Desktop ecological values and constraints assessment:

Great Ocean Road Coastal Trail

FINAL REPORT

Prepared for World Trail Pty Ltd

29 March 2022

Biosis offices

NEW SOUTH WALES

Albury
Phone: (02) 6069 9200
Email: albury@biosis.com.au

Newcastle
Phone: (02) 4911 4040
Email: newcastle@biosis.com.au

Sydney
Phone: (02) 9101 8700
Email: sydney@biosis.com.au

Western Sydney
Phone: (02) 91018733
Email: WesternSydneyOffice@biosis.com.au

Wollongong
Phone: (02) 4201 1090
Email: wollongong@biosis.com.au

VICTORIA

Ballarat
Phone: (03) 5304 4250
Email: ballarat@biosis.com.au

Melbourne
Phone: (03) 8686 4800
Email: melbourne@biosis.com.au

Wangaratta
Phone: (03) 5718 6900
Email: wangaratta@biosis.com.au

Document information

Report to:	World Trail Pty Ltd
Prepared by:	Samuel Trollope and Erin Baldwin
Biosis project no.:	35990
File name:	35990.GORCT.Ecology.Desktop.FIN01.20220320

Citation: Biosis 2021. Desktop ecological values and constraints assessment: Great Ocean Road Coastal Trail. Report prepared for World Trail Pty Ltd. Trollope, S. & Baldwin, E. Biosis Pty Ltd, Melbourne, Vic. Project no. 35990

Document control

Version	Internal reviewer	Date issued
Draft version 01	MJAL	07/01/2022
Final version 01	MJAL	21/03/2022

Acknowledgements

Biosis acknowledges the contribution of the following people and organisations in undertaking this study:

- World Trail Pty Ltd: Brigid Isaac
- Department of Environment, Land, Water and Planning (DELWP): Evan Lewis
- DELWP for access to the Victorian Biodiversity Atlas
- Department of Agriculture, Water and Environment for access to the Protected Matters Search Tool of the Australian Government.

Biosis staff involved in this project were:

- Lachlan Milne and Michael Knudsen (mapping)
- Matt Looby (quality assurance and assistance in the field).

Contents

Tables

Figures

Summary

Biosis Pty Ltd was commissioned by World Trail Pty Ltd (World Trail) on behalf of the Department of Environment, Land, Water and Planning (DELWP) to undertake a desktop assessment of the ecological values and constraints for the proposed alignments of the Great Ocean Road Coastal Trail (GORCT).

This preliminary ecological assessment is an important output in designing an achievable walking trail network between Fairhaven and Skenes Creek, along the Great Ocean Road on Victoria's south-western coastline. Analysis of both the physical and non-physical environmental factors of the project area through desktop assessments and preliminary site inspections has revealed a range of opportunities and constraints that will inform the trail design process.

The concept trail design includes a mixture of new and existing trails over approximately 90 kilometres that provides a link between the Surf Coast Walk and the Great Ocean Walk. Campgrounds and car parking facilities are also planned as part of the project, but are yet to be finalised. The proposed mix of trail on existing tracks and roads represents a significant opportunity to reduce the project's overall impacts on environmental values. This report focusses on Concept Alignment 2 design version.

The location of the trail network predominantly in National Parks or public reserves has resulted in the presence of a number of ecological constraints along the trail alignment. Avoidance and minimisation of impacts to threatened species and communities, minimising waterway crossings, finding and securing Victorian native vegetation offsets that satisfy the requirements of the project and determining approvals pathways for works are key considerations for the next phase of project planning.

Key ecological values identified include:

- The project area crosses two bioregions with distinct environmental conditions, vegetation communities and species assemblages.
- Six Ecological Vegetation Classes (EVCs) within the Otway Plain bioregion are modelled to occur within the assessment corridor. This includes one EVC with a Bioregional Conservation Status (BCS) of Rare (reflecting its limited geographic occurrence in Victoria) and one EVC with a BCS of Vulnerable.
- Sixteen (16) EVCs within the Otway Range bioregion are modelled to occur within the assessment corridor. This includes two EVCs with a BCS of Endangered and two EVCs with a BCS of Vulnerable. The remaining EVCs have a BCS of Least Concern or Depleted.
- Forty (40) threatened flora species are considered likely to occur within the assessment corridor (i.e. 10 metres either side of the concept trail alignment), comprising seven species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and 38 listed under both the EPBC Act and the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act).
- Four Threatened Ecological Communities (TECs) are likely to occur, comprised of two communities listed under the EPBC Act and two communities listed under the FFG Act:
  - Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community (EPBC Act listed as Endangered)
  - Subtropical and Temperate Coastal Saltmarsh (EPBC Act listed as Vulnerable)
  - Cool Temperate Rainforest Community (FFG Act listed), which may also include the Cool Temperate Mixed Forest community

  - Coastal Moonah (*Melaleuca lanceolata* subsp. *lanceolata*) Woodland Community (FFG Act listed).
- Twenty-four (24) threatened fauna species listed under the EPBC Act and 36 species listed under the FFG Act are likely to occur within the project area including:
  - Hollow-dependent, sedentary or fauna with relatively defined ecological niches and / or small home ranges are considered most likely to be impacted by the project due to their ecology and habitat requirements and the nature of the proposed activities. This includes 11 threatened fauna species listed under the EPBC Act and 15 species listed under the FFG Act.
- The project area contains a diversity of freshwater aquatic and riparian habitats consisting of numerous creeks, rivers, drainage lines, seasonal gullies, damp depressions and wetlands. These environments provide habitat to a threatened fish (Australian Grayling and Australian Mudfish), mammals (Platypus), invertebrates (Otway Bush Yabby) and terrestrial burrowing crayfish species (Otway Burrowing Crayfish and Hairy Burrowing Crayfish).

Key ecological or environmental constraints include:

- Large continuous areas of high to moderate quality native forest, heathland and woodland vegetation.
- Abundant and diverse areas of habitat for threatened flora and fauna.
- Potential significant impacts on threatened species and threatened ecological communities.
- Potential spread of weeds, pests, pathogens and diseases.
- Steep slopes and floodplains present across concept trail alignment where erosion and sediment risks will need to be managed.
- Major waterway and gully crossings.
- Numerous small creek crossings and riparian ecosystems.
- Large potential construction footprints for two campgrounds and car parking facilities (specific locations to be confirmed).

Locations where ground validation of concept alignment 2 was conducted:

- Modelled presence of EPBC Act and FFG Act listed ecological communities.
- Areas of concentrated threatened species records (such as heathy EVCs in the Otway Plain bioregion).
- Habitat for EPBC Act listed species that are likely to be significantly impacted by the project, such as sedentary fauna or species that are highly sensitive to disturbance.
- New walking trail alignments.
- Existing trail alignments (rapid assessment).

Detailed assessment of ecological values, aboriginal cultural heritage and historical heritage will be important next steps and will help to further refine the project's impacts and determine the required statutory approvals. This detailed assessment stage will inform the refinement of the proposed trail alignments to ensure they avoid areas or the highest value features of ecological significance and minimise impacts on soil, water and native vegetation.

1 Introduction

1.1 Project background

A detailed project background is provided in other supporting technical reports.

In this ecological values and constraints assessment we have focused on the sections of proposed trail that link existing trails and would require new construction as these sections would require the largest disturbance and hence carry the greatest risk to ecological features. This report focussed on Concept Alignment 2 design version and is supported by a web based mapping tool that outlines ecological constraints and allows stakeholders to isolate and identify individual constraints and opportunities present throughout the alignment.

This ecological constraints and opportunities assessment focuses on environmental factors and applicable environmental legislation. There are likely to be a number of land tenure, existing use, aboriginal and non-aboriginal heritage and social constraints that influence trail design and construction and these will be addressed by the broader project team through separate technical studies and community engagement.

1.2 Objectives of the project

The objectives of the desktop ecological values and constraints assessment are to:

- Undertake desktop background research of the locality, encompassing databases, vegetation mapping and existing reports to inform the development of an ecological constraints and opportunities model.
- Review ecological values and constraints present and outline the implications of these constraints.
- Provide indicative mapping of significant ecological features and constraints from modelled and desktop data.
- Conduct an on-ground validation of the trail alignment to verify the biodiversity values and constraints raised within the ecological desktop assessment.
- Provide a short report including recommendations to avoid and minimise impacts and next steps required to progress the project.

1.3 Project area details and definitions

Table 1 and Table 2 below outline key project terms, abbreviations and their definitions.

Table 1 Project terms and definitions

Term	Definition
Project area	All indicative trail alignments buffered outwards by 2 kilometres. The area where ecological values are reviewed and described at a landscape scale for desktop assessment purposes. See Figure 1.
Search area	The project area buffered outwards by 10 kilometres. This area is used to conduct the database review of biodiversity values.
Indicative trail alignment (Concept alignments)	A centreline representing the proposed alignment of the walking trail. The indicative trail alignment is used as a basis for existing conditions surveys and impact assessment but does not necessarily represent the exact alignment of the trail once constructed. In areas of high environmental significance micro-siting will be used to avoid or minimise impacts to biodiversity along the trail alignment. This report focusses on Concept Alignment 2 that we understand has been determined primarily through desktop design.
Assessment corridor	A 20 metre wide assessment corridor along all trails (i.e. 10 metres either side of the trail centreline) where biodiversity data will be collected (e.g. vegetation and tree mapping). The use of an assessment corridor provides for the informed re-alignment of the trail to avoid or minimise impacts to biodiversity as required.
Impact footprint	A 2 metre wide corridor (1 metre either side of the trail centreline) along the entire indicative trail alignment where vegetation removal and soil disturbance is likely to occur to construct trails.
Micro-siting	This term refers to the positioning of a section of trail by technical experts (ecologists, trail builders, other consultants) to avoid, or reduce impacts to key ecological values or to avoid hazards (such as dead trees). The trail alignment is walked and inspected, during design and/or prior to construction, making minor changes to the alignment within the 20 metre assessment corridor. Key values and hazards to consider and/or avoid using micro-siting include: • Threatened flora populations and ecological communities • Critical habitat elements for threatened fauna • Large trees and their structural root zone • Hazardous trees (dead or senescing) • High threat weed infestations • Known soil/plant pathogen infestations • Riparian zones and waterways.

Table 2 Project abbreviations and acronyms

Abbreviation	Definition
BCS	Bioregional Conservation Status
CaLP Act	*Catchment and Land Protection Act 1994*
CMA	Catchment Management Authority
DAWE	Department of Agriculture, Water and the Environment
DELWP	Department of Environment, Land, Water and Planning
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EVC	Ecological Vegetation Class
FFG Act	*Flora and Fauna Guarantee Act 1988*
GORCT	Great Ocean Road Coastal Trail
IBRA	Interim Biogeographic Regionalisation for Australia
PMST	Protected Matter Search Tool
TEC	Threatened Ecological Community

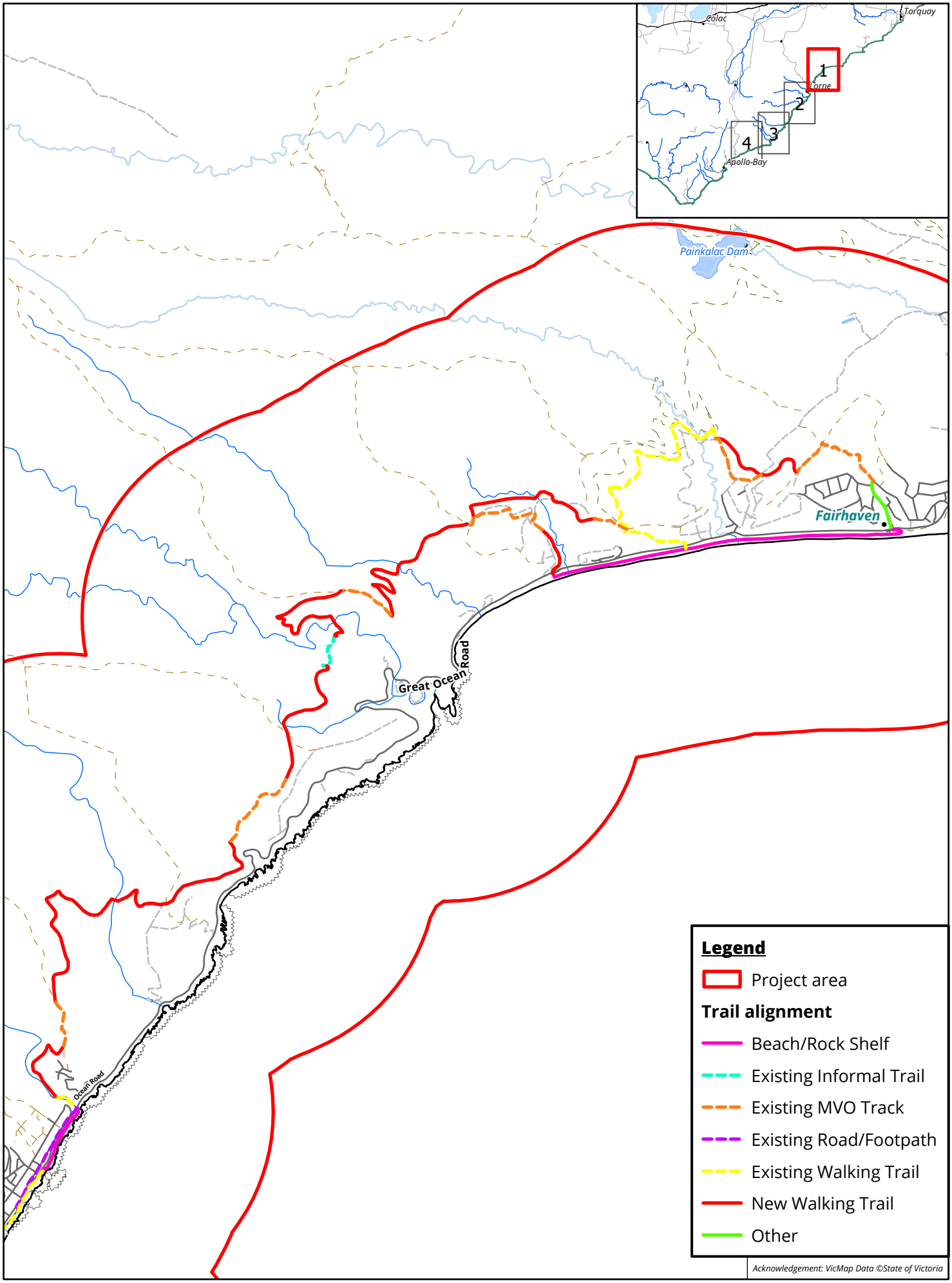


Figure 1.1 Location of the study area - Great Ocean Road trail, Victoria

Matter: 35990,
Date: 07 January 2022 ,
Prepared for: ML, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F1_locality
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx

0 0.4 0.8 1.2 1.6 2
Kilometers
Scale: 1:50,000 @ A4
Coordinate System GDA 1994 VICGRID94

N

00

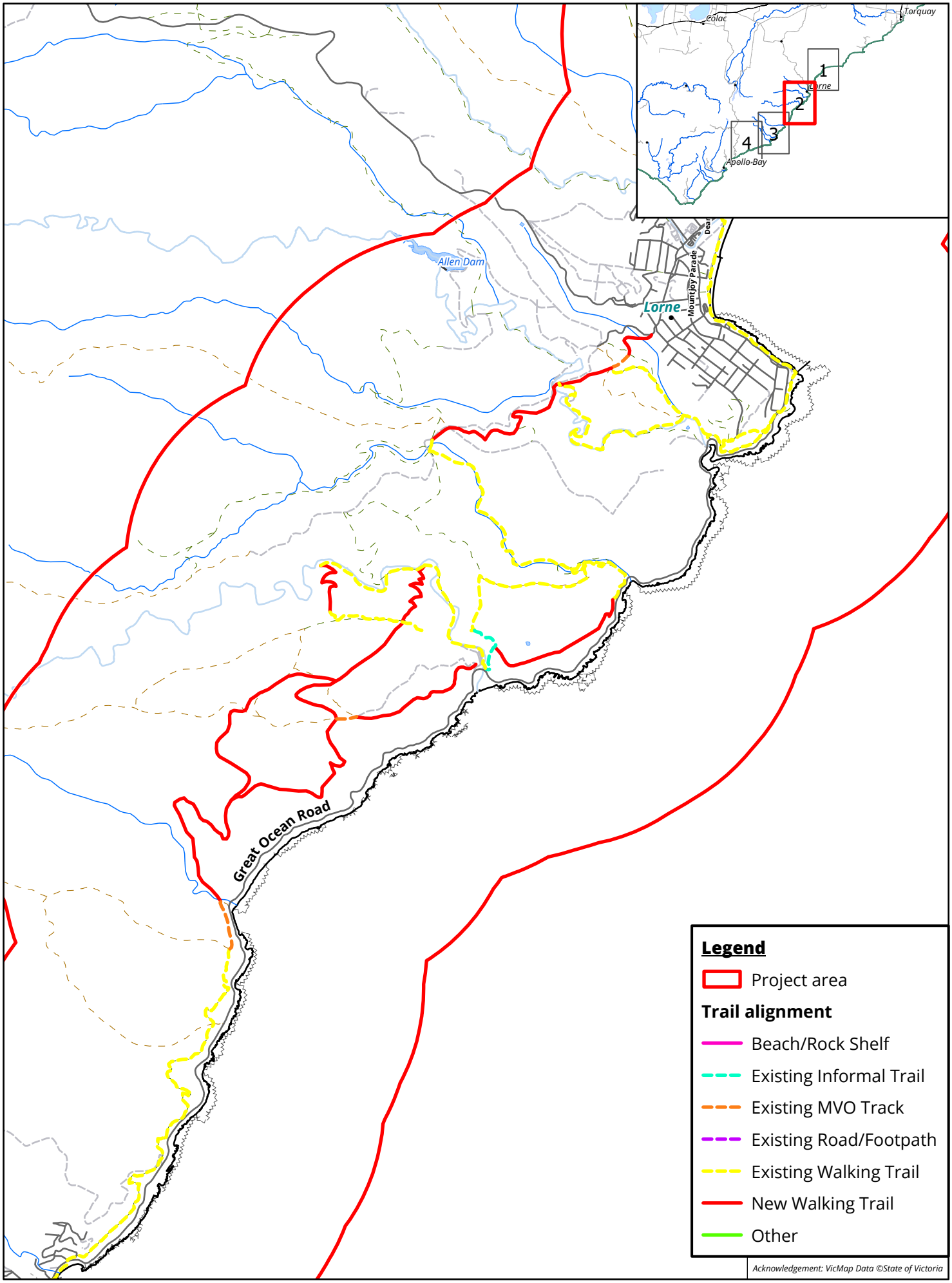


Figure 1.2 Location of the study area - Great Ocean Road trail, Victoria

Matter: 35990,
Date: 07 January 2022 ,
Prepared for: ML, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F1_locality
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx

0 0.4 0.8 1.2 1.6 2
Kilometers
Scale: 1:50,000 @ A4
Coordinate System GDA 1994 VICGRID94

N

00

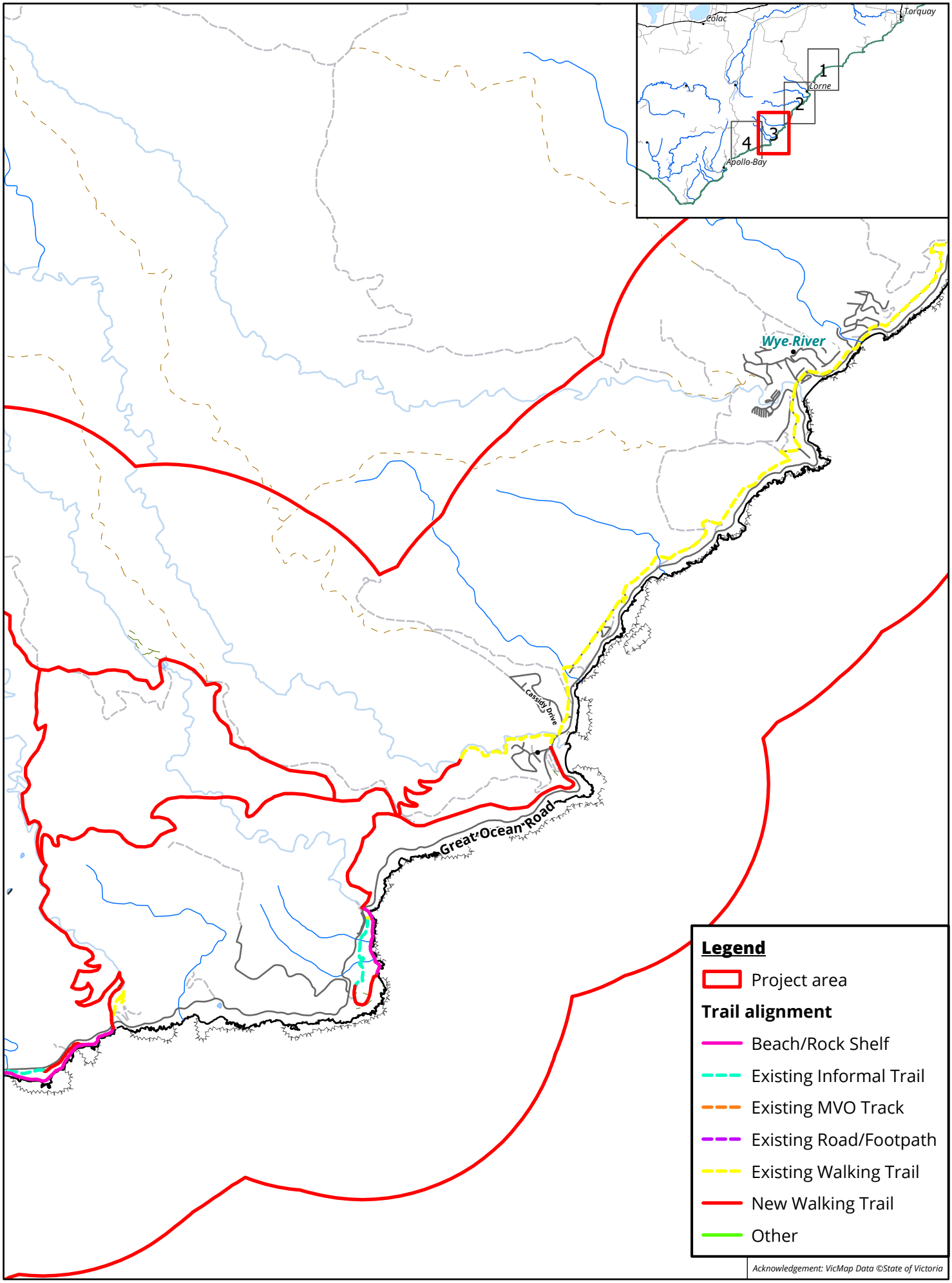


Figure 1.3 Location of the study area - Great Ocean Road trail, Victoria

Matter: 35990,
Date: 07 January 2022 ,
Prepared for: ML, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F1_locality
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx

0 0.4 0.8 1.2 1.6 2
Kilometers
Scale: 1:50,000 @ A4
Coordinate System GDA 1994 VICGRID94

N

00

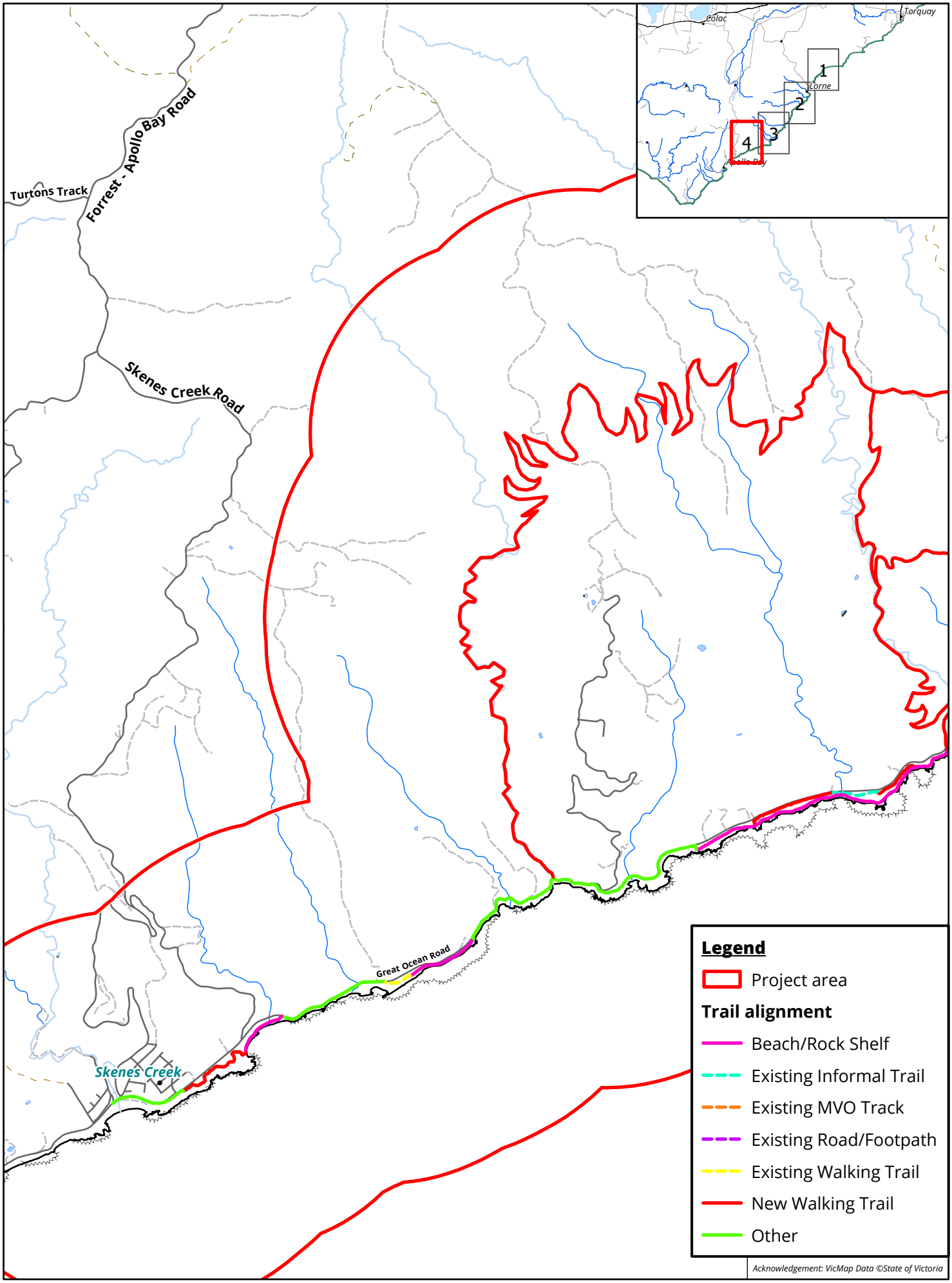


Figure 1.4 Location of the study area - Great Ocean Road trail, Victoria

Matter: 35990,
Date: 07 January 2022 ,
Prepared for: ML, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F1_locality
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx

0 0.4 0.8 1.2 1.6 2
Kilometers
Scale: 1:50,000 @ A4
Coordinate System GDA 1994 VICGRID94

N

00

2 Approach

This section outlines the approach taken by the project team to deliver the preliminary ecological values and constraints analysis. Our approach has included:

- Background review of existing reports, databases and spatial datasets.
- Production of spatial data decision support tools including web-based applications and weighted overlay analysis map of ecological values.
- Identification and documentation of project opportunities and constraints.

2.1 Background review

2.1.1 Existing reports

The following background reports and information sources have been reviewed:

- Fairhaven to Skenes Creek Coastal Trail Feasibility Study (Ernst Young 2019)
- Cape Patten to Skenes Creek Trail Alignment Feasibility Study (World Trail 2021)
- Great Otway National park and Otway Forest Park Management Plan (Parks Victoria & DSE 2009)
- Coastal Management Plan 2013 (GORCC 2013)
- Fairhaven to Eastern View Master Plan: 2015 - 2020 (GORCC 2015)
- Coastal Hazards Management Plan Marengo to Skenes Creek (Water Technology 2012)
- Species profiles and Threats databases (DAWE 2020)
- EPBC Act threatening processes list (DAWE 2021)
- FFG Act potentially threatening processes list (DELWP 2016)
- FFG action statements
- Scientific / Research papers by Gibson et al. (2002), Wilson (1990) and DEE (2016).

2.1.2 Database searches

The following databases were searched for information related to the search area and its surrounds:

- 10 kilometre buffered search of DELWP's Victorian Biodiversity Atlas (VBA), including the 'VBA_FLORA25, FLORA100 & FLORA Restricted' and 'VBA_FAUNA25, FAUNA100 & FAUNA Restricted' datasets.
- 10 kilometre buffered search of DAWE's Protected Matters Search Tool (PMST) for matters protected by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Other sources of biodiversity information were examined including:

- DELWP's NatureKit mapping tool
- Planning Scheme overlays relevant to biodiversity based on http://planningschemes.dpcd.vic.gov.au.

2.1.3 Spatial datasets

The following spatial datasets have been accessed and used to understand existing conditions and to identify opportunities and constraints:

- Topographic data including roads, waterways, contours, cadastre.
- Land tenure (public and private).
- Ecological Vegetation Classes (EVC) (NV2005_EVCBCS).
- *Flora and Fauna Guarantee Act 1988* Listed Communities (NV2005_FFG_COMM).
- Ecological Communities of National Environmental Significance Distributions (Public Grids).
- Victorian Biodiversity Atlas (VBA) flora and fauna records.
- Ramsar Wetlands of Australia (DoEE 2018).
- Public Land Management - Overlays (PLM25_OVERLAYS).

2.1.4 Ground validation

A preliminary site inspection of the trail alignments was undertaken by Principal Ecologist Matt Looby, Consultant Botanist Sam Trollope and Project Zoologist Erin Baldwin on 1 to 3 February 2022. Approximately 50 person hours were spent in the field to:

- Ground truth the locations of modelled EVCs intersecting proposed trail alignments.
- Confirm the presence and location of threatened ecological communities, EVCs and species habitat occurring within the assessment corridor and broader project area.
- Understand the on-ground constraints (e.g. site access, topography, land tenure) of the project area to guide detailed field work preparation and logistics.
- Identify opportunities to avoid and minimise removal of native vegetation and impacts to fauna habitat for consideration in Concept Alignment 3.

Biosis ecologists undertake site assessments under the following permits and approvals:

- Research Permit/Management Authorisation and Permit to Take/Keep Protected Flora & Protected Fish issued by DELWP under the Victorian *Wildlife Act 1975*, *Flora and Fauna Guarantee Act 1988* (FFG Act), *National Parks Act 1975* and *Crown Land (Reserves) Act 1978* (Permit Number 10008711)
- Approvals 30.17 and 19.18 issued by the Wildlife and Small Institutions Animal Ethics Committee of the Victorian Government Department of Economic Development, Jobs, Transport and Resources (DEDJTR)
- Scientific Procedures Fieldwork Licence issued by DEDJTR's Wildlife and Small Institutions Animal Ethics Committee (Licence Number 20020).

2.2 Identifying ecological values and constraints

2.2.1 Ecological values model

An ecological values model (map layer) was developed for the project area utilising a GIS-weighted overlay analysis. Weighted overlay analysis is a method that overlays and combines available input layers to produce a single map. The map result shows the influence of each of the input layers as they are added to or subtracted from each other.

For the GORCT project, seven input layers that represent various aspects of 'ecological value' were compiled, weighted and added (overlayed) together. These seven layers include hydrology, native vegetation condition, habitat likeness, DELWP Habitat Importance Model density, native vegetation conservation status, threatened species records and modelling threatened community occurrence. The resulting map shows a scale of known ecological values, where the higher the scale value, the higher the ecological value. Higher values mean ecological values place a higher constraint on trail design options. High constraints do not necessarily mean that a section of trail cannot be constructed, but that further investigation is required to aid decision making.

Five iterations of the weighted overlay analysis where conducted using different combinations of layer weights. The project ecologist evaluated the results and selected the result that best reflects their experience and understanding of the data and the environment on the ground. Appendix 3 provides the details of the results and layer weights.

2.2.2 Definitions of threatened species or communities

Threatened species or communities include those species or communities that are listed under the EPBC Act and / or FFG Act. The conservation status of a species or ecological community is determined by its listing status under Commonwealth or State legislation / policy (Table 3).

Table 3 Conservation status of threatened species and ecological communities

Conservation status	
National	Listed as nationally critically endangered, endangered or vulnerable under the EPBC Act
State	Listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable or conservation dependent in Victoria under the FFG Act

Lists of threatened species generated from the databases are provided in Appendix 1 (flora) and Appendix 2 (fauna) and the species have been assessed to determine their likelihood of occurrence based on the process outlined below.

2.3 Determining likelihood of occurrence of listed threatened species

Likelihood of occurrence indicates the potential for a species or ecological community to occur regularly within the project area. It is based on expert opinion, information in relevant biodiversity databases and reports, and a desktop assessment of the habitats on site. Likelihood of occurrence is ranked as negligible, low, medium, high or recorded. The rationale for the rank assigned is provided for each species in Appendix 1 (flora and TECs) and Appendix 2 (fauna). Those species or communities for which there is little or no suitable habitat within the project area are assigned a likelihood of low or negligible and are not considered further.

Only those species or communities listed under the EPBC Act or the FFG Act (hereafter referred to as ' threatened species and communities') are assessed to determine their likelihood of occurrence.

Threatened species which have at least medium likelihood of occurrence are given further consideration in this report and will be subject to future detailed investigations.

2.4 Desktop aquatic habitat assessment

A desktop aquatic assessment was undertaken with the aim to identify specific or sensitive environmental attributes most likely to occur within the project area that should be considered during the project's design. The desktop assessment is the culmination of a two stage process whereby aerial imagery was reviewed to broadly describe the aquatic habitats present within the project area. Following description, habitats were

assessed for their suitability for the occurrence of threatened aquatic biota using a combination of specialist knowledge and surrounding fauna records sourced from the VBA.

2.5 Legislation and policy

The following key pieces of legislation relating to biodiversity values are likely to apply to the project. They will be assessed in the detailed ecological assessment once the final concept route has been confirmed. The corresponding planning report will also identify approval requirements under each of the relevant pieces of legislation. These pieces of legislation and policy include:

- Matters listed under the EPBC Act, associated policy statements, significant impacts guidelines, listing advice and key threatening processes
- Threatened taxa, communities and threatening processes listed under Section 11 of the FFG Act and associated action statements, final recommendation reports and listing advice
- *Planning and Environment Act 1987*
- The Surf Coast and Colac Otway Planning Schemes
- *National Parks Act 1975*
- *Reference Areas Act 1978*
- *Heritage Rivers Act 1992*
- Noxious weeds and pest animals lists under the *Catchment and Land Protection Act 1994* (CaLP Act)
- *Environment Effects Act 1978*
- *Fisheries Act 1995*
- *Water Act 1989*
- *Environment Protection Act 2017*
- *Marine and Coastal Act 2018*
- *Great Ocean Road and Environs Protection Act 2020*.

2.6 Limitations

This desktop constraints assessment was developed using modelled information and databases curated by the Victorian and Australian government. The accuracy of the modelled information and results presented here is dependent on the accuracy and validity of these database records and spatial datasets.

The use of modelled information for small scale, linear developments such as walking trails is problematic, as the scale of mapping units does not often represent the extent of the on-ground constraint, particularly when the flexibility of trail development is considered.

During the ground validation field assessment, some trails were not inspected. The reason for this was restricted vehicle access through locked gates and private properties. Similarly, some sections of trail were not inspected due to difficult and steep terrain. In this situation, attempts were made to sample the sections of trail where access was most suitable and infer through aerial imagery interpretation whether the landscape was uniform. It was concluded by the field assessment team that the vegetation and habitat was uniform across the assessment area, and therefore the sections of trail not accessed would have similar ecological values and constraints to those that were surveyed.

The ground validation field assessment occurred in February 2022 (refer section 2.1.4). One of the objectives was to verify that habitat for threatened species was present and consistent with the values identified in the desktop assessment. Whilst a record of incidental observations was collected, the purpose was not to identify and search for threatened species. This objective will be assessed during the detailed assessment with recommendations and guidance provided that outlines specific timings for targeted surveys if they are required.

There are likely to be data deficient areas throughout the project area due to a lack of previous sampling and survey work, for example in the higher elevation areas of the Otway Ranges away from the centres of development. Conversely, some areas have a higher concentration of survey data such as the Heathland vegetation in the north of the project area. A conservative approach is therefore applied to this ecological assessment. Investigation of other databases and scientific research is undertaken, where possible, to provide further detail and cross reference.

While the purpose of this desktop assessment and preliminary field work is to address ecological values over the entire project area, an emphasis has been placed around the locations where new trails are proposed. Existing trails that will form part of the coastal trail network will be assessed during the detailed assessment once construction methodology and upgrade works have been confirmed.

Mapping shapefiles of the Concept Alignment 2 were supplied by World Trail.

3 Key ecological values and constraints

This section summarises the key ecological values that are key design considerations and will influence detailed field investigations, impact assessment and final trail design.

3.1 Landscape context

The project area (Figure 1) encompasses coastal and hinterland vegetation that forms part of two distinct bioregions within Victoria: The Otway Plain and the Otway Range bioregions.

The Otway Plain

The Otway Plain bioregion occurs at the north-east end of the project area around Fairhaven. This bioregion is characterised by sloping coastal plains (RBGV 2021a) occurring from the coast line to 200 metres in elevation (VRO 2021). The region has a temperate climate, dominated by westerly winds and receives an average annual rainfall ranging between 552 – 899 millimetres (VRO 2021). Although, the Otway ranges to the south-east of the Otway Plain in the project area creates a rain shadow effect which significantly decreases the amount of precipitation around the Anglesea area (RBGV 2021a).

While much of the vegetation has been cleared and replaced with land uses for cropping and settlement (RBV 2021a), there are a number of notable public reserves that contain the majority of native vegetation and habitat within the project area. These reserves include the Great Otway National Park and a number of coastal reserves such as Fairhaven Coastal Reserve and Boonah Coastal Reserve. Other nearby marine and coastal conservation reserves include the Eagle Rock Marine Sanctuary and the Lorne – Queenscliff Coastal Reserve.

Vegetation of the Otway Plain in the project area, consists largely of coastal heathlands that are dominated by Tea-tree *Leptospermum* spp. The community grades into woodland dominated by Swamp Gum *Eucalyptus ovata*, Brown Stringybark *E. baxteri* or Messmate *E. obliqua*, all with a heath-dominated understorey (RBGV 2021a). Dry sclerophyll forests are also present, co-dominated by Swamp Gum and Brown Stringybark. The major waterway is Painkalac Creek which feeds into saltmarsh wetlands dominated by Beaded Glasswort *Sarcocornia quinqueflora* and Sea Rush *Juncus kraussii* on the mud flats (RBGV 2021a).

The Otway Range

The Otway Range bioregion includes the majority of the project area, starting at the western extent of the Otway Plain until the south-west end of the project area at Skenes Creek. The landscape here is characterised by steep topography on the southern coastal fall of the ranges, although terrain immediately adjacent to the coast can be gentler slopes (RBGV 2021b).

The climate is associated with the topography of the ranges, but primarily consists of hot, dry summers and cool, wet winters. Rainfall is more frequent in winter and spring, the wettest regions of the Otway Range experiencing annual rainfall greater than 1800 millimetres (RBGV 2021b).

In the project area, vegetation within the Otway Range Bioregion is largely comprised of forests and woodlands. These vegetation types includes Cool Temperate Rainforest that is widespread in the region, however has declined markedly since European settlement (RBGV 2021b). This vegetation community is usually co-dominated by Myrtle Beech *Nothofagus cunninghamii* and Blackwood *Acacia melanoxylon* occurring in gullies. Wet sclerophyll forest is the dominant vegetation within the project area and is comprised of a tall canopy (exceeding 40 metres high). A variety of Eucalyptus species dominate this community, often driven by

moisture levels. Wet sclerophyll forests are widespread throughout the region, occurring on the high rainfall slopes of the Otway Ranges (RBGV 2021b).

The majority of vegetation cover throughout this part of the project area is continuous native vegetation forming part of the Great Otway National Park, broken up around settlements along the coastline.

3.2 Vegetation / habitat types

A total of six Ecological Vegetation Classes (EVCs) across Otway Plain bioregion and 16 EVCs across the Otway Range bioregion are modelled to occur within the assessment corridor according to DELWP's *Native Vegetation - Modelled 2005 Ecological Vegetation Classes (with Bioregional Conservation Status)* dataset (Figure 2). These EVCs are presented along with respective bioregional conservation status (BCS) in Table 4 and include a range of forest, scrub, woodland, wetland, heathland and rainforest communities. It should be noted that there are some EVCs, primarily wetland communities, not modelled within the NV2005_EVCBCS dataset (DELWP 2018a). Such EVCs may also be present within the project area but have not been captured in this desktop assessment due to the scale at which vegetation modelling is undertaken by DELWP.

Within the Otway Plain bioregion, one EVC (EVC 6 – Sand Heathland) has a BCS of Rare which reflects its limited geographical occurrence, and one EVC is considered Vulnerable (EVC 23 – Herb-rich Foothill Forest).

Within the Otway Range bioregion, two EVCs are considered Endangered (EVC 10 - Estuarine Wetland and EVC 31 - Cool Temperate Rainforest) and a further two EVCs are considered Vulnerable (EVC 3 - Damp Sands Herb-rich Woodland and EVC 198 - Sedgy Riparian Woodland).

The remaining EVCs across both bioregions are consider Least Concern, which means greater than 50% pre-European extent remains and this vegetation is subject to little to no degradation over a majority of its occurrence in the bioregions.

Table 4 DELWP 2005 modelled EVCs intercepted by Concept Alignment 2

EVC	BCS
Otway Plain Bioregion	
EVC 1 – Coastal Dune Scrub / Coastal Dune Grassland mosaic	Depleted
EVC 6 – Sand Heathland	Rare
EVC 21 - Shrubby Dry Forest	Least Concern
EVC 23 – Herb-rich Foothill Forest	Vulnerable
EVC 45 – Shrubby Foothill Forest	Least Concern
EVC 48 – Heathy Woodland	Least Concern
Otway Range Bioregion	
EVC 1 – Coastal Dune Scrub / Coastal Dune Grassland mosaic	Depleted
EVC 3 - Damp Sands Herb-rich Woodland	Vulnerable
EVC 10 - Estuarine Wetland	Endangered
EVC 16 - Lowland Forest	Depleted

EVC	BCS
EVC 17 - Riparian Scrub/Swampy Riparian Woodland Complex	Least Concern
EVC 18 - Riparian Forest	Least Concern
EVC 21 - Shrubby Dry Forest	Least Concern
EVC 22 - Grassy Dry Forest	Least Concern
EVC 23 – Herb-rich Foothill Forest	Depleted
EVC 30 - Wet Forest	Least Concern
EVC 31 - Cool Temperate Rainforest	Endangered
EVC 45 - Shrubby Foothill Forest	Least Concern
EVC 48 - Heathy Woodland	Least Concern
EVC 161 - Coastal Headland Scrub	Depleted
EVC 198 - Sedgy Riparian Woodland	Vulnerable
EVC 201 - Shrubby Wet Forest	Least Concern

Consideration of avoiding rare, threatened (endangered or vulnerable), sensitive or isolated vegetation types will be important through design to reduce the project's overall impacts and to locate the majority of impacts in more resilient and / or plentiful (e.g. Least Concern) vegetation types.

While much of the concept trail runs through a large proportion of EVCs with a Least Concern BCS (Table 5), there may be opportunities to reduce impacts within threatened EVCs if new trails are proposed by finding alternative trail alignments or using existing trails.

Table 5 Total area (ha) of modelled native vegetation in the 20 metre wide assessment corridor

Biodiversity Conservation Status	Total hectares
Otway Plain Bioregion	
Rare	1.64
Endangered	0
Vulnerable	0.43
Depleted	1.21
Least Concern	6.67
Otway Range Bioregion	
Rare	0
Endangered	0.67
Vulnerable	8.75

Biodiversity Conservation Status	Total hectares
Depleted	56.05
Least Concern	162.73

3.2.1 Aquatic habitats and threatened aquatic fauna

The project area contains a diversity of freshwater aquatic and riparian habitats consisting of numerous creeks, rivers, drainage lines, seasonal gullies, damp depressions and coastal wetlands.

Riparian systems are known to have a strong connection with instream systems and are sensitive to indicators of environmental change. The majority of rivers, streams and creeks within the project area are surrounded by forested areas of the Great Otway National Park and broader public land estate, which is contiguous with large tracts of Wet Forest and Shrubby Foothill Forest. The limited modification of terrestrial riparian habitat infers limited disturbance or modification to channel and instream habitats, which are likely to contain a diversity of flow conditions and depths (fast-shallow, slow-shallow, fast-deep) and instream structural complexity.

Stream habitat consists of both the underwater habitat provided by the shape of the stream channel (channel habitat) and the aquatic habitat provided within the stream channel (or instream habitat). Slow-flow, backwater, semi-permanent or permanent instream pool/run environments within rivers, streams and creeks within the project area are likely to contain significant areas of overhanging vegetation, root cover, submerged rocks, woody debris, leaf packs and detritus. These habitat features are likely to provide habitat for a diversity of locally common species of frogs, fish, sensitive macroinvertebrates (e.g. Stoneflies and Caddisflies) as well as FFG Act listed threatened species Platypus *Ornithorhynchus anatinus* and Otway Bush Yabby *Geocharax tasmanicus*.

Boulders and rocky outcrops situated within riparian zones of waterway are likely to provide roosting sites for a diversity of birds and basking sites for reptiles, whilst fallen leaf litter and bark within and adjacent to rivers, creeks, drainage lines, wetlands and damp areas are likely to provide habitat for FFG Act listed species Otway Burrowing Crayfish *Engaeus fultoni* and Hairy Burrowing Crayfish *Engaeus sericatus* (terrestrial species that are reliant on subsurface riparian water).

Numerous freshwater wetlands are likely to exist within the project area. Wetlands located within forested and undisturbed environments are likely to contain a high diversity of macrophytes and are likely to provide high quality breeding habitat for a small number of locally common waterbirds, fish and frogs as well as potential foraging and / or breeding habitat for threatened EPBC Act listed species Australasian Bittern *Botaurus poiciloptilus* and Australian Painted Snipe *Rostratula australis*.

A number of larger rivers and creeks intercept the project area, connecting with estuarine and marine environments. Diadromous species such as the EPBC Act listed Australian Grayling *Prototroctes maraena* and FFG Act listed Australian Mudfish *Neochanna cleaveri* have been recorded within a number of these larger waterways. Records of Australian Grayling within the waterway environments (listed in Section 3.4.1 of this report) infer such systems are likely to contain sections of moderate to fast flow, with a gravel substrate and alternating pool and riffle zones (of which is the species preferred habitat).

3.2.2 Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDEs) are ecosystems that are partially or completely dependent on underground water, or the surface expression of this water, for their existence or health. These ecosystems include flora and fauna species and communities that are dependent on water discharge to the surface at a level where they can access to persist in permanently wet environments, or to persist during times of extended low rainfall.

Agriculture Victoria (2020) states that the Corangamite CMA is a complex span of landscapes, however the most likely areas of potential GDE occurrence are in forested areas near the coast where local springs and soaks may feed forested gullies or wetland vegetation.

3.3 Threatened flora

Threatened flora has a higher chance of being impacted during works due the sedentary nature of flora species and, for some species such as grasses or dormant herbs, the difficulty in identifying individuals. Consideration will need to be given to habitat for threatened flora species at the detailed design and assessment phase for all works associated with the project. In general the risk of significantly impacting threatened flora can be reduced through a combination of detailed assessment, design response and micro-siting at the construction stage (especially for trails).

A 10 kilometre buffered search of the EPBC Protected Matters Search Tool and Victorian biodiversity databases indicates 16 nationally listed and 74 Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) listed flora species occur, or are predicted to occur, in the search area. These species are provided with likelihood rankings in Appendix 1 (flora). A total of seven nationally listed and 38 state listed flora species are considered to have a medium or higher likelihood of occurring within the project area (Table 6). Five of the seven nationally listed flora species are also of state listed. All database records of threatened flora occurring in the project area are included in Figure 3.

Table 6 Threatened flora species most likely to require further consideration during the detailed design, assessment and approvals phase

Scientific name	Common name	Conservation status	
		EPBC	FFG
National significance			
Amphibromus fluitans	River Swamp Wallaby-grass	VU	
Grevillea infecunda	Anglesea Grevillea	VU	e
Leiocarpa gatesii	Wrinkled Buttons	VU	cr
Prasophyllum spicatum	Dense Leek-orchid	VU	cr
Pterostylis chlorogramma	Green-striped Greenhood	VU	e
Pterostylis cucullata	Leafy Greenhood	VU	
Thelymitra matthewsii	Spiral Sun-orchid	VU	e
State significance			
Acacia nanodealbata	Dwarf Silver-wattle		v
Acacia verticillata subsp. *ruscifolia*	Broad-leaf Prickly Moses		e
Caladenia maritima	Angahook Pink-fingers		cr
Caladenia valida	Robust Spider-orchid		cr
Caladenia venusta	Large White Spider-orchid		e
Caladenia vulgaris	Slender Pink-fingers		v
Calochilus imberbis	Naked Beard-orchid		cr
Calyptrochaeta brownii	Brown's Mitre-moss		e
Chaetospora turbinata	Top Bog-sedge		v
Echinodium hispidum	Madeira Moss		v
Eucalyptus brookeriana	Brooker's Gum		e
Eucalyptus falciformis	Western Peppermint		v

Scientific name	Common name	Conservation status	
		EPBC	FFG
Eucalyptus globulus subsp. *globulus*	Southern Blue-gum		e
Eucalyptus litoralis	Otway Grey-gum		e
Euryomyrtus ramosissima subsp. *prostrata*	Nodding Baeckea		e
Gratiola pumilo	Dwarf Brooklime		e
Lawrencia spicata	Salt Lawrencia		e
Lepidosperma canescens	Hoary Rapier-sedge		e
Monotoca glauca	Currant-wood		e
Nematolepis squamea subsp. *squamea*	Satinwood		v
Poa billardierei	Coast Fescue		e
Poa poiformis var. *ramifer*	Dune Poa		e
Prasophyllum barnettii	Elegant Leek-orchid		e
Pterostylis sp. aff. *plumosa* (Anglesea)	Large Plume-orchid		cr
Roepera billardierei	Coast Twin-leaf		e
Thelymitra benthamiana	Blotched Sun-orchid		e
Thelymitra hiemalis	Winter Sun-orchid		cr
Thelymitra pallidiflora	Pallid Sun-orchid		cr
Thelymitra X merraniae	Merran's Sun-orchid		cr
Thomasia petalocalyx	Paper Flower		e
Xanthorrhoea caespitosa	Tufted Grass-tree		v
Xanthosia leiophylla	Parsley Xanthosia		e
Xanthosia tasmanica	Southern Xanthosia		e

3.3.1 Nationally significant flora

The seven nationally listed flora species considered likely to occur within the project area occur in a variety of habitats including woodland, heathland, coastal scrub and wetland vegetation types. The seven species listed under the EPBC Act most likely to occur within the assessment area are:

- River Swamp Wallaby-grass *Amphibromus fluitans*
  - This species occurs in south-eastern Australia and is recorded inland from Lorne, on the northern fall of the Otway Range.
  - This species is likely to occur along slow moving waterways including swamps, lagoons, and billabongs and may also occupy artificial habitats such as dams (DEWHA 2008).
- Anglesea Grevillea *Grevillea infecunda*
  - Population is endemic to the Anglesea and Aries Inlet area where it occurs in dry-sclerophyll forests and woodlands, usually under a sparse canopy and on sandy soils (Oberon 2006a).
  - Likely to occur in Heathland EVCs and Lowland Forest EVCs within the Otway Plain Bioregion.
- Wrinkled Buttons *Leiocarpa gatesii*
  - Population is endemic to the southern fall of the Otway Range, between Fairhaven and Lorne, where is occurs in damp forest and lowland forest (Oberon 2006b).

- Likely to occur in wetter forest EVCs including EVC 201 Shrubby Wet Forest and EVC 45 Shrubby Foothill Forest.

- Dense Leek-orchid *Prasophyllum spicatum*
  - Recorded in the heathland EVCs near Anglesea, this species prefers coastal or near-coastal heathland and heathy woodland habitat, usually on sandy soils (Duncan 2010).
  - Likely to occur within EVC 48 - Heathy Woodland inland of Fairhaven.
- Green-striped Greenhood *Pterostylis chlorogramma*
  - This species is endemic to Victoria, where it has a wide distribution from South Gippsland to West Victoria. Its preferred habitat is mixed box-stringybark forest that has a shrubby understorey (Duncan, Pritchard, & Coates 2009). It has been recorded in Lowland Forest near Fairhaven.
  - Also likely to occur in heathy and shrubby habitats.
- Leafy Greenhood *Pterostylis cucullata*
  - This species is endemic to south-eastern Australia where is occurs as two different subspecies. The lowland subspecies *cucullata* occurs primarily in Coast Tea-tree *Leptospermum laevigatum* or Moonah *Melaleuca lanceolata* coastal scrubs (Duncan, M 2010a). No records within 10 kilometres of the assessment area.
  - Likely to occur within EVC 1 - Coastal Dune Scrub/Coastal Dune Grassland Mosaic along the coastline adjoining the project area.
- Spiral Sun-orchid *Thelymitra matthewsii*
  - This species occurs in Victoria and South Australia where is grows in heathy open forests and woodlands (Duncan, M 2010b). Recorded in Lowland Forest and Heathy Woodland near Anglesea and Fairhaven.
  - Likely to occur in heath EVCs such as EVC 48 – Heathy Woodland, EVC 6 – Sand Heathland and Lowland Forest EVCs within the Otway Plain bioregion.

Terrestrial orchids are cryptic species that remain dormant in the form of an underground tuber for several months when they cannot be detected during surveys. It is recommended that any works associated with the project avoid areas where the species has been previously recorded (e.g. VBA records) and areas of suitable habitat, particularly heathy EVCs such as EVC 48 Heathy Woodland and EVC 6 Sand Heathland, but also EVC 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic and EVC 16 Lowland Forest.

In the event that impacts within suitable habitat for any EPBC Act listed species is unavoidable it is highly likely that targeted surveys will be required to support an assessment of the potential for significant impact on matters of national environmental significance (MNES) (which includes EPBC Act listed flora species).

3.3.2 State significant flora

The 38 FFG Act flora species considered to have a medium or higher likelihood of occurring within the project area occupy a wide range of habitats from riparian zones and rainforest through to shrublands, heathlands and coastal dunes. Records of FFG Act listed flora species are widespread throughout the project area with a notable concentration of listed species records around the heathy habitat types of the Otway Plain bioregion (near Fairhaven) and in the forest habitats of the Otway Range bioregion around Lorne.

Due to the large number of FFG Act listed flora species and the breadth of habitats that these species occupy it is likely that several of these species will need to be considered further. This may include a detailed flora assessment and micro-siting process once the concept route has been finalised.

3.4 Threatened fauna

A search of the EPBC Protected Matters Search Tool and Victorian databases indicates 115 threatened fauna species occur, or are predicted to occur, within 10 kilometres of the project area. Of those, 24 species listed under the EPBC Act and 35 species listed under the FFG Act have been recorded or assessed to have a medium or higher likelihood of occurrence within the project area (Appendix 2). Threatened fauna recorded within the project area are shown in Figure 3.

The majority of threatened fauna known or predicted to occur within the project area are highly mobile, pelagic and / or volant (i.e. species that primarily fly or glide). Impacts to these species are considered negligible, as they are unlikely to be disturbed by terrestrial, ground based activities.

Hollow-dependent fauna, sedentary fauna or fauna with relatively defined ecological niches and / or small home ranges are considered most likely to be impacted by the project due to their ecology and habitat requirements and the nature of the proposed activities, which may involve habitat loss and disturbance. These species (herein referred to as 'species most likely to require further consideration during the detailed design phase') are discussed further in the below sections.

3.4.1 Nationally significant fauna

Ten (10) nationally significant fauna are considered likely to require further consideration during the detailed design phase of the project (Table 7), due to their ecology and habitat requirements.

Table 7 Nationally significant fauna species most likely to require further consideration during the detailed design phase

Scientific name	Common name	Conservation status	
		EPBC	FFG
National significance			
Rostratula australis	Australian Painted-snipe	EN	cr
Botaurus poiciloptilus	Australasian Bittern	EN	cr
Thinornis cucullatus	Hooded Plover	VU	v
Dasyurus maculatus maculatus	Spot-tailed Quoll	EN	e
Antechinus minimus maritimus	Swamp Antechinus	VU	v
Potorous tridactylus trisulcatus	Long-nosed Potoroo	VU	v
Mastacomys fuscus mordicus	Broad-toothed Rat	VU	v
Isoodon obesulus obesulus	Southern Brown Bandicoot	EN	e
Miniopterus orianae bassanii	Southern Bent-winged Bat (southern ssp.)	CR	cr
Prototroctes maraena	Australian Grayling	VU	e

Habitats and the location of records of nationally significant fauna within the project area considered most likely to require further consideration during the detailed design phase of the project are summarised below:

- Australian Painted Snipe

- Australian Painted Snipe is common in eastern Australia where it inhabits a wide range of shallow freshwater wetlands, including temporary and permanent lakes, swamps and claypans with dense, emergent tussocks of grass, sedges, rushes or reeds.
- No records of Australian Painted Snipe occur within search area. However, this species is widespread and cryptic, and may occasionally occur in wetlands, swamps or shallow areas in rivers and creeks throughout the project area.

- Australasian Bittern
  - Australasian Bittern is divided into two sub-populations in Australia, referred to as the south-eastern (south–east Queensland to south–east South Australia and Tasmania) and the south-western (south-west of Western Australia) populations, where it predominantly occurs in discrete, freshwater wetlands with tall dense vegetation; particularly those dominated by sedges, rushes and reeds or cutting grass growing over a muddy or peaty substrate.
  - Five records of Australasian Bittern occur within the search area. The closest records to the project area are in forest north-east of Airey's Inlet, south of Apollo Bay and north of Skene's Creek. This species is widespread and cryptic, and may occasionally occur in wetlands, swamps or shallow areas in rivers and creeks throughout the project area.
- Hooded Plover
  - Hooded Plover inhabit littoral environments (i.e. environments relating to or situated on the shore of the sea), estuaries and coastal lakes. Breeding pairs occupy distinct territories and are highly selective of habitats that support their survival and reproductive needs.
  - Numerous records of Hooded Plover have been recorded within littoral and estuarine environments within the search area. The species is locally 'iconic' (i.e. strong local community focus/effort at stabilising and restoring species numbers/habitat). The majority of records within the project area concentrate between Fairhaven and Airey's Inlet, and between Apollo Bay and Skene's Creek. However, it is likely that breeding pairs may be present within suitable habitat throughout the project area.
- Spot-tailed Quoll
  - In Victoria, Spot-tailed Quoll is mainly confined to national parks, reserves and state forests where it prefers mature wet forest and areas containing a dense overstorey and understorey with an abundance of rocks, large hollow-bearing trees, rocky escarpments and/or fallen logs for dens. Heathy woodland and coastal scrub habitats are also known to be occasionally utilised by male quolls as secondary habitat for foraging.
  - Some records of Spot-tailed Quoll have been recorded within a variety of habitats within the project area including Wet Forest, Shrubby Foothill Forest, Swamp Scrub, Heathy Woodland and Sand Heathland. More recent records (<10 years) have been recorded south-east of the concept trail (nearby Conservation Ecology Centre; scat detected in 2012 by Parks Victoria). This species is highly cryptic and may inhabit a variety of wet forest, woodland and heathland vegetation types present throughout the project area.
- Swamp Antechinus
  - Swamp Antechinus inhabit damp areas, with dense vegetation (1-2 metres above ground level), within wet heathlands, tussock grasslands, sedgelands, damp gullies, swamps and shrubby woodlands typically <220 metres above sea level.

- Numerous records of Swamp Antechinus have been recorded within the project area. The majority of recent records are scattered throughout Coastal Heathland Scrub, Heathy Woodland, Lowland Forest and Shrubby Dry Forest surrounding Airey's Inlet. However, there is also potential for this species to be present within Swamp Scrub, Sand Heathland, Riparian Scrub/Swamp Riparian Woodland, Sedgy Riparian Woodland and Coastal Tussock Grassland throughout the project area in areas which contain suitable habitat.

- Long-nosed Potoroo
  - Long-nosed Potoroo primarily inhabit a diversity of dense and open forest and woodland environments containing a patchwork of ground cover densities, where they feed primarily on both hypogeous and epigeous components of fungal fruit bodies.
  - Numerous, including recent (<10 years), records of Long-nosed Potoroo have been recorded within the eastern half of the project area (north of Wye River), predominantly in Shrubby Foothill Forest. Wetter forest types (e.g. Wet Forest, Shrubby Foothill Forest and Riparian Forest) within the project area are likely to provide shelter sites throughout the day and protection from both terrestrial and airborne predators. Open heathland and woodlands (e.g. Damp Sands Herb-rich Woodland, Heathy Woodland and Coastal Heathland Scrub) are also likely to provide greater foraging opportunities where the understorey is less dense.
- Broad-toothed Rat
  - Broad-toothed Rat occupies a range of habitats across alpine and non-alpine areas, but is typically highly selective preferring heathlands, grassland adjacent to boulder outcrops, swamps, sedgelands, coastal grassy or shrubby dunes, and sometimes forests with grassy understories not far from drainage lines.
  - Some records of Broad-toothed Rat have been recorded within Shrubby Foothill Forest and Wet Forest habitat types in association with creeks or drainage lines within the project area. Recent records (<10 years) within the study area concentrate to a drainage line north of Cumberland River. This species is cryptic and has potential to occur within heathland, sedgeland, and sedgeland dominated areas within a variety of forest, woodland and heathland types within the study area including: Heathy Woodland, Shrubby Wet Forest, Swamp Scrub, Sand Heathland, Riparian Scrub/Swamp Riparian Woodland, Sedgy Riparian Woodland and Coastal Tussock Grassland.
- Southern Brown Bandicoot
  - Southern Brown Bandicoot are known to inhabit a variety of habitats including heathland, shrubland, sedgeland, heathy open forest and woodland which contain low dense ground cover.
  - Some recent records of Southern Brown Bandicoot concentrate in the eastern section of the study area surrounding Airey's Inlet where they have been recorded within Heathy Woodland, Shrubby Dry Forest and Damp Sands Herb-rich Woodland. Numerous and recent records within these habitats types extend north-east beyond the project area boundary, concentrating around the Anglesea River. This species also have potential to occur within Sand Heathland, Riparian Scrub/Swamp Riparian Woodland and Sedgy Riparian Woodland.
- Southern Bent-winged Bat (southern spp.)
  - Southern Bent-winged Bat (southern spp.) is an insectivorous, obligate cave-dwelling bat. Habitat critical to the survival of the Southern Bent-wing Bat includes three maternity caves and non-maternity caves. Foraging predominately occurs over swamps and terrestrial vegetation

surrounding the fringes of aquatic vegetation. However, surrounding native forests are commonly used.

  - No records of Southern Bent-wing Bat (southern spp.) occur within the search area. However, the distribution of the Southern Bent-wing Bat and Eastern Bent-wing Bat overlap in western Victoria, with the Southern Bent-wing Bat (southern spp.) known to roost in four caves in the Otways, Camperdown and Lorne area (location of caves not disclosed). Caves in these areas are utilised as non-breeding sites, and may potentially occur within the project area.

- Australian Grayling
  - Australian Grayling is a diadromous species which spend most of their lives in freshwater, inhabiting streams with a moderate to fast flow, with a gravel substrate and alternating pool and riffle zones. Adults respond to flow events in autumn (April-May) by undertaking downstream migrations to lower freshwater reaches of rivers to spawn. Juveniles migrate out to sea before returning to freshwater at four to six months in age.
  - Australian Grayling has been recorded in Wild Dog Creek, Skenes Creek, Carisbrook Creek, Kennett River, Wye River, Cumberland River, Saint George River, Erskine River and Grassy Creek within and / or adjacent to the project area. There is potential for this species to occur in other streams and creeks (connected to marine environments for spawning) that intercept the project and study areas.

In the event that impacts within suitable habitat for any EPBC Act listed species is unavoidable it is highly likely that targeted surveys will be required to support an assessment of the potential for significant impact on matters of national environmental significance (MNES) (which includes EPBC Act listed species).

3.4.2 State significant fauna

Seventeen (17) state significant fauna are considered likely to require further consideration during the detailed design phase of the project (Table 8), due to their ecology and habitat requirements.

Table 8 State significant fauna species most likely to require further consideration during the detailed design phase

Scientific name	Common name	FFG Act Conservation status
State significance		
Lewinia pectoralis	Lewin's Rail	v
Ninox connivens	Barking Owl	cr
Ninox strenua	Powerful Owl	v
Tyto novaehollandiae	Masked Owl	cr
Calamanthus pyrrhopygius	Chestnut-rumped Heathwren	v
Stagonopleura guttata	Diamond Firetail	v
Dasyornis broadbenti caryochrous	Rufous Bristlebird (Otway)	v
Sminthopsis leucopus	White-footed Dunnart	v
Ornithorhynchus anatinus	Platypus	v
Miniopterus orianae oceanensis	Eastern Bent-winged Bat	cr
Lissolepis coventryi	Swamp Skink	e
Pseudophryne semimarmorata	Southern Toadlet	e
Neochanna cleaveri	Australian Mudfish	e
Victaphanta compacta	Otway Black Snail	e

Scientific name	Common name	FFG Act Conservation status
Geocharax tasmanicus	Otway Bush Yabby	e
Engaeus fultoni	Otway Burrowing Crayfish	v
Engaeus sericatus	Hairy Burrowing Crayfish	v

Consistent with national significant fauna, state significant fauna most likely to require further consideration during the detailed design phase occur within a broad variety of habitats including forests, woodlands, heathlands, caves and aquatic environments within the project area. A summary of habitat types and features within the project area most likely to be occupied by these species are provided in Table 9.

Table 9 Habitat type and features of state significant fauna most likely to require further consideration during the detailed design phase

Common name	FFG Act Conservation Status	Habitat type	Habitat features
Lewin's Rail	v	Freshwater aquatic environments.	Temporary and permanent lakes, swamps and claypans with dense, emergent tussocks of grass, sedges, rushes or reeds.
Barking Owl	cr	Shrubby Dry Forest, Shrubby Wet Forest, Shrubby Foothill Forest, Lowland Forest, Riparian Forest, Swampy Riparian Woodland and Cool Temperate Rainforest.	Most likely to roost or nest in forests and woodland habitat types, as well as in sheltered gullies with dense understoreys or along watercourses, where they are reliant on dense canopies and large, old hollow-bearing trees.
Powerful Owl	v	Shrubby Dry Forest, Shrubby Wet Forest, Shrubby Foothill Forest, Lowland Forest, Riparian Forest, Swampy Riparian Woodland and Cool Temperate Rainforest.	Most likely to roost or nest in forests and woodland habitat types, as well as in sheltered gullies with dense understoreys or along watercourses, where they are reliant on dense canopies and large, old hollow-bearing trees.
Masked Owl	cr	Shrubby Dry Forest, Shrubby Wet Forest, Shrubby Foothill Forest, Lowland Forest, Riparian Forest, Swampy Riparian Woodland and Cool Temperate Rainforest.	Most likely to roost or nest in forests and woodland habitat types, as well as in sheltered gullies with dense understoreys or along watercourses, where they are reliant on dense canopies and large, old hollow-bearing trees.
Chestnut-rumped Heathwren	v	Coastal Heathland Scrub, Heathy Woodland, Shrubby Foothill Forest and Shrubby Wet Forest.	Low, dense vegetation for foraging and nesting.
Diamond Firetail	v	Coastal Heathland Scrub, Heathy Woodland, Shrubby Foothill Forest and Shrubby Wet Forest.	Vegetation with a dense understorey.

Common name	FFG Act Conservation Status	Habitat type	Habitat features
Rufous Bristlebird (Otway)	v	Coastal Heathland Scrub, Heathy Woodland, Shrubby Foothill Forest and Shrubby Wet Forest.	Vegetation with a dense understorey.
White-footed Dunnart	v	Coastal Heathland Scrub, Heathy Woodland, Shrubby Foothill Forest, Shrubby Wet Forest, Sedgy Riparian Woodland and Swampy Riparian Woodland, Damp Sands Herb-rich woodland, Damp Heath Scrub and Swamp Scrub.	Heathland, Sedgeland, and sedge-dominated areas associated with drainage lines.
Platypus	v	Freshwater aquatic environments.	Freshwater creeks, slow-moving rivers and lakes joined by rivers.
Eastern Bent-winged Bat	cr	Freshwater and forest environments for foraging and potential for non-breeding roosting caves to be present within study area.	Swamps and terrestrial vegetation occurring around the fringes of aquatic environments. However, native forests are also commonly used.
Swamp Skink	e	Swamp Scrub, Damp Sands Herb-rich Woodland, Swampy Riparian Woodland, Sedgy Riparian Woodland and Damp Heath Scrub.	Restricted to densely vegetated swamps and associated watercourses, wet heaths, sedge lands and saltmarshes.
Southern Toadlet	e	Wet Forest and Riparian Forest	Low elevations in damp areas with leaf litter, logs and rocks for shelter.
Australian Mudfish	e	Freshwater, estuarine and marine environments.	Streams and rivers connected to the ocean. Diadromous species which migrates from the sea to freshwater habitats which comprise swampy sites, drains and semi-permanent waters with abundant aquatic vegetation.
Otway Black Snail	e	Wet Forest and Cool Temperate Rainforest	No particular habitat preferences. It can be found equally on ridgelines, gullies and slope ecotones.
Otway Bush Yabby	e	Freshwater aquatic environments.	Freshwater creeks, streams and slow-flowing rivers.
Otway Burrowing Crayfish	v	Wet Forest, Cool Temperate Rainforest, Riparian Forest	Riparian zones, damp areas and drainage lines >100 metres in elevation
Hairy Burrowing Crayfish	v	Wet Forest and Riparian Forest	Riparian zones, damp areas and drainage lines.

The majority of assessment corridor includes public land. As a public authority, DELWP has a duty under the FFG Act to consider objectives of FFG Act, Biodiversity 2037 targets (DELWP 2017c), action statements, potentially threatening processes (i.e. loss of hollow-bearing trees or coarse woody debris), critical habitat determinations and management plans made under the Act. Whilst approvals for impacts to FFG Act fauna habitat and communities are currently not required under the FFG Act, impacts will be considered by DELWP and the Responsible Authority in determining a response to an application for vegetation removal under Clause 52.17.

3.5 Threatened ecological communities

A 10 kilometre buffered search of the EPBC Protected Matters Search Tool and Victorian databases indicates five nationally listed EPBC Act and two Victorian FFG Act listed ecological communities occur, or are predicted to occur, in the search area. Of these, three nationally listed and two state listed threatened ecological communities (TECs) are considered likely to occur within the project area. Modelled occurrences of these TECs are presented in Figure 2.

3.5.1 Threatened ecological communities listed under EPBC Act

The following two nationally listed threatened communities have modelled EVCs that correspond with the community within the project area and may require further consideration during the detailed design and assessment phase of the project:

- Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community
  - This TEC occurs along the Victorian coastline between the South Australian border and Wilsons Promontory (DoEE 2018), occurring within salt-wedge estuaries.
  - There are 25 salt wedge estuaries that occur along the central and western coastline of Victoria. Of these, five are situated within the project area: Painkalac Creek (Fairhaven), Erskene River (Lorne), Saint George River (Lorne), Wye River and Kennett River.
  - Existing bridges are proposed to be part of the trail alignment when crossing the estuaries where this community occurs.
- Subtropical and Temperate Coastal Saltmarsh
  - This TEC occurs within a relatively narrow margin of the Australian coastline. The physical environment for the ecological community is coastal areas under regular or intermittent tidal influence (DSEWPC 2013a).
  - This TEC is modelled to occur along the lower reaches of Erskine River and Wye River.
  - Existing bridges are proposed to be part of the trail alignment when crossing the estuaries where this community occurs.

3.5.2 Threatened communities listed under FFG Act

The following state listed threatened communities are modelled within the project area and may require further consideration during the detailed design and assessment phase of the project:

- Cool Temperate Rainforest Community (and the associated Cool Temperate Mixed Forest Community)

- This community occurs most commonly in wet gullies, along the margins of streams, forming extensive stands in undisturbed areas that are protected from fire. It is modelled to occur within the Otway Ranges (DSE 2009).
- This TEC is modelled to occur, inland from the coast within the Otway Ranges bioregion, in the sheltered gullies of the southern fall of the ranges, especially between Kennett River and Skenes Creek.

- Coastal Moonah (*Melaleuca lanceolata* subsp. *lanceolata*) Woodland Community
  - This community is dominated by Moonah *Melaleuca lanceolata* subsp. *lanceolata* supported by an understorey of graminoids and woody perennial plants. It occurs as scattered patches along the coast between Phillip Island and Lorne (DSE 2003).
  - This TEC is modelled to occur along the coast, primarily around Fairhaven.

Table 10 summarises the EVCs modelled within the project area that best correspond to each TEC. It is recommended that impacts to TECs, particularly the critically endangered EPBC Act listed TECs, are avoided and / or minimised during the design and assessment phase of the project. Potential impacts to several TECs could be avoided during the design by locating project works outside of Wetland EVCs (including EVC 9 – Coastal Saltmarsh and EVC 10 - Estuarine Wetland) and other sensitive EVCs such as EVC 31 - Cool Temperate Rainforest. If these TECs cannot be avoided then developing a trail design that minimises impact to hydrology and impacts to the forest floor is recommended that are specific to the sensitivities of each TEC.

Table 10 TECs most likely to occur in the project area with corresponding EVC(s)

TEC	Corresponding EVC(s)
Nationally listed	
Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community[1]	EVC 09 - Coastal Saltmarsh
	EVC 10 - Estuarine Wetland
Subtropical and Temperate Coastal Saltmarsh[2]	EVC 09 - Coastal Saltmarsh
	EVC 10 - Estuarine Wetland
State listed	
Cool Temperate Rainforest/Cool Temperate Mixed Forest Community	EVC 31 - Cool Temperate Rainforest
Coastal Moonah (*Melaleuca lanceolata* subsp. *lanceolata*) Woodland Community	EVC 1 - Coastal Dune Scrub/Coastal Dune Grassland Mosaic

Notes to table:

[1] Corresponding EVCs outlined in DoEE (2018)

[2] Corresponding EVCs outlined in DSEWPC (2013a)

[3] Corresponding EVCs outlined in DEH (2006)

Otway Plain

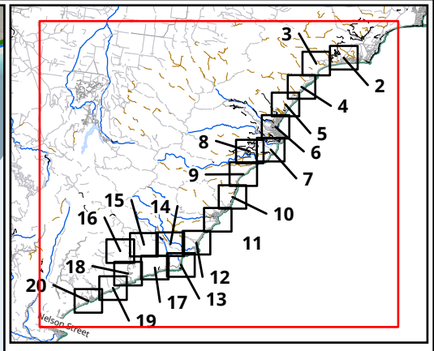
SURF COAST SHIRE

COLAC OTWAY SHIRE

Otway Ranges

Otway Plain

Esri, Geoscience Australia, NASA, NGA, USGS



Legend

Project area

Trail alignment

- Beach/Rock Shelf
- Existing Informal Trail
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail
- Other

Protected communities

- EPBC Act Ecological Communities of National Environmental Signficance
- Flora and Fauna Guarantee Act listed communities

Ecological vegetation class

- 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic
- 10 Estuarine Wetland
- 16 Lowland Forest
- 161 Coastal Headland Scrub
- 163 Coastal Tussock Grassland
- 17 Riparian Scrub/Swampy Riparian Woodland Complex
- 18 Riparian Forest
- 198 Sedgy Riparian Woodland
- 201 Shrubby Wet Forest
- 21 Shrubby Dry Forest
- 22 Grassy Dry Forest
- 23 Herb-rich Foothill Forest
- 3 Damp Sands Herb-rich Woodland
- 30 Wet Forest
- 302 Coastal Saltmarsh/Mangrove Shrubland Mosaic
- 31 Cool Temperate Rainforest
- 45 Shrubby Foothill Forest
- 48 Heathy Woodland
- 6 Sand Heathland
- 83 Swampy Riparian Woodland
- 894 Scoria Cone Woodland

Figure 2.1 Ecological vegetation class in the proximity of the trail alignment

0 1,000 2,000 3,000 4,000 5,000

Metres

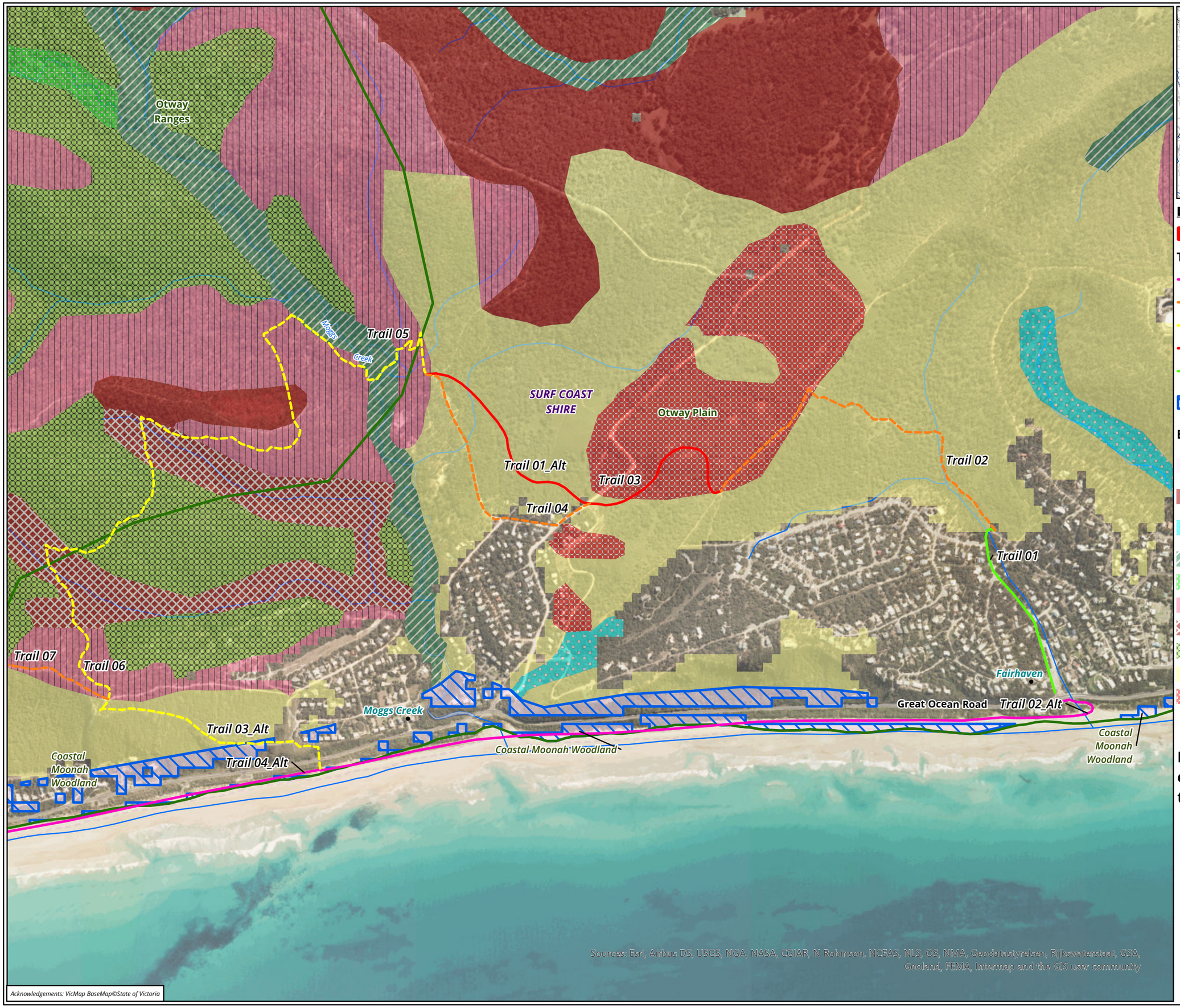
Scale: 1:130,000 @ A3

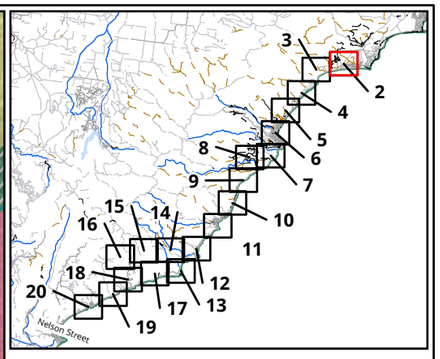
Coordinate System: GDA 1994 VICGRID94

N

biosis

Matter: 35990,
Date: 06 January 2022 ,
Prepared for: ML, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F2_EVC
Project: P:\35800s\35871\Mapping\
35990_GORT_WT_Ecology_Figures.aprx





Legend

Project area

Trail alignment

- Beach/Rock Shelf
- Existing MVO Track
- Existing Walking Trail
- New Walking Trail
- Other
- Flora and Fauna Guarantee Act listed communities

Ecological vegetation class

- 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic
- 16 Lowland Forest
- 17 Riparian Scrub/Swampy Riparian Woodland Complex
- 198 Sedgy Riparian Woodland
- 201 Shrubby Wet Forest
- 21 Shrubby Dry Forest
- 23 Herb-rich Foothill Forest
- 45 Shrubby Foothill Forest
- 48 Heathy Woodland
- 6 Sand Heathland

Figure 2.2 Ecological vegetation class in the proximity of the trail alignment

0 100 200 300 400 500

Metres

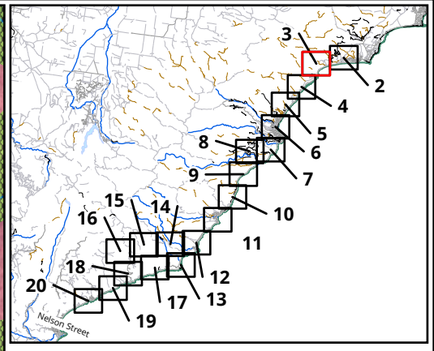
Scale: 1:10,000 @ A3

Coordinate System: GDA 1994 VICGRID94

N

biosis

Matter: 35990,
Date: 06 January 2022 ,
Prepared for: ML, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F2_EVC
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx



Legend

Project area

Trail alignment

- Beach/Rock Shelf
- Existing Informal Trail
- Existing MVO Track
- New Walking Trail
- Flora and Fauna Guarantee Act listed communities

Ecological vegetation class

- 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic
- 16 Lowland Forest
- 161 Coastal Headland Scrub
- 17 Riparian Scrub/Swampy Riparian Woodland Complex
- 201 Shrubby Wet Forest
- 21 Shrubby Dry Forest
- 23 Herb-rich Foothill Forest
- 45 Shrubby Foothill Forest
- 48 Heathy Woodland

Coolnine Creek
Otway Ranges
SURF COAST SHIRE
Trail 08
Trail 06_Alt
Trail 09
Otway Plain
Coastal Moonah Woodland
Trail 05_Alt
Eastern View
Memorial Arch
Trail 04_Alt
Great Ocean Road
Spout Creek
Trail 10
Trail 11
Grassy Creek
Trail 12
Trail 13
Trail 14
Great Ocean Road

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

Acknowledgements: VicMap BaseMap©State of Victoria

Figure 2.3 Ecological vegetation class in the proximity of the trail alignment

0 100 200 300 400 500

Metres

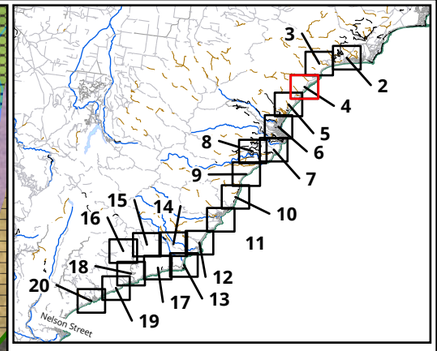
Scale: 1:10,000 @ A3

Coordinate System: GDA 1994 VICGRID94

N

biosis

Matter: 35990,
Date: 06 January 2022 ,
Prepared for: ML, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F2_EVC
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx



Legend

Project area

Trail alignment

Existing MVO Track

New Walking Trail

Ecological vegetation class

16 Lowland Forest

161 Coastal Headland Scrub

201 Shrubby Wet Forest

21 Shrubby Dry Forest

3 Damp Sands Herb-rich Woodland

45 Shrubby Foothill Forest

Figure 2.4 Ecological vegetation class in the proximity of the trail alignment

0 100 200 300 400 500

Metres

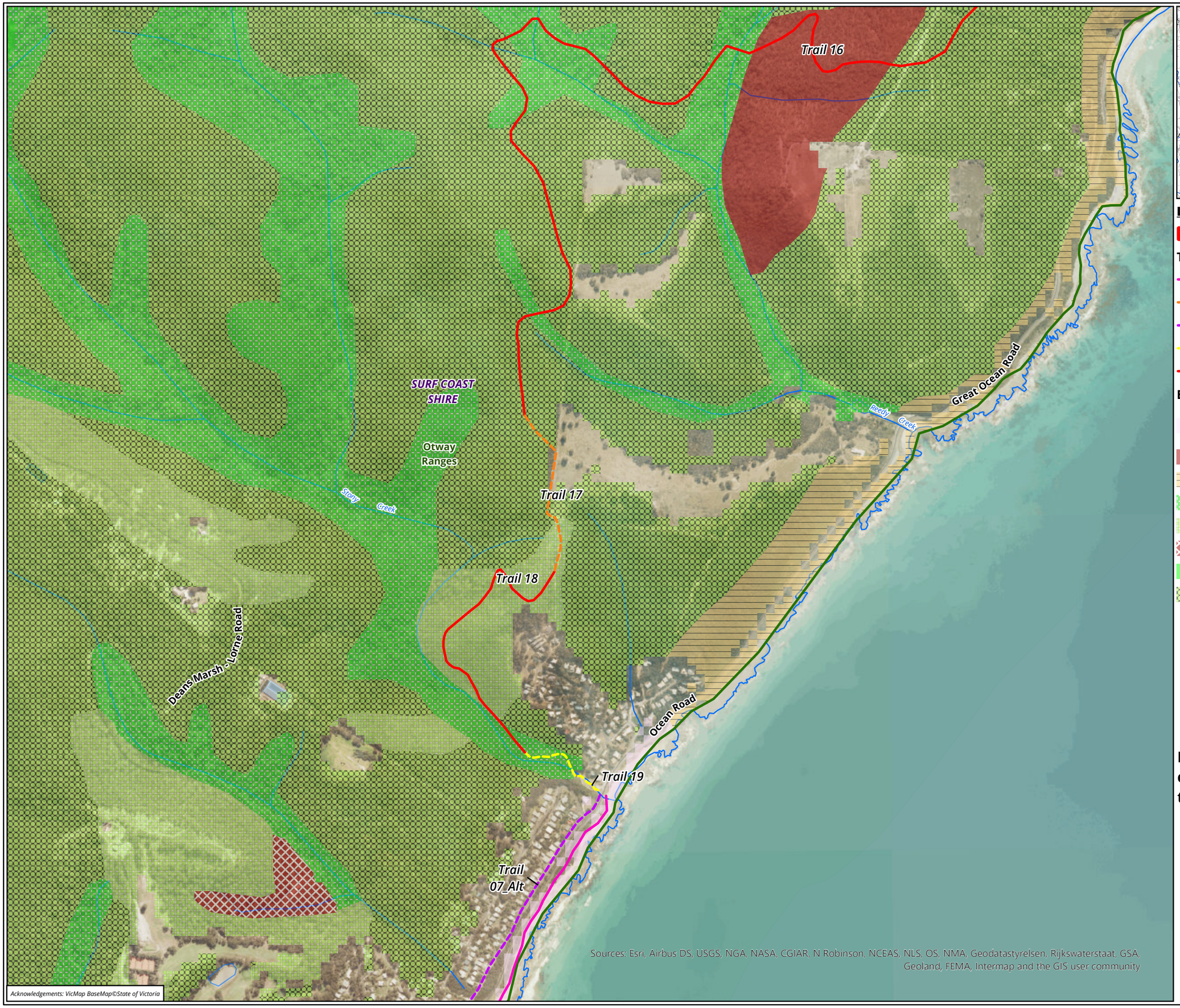
Scale: 1:10,000 @ A3

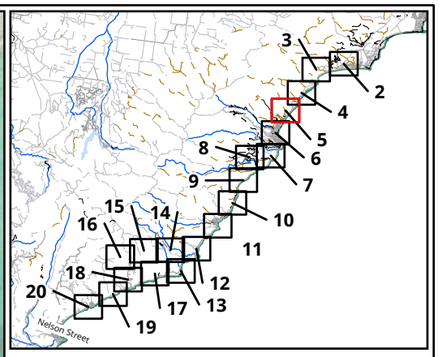
Coordinate System: GDA 1994 VICGRID94

N

biosis

Matter: 35990,
Date: 06 January 2022 ,
Prepared for: ML, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F2_EVC
Project: P:\35800s\35871\Mapping\
35990_GORT_WT_Ecology_Figures.aprx





Legend

Project area

Trail alignment

- Beach/Rock Shelf
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Ecological vegetation class

- 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic
- 16 Lowland Forest
- 161 Coastal Headland Scrub
- 201 Shrubby Wet Forest
- 22 Grassy Dry Forest
- 23 Herb-rich Foothill Forest
- 30 Wet Forest
- 45 Shrubby Foothill Forest

Figure 2.5 Ecological vegetation class in the proximity of the trail alignment

0 100 200 300 400 500

Metres

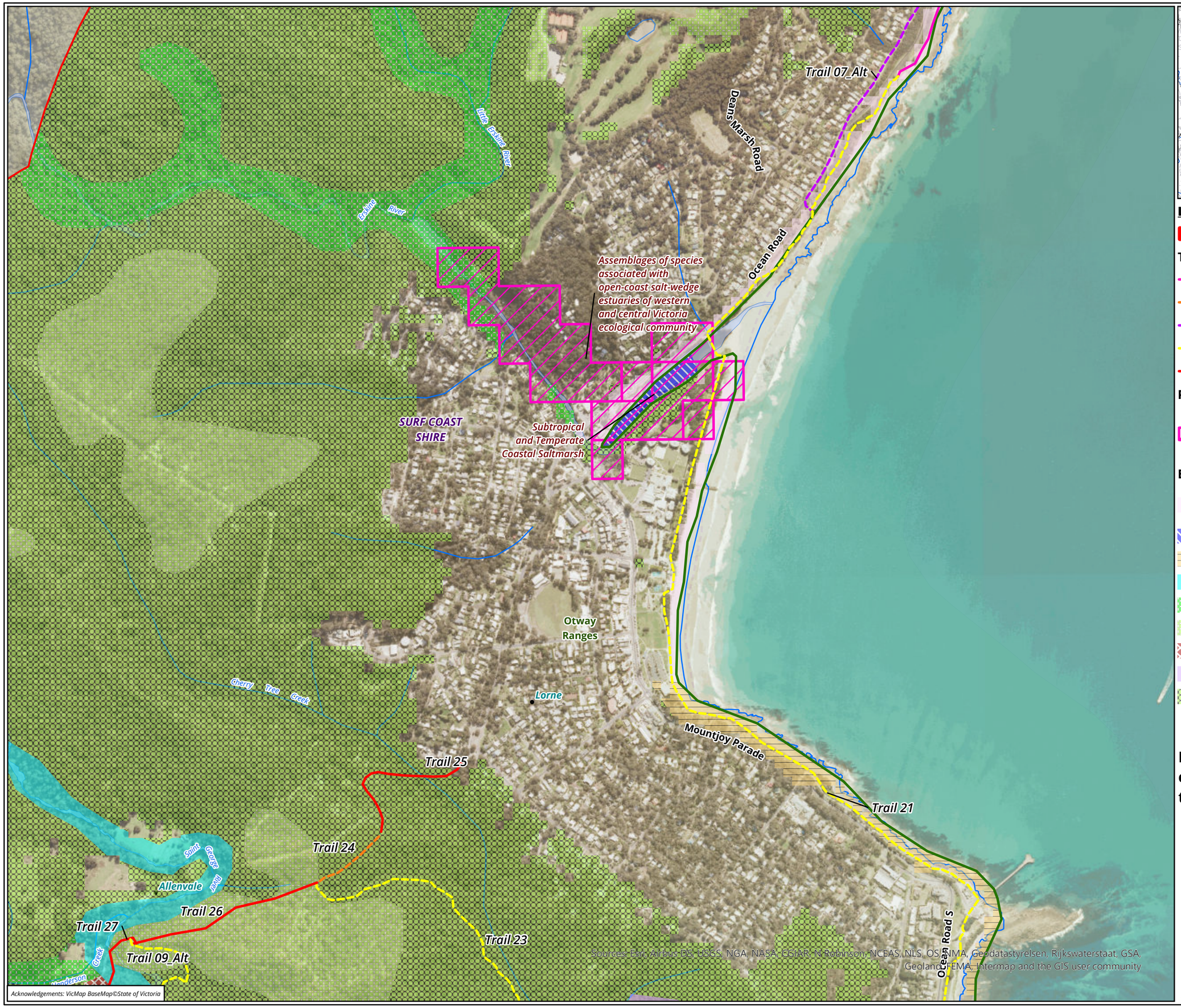
Scale: 1:10,000 @ A3

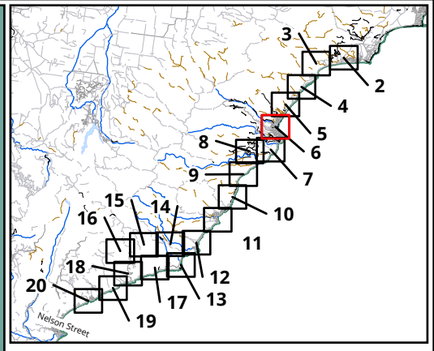
Coordinate System: GDA 1994 VICGRID94

N

biosis

Matter: 35990,
Date: 06 January 2022 ,
Prepared for: ML, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F2_EVC
Project: P:\35800s\35871\Mapping\
35990_GORT_WT_Ecology_Figures.aprx





Legend

Project area

Trail alignment

- Beach/Rock Shelf
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Protected communities

- EPBC Act Ecological Communities of National Environmental Signficance

Ecological vegetation class

- 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic
- 10 Estuarine Wetland
- 161 Coastal Headland Scrub
- 18 Riparian Forest
- 201 Shrubby Wet Forest
- 22 Grassy Dry Forest
- 23 Herb-rich Foothill Forest
- 3 Damp Sands Herb-rich Woodland
- 45 Shrubby Foothill Forest

Figure 2.6 Ecological vegetation class in the proximity of the trail alignment

0 100 200 300 400 500

Metres

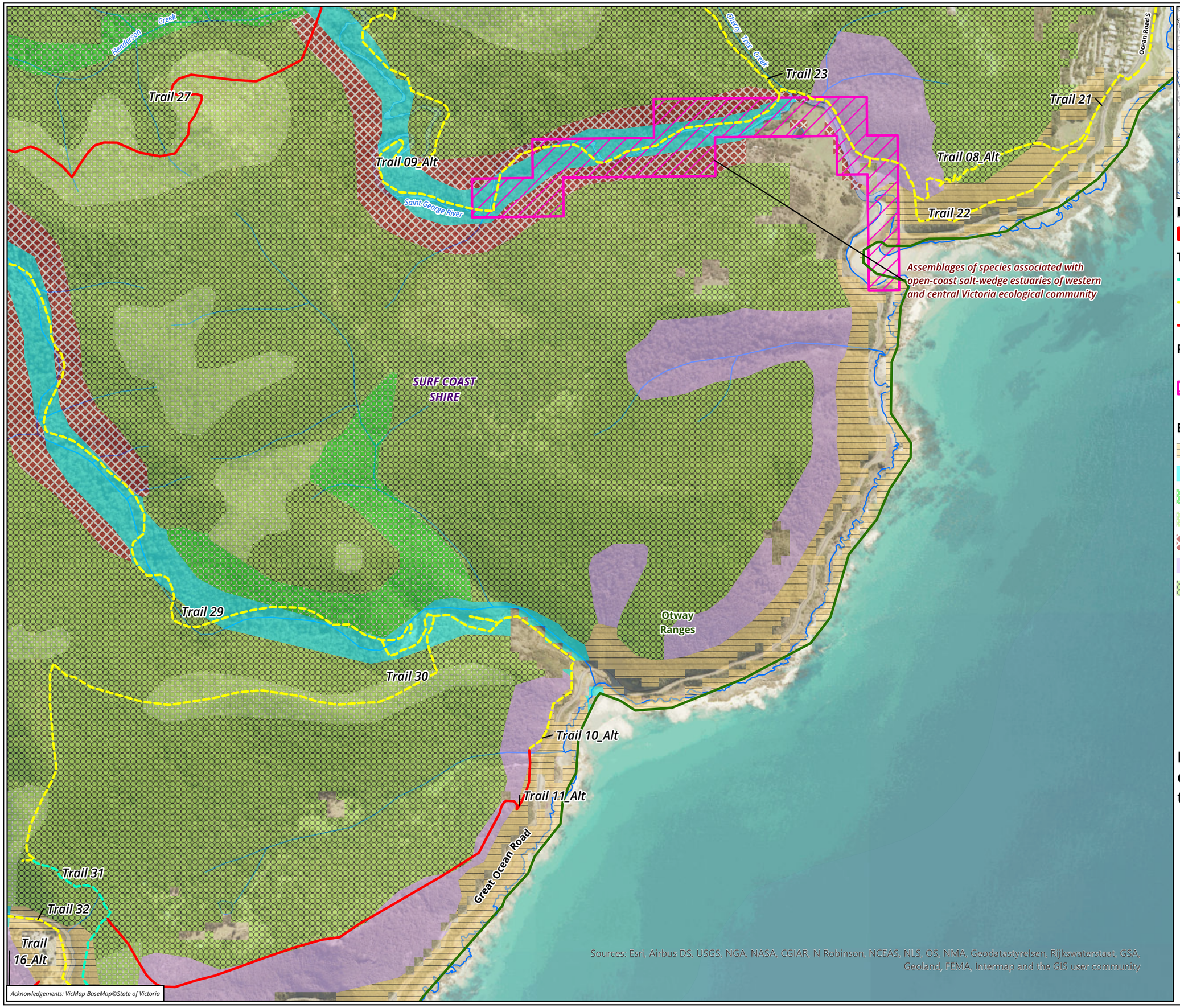
Scale: 1:10,000 @ A3

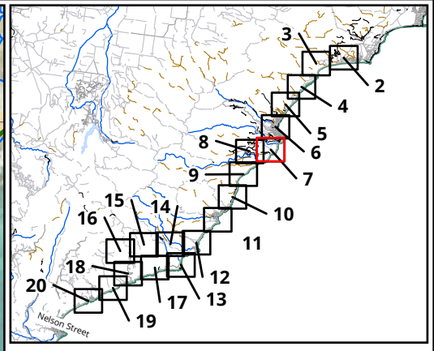
Coordinate System: GDA 1994 VICGRID94

N

biosis

Matter: 35990,
Date: 06 January 2022 ,
Prepared for: ML, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F2_EVC
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx





Legend

Project area

Trail alignment

- Existing Informal Trail
- Existing Walking Trail
- New Walking Trail

Protected communities

- EPBC Act Ecological Communities of National Environmental Signficance

Ecological vegetation class

- 161 Coastal Headland Scrub
- 18 Riparian Forest
- 201 Shrubby Wet Forest
- 22 Grassy Dry Forest
- 23 Herb-rich Foothill Forest
- 3 Damp Sands Herb-rich Woodland
- 45 Shrubby Foothill Forest

Figure 2.7 Ecological vegetation class in the proximity of the trail alignment

0 100 200 300 400 500

Metres

Scale: 1:10,000 @ A3

Coordinate System: GDA 1994 VICGRID94

N

biosis

Matter: 35990,
Date: 06 January 2022 ,
Prepared for: ML, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F2_EVC
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx