/h | HV ] % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh | Dist ] m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Median Storage | | | | | | | | | | | | | |
| Lane 1 | 194 | 20.0 | 1625 | 0.119 | 100 | 3.1 | LOS A | 0.0 | 0.0 | Full | 175 | 0.0 | 0.0 |
| Approach | 194 | 20.0 | | 0.119 | | 3.1 | NA | 0.0 | 0.0 | | | | |
| West: Bass Highway | | | | | | | | | | | | | |
| Lane 1 | 726 | 10.0 | 1831 | 0.396 | 100 | 0.1 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 726 | 10.0 | 1831 | 0.396 | 100 | 0.1 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 3 | 23 | 20.0 | 1625 | 0.014 | 100 | 7.7 | LOS A | 0.0 | 0.0 | Short | 125 | 0.0 | NA |
| Approach | 1475 | 10.2 | | 0.396 | | 0.2 | NA | 0.0 | 0.0 | | | | |
| Intersection | 1668 | 11.3 | | 0.396 | | 0.5 | NA | 0.0 | 0.0 | | | | |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**Approach Lane Flows (veh/h)**

South: Median Storage

| Mov. From S To Exit: | R2 E | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|
| Lane 1 | 194 | 194 | 20.0 | 1625 | 0.119 | 100 | NA | NA |
| Approach | 194 | 194 | 20.0 | | 0.119 | | | |

West: Bass Highway

| Mov. From W To Exit: | T1 E | R2 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 726 | - | 726 | 10.0 | 1831 | 0.396 | 100 | NA | NA |
| Lane 2 | 726 | - | 726 | 10.0 | 1831 | 0.396 | 100 | NA | NA |
| Lane 3 | - | 23 | 23 | 20.0 | 1625 | 0.014 | 100 | 0.0 | 2 |
| Approach | 1452 | 23 | 1475 | 10.2 | | 0.396 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 1668 | 11.3 | 0.396 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

## Merge Analysis

| | Exit Lane Number | Short Lane Length m | Percent Opng in Lane % | Opposing Flow Rate veh/h | Opposing Flow Rate pcu/h | Critical Gap sec | Follow-up Headway sec | Lane Flow Rate veh/h | Capacity veh/h | Deg. Satn v/c | Min. Delay sec | Merge Delay sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South Exit: Median Storage<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| East Exit: Bass Highway<br>Merge Type: **Priority** | | | | | | | | | | | | |
| Exit Short Lane | 3 | 175 | 0.0 | 726 | 762 | 3.00 | 2.00 | 194 | 1009 | 0.192 | 1.6 | 2.1 |
| Merge Lane | 2 | - | 100.0 | Merge Lane is not Opposed | | | | 726 | 1800 | 0.403 | 0.0 | 0.0 |

# LANE SUMMARY

## Site: S1-1 [Bass Highway - S Post Dev PM (Site Folder: General)]

Staged Crossing at T Intersection Type C
Site Category: (None)
Stop (Two-Way)

**Lane Use and Performance**

| | DEMAND FLOWS [ Total veh/h | HV ] % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh | Dist ] m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: A1 | | | | | | | | | | | | | |
| Lane 1 | 67 | 20.0 | 910 | 0.074 | 100 | 10.5 | LOS B | 0.3 | 2.3 | Short | 7 | 0.0 | NA |
| Lane 2 | 194 | 20.0 | 244 [1] | 0.794 | 100 | 43.2 | LOS E | 5.4 | 44.4 | Full | 500 | 0.0 | 0.0 |
| Approach | 261 | 20.0 | | 0.794 | | 34.8 | LOS D | 5.4 | 44.4 | | | | |
| East: B1-1 | | | | | | | | | | | | | |
| Lane 1 | 21 | 20.0 | 1625 | 0.013 | 100 | 8.6 | LOS A | 0.0 | 0.0 | Short | 100 | 0.0 | NA |
| Lane 2 | 441 | 10.0 | 1831 | 0.241 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 3 | 441 | 10.0 | 1831 | 0.241 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 902 | 10.2 | | 0.241 | | 0.2 | NA | 0.0 | 0.0 | | | | |
| North: Median Storage | | | | | | | | | | | | | |
| Lane 1 | 23 | 20.0 | 492 | 0.047 | 100 | 7.3 | LOS A | 0.2 | 1.3 | Full | 7 | 0.0 | 0.0 |
| Approach | 23 | 20.0 | | 0.047 | | 7.3 | LOS A | 0.2 | 1.3 | | | | |
| Intersection | 1186 | 12.6 | | 0.794 | | 8.0 | NA | 5.4 | 44.4 | | | | |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

**Approach Lane Flows (veh/h)**

South: A1

| Mov. From S To Exit: | L2 W | T1 N | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 67 | - | 67 | 20.0 | 910 | 0.074 | 100 | 0.0 | 2 |
| Lane 2 | - | 194 | 194 | 20.0 | 244 [1] | 0.794 | 100 | NA | NA |
| Approach | 67 | 194 | 261 | 20.0 | | 0.794 | | | |

East: B1-1

| Mov. From E To Exit: | L2 S | T1 W | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 21 | - | 21 | 20.0 | 1625 | 0.013 | 100 | 0.0 | 2 |
| Lane 2 | - | 441 | 441 | 10.0 | 1831 | 0.241 | 100 | NA | NA |

| Mov. From N To Exit: | T1 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|
| Lane 3 | - | 441 | 441 | 10.0 | 1831 | 0.241 | 100 | NA | NA |
| Approach | 21 | 881 | 902 | 10.2 | | 0.241 | | | |

North: Median Storage

| Mov. From N To Exit: | T1 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|
| Lane 1 | 23 | 23 | 20.0 | 492 | 0.047 | 100 | NA | NA |
| Approach | 23 | 23 | 20.0 | | 0.047 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 1186 | 12.6 | 0.794 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

## Merge Analysis

| | Exit Lane Number | Short Lane Length m | Percent Opng in Lane % | Opposing Flow Rate veh/h | pcu/h | Critical Gap sec | Follow-up Headway sec | Lane Flow Rate veh/h | Capacity veh/h | Deg. Satn v/c | Min. Delay sec | Merge Delay sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South Exit: A1<br>Merge Type: **Priority** | | | | | | | | | | | | |
| Exit Short Lane | 1 | 7 | 0.0 | 23 | 25 | 3.00 | 2.00 | 21 | 1774 | 0.012 | 0.0 | 0.0 |
| Merge Lane | 2 | - | 100.0 | Merge Lane is not Opposed | | | | 23 | 1800 | 0.013 | 0.0 | 0.0 |
| North Exit: Median Storage<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| West Exit: B2-1<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| Full Length Lane | 2 | Merge Analysis not applied. | | | | | | | | | | |

# LANE SUMMARY

## Site: 101 [Minna Road - GF AM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Lane Use and Performance**

| | DEMAND FLOWS [ Total veh/h | HV ] % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh | Dist ] m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Minna Road | | | | | | | | | | | | | |
| Lane 1 | 44 | 0.0 | 1948 | 0.023 | 100 | 0.1 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 44 | 0.0 | | 0.023 | | 0.1 | NA | 0.0 | 0.0 | | | | |
| North: Minna Road | | | | | | | | | | | | | |
| Lane 1 | 23 | 0.0 | 1935 | 0.012 | 100 | 0.3 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 23 | 0.0 | | 0.012 | | 0.3 | NA | 0.0 | 0.0 | | | | |
| West: Heybridge Site Access | | | | | | | | | | | | | |
| Lane 1 | 1 | 0.0 | 1384 | 0.001 | 100 | 8.1 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 1 | 0.0 | 1092 | 0.001 | 100 | 8.6 | LOS A | 0.0 | 0.0 | Short | 7 | 0.0 | NA |
| Approach | 2 | 0.0 | | 0.001 | | 8.4 | LOS A | 0.0 | 0.0 | | | | |
| Intersection | 69 | 0.0 | | 0.023 | | 0.4 | NA | 0.0 | 0.0 | | | | |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**Approach Lane Flows (veh/h)**

South: Minna Road

| Mov. From S To Exit: | L2 W | T1 N | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 1 | 43 | 44 | 0.0 | 1948 | 0.023 | 100 | NA | NA |
| Approach | 1 | 43 | 44 | 0.0 | | 0.023 | | | |

North: Minna Road

| Mov. From N To Exit: | T1 S | R2 W | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 22 | 1 | 23 | 0.0 | 1935 | 0.012 | 100 | NA | NA |
| Approach | 22 | 1 | 23 | 0.0 | | 0.012 | | | |

West: Heybridge Site Access

| Mov. From W To Exit: | L2 N | R2 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 1 | - | 1 | 0.0 | 1384 | 0.001 | 100 | NA | NA |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Lane 2 | - | 1 | 1 | 0.0 | | 1092 | 0.001 | 100 | 0.0 | 1 |
| Approach | 1 | 1 | 2 | 0.0 | | | 0.001 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 69 | 0.0 | 0.023 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

**Merge Analysis**

| | Exit Lane Number | Short Lane Length m | Percent Opng in Lane % | Opposing Flow Rate veh/h | pcu/h | Critical Gap sec | Follow-up Headway sec | Lane Flow Rate veh/h | Capacity veh/h | Deg. Satn v/c | Min. Delay sec | Merge Delay sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South Exit: Minna Road<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| North Exit: Minna Road<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| West Exit: Heybridge Site Access<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |


Organisation: STANTEC NEW ZEALAND | Licence: NETWORK / Enterprise | Processed: Tuesday, December 13, 2022 4:16:41 PM
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# LANE SUMMARY

## Site: 101 [Minna Road - GF PM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Lane Use and Performance**

| | DEMAND FLOWS [ Total veh/h | HV ] % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh | Dist ] m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Minna Road | | | | | | | | | | | | | |
| Lane 1 | 41 | 0.0 | 1948 | 0.021 | 100 | 0.1 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 41 | 0.0 | | 0.021 | | 0.1 | NA | 0.0 | 0.0 | | | | |
| North: Minna Road | | | | | | | | | | | | | |
| Lane 1 | 45 | 0.0 | 1942 | 0.023 | 100 | 0.1 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 45 | 0.0 | | 0.023 | | 0.1 | NA | 0.0 | 0.0 | | | | |
| West: Heybridge Site Access | | | | | | | | | | | | | |
| Lane 1 | 1 | 0.0 | 1388 | 0.001 | 100 | 8.1 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 1 | 0.0 | 1073 | 0.001 | 100 | 8.6 | LOS A | 0.0 | 0.0 | Short | 7 | 0.0 | NA |
| Approach | 2 | 0.0 | | 0.001 | | 8.4 | LOS A | 0.0 | 0.0 | | | | |
| Intersection | 88 | 0.0 | | 0.023 | | 0.3 | NA | 0.0 | 0.0 | | | | |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**Approach Lane Flows (veh/h)**

South: Minna Road

| Mov. From S To Exit: | L2 W | T1 N | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 1 | 40 | 41 | 0.0 | 1948 | 0.021 | 100 | NA | NA |
| Approach | 1 | 40 | 41 | 0.0 | | 0.021 | | | |

North: Minna Road

| Mov. From N To Exit: | T1 S | R2 W | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 44 | 1 | 45 | 0.0 | 1942 | 0.023 | 100 | NA | NA |
| Approach | 44 | 1 | 45 | 0.0 | | 0.023 | | | |

West: Heybridge Site Access

| Mov. From W To Exit: | L2 N | R2 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 1 | - | 1 | 0.0 | 1388 | 0.001 | 100 | NA | NA |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Lane 2 | - | 1 | 1 | 0.0 | | 1073 | 0.001 | 100 | 0.0 | 1 |
| Approach | 1 | 1 | 2 | 0.0 | | | 0.001 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 88 | 0.0 | 0.023 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

| Merge Analysis | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Exit Lane Number | Short Lane Length m | Percent Opng in Lane % | Opposing Flow Rate veh/h | pcu/h | Critical Gap sec | Follow-up Headway sec | Lane Flow Rate veh/h | Capacity veh/h | Deg. Satn v/c | Min. Delay sec | Merge Delay sec |
| South Exit: Minna Road<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| North Exit: Minna Road<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| West Exit: Heybridge Site Access<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |

# LANE SUMMARY

## Site: 101 [Minna Road - Post Dev AM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Lane Use and Performance**

| | DEMAND FLOWS [ Total veh/h | HV ] % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh | Dist ] m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Minna Road | | | | | | | | | | | | | |
| Lane 1 | 44 | 20.0 | 1723 | 0.026 | 100 | 0.1 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 44 | 20.0 | | 0.026 | | 0.1 | NA | 0.0 | 0.0 | | | | |
| North: Minna Road | | | | | | | | | | | | | |
| Lane 1 | 279 | 20.0 | 1569 | 0.178 | 100 | 5.6 | LOS A | 0.9 | 7.6 | Full | 500 | 0.0 | 0.0 |
| Approach | 279 | 20.0 | | 0.178 | | 5.6 | NA | 0.9 | 7.6 | | | | |
| West: Heybridge Site Access | | | | | | | | | | | | | |
| Lane 1 | 1 | 20.0 | 1248 | 0.001 | 100 | 9.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 1 | 20.0 | 704 | 0.001 | 100 | 11.1 | LOS B | 0.0 | 0.0 | Short | 7 | 0.0 | NA |
| Approach | 2 | 20.0 | | 0.001 | | 10.1 | LOS B | 0.0 | 0.0 | | | | |
| Intersection | 325 | 20.0 | | 0.178 | | 4.9 | NA | 0.9 | 7.6 | | | | |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**Approach Lane Flows (veh/h)**

South: Minna Road

| Mov. From S To Exit: | L2 W | T1 N | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 1 | 43 | 44 | 20.0 | 1723 | 0.026 | 100 | NA | NA |
| Approach | 1 | 43 | 44 | 20.0 | | 0.026 | | | |

North: Minna Road

| Mov. From N To Exit: | T1 S | R2 W | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 22 | 257 | 279 | 20.0 | 1569 | 0.178 | 100 | NA | NA |
| Approach | 22 | 257 | 279 | 20.0 | | 0.178 | | | |

West: Heybridge Site Access

| Mov. From W To Exit: | L2 N | R2 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 1 | - | 1 | 20.0 | 1248 | 0.001 | 100 | NA | NA |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Lane 2 | - | 1 | 1 | 20.0 | | 704 | 0.001 | 100 | 0.0 | 1 |
| Approach | 1 | 1 | 2 | 20.0 | | | 0.001 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 325 | 20.0 | 0.178 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

## Merge Analysis

| | Exit Lane Number | Short Lane Length m | Percent Opng in Lane % | Opposing Flow Rate veh/h | Opposing Flow Rate pcu/h | Critical Gap sec | Follow-up Headway sec | Lane Flow Rate veh/h | Capacity veh/h | Deg. Satn v/c | Min. Delay sec | Merge Delay sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South Exit: Minna Road<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| North Exit: Minna Road<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| West Exit: Heybridge Site Access<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |

# LANE SUMMARY

## Site: 101 [Minna Road - Post Dev PM (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

**Lane Use and Performance**

| | DEMAND FLOWS [ Total veh/h | HV ] % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh | Dist ] m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Minna Road | | | | | | | | | | | | | |
| Lane 1 | 41 | 20.0 | 1723 | 0.024 | 100 | 0.2 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 41 | 20.0 | | 0.024 | | 0.2 | NA | 0.0 | 0.0 | | | | |
| North: Minna Road | | | | | | | | | | | | | |
| Lane 1 | 45 | 20.0 | 1719 | 0.026 | 100 | 0.1 | LOS A | 0.0 | 0.1 | Full | 500 | 0.0 | 0.0 |
| Approach | 45 | 20.0 | | 0.026 | | 0.1 | NA | 0.0 | 0.1 | | | | |
| West: Heybridge Site Access | | | | | | | | | | | | | |
| Lane 1 | 221 | 20.0 | 1252 | 0.177 | 100 | 9.1 | LOS A | 0.8 | 6.6 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 1 | 20.0 | 959 | 0.001 | 100 | 9.6 | LOS A | 0.0 | 0.0 | Short | 7 | 0.0 | NA |
| Approach | 222 | 20.0 | | 0.177 | | 9.1 | LOS A | 0.8 | 6.6 | | | | |
| Intersection | 308 | 20.0 | | 0.177 | | 6.6 | NA | 0.8 | 6.6 | | | | |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**Approach Lane Flows (veh/h)**

South: Minna Road

| Mov. From S To Exit: | L2 W | T1 N | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 1 | 40 | 41 | 20.0 | 1723 | 0.024 | 100 | NA | NA |
| Approach | 1 | 40 | 41 | 20.0 | | 0.024 | | | |

North: Minna Road

| Mov. From N To Exit: | T1 S | R2 W | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 44 | 1 | 45 | 20.0 | 1719 | 0.026 | 100 | NA | NA |
| Approach | 44 | 1 | 45 | 20.0 | | 0.026 | | | |

West: Heybridge Site Access

| Mov. From W To Exit: | L2 N | R2 S | Total | %HV | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Prob. SL Ov. % | Ov. Lane No. |
|---|---|---|---|---|---|---|---|---|---|
| Lane 1 | 221 | - | 221 | 20.0 | 1252 | 0.177 | 100 | NA | NA |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Lane 2 | - | 1 | 1 | 20.0 | | 959 | 0.001 | 100 | 0.0 | 1 |
| Approach | 221 | 1 | 222 | 20.0 | | | 0.177 | | | |

| | Total | %HV | Deg.Satn (v/c) |
|---|---|---|---|
| Intersection | 308 | 20.0 | 0.177 |

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

## Merge Analysis

| | Exit Lane Number | Short Lane Length m | Percent Opng in Lane % | Opposing Flow Rate veh/h | pcu/h | Critical Gap sec | Follow-up Headway sec | Lane Flow Rate veh/h | Capacity veh/h | Deg. Satn v/c | Min. Delay sec | Merge Delay sec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South Exit: Minna Road<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| North Exit: Minna Road<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |
| West Exit: Heybridge Site Access<br>Merge Type: **Not Applied** | | | | | | | | | | | | |
| Full Length Lane | 1 | Merge Analysis not applied. | | | | | | | | | | |

# DESIGN WITH COMMUNITY IN MIND

Communities are fundamental. Whether around the corner or across the globe, they provide a foundation, a sense of place and of belonging. That's why at Stantec, we always design with community in mind.

We care about the communities we serve—because they're our communities too. This allows us to assess what's needed and connect our expertise, to appreciate nuances and envision what's never been considered, to bring together diverse perspectives so we can collaborate toward a shared success.

We're designers, engineers, scientists, and project managers, innovating together at the intersection of community, creativity, and client relationships. Balancing these priorities results in projects that advance the quality of life in communities across the globe.

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Visit us at stantec.com or find us on social media.

Level 25-28, 600 Bourke Street, Melbourne VIC 3000

PO Box 24055, Melbourne VIC 3000

Tel 3 9851 9600 | www.stantec.com