Great Ocean Road Coastal Trail

Flora and fauna assessment

FINAL REPORT

Prepared for World Trail Pty Ltd

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which it was intended.

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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 flora and fauna assessment of proposed alignments of the Great Ocean Road Coastal Trail (GORCT). The ecological assessment will contribute to the Master Plan being developed by DELWP to assist in determining the final walking trail alignment with cultural heritage assessments and planning approvals also part of this project. Preliminary assessments have also been undertaken as part of the project, which included an ecological desktop assessment, a heritage desktop assessment and a geotechnical report, resulting in changes to the alignment and the development of the ground-truthed route 1 (GTR 1) assessed in this flora and fauna assessment.

The proposed network of walking trails includes a mixture of existing trails (existing walking trails, management vehicle tracks, footpaths, and beach), that will be connected by sections of new trail. Sections of informal trail have been incorporated into the network where possible to minimise impact. They are mostly in poor condition and are considered as new trails for the purposes of planning and construction. The proposed mix of trail on existing tracks and roads represents a significant opportunity to reduce the project's overall impacts on environmental values.

Ground-truthed route 1 consists of a network of approximately 83 kilometres, including using 42 kilometres of existing trails and the construction of 41 kilometres of new trail. The detailed ecological investigation commenced in May 2022 once the centreline had been marked out with flagging tape by the trail designers. Towards the end of this assessment, two revisions were made to the trail alignment as a result of advice from the Geotechnical Risk Assessment and public feedback. These two revisions have not been included in this assessment, but are now included in the updated alignment, GTR 2, and are noted as requiring assessment in future stages of detailed planning. This ecological investigation involved detailed flora and fauna assessments of the GTR 1 network (Fairhaven to Grey River), including:

- Mapping of Ecological Vegetation Classes (EVCs) along the assessment corridor.
- Recording of all native and introduced flora along the assessment corridor.
- Mapping of all large trees according to EVC benchmarks along the assessment corridor.
- Characterising fauna habitat types and quality.
- Bird surveys and forest owl surveys.
- Remote camera traps surveys.
- Documenting land management issues and existing threatening processes.

Ecological values

Key ecological values identified within the assessment corridor and broader habitat are as follows:

- The project area crosses two bioregions with distinct environmental conditions, vegetation communities and species assemblages (the Otway Plain and the Otway Ranges).
- Two EVCs occur in the Otway Plain bioregion composed of three condition states:
  - EVC 21 – Shrubby Dry Forest, Bioregional Conservation Status (BCS) of least concern.
  - EVC 48 – Heathy Woodland, BCS of least concern.
- Eight EVCs occur in the Otway Ranges bioregion composed of 15 condition states:

  - EVC 16 – Lowland Forest, BCS of depleted.
  - EVC 18 – Riparian Forest, BCS of least concern.
  - EVC 21 – Shrubby Dry Forest, BCS of least concern.
  - EVC 22 – Grassy Dry Forest, BCS of depleted.
  - EVC 45 – Shrubby Foothill Forest, BCS of least concern.
  - EVC 48 – Heathy Woodland, BCS of least concern.
  - EVC 161 – Coastal Headland Scrub, BCS of depleted.
  - EVC 201 – Shrubby Wet Forest, BCS of least concern.
- Forest, woodland and coastal scrub vegetation that supports a suite of habitat elements including large trees, fallen timber, rocks, tussock-forming grasses, major river systems with minor tributaries, seasonally wet areas and structurally-complex understorey.
- Populations of Wrinkled Buttons *Leiocarpa gatesii* and Long-nosed Potoroo *Potorous tridactylus tridactylus* both listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Flora and Fauna Guarantee Act 1988* (FFG Act).
- Populations of Gang-gang Cockatoo *Callocephalon fimbriatum* and Yellow-bellied Glider *Petaurus australis* both listed under the EPBC Act.
- Populations of threatened flora species listed under the FFG Act: Brooker's Gum *Eucalyptus brookeriana*, Southern Blue-gum *Eucalyptus globulus* subsp. *globulus* and Paper Flower *Thomasia petalocalyx.*
- Populations of threatened fauna species listed under the FFG Act: Grey Goshawk *Accipiter novaehollandiae*, Rufous Bristlebird (Otway) *Dasyornis broadbenti caryochrous*, White-bellied Sea-Eagle *Haliaeetus leucogaster* and Powerful Owl *Ninox strenua.*
- Potential habitat for 50 threatened species:
  - Listed under EPBC Act: Anglesea Grevillea *Grevillea infecunda*, Green-striped Greenhood *Pterostylis chlorogramma*, Spiral Sun-orchid *Thelymitra matthewsii*, Australian Grayling *Prototroctes maraena*, White-throated Needle-tail *Hirundapus caudacutus*, Southern Bent-winged Bat *Miniopterus orianae bassanii*, Grey-headed Flying-fox *Pteropus poliocephalus*, Southern Brown Bandicoot *Isoodon obesulus* and Swamp Antechinus *Antechinus minimus maritimus*.
  - Listed under FFG Act: 25 flora species and 16 fauna species (see Section 4.2.1)
- Waterways, aquatic habitats and major river systems.

Government legislation and policy

An assessment of the project in relation to key biodiversity legislation and policy is provided and summarised below.

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
EPBC Act	**Flora** Wrinkled Buttons recorded in assessment corridor. Potential habitat for three other flora species: • Anglesea Grevillea • Green-striped Greenhood • Spiral Sun-orchid **Fauna** The following fauna were recorded in the project area: • Long-nosed Potoroo • Yellow-bellied Glider • Gang-gang Cockatoo Potential habitat for seven other fauna species: • White-throated Needletail • Swamp Antechinus • Broad-toothed Rat • Southern Brown Bandicoot • Grey-headed Flying-fox • Southern Bent-winged Bat • Australian Grayling **Ecological Communities** The following ecological communities are likely to occur in the project area: • Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community. • Giant Kelp Marine Forests of South East Australia. • Natural Damp Grassland of the Victorian Coastal Plains. • Subtropical and Temperate Coastal Saltmarsh. • White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.	The project has the potential to require referral under the EPBC Act for impacts on Wrinkled Buttons, Anglesea Grevillea, Green-striped Greenhood and Spiral Sun-orchid.	Targeted surveys recommended for: • Wrinkled Buttons • Anglesea Grevillea • Green-striped Greenhood • Spiral Sun-orchid • Swamp Antechinus • Broad-toothed Rat Most canopy trees will be avoided during trail construction and any selective removal or trimming of trees for safety reasons is likely to be minor in nature. Habitat suitable for Gang-gang Cockatoo, Yellow bellied Glider and Grey-headed Flying-fox will not be significantly impacted. Eight large trees are proposed for removal at the locations of large swing bridge abutments, however are not likely to significantly impact threatened fauna. Trails in proximity to important habitat for Southern Bent-wing Bat have been excluded from the trail network. White-throated Needletail is unlikely to be impacted as this species is primarily aerial. No threatened ecological communities are likely to be significantly impacted by the project.

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
FFG Act	79 protected flora species were recorded in the assessment corridor. The following listed species were also recorded in addition to those mentioned above: • Brooker's Gum • Southern Blue-gum • Paper flower Four fauna species recorded and potential habitat for 23 fauna species. Recorded species are: • Grey Goshawk • Powerful Owl • Rufous Bristlebird • White-bellied Sea Eagle	Protected Flora Permit required. Actions required to avoid and minimise impacts on listed species.	Site is public land therefore the FFG Act applies. The project proponent as a public authority must also consider their obligations under the Public Authority Duty.

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
Planning & Environment Act	All indigenous vegetation to be removed, destroyed or lopped.	Planning permit required to lop or remove native vegetation. Crown Land exemption may be available to the project. The Crown land exemption is only able to be used by the relevant authority for land which is under their own management (For example, DELWP is only able to use the Crown land exemption on land which is under management by DELWP). This exemption is implemented through DELWP's *Procedure for the removal destruction or lopping of native vegetation on Crown land* (DELWP 2018) and would negate the need for native vegetation offsets where it applies.	Permit application needs to address provisions of the relevant overlays. A permit application will need to respond to the application requirements and decision guidelines within the ESO, LSO and LSIO. In order to meet the Crown Land exemption within Clause 52.17 the native vegetation removal must be undertaken on land managed by DELWP and the requirements of the *Procedure to remove, destroy or lop native vegetation on Crown land* must be met. Under the Procedure to remove, destroy or lop native vegetation on Crown land compensatory native vegetation offsets would not be required, however counter balancing measures are required. If the Crown Land exemption is not applicable, a planning permit will be required under Clause 52.17. Best practice environmental management on public land requires avoidance, minimisation and offsetting of native vegetation in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation*.
CaLP Act	10 Noxious weeds 2 declared pest animals	N/A	Comply with requirements to control/eradicate

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
Environment Effects Act	Removal of native vegetation and threatened species habitat impacts	An EES referral is not triggered by criteria relating to biodiversity alone when assessing impacts against GTR 1. Partial clearing of mostly understorey vegetation results in 9.929 ha from least concern, and depleted EVCs is unlikely to have regional or state significant environmental impacts. The project does have the potential to be referred under the EE Act once consideration of heritage and / or social impacts are assessed.	The Ministerial guidelines are not binding, and the decision as to whether an EES is required is ultimately at the discretion of the Minister for Planning. An EES may be triggered once consideration of social impacts and impacts to cultural heritage are assessed. Further, adverse impacts to biodiversity are anticipated as variations in trail designs occur. Referral criteria are likely to be triggered once assessments of those impacts are undertaken.
National Parks Act	Trails intersect two management zones: • Conservation • Conservation and Recreation	Consent is required under Section 27 of the Act.	Consult with Parks Victoria to determine conditions and consent.
Crown Land (Reserves) Act	Crown land	Consultation between GORCAPA and DELWP required to determine specific recommendations.	N/A
Reference Areas Act	The following reference areas are in close proximity to the project area: • Olangolah Creek Reference Area • Aquila Creek Reference Area • Painkalac Creek Reference Area	GTR 1does not intersect these reference areas. No further approvals required.	Ensure future iterations of the trail alignment avoid reference areas.
Water Act	Designated waterways	Corangamite Catchment Management Authority (CMA) Works on Waterway permit required for trail sections that cross designated waterways.	Seek waterway determination from Corangamite CMA / regional water authority and comply with their guidelines and permit requirements.

Legislation / policy	Relevant ecological feature on site	Permit / approval required	Notes
Fisheries Act	Potential impact to five protected aquatic species.	No permit required if mitigation measures are strictly adhered to, and no habitat or biota are destroyed.	Providing mitigation measures outlined in this report are adhered to, the potential for protected aquatic biota as listed above, to be injured, damaged or destroyed is considered to be negligible and no permit is required from DELWP.
Environment Protection Act 2017	Multiple crossing of unnamed tributaries and declared waterways.	N/A	Adhere to the mitigation measures outlined in this report, particularly waterway crossings with elevated structures and sediment control.

Guidelines for the removal, destruction or lopping of native vegetation (the Guidelines)

Based on the current design and estimated works footprints, the proposed trail development will require the removal of 9.929 hectares of native vegetation, including eight large trees, from within location category 3. Therefore, if a planning permit is required it will be assessed on the detailed assessment pathway. The strategic biodiversity value score of the native vegetation to be removed ranges between 0.560 – 1.000. In relation to the permit trigger under Clause 52.17, if DELWP remains the project proponent and where DELWP is the public land manager in areas of proposed works, native removal could be undertaken through reliance on the Crown Land exemption in Clause 52.17-7 of the Victoria Planning Provisions. This exemption is implemented through DELWP's *Procedure for the removal destruction or lopping of native vegetation on Crown land* (DELWP 2018). In this scenario, native vegetation offsets would not be required, however counter balancing measures would be required.

Avoid and minimise statement

The following design principles and measures have been adopted across the project design phase and will underpin the construction and operation phases to adequately describe and quantify biodiversity impacts and to ensure these impacts are avoided and minimised:

- Detailed project planning including feasibility studies, desktop constraints assessment, terrain modelling and an initial trail mark-out and later assessments that aimed to micro-site around potential areas of high ecological value. This process resulted in the reduction in the length of proposed trails, and the removal of some trails from the proposed alignment due to potential impacts to threatened flora and fauna species, and to sensitive EVCs.
- Aligning 43 kilometres of the trail network on exiting trails (i.e. formal walking trails and management vehicle tracks).
- Aligning 6.7 kilometres of the trail network on informal trails (i.e. unsanctioned walking trails that have been illegally constructed. Note that this trail type has been included in the vegetation loss calculations).
- Ensuring trail styles and construction methods only require the removal of understorey vegetation so the forest canopy and sub-canopy will remain intact.

- Designing trails to follow land contours and take advantage of flat spurs and ridges, where possible, minimising the need for major soil excavation.
- Using the design principle of elevating all waterway crossings and EVCs sensitive to hydrological changes (i.e: EVC 201 – Shrubby Wet Forest) to minimise disturbance of aquatic habitats and to reduce ongoing point sources for sedimentation of local waterways.
- Committing to the principle of pre-construction micro-siting to achieve avoidance of key habitat features for threatened fauna, avoid significant flora species populations, minimise disturbance of wildlife habitat, minimise indirect impacts on significant trees and minimise impacts on waterways, other watercourses, springs and soaks.
- Committing to the development of a weed management plan to monitor and control weeds along the trail network.
- Committing to a strategy to monitor and control the spread of Cinnamon Fungus along the trail network.
- Engaging a professional arborist at the design stage to review existing conditions for trees in the project area provide sensitive construction techniques that can be applied to ensure encroachment into tree protection zones and structural root zones does not lead to the long-term decline of forest trees.
- Siting of trails to **avoid** areas of high ecological value, including:
  - Avoid incorporating trails that pass near Southern-bent Wing-bat non-breeding caves and roost sites into the trail network.
  - Avoid siting new trails that intersect high quality remnants of EVC 6 – Sand Heathland and EVC 48 – Heathy Woodland. These EVCs contain a high proportion of threatened flora and fauna habitat in the project area. The trail has been realigned in GTR 2 to occur on existing trails.
  - Avoid siting trails that intersect with critical small mammal refuges and heavy Cinnamon Fungus infestation near Coal Mine Creek.
- Siting and construction of trails to **minimise** impacts to the extent possible on areas of high ecological value, including:
  - Minimising impacts on Hooded Plover by reducing the length of trails sited on beaches.
  - Micro-site the trail to avoid populations of the EPBC Act listed Wrinkled Buttons.
  - Elevate trails that intersect with critical small mammal habitat corridors.
- Minimising trail development near estuaries and coastal wetlands.
- Further micro-siting is proposed to avoid ecological features and threatened flora populations.

A summary of trails removed/realigned from the concept and initial design versions of the trail network are summarised below.

Trail number	Trail design version	Comments / rationale
Trails: • 4 • 22_Alt • 29_Alt	Concept Alignment 1	Removal of trails aligned along beach from the network to avoid impacts on breeding habitat for Hooded Plover.
Trails: • 1_Alt • 3	Concept Alignment 2	Removal of trails from network to avoid areas of high quality EVC 48 - Heathy Woodland and EVC 6 - Sand Heathland. Trails have been realigned in GTR 2 to use existing walking trails and management vehicle tracks.
Trails: • 16_Alt • 20_Alt • 21_Alt • 22_Alt • 23_Alt • 24_Alt	Concept Alignment 2	These trails have been removed from the trail network as a result of advice from DELWP, to avoid potential impacts on Southern Bent-wing Bat non-breeding and roosting caves.
Trail: 5_Alt	Concept Alignment 2	Realignment of trail to avoid intersecting critical refuge habitat for small mammals and to avoid intersecting heavy infestation of Cinnamon fungus. The trail has been suitably realigned away from sand dunes which function as the critical refuge habitat.
Trails: • 2 • 3 • 4 • 5 • 6	Ground-truthed Route 1	Removal of trails from formal network to avoid areas of high quality EVC 48 - Heathy Woodland. Section was realigned to use existing trails further north.

If a planning permit is required and the Crown land Procedure does not apply to this project, the offset requirements would be 0.541 general habitat units and 8.281 species habitat units for the following species:

- Wrinkled Buttons - 7.061 species habitat units.
- Coast Correa - 1.061 species habitat units.
- Otway Black Snail - 0.024 species habitat units.
- Southern Blue-gum - 0.135 species habitat units.

The general offset must be within the Corangamite Catchment Management Authority; Surf Coast Shire Council or Colac Otway Shire Council municipal districts, and must have a minimum strategic biodiversity value score of 0.682. The offset must also protect Eight large trees.

Recommendations

The design of the proposed trails and associated works has given consideration to avoiding and minimising ecological impacts by undertaking feasibility and ecological constraints assessments of trail concepts. Further refinement of the trail construction method and investigation of design responses, such as elevated structure/bridge footing types, will be undertaken during the project approvals process. These additional steps will ensure impacts are comprehensively minimised.

Key impact avoidance and minimisation strategies, and mitigation measures include:

Project specific recommendations

- Develop a weed control strategy that monitors weed invasion along the trail, at a minimum:
  - Within key threatened species habitat (i.e. Wrinkled Buttons habitat, and small mammal refuge habitat at the Coalmine Creek intersect).
  - Along tracks that extend through major weed infestations.
- Incorporate/develop the following mitigation strategies to prevent the spread of Cinnamon Fungus:
  - Control Cinnamon Fungus infestations that occur along the trail network with a Phosphite fungicide.
  - Protect Austral Grass-tree from adverse drainage during construction and operation of trail to reduce impact of Cinnamon Fungus.
  - Develop a Cinnamon Fungus monitoring strategy that:
    - Documents the extent of existing infestations.
    - Conducts annual assessment of all known infections that records: the extent of infestations, and the effectiveness of treatment strategies implemented.
    - Monitors susceptible EVCs along the trail network for new infestations to be included in future monitoring and treatment programs.
  - Incorporate hygiene stations to reduce the spread of weeds and pathogens into the trail network. Critical areas for positioning hygiene stations include:
    - At the fronts of Cinnamon Fungus infestations that are intersected by the trail. This is to contain the infection to the existing area and prevent further spread along the trail.
    - At entry and exit point where the trail intersects with EVC 45 – Heathy Woodland or EVC 6 – Sand Heathland that are susceptible to Cinnamon Fungus (note: EVC 6 was not recorded within GTR 1 alignment).
- Create a trail Construction and Environment Management Plan that mitigates the spread of soil pathogens and diseases, such as Cinnamon Fungus and Myrtle Wilt. Such plans should detail:
  - Strict hygiene methods to be implemented during trail construction.
  - On-going monitoring to assess the spread of Cinnamon Fungus and Myrtle Wilt.
  - All environmental controls and mitigation measures covering vegetation removal prescriptions/seasonality, work site delineation, weed/pathogen hygiene, sediment control and unexpected finds protocols and salvage protocols.
- Construct elevated boardwalks, to reduce impacts on hydrology and/or soil compaction, when the walking trail intersects:
  - Ephemeral waterways and minor tributaries.
  - EVC 201 – Shrubby Wet Forest.
  - EVC 31 – Cool Temperate Rainforest (if intersected by future trail design variations).

- Adhere to construction methodology outlined in Axiom Tree Management (2022) to reduce impacts on trees through the implementation of tree protection measures.
- Protect critical refuge habitat for small to medium sized ground-dwelling mammals by:
  - Aligning trail to avoid areas of critical refuge habitat (i.e trail 15 is appropriately aligned above refuge habitat and no other critical refuge habitat is intersected by GTR 1).
  - Avoid impacts to vegetation functioning as a corridor to the refuge habitat (elevate trail 43 as it crosses Coalmine Creek so that the grass and shrub layer are not impacted).
  - Use appropriate fencing, that enables small mammal passage, however discourages pedestrians from leaving trail at the Coalmine Creek intersect.
  - Install hygiene stations for *Phytophthora cinnamomic* in consultation with the Corangamite Catchment Management Authority (CCMA).
  - Consider improving habitat and protecting environmental values by:
    - Improving the vegetation for small mammals at Coalmine Creek habitat corridor in consultation with the CCMA.
    - Installing interpretive signage that emphasises the importance of habitat along the trail for threatened species (i.e. small mammals) and the importance of remaining on the trail to preserve those habitats.
- Microsite the trail to avoid Button Wrinkle populations (trail 8, 42, 43, optional 9, 61, alternative 3 of GTR 1).
- Undertake woody weed removal prior to constructing trail 70. Microsite the trail once Sweet Pittosporum has been removed to avoid / minimise disturbance to the high-quality understorey within EVC 161 – Coastal Headland Scrub (particularly within the Moderate and High condition states).
- Micro-site bridge abutments, where possible, to locate outside of TPZs, particularly of large trees and Southern Blue-gum.

General recommendations

General trail construction and maintenance recommendations include:

- Avoiding the direct removal of canopy trees along trails, particularly large hollow-bearing trees, through the micro-siting of the trail.
- Undertaking necessary pre-construction site visits with contractors prior to any works commencing to ensure all high value areas are avoided and protected.
- Restricting disturbance to track margins in areas where existing trails are present.
- To the fullest extent practicable, minimise disturbance to any native vegetation, including aquatic vegetation, within the project area. This may include the demarcation of areas of native vegetation to be retained during works.
- Adhering to the construction corridors, maintenance zones and permanent vegetation removal footprints outlined in this report.
- Implementing best practice trail design, construction and sediment management practices.
- Minimising the impacts of construction by 'building from the trail' and from within the construction footprint.

- Implementing strict weed and pathogen hygiene protocols during construction and operation of trails.
- Any plant or equipment used should be washed down and cleaned prior to and following use to reduce the translocation risk of weed species.
- Engage a suitably qualified arborist to advise on the management of trees during the construction phase of the project. The project arborist should induct workers prior to commencing trail construction works on:
  - Basic tree functions and impacts from trail.
  - Construction guidelines for working close to trees.
  - Procedure when roots are damaged and native vegetation offsets are required.
- Should instream or riparian works be proposed, undertake biological and physicochemical monitoring of waterways to be impacted in accordance with *The Environment Protection Act 2017*, the Environment Protection Regulations 2021 and Environment Reference Standards (ERS) introduced from 1 July 2021. Biological and physicochemical monitoring should be undertaken in appropriate locations and seasons prior to and following any proposed instream / riparian zone works to determine if there has been any negative impact on the health of waterways as a result of the project.
- The results of this assessment should be incorporated into the future stages of project design, by ensuring the flora and fauna mapping information is incorporated into, or used alongside mapping.

To resolve presence/absence and population extents of threatened species within the assessment corridor, targeted surveys are recommended for:

- Wrinkled Buttons
- Anglesea Grevillea
- Green-striped Greenhood
- Spiral Sun-orchid
- Swamp Antechinus
- Broad-toothed Rat
- Otway Burrowing Crayfish.

1. Introduction

1.1 Project background

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 flora and fauna assessment of proposed alignments of the Great Ocean Road Coastal Trail (GORCT). The ecological assessment will contribute to the Master Plan being developed by DELWP to assist in determining the final walking trail alignment with cultural heritage assessments and planning approvals also part of this project.

In early 2022, Biosis completed an ecological desktop assessment and rapid field assessment that examined the flora and fauna values of the project area along concept alignment 2 (Biosis 2022a). The assessment included a review of approximately 90 kilometres of a concept trail that provides a link between the Surf Coast Walk and the Great Ocean Walk; predictive modelling to identify areas that contained ecological constraints and values; and a site assessment to validate the ecological values and constraints identified. The network of trails includes a mixture of existing trails (existing walking trails, management vehicle tracks, footpaths and beach) as well as sections of new trail (includes sections of informal trails). Sections of informal trail have been incorporated into the network where possible to minimise impact. They are mostly in poor condition and are considered as new trails for the purposes of planning and construction. The proposed mix of trail on existing tracks and roads represents a significant opportunity to reduce the project's overall impacts on environmental values. A range of supporting infrastructure including hiker campgrounds, lookouts, bridges and car parking facilities are also planned as part of the project but are yet to be finalised and are not subject to detailed investigation here.

Ecological, heritage and geotechnical assessments were considered as well as public consultation to refine the concept alignment and provide an alignment that was marked out on the ground and which forms the basis for this assessment: ground-truthed route 1 (GTR 1). This alignment was marked out using tape on the ground by World Trail designers in April through to June 2022. It represents a reduction in length and refinement of the alignment to reduce the impact on threatened flora and fauna and cultural heritage, as well as improving trail safety from geotechnical advice. The final two segments of trail between Kennett River and Skenes Creek have are not included in this assessment due to the complexities in finding a suitable alignment, and will need to be assessed at a future stage of the project once the trail alignment is established. This report presents the findings from the detailed assessment relating to the section of trail from Fairhaven to Grey River (segments 1- 5 of GTR 1).

Ground-truthed route 1 (Fairhaven to Grey River) consists of a network of 83 kilometres, including using 42 kilometres of existing trails and the construction of 41 kilometres of new trail. The detailed ecological investigation commenced in May 2022 once the centreline had been marked out with tape. These involved detailed flora and fauna assessments of the trail network, including:

- Mapping of Ecological Vegetation Classes (EVCs) along the assessment corridor.
- Recording of all native and introduced flora along the assessment corridor.
- Mapping of all large trees according to EVC benchmarks along the assessment corridor.
- Characterising fauna habitat types and quality.
- Bird surveys and forest owl surveys.
- Remote camera traps surveys.

- Documenting land management issues and existing threatening processes.

The location of GTR 1 is predominantly in National Parks and public reserves resulting in the presence of a number of ecological constraints along the trail alignment that were identified in the early 2022 desktop assessment. For this detailed assessment, the impact footprint is defined as an area 1.25 metre either side of the proposed trail centreline (i.e. 2.5 metre wide impact footprint). This footprint will allow for the final 1 metre wide constructed trail surface and all associated earthworks and drainage works required during construction. The impact footprint is herein referred to as the 'construction corridor'. An area 10 metres either side of the trail centre line was assessed in detail during field investigations, this area is referred to as the 'assessment corridor'. The broader landscape in which the trail network sits is referred to as the 'project area'.

The project area was not assessed in detail but fauna surveys were undertaken in the broader area to characterise fauna diversity and habitat types. The vegetation survey addressed the sections of proposed trail where direct impacts to vegetation are required to constructed trails or crossings. These include: sections of trails that link existing trails and would require new construction; and on informal existing trails that require vegetation removal to meet trail construction specifications.

1.2 Trail construction methods and possible impacts

Trails and structures will be constructed by small machinery and by hand resulting in a range of possible impacts on native vegetation, threatened species populations as well as habitat, soils and waterways. The construction method is described in the infrastructure section of the Planning and Design Report, and the following impacts have been identified for the purpose of this ecological impact assessment:

- Removal of native vegetation in the 2.5 metre wide trail construction corridor, noting that the final trail width is unlikely to be more than 1 metre wide so vegetation will be allowed to regenerate either side of the new trails.
- Removal of native vegetation where swing bridges will be located for the construction of abutments and guy-cable anchors.
- Disturbance or removal of rare or threatened plants, noting efforts have been made to realign trails around known populations or potential habitat of threatened species.
- Removal of threatened fauna habitat, especially for species that rely on understorey shrubs, ground layer vegetation, surface rock or coarse woody debris.
- Impacts on tree protection zones, noting that no canopy trees or large trees will be directly removed/felled for trail construction. There may be encroachment into tree protection zones (TPZs) of large trees at these locations, however direct removal of large trees will be avoided.
- Disturbance of riparian zones for installation of elevated structures.
- Soil disturbance and altered drainage patterns resulting in sediment mobilisation that may enter local drainage lines and waterways, noting design responses for managing soil erosion risks proposed in the project masterplan.
- Possible local disturbance to wildlife through increased human presence in forested areas, especially nesting and roosting sites for large forest owls and arboreal mammals.
- Increased risk of weed introduction and spread, noting mitigation strategies recommended here and incorporated into the project masterplan.
- Increased risk of pathogen spread, particularly Cinnamon Fungus, noting mitigation strategies recommended here and incorporated into the project masterplan.

1.3 Scope of assessment

The objectives of the flora and fauna investigation are to:

- Assist in finalising proposed trail locations through general ecological advice at the design and assessment stages.
- Review databases relating to flora and fauna (terrestrial and aquatic) issues relevant to the project area, including the Victorian Biodiversity Atlas (VBA) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (PMST).
- Conduct a detailed field assessment of the flora and fauna values present within the project area.
- Identify and map Ecological Vegetation Classes, large trees and threatened flora and fauna species.
- Identify and broadly map high threat weed infestations along the proposed trail alignments.
- Identify and map visual signs of Cinnamon Fungus *Phytophthora cinnamomi* infection.
- Assess the potential for the project area and assessment corridor to support habitat for threatened species.
- Undertake vegetation quality assessments.
- Review the implications of relevant biodiversity legislation and policy, including Guidelines for the removal, destruction, or lopping of native vegetation (DELWP 2017).
- Assess potential impacts and discuss mitigation options relevant to trail design and siting.
- Recommend any further assessments of the project area that may be required (such as targeted searches for listed species).

1.4 Location of the project area

The project area is located on Victoria's south-western coastline between Fairhaven and Grey River, approximately 100 kilometres south-east of Melbourne (Figure 1). It encompasses 15,047 hectares of public land. The alignment intersects many zones, these are addressed in the planning desktop assessment (Biosis 2022b).

The project area is within the:

- Otway Plain Bioregion and the Otway Ranges Bioregion.
- Otway Coast River Basin.
- Corangamite Catchment Management Authority (CMA) management area.
- Surf Coast Shire and Colac Otway Shire.

The trail alignment (GTR 1) traverses several Crown land tenures including (Figure 2):

- The Great Otway National Park managed by Parks Victoria (accounting for the majority of the trail network).
- Multiple coastal reserves:
  - Lorne - Queenscliff Coastal Reserve
  - Apollo Bay Coastal Reserve
  - Cumberland River Coastal Camping Reserve

- Elliot River - Addis Bay Coastal Reserve (managed by Parks Victoria)
- Kennett River Coastal Reserve
- Kennett River Water Frontage
- Lorne Coastal Reserve
- Lily Pond Bushland Reserve
- Queens Park (managed by DELWP)
- Wye River Coastal Reserve
- Wye River Water Frontage.

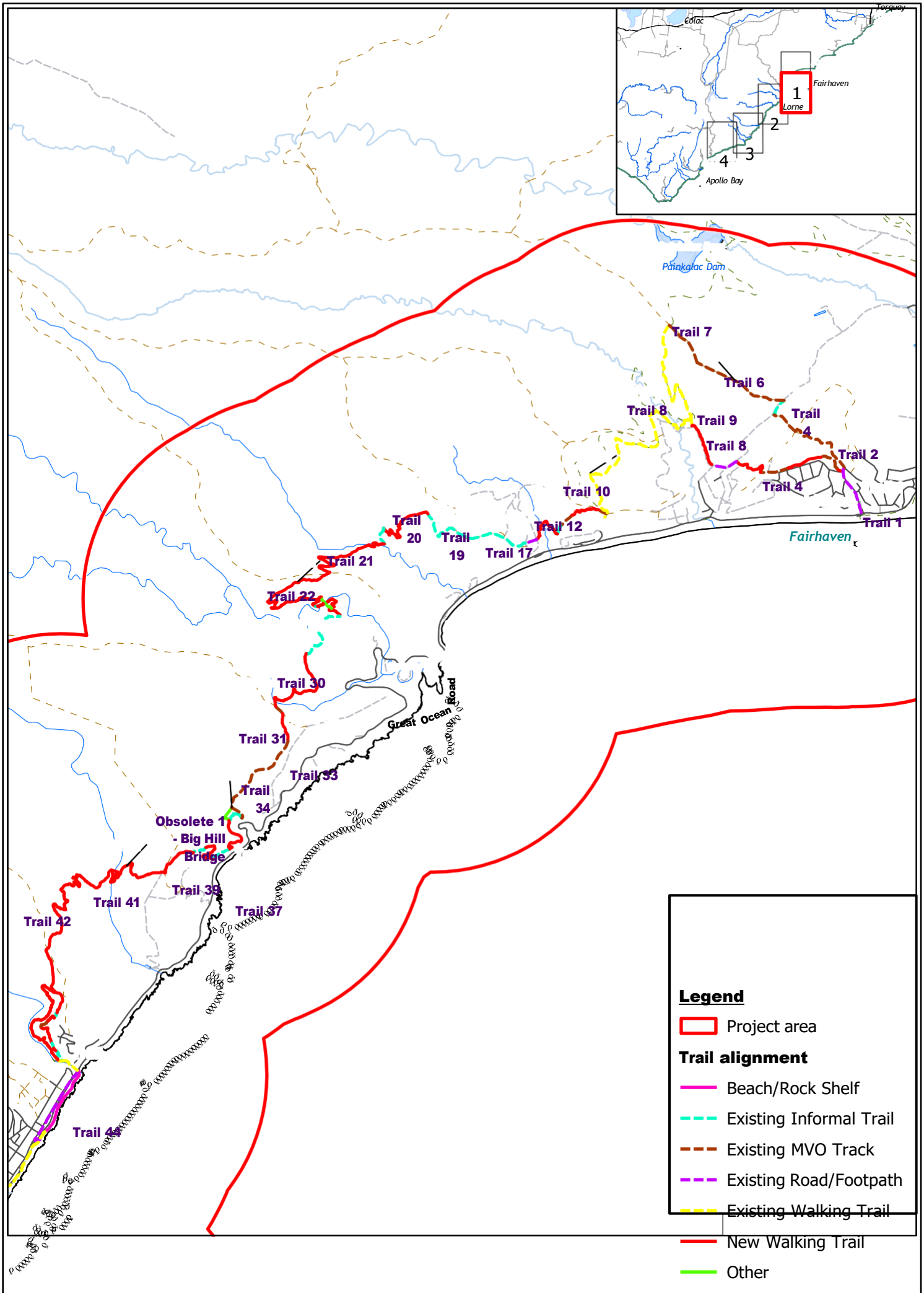

Figure 1.1 Location of the study area - Great Ocean

Coastal Trail, Victoria

Matter: 35990,
Date: 29 September 2022 ,
Prepared for: ST, 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

Kilometres

Scale: 1:50,000 @ A4

Coordinate System GDA 1994 VICGRID94

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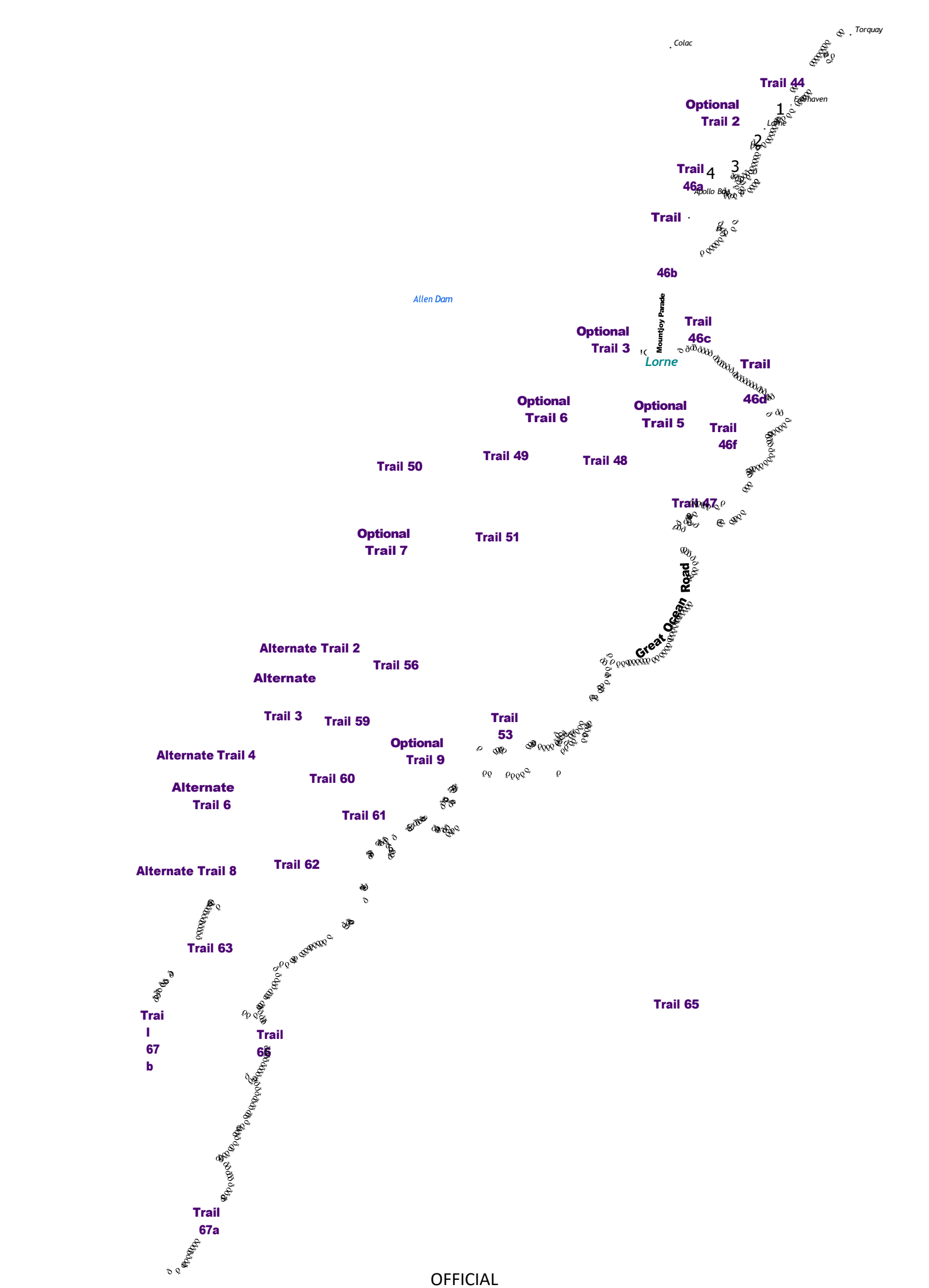

Torquay
Colac
Trail 44
Optional
Trail 2
Eastwaven
Lorne
1
2
3
4
Trail
46a
Apollo Bay
Trail
46b
Allen Dam
Mountjoy Parade
Optional
Trail 3
Trail
46c
Lorne
Trail
46d
Optional
Trail 6
Optional
Trail 5
Trail
46f
Trail 49
Trail 48
Trail 50
Trail 47
Optional
Trail 7
Trail 51
Great Ocean Road
Alternate Trail 2
Trail 56
Alternate
Trail 3
Trail 59
Trail
53
Optional
Trail 9
Alternate Trail 4
Trail 60
Alternate
Trail 6
Trail 61
Trail 62
Alternate Trail 8
Trail 63
Trail 65
Trail
67
b
Trail
66
Trail
67a

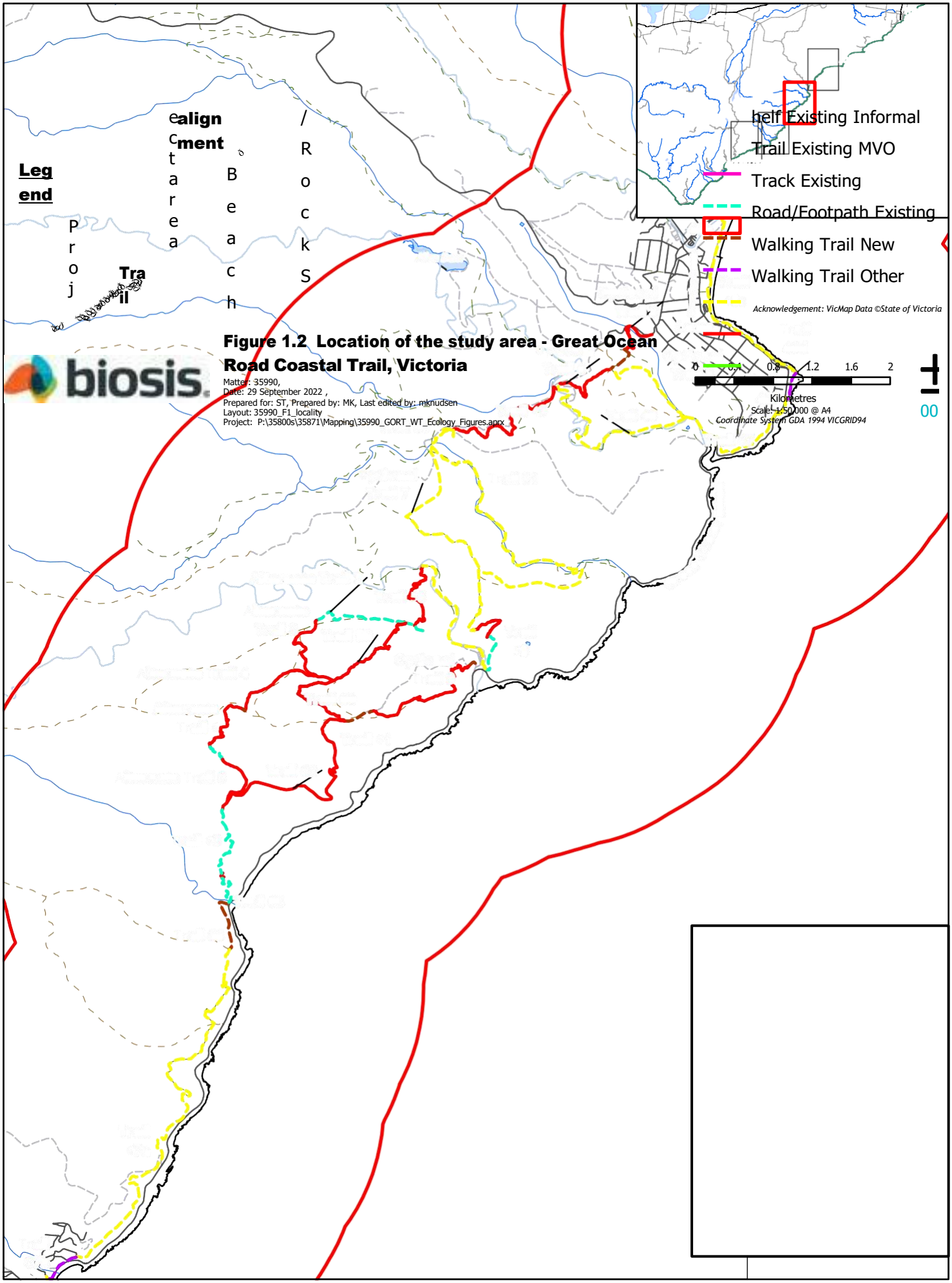
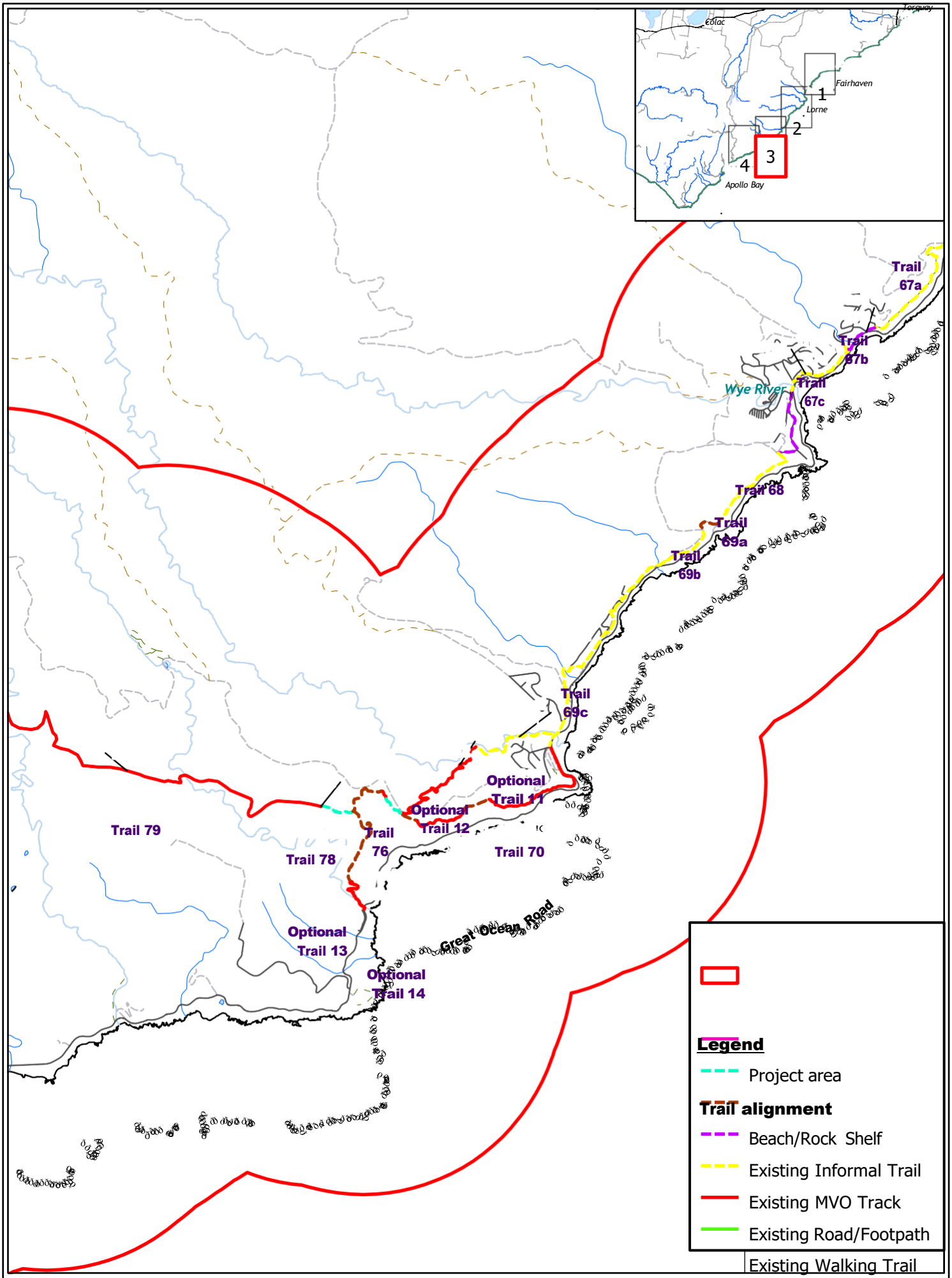


Figure 1.2 Location of the study area - Great Ocean Road Coastal Trail, Victoria

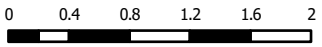
Matter: 35990,
Date: 29 September 2022 ,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F1_locality
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx


Colac
Torquay
Fairhaven
Lorne
Apollo Bay
1
2
3
4
Trail 67a
Trail 67b
Trail 67c
Wye River
Trail 68
Trail 69a
Trail 69b
Trail 69c
Optional Trail 11
Optional Trail 12
Trail 76
Trail 70
Trail 78
Trail 79
Optional Trail 13
Optional Trail 14
Great Ocean Road
Legend
Project area
Trail alignment
Beach/Rock Shelf
Existing Informal Trail
Existing MVO Track
Existing Road/Footpath
Existing Walking Trail
New Walking Trail
Other

Figu

re 1.3 Location of the study area - Great Ocean Road Coastal Trail, Victoria

Matter: 35990,
Date: 29 September 2022 ,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F1_locality
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx



Kilometres
Scale: 1:50,000 @ A4
Coordinate System GDA 1994 VICGRID94

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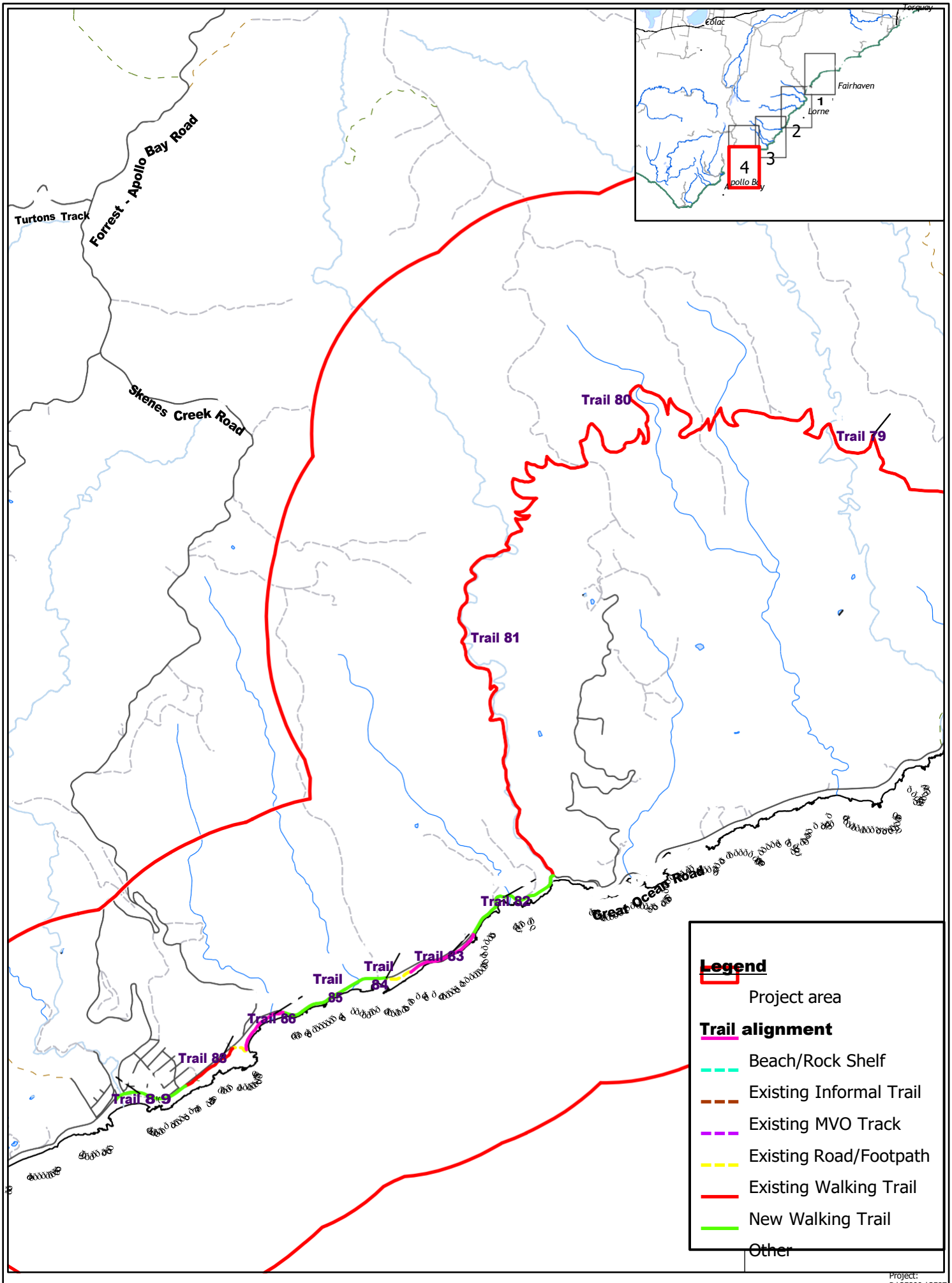


Figure 1.4 Location of the study area - Great Ocean Road Coastal Trail, Victoria

Matter: 35990,
Date: 29 September 2022 ,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F1_locality

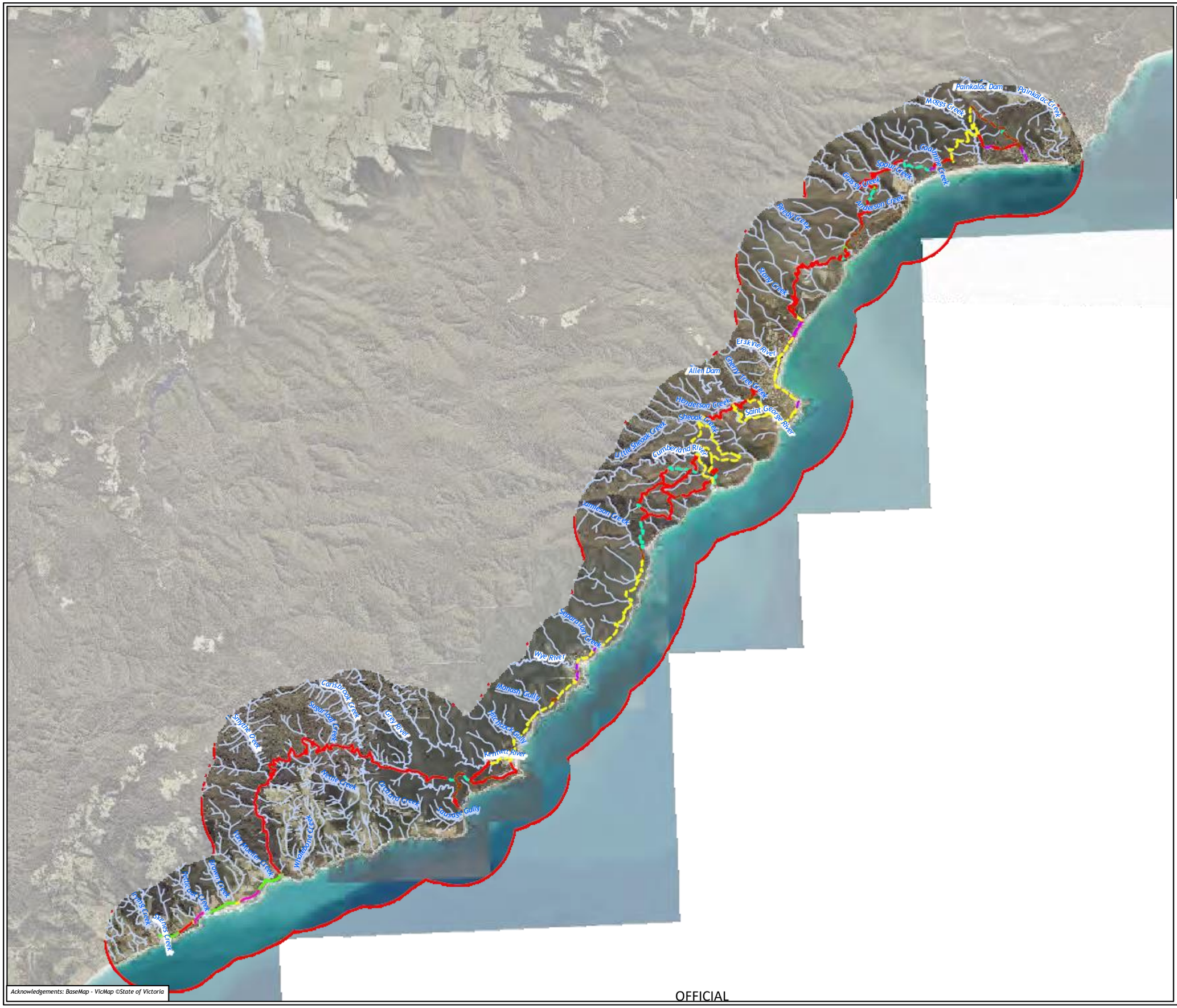
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx

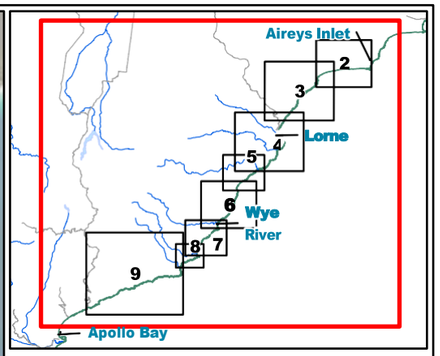
Acknowledgement: VicMap Data ©State of Victoria

0 0.4 0.8 1.2 1.6 2

Kilometres
Scale: 1:50,000 @ A4
Coordinate System GDA 1994 VICGRID94

00





Legend

Project area

Trail alignment

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

Figure 2.1 Land tenure and conservation areas within

the study area

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

Metres

Scale: 1:130,000 @ A3

Coordinate System: GDA 1994 VICGRID94

biosis

Matter: 35990,
Date: 29 September 2022,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F3_Land
Project: P:\35800s\35871\Mapping\
35990_GORT_WT_Ecology_Figures.aprx

Acknowledgements: BaseMap - VicMap ©State of Victoria

Legend

- Project area

Trail alignment

- Existing Informal Trail
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Land category

- Commonwealth land
- National parks and nature conservation reserves
- Other conservation reserves
- Other public land

Figure 2.2 Land tenure and conservation areas within the study area

0 200 400 600 800 1,000

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 VICGRID94

Acknowledgements: BaseMap - VicMap ©State of Victoria

Matter: 35990,
Date: 29 September 2022,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F3_Land
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
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail
- Other

Land category

- National parks and nature conservation reserves
- Other conservation reserves
- Other public land
- State forest

Figure 2.3 Land tenure and conservation areas within the study area

PARKS VICTORIA

biosis

COM OTHER

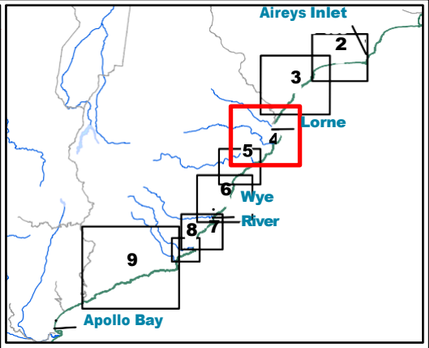
0 260 520 780 1,040 1,300

Metres

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 VICGRID94

Matter: 35990,
Date: 29 September 2022,
Prepared for: ST,
Prepared by: MK,
Last edited by: mknudsen Layout: 35990_F3_Land
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

Existing Road/Footpath

Existing Walking Trail

New Walking Trail

Land category

Commonwealth land

National parks and nature conservation reserves

Other conservation reserves

Other public land

State forest

Figure 2.4 Land tenure and conservation areas within the study area

0 260 520 780 1,040 1,300

Metres

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 VICGRID94

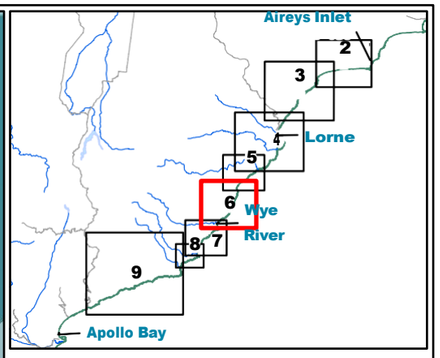
biosis

Matter: 35990,
Date: 29 September 2022,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F3_Land
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx

Figure 2.5 Land tenure and conservation areas within the study area

Artillery Rocks

Matter: 35990,
Date: 29 September 2022,
Prepared for: ST,
Prepared by: MK,
Last edited by: mknudsen
Layout: 35990_F3_Land
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx



Legend

Project area

Trail alignment

- Existing Informal Trail
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Land category

- National parks and nature conservation reserves
- Other conservation reserves
- Other public land

Figure 2.6 Land tenure and conservation areas within the study area

0 200 400 600 800 1,000

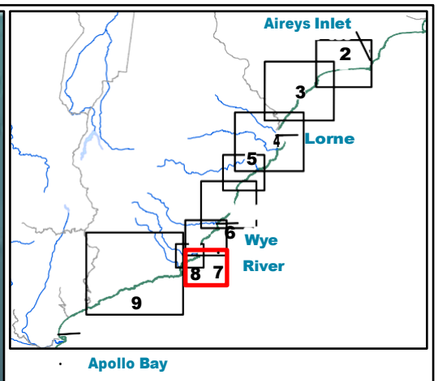
biosis

COM Local

Wongarra Coastal Reserve

Metres
Scale: 1:20,000 @ A3
Coordinate System: GDA 1994
VICGRID94

Matter: 35990,
Date: 29 September 2022,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen Layout: 35990_F3_Land
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx



Legend

Project area

Trail alignment

- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Land category

- National parks and nature conservation reserves
- Other conservation reserves
- Other public land

Figure 2.7 Land tenure and conservation areas within the study area

0 150 300 450 600 750

Metres

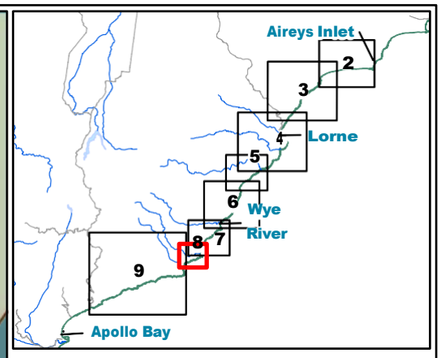
Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 VICGRID94

COM OTHER

River

Matter: 35990,
Date: 29 September 2022,
Prepared for: ST,
Prepared by: MK,
Last edited by: mknudsen
Layout: 35990_F3_Land
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx



Legend

Project area

Trail alignment

- Existing Informal Trail
- Existing MVO Track
- Existing Walking Trail
- New Walking Trail

Land category

- National parks and nature conservation reserves
- Other conservation reserves
- Other public land

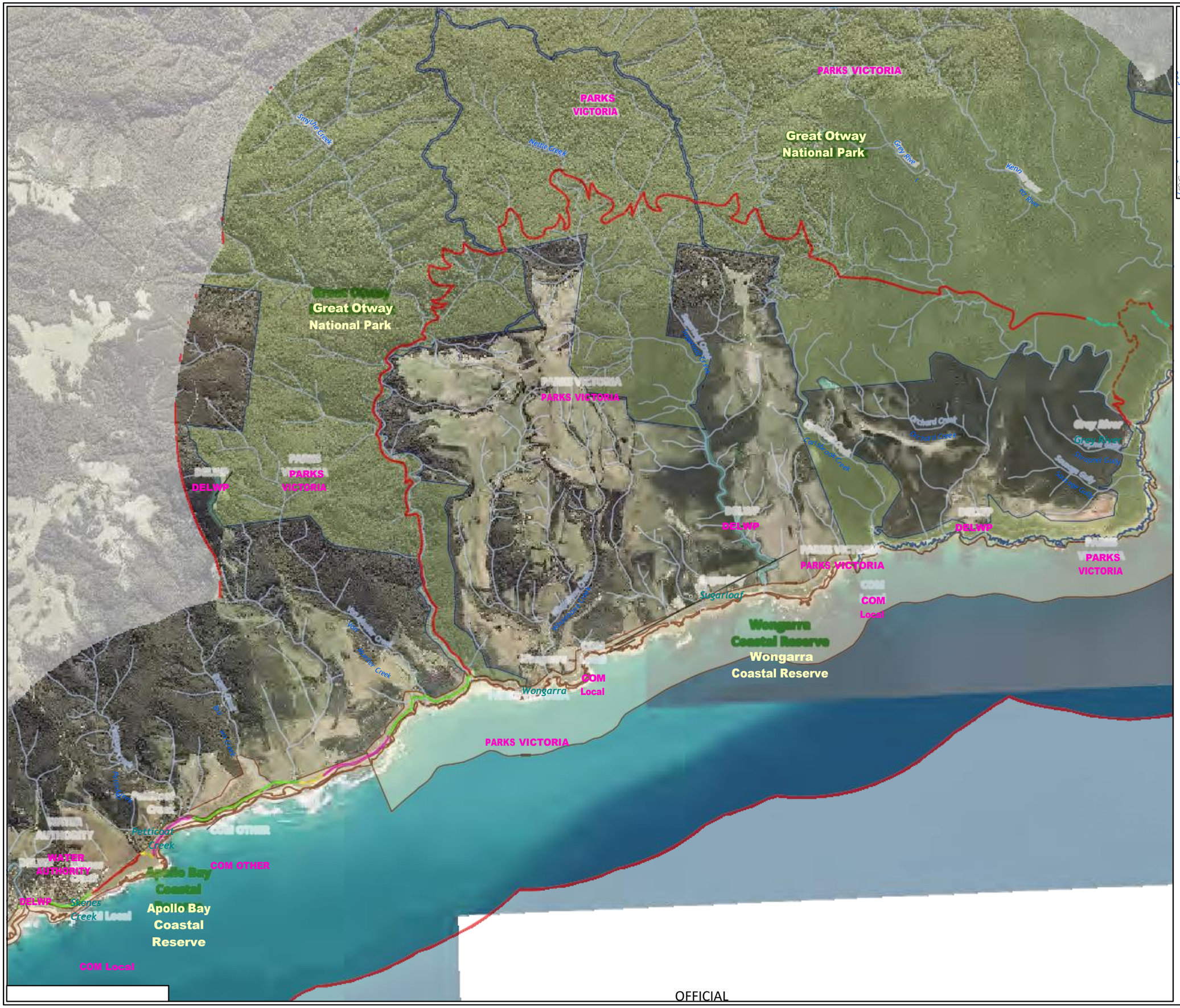
Figure 2.8 Land tenure and conservation areas within the study area

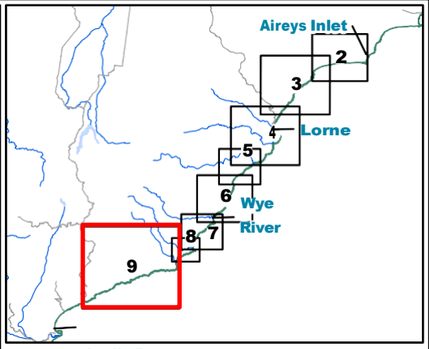
0 100 200 300 400 500

Metres
Scale: 1:10,000 @ A3
Coordinate System: GDA 1994 VICGRID94

biosis

Matter: 35990,
Date: 29 September 2022,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen
Layout: 35990_F3_Land
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
- Existing Walking Trail
- New Walking Trail
- Other

Land category

- National parks and nature conservation reserves
- Other conservation reserves
- Other public land

Figure 2.9 Land tenure and conservation areas within the study area

0 360 720 1,080 1,440 1,800

Metres

Scale: 1:35,000 @ A3

Coordinate System: GDA 1994 VICGRID94

biosis.

Acknowledgements: BaseMap - VicMap ©State of Victoria

Matter: 35990,
Date: 29 September 2022,
Prepared for: ST, Prepared by: MK, Last edited by: mknudsen Layout: 35990_F3_Land
Project: P:\35800s\35871\Mapping\35990_GORT_WT_Ecology_Figures.aprx

1.5 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
Search area	The project area buffered outwards by 10 kilometres. This area is used to conduct the database review of biodiversity values.
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.
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 2.5 metre wide corridor (1.25 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.
Ground-truthed route 1 (GTR 1)	The basis for the assessment within this report. All trail numbers used in this report refer to GTR 1 unless otherwise specified. 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.
Ground-truthed route 2 (GTR 2)	A centreline representing the proposed alignment of the walking trail, updated to reflect changes since the field assessment of GTR 1. This indicative trail alignment has not been finalised and was not assessed during detailed flora investigations where it deviated from GTR 1. However, where relevant, this report mentions fauna habitat recorded in this section of the alignment in context of habitats present within the GTR 1 project area.
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*
CEMP	Construction Environmental Management Plan
CMA	Catchment Management Authority
CTRC	Cool Temperate Rainforest Community
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Federal)
DELWP	Department of Environment, Land, Water and Planning (State)
EE Act	*Environment Effects Act 1978*
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

2. Methods

2.1 Database review

In order to provide a context for the project area, information about flora and fauna from within 10 kilometres of the project area (the 'local area') was obtained from relevant biodiversity databases, many of which are maintained by the Victorian Government Department of Environment, Land, Water and Planning (DELWP) or the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW). Aquatic fauna records were searched for the Otway Coast Basin, which has two catchments: Gellibrand River and Otway Coast. Records from the following databases were collated and reviewed:

- DELWP's Victorian Biodiversity Atlas (VBA), including the 'VBA_FLORA25, FLORA100 & FLORA Restricted' and 'VBA_FAUNA25, FAUNA100 & FAUNA Restricted' datasets.
- DCCEEW's Protected Matters Search Tool 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.
- DELWP's Habitat Importance maps.
- DELWP's Native Vegetation Information Management (NVIM) system.
- DELWP's Ensym NVR Tool Support team was provided with site-based spatial information in order to generate a Native Vegetation Removal Report for the project area.
- Planning Scheme overlays relevant to biodiversity based on http://planningschemes.dpcd.vic.gov.au.

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 threatened species

Likelihood of occurrence indicates the potential for a species or ecological community to occur regularly within the assessment corridor. It is based on expert opinion, information in relevant biodiversity databases

and reports, and an 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 Appendix 2 (fauna). Those species 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 listed under the EPBC Act or the FFG Act (hereafter referred to as ' threatened species') are assessed to determine their likelihood of occurrence. The habitat value for threatened species is calculated by the Habitat Importance Modelling produced by DELWP (DELWP 2017a). Where threatened species are recorded in the project area this is noted in Appendix 1 (flora) and Appendix 2 (fauna).

Threatened species which have at least medium likelihood of occurrence are given further consideration in this report. The need for targeted survey for these species is also considered.

2.4 Site investigation

2.4.1 Flora assessment

The detailed flora assessment was undertaken by a team of ecologists that included Matt Looby, Sam Trollope, Sarah Hilliar, Sam Bodycomb and Molly Farquharson. The flora assessment took place during the following weeks:

- 23 May to 27 May 2022.
- 20 June to 24 June 2022.

A list of flora species was collected and will be submitted to DELWP for incorporation into the Victorian Biodiversity Atlas (VBA). Planted species have not been recorded unless they are naturalised. A total of approximately 300 hours was spent surveying the assessment corridor along 38.5 kilometres of trail. 2.5 kilometres of trail were not surveyed due to late design changes (trails alternate 4, alternate 6, and alternate 8, all located west of Cumberland River).

Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses' (Clause 73.01).

The Guidelines classify native vegetation into two categories (DELWP 2017a):

- A **patch** of native vegetation (measured in hectares) is either:
  - An area of native vegetation, with or without trees, where at least 25% of the total perennial understorey cover is native plants.
  - An area with three or more native canopy trees where the drip line (i.e. the outermost boundary of a tree canopy) of each tree touches the drip line of at least one other tree, forming a continuous canopy.
  - Any mapped wetland included in the *Current wetlands map,* available in DELWP systems and tools.

Patch vegetation is classified into ecological vegetation classes (EVCs). An EVC contains one or more floristic (plant) communities and represents a grouping of broadly similar environments. Definitions of EVCs and benchmarks (condition against which vegetation quality at the site can be compared) are determined by DELWP.

- A **scattered tree** is defined as a native canopy tree that does not form part of a patch of native vegetation.

A canopy tree is a mature tree that is greater than three metres in height and is normally found in the upper layer of a vegetation type. Ecological vegetation class descriptions provide a list of the typical canopy species. A scattered tree is defined as either small or large, and is determined using the large tree benchmark for the relevant EVC. The extent of a small scattered tree is the area of a circle with a 10 metre radius (i.e. 0.031 hectares), while the extent of a large scattered tree is a circle with a 15 metre radius (i.e. 0.070 hectares). A condition score is applied to each scattered tree based on information provided by DELWP's NVIM.

All large trees within the assessment corridor were mapped. This is in accordance with the standard practice for mapping large trees according to EVC benchmark in native vegetation patches. Biosis ecologists collected data on large tree variables such as diameter at breast height (within 5 to 10 centimetre size classes), tree species, tree health, stem count and presence of hollows. The hollow-bearing status of each benchmark large tree was assessed rapidly from ground observations and where there was doubt regarding the presence of tree hollows a 'no value' result was applied to the large tree in question.

Vegetation Quality Assessment (VQA) sampling was undertaken for representative patches of native vegetation of the same EVC and condition state identified in the assessment corridor. Samples were collected in 0.25 hectare quadrats or within the full extent of the habitat zone. The VQA score was then applied to vegetation of the same EVC and condition state throughout the assessment and construction (impact) corridor. Sampling was stratified based on the area of each EVC and condition state within the assessment corridor. This method aimed to sample over 20 percent of each EVC and condition state within the construction corridor. This assessment is consistent with DELWP's habitat hectare method (DSE 2004a) and the Guidelines (DELWP 2017a).

For the purposes of this assessment the limit of the resolution for identification of a patch of native vegetation was taken to be 0.001 habitat hectares (Hha). That is, if a discrete patch native vegetation was present with sufficient cover but its condition and extent would not have resulted in the identification of at least 0.001 habitat hectares, the vegetation patch of vegetation was not mapped or included in the assessment.

Where relevant, notes were made on specific issues such as noxious weed infestations, evidence of management works, current grazing impacts and the regeneration capacity of the vegetation.

Species nomenclature for flora follows the VBA.

2.4.2 Mapping vegetation removal and tree protection zones

Based on the trail construction methods outlined in the project masterplan, it is proposed to remove understorey vegetation only during construction of the trail surface. Most canopy forming trees and immature trees according the EVC benchmark will be avoided during a construction. Vegetation removal within the construction footprint includes the 1 metre built trail surface and a 0.75 metre construction buffer either side of the trail surface to allow for earthworks and drainage. Vegetation removal is therefore assessed using a 2.5 metre wide footprint and applied along the length of each trail. For forest and woodland vegetation, a partial clearing score has been applied to calculate native vegetation offset requirements as outlined in the Guidelines (DELWP 2017) and Assessors Handbook (DELWP 2018). All treeless vegetation types have had a full clearing score applied (i.e. EVC 161- Coastal Headland Scrub). For areas where infrastructure is proposed, such as large swing bridges full, clearing has been applied where it impacts native vegetation.

Where small-scale elevated structures are proposed, the vegetation under these structures has been 'deemed lost' and included in offset calculations by applying the 2.5 metre wide construction corridor as outlined above, although recent examples from other walking trail projects in Victoria and NSW demonstrate that such vegetation is likely to persist under structures that allow rainfall and light to penetrate to the ground.

Where large scale, swing bridges are proposed across steep-sided ravines, the vegetation beneath has not been deemed lost, as the height of the bridge is not anticipated to significantly impact the vegetation below. Instead, a construction footprint is applied for each abutment supporting the bridge at either end:

- 20 x 25 metre construction zone.
- 5 x 5 metre for wind guy cable anchor blocks (four per abutment).
- 2.5 x 5 metre vegetation loss along the initial span of the bridge

Tree Protection Zone (TPZ) impacts of trees within the trail assessment corridor have been assessed by an independent arborist (Axiom Tree Management 2022). This assessment indicates that TPZ impacts are likely to be minimal, provided construction recommendations are followed that protect root systems and tree trunks. This assessment is based on a review of existing trails built through similar terrain and vegetation types in the local area and the limited to negligible tree health impacts that have resulted from trails in other parts of Victoria. Therefore, TPZ impacts have not been included in the vegetation removal footprint for trail construction but have been considered for the construction of the larger infrastructure such as the abutments of the swing bridges. Impacts here are likely to require more extensive ground disturbance than trail construction. Further information about construction methods will be included in the Planning and Design report.

2.4.3 Fauna assessment

The project area and broader search area of GTR 1 and 2 were investigated by Project Zoologist Erin Baldwin (former Biosis staff member) and Zoologist Zahlia Payne (with assistance from Research Assistant Karthika Jayakumar) between the 26 and 29 April and 17 and 18 May 2022 to determine its values for fauna. These were determined primarily on the basis of the types and qualities of habitat(s) present.

The fauna assessment included nocturnal surveys for arboreal mammals and forest owls, bird surveys and the deployment of 30 remote cameras to maximise the detection of threatened and/or cryptic vertebrate fauna groups. However, as the trail alignment within the GTR 1project area west of Grey River has not been finalised and was not assessed during detailed flora investigations, results of the fauna investigations presented in this report only relate to fauna and fauna habitat recorded within the GTR 1 project area (Fairhaven to Grey River). Once final alignment is determined, further fauna and flora assessments will be undertaken prior to planning applications.

Methods related to these survey techniques are described in further detail below.

Nocturnal surveys

Two nights of nocturnal surveys were undertaken to record nocturnal fauna species such as owls, possums, gliders and frogs within the GTR 1 and 2 project areas across a combination of dry and wet forest types. Nocturnal surveys used a combination of spotlighting from a vehicle and transects on foot, listening for bird and frog calls and the use of playback to elicit responses from owl species with potential to occur in the project area.

Bird surveys

Five bird survey sites were chosen to target a range of different habitat types within the GTR 1 and 2 project area. Bird surveys were undertaken at each survey site either in the morning and/or afternoon following the Birds Australia 2 hectare 20 minute bird survey method to maximise the number of species recorded. Birds were detected and identified visually and/or by calls. The location of bird survey sites within the GTR 1 project area are shown in Figure 3.

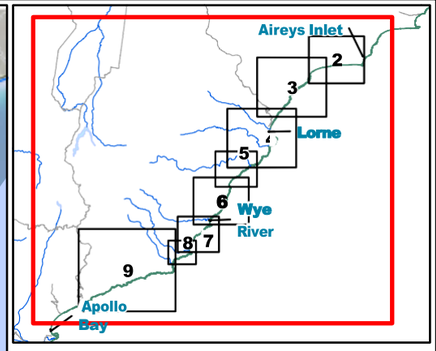
Remote cameras

Remote cameras were primarily used in the current survey to target ground-dwelling mammal species. However, this survey technique can also be useful to detect reptiles and birds. Two remote camera types were utilised during the survey, including 20 Reconyx™ HC600 HyperFire Infra Red trail cameras and 10 Reconyx™ HF2X HyperFire 2 (which were predominantly placed in suitable habitat within the proposed alignment south of the Great Ocean Road to detect the threatened species Swamp Antechinus).

Thirty remote cameras were typically deployed in pairs, 100 metres apart, across a diversity of ecological vegetation classes within the GTR 1 and 2 project areas. The exception is two cameras, which were deployed singly within the same environment due to a lack of trees suitable for camera attachment. The locations of remote cameras deployed within the GTR 1 project area over the survey period are shown in Figure 3.

Cameras were attached to a tree trunk approximately 40 centimetres above ground level in order to target ground dwelling species. Cameras were deployed facing a lure station containing standard mammal bait (oats, peanut butter, golden syrup truffle oil) located approximately 2 meters from the remote camera to lure animals within the camera's sensor range. The range and capture position of the camera was trialled and reviewed on a handheld camera following each attachment prior to programming.

All cameras were programmed to take three photos per trigger event, with no delay between triggers. All remote cameras were set to a 'high' sensitivity and programmed to operate continuously over the entire period in which they were deployed. All cameras were deployed between 26 and 27 April 2022 and collected on the 17 and 18 May 2022, with the exception of two cameras (Camera 50 and Camera 51) which were collected during detailed botanical assessment of the assessment corridor within GTR 1 on the 21 June 2022.



Legend

- Project area
- Bird survey location
- VQA locations
- Camera location

Trail alignment

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

Figure 3.1 Survey effort in the project area

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

Metres

Scale: 1:130,000 @ A3

Coordinate System: GDA 1994 VICGRID94

Acknowledgements: BaseMap - VicMap ©State of Victoria, Fieldwork - Practical Ecology

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Date: 29 September 2022,
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Layout: 35990_F2_Survey
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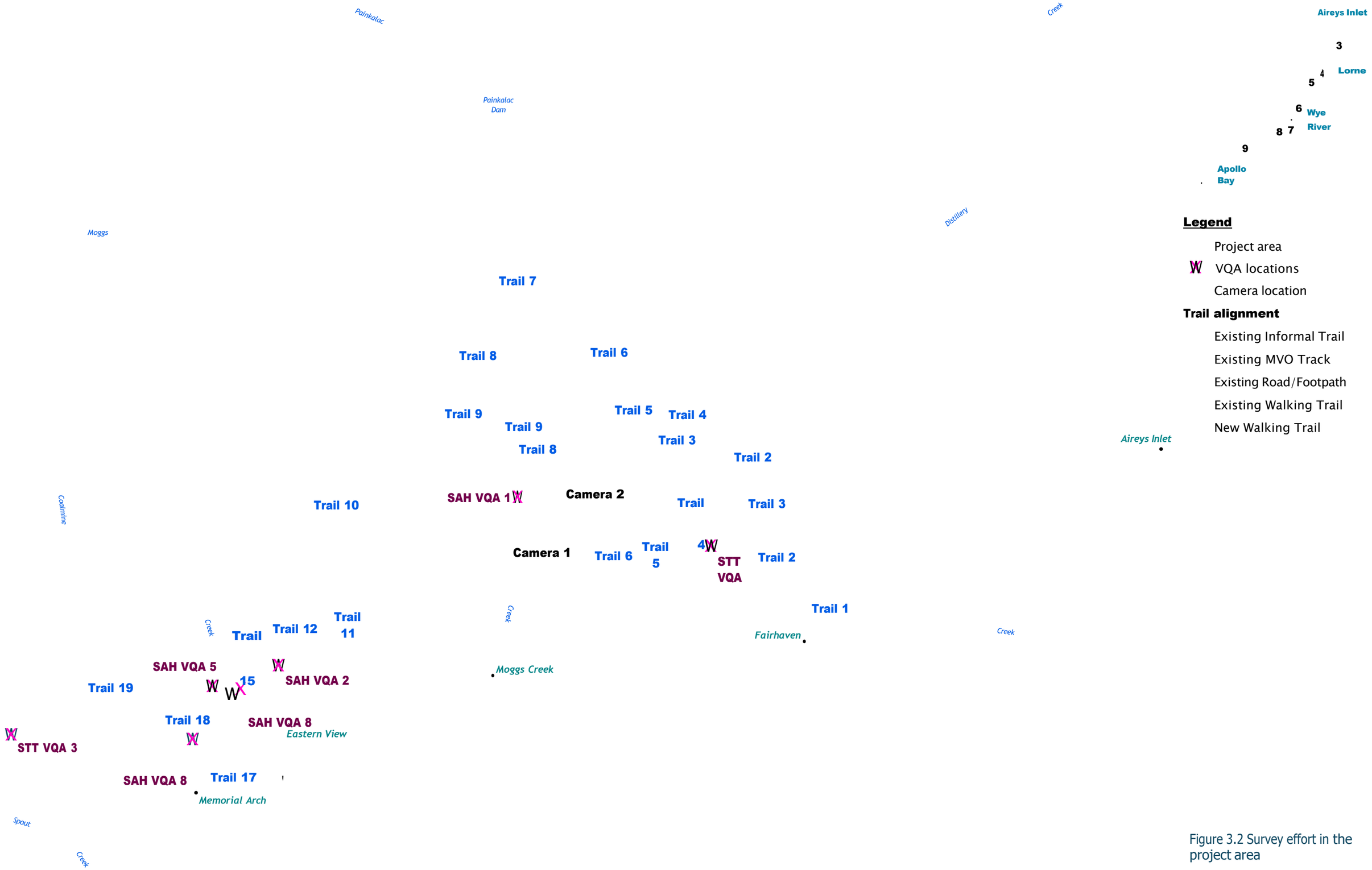
35990_GORT_WT_Ecology_Figures.aprx



Legend

- Project area
- VQA locations
- Camera location

Trail alignment

- Existing Informal Trail
- Existing MVO Track
- Existing Road/Footpath
- Existing Walking Trail
- New Walking Trail

Figure 3.2 Survey effort in the project area

0 200 400 600 800

Metres
Scale: 1:20,000 @ A3
Coordinate System: GDA 1994 VICGRID94


Trail 7
Trail 8
Trail 6
Trail 9
Trail 5
Trail 4
Trail 9
Trail 3
Trail 8
Trail 2
SAH VQA 1
Camera 2
Trail 3
Trail 10
Camera 1
Trail 6
Trail 5
Trail 4
STT VQA
Trail 2
Trail 1
Trail 11
Trail 12
Trail 15
SAH VQA 5
SAH VQA 2
Trail 19
Trail 18
SAH VQA 6
STT VQA 3
SAH VQA 8
Trail 17
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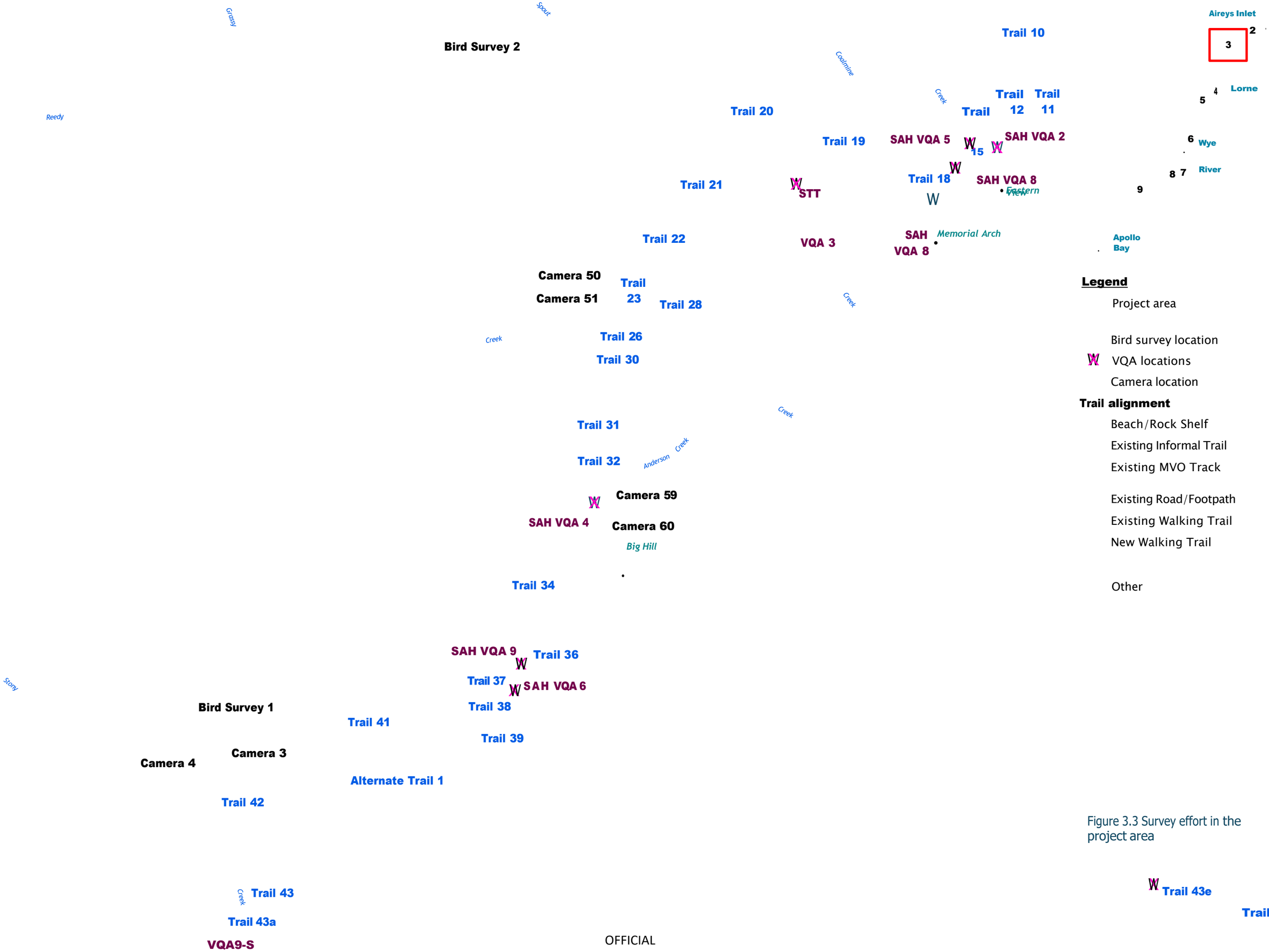
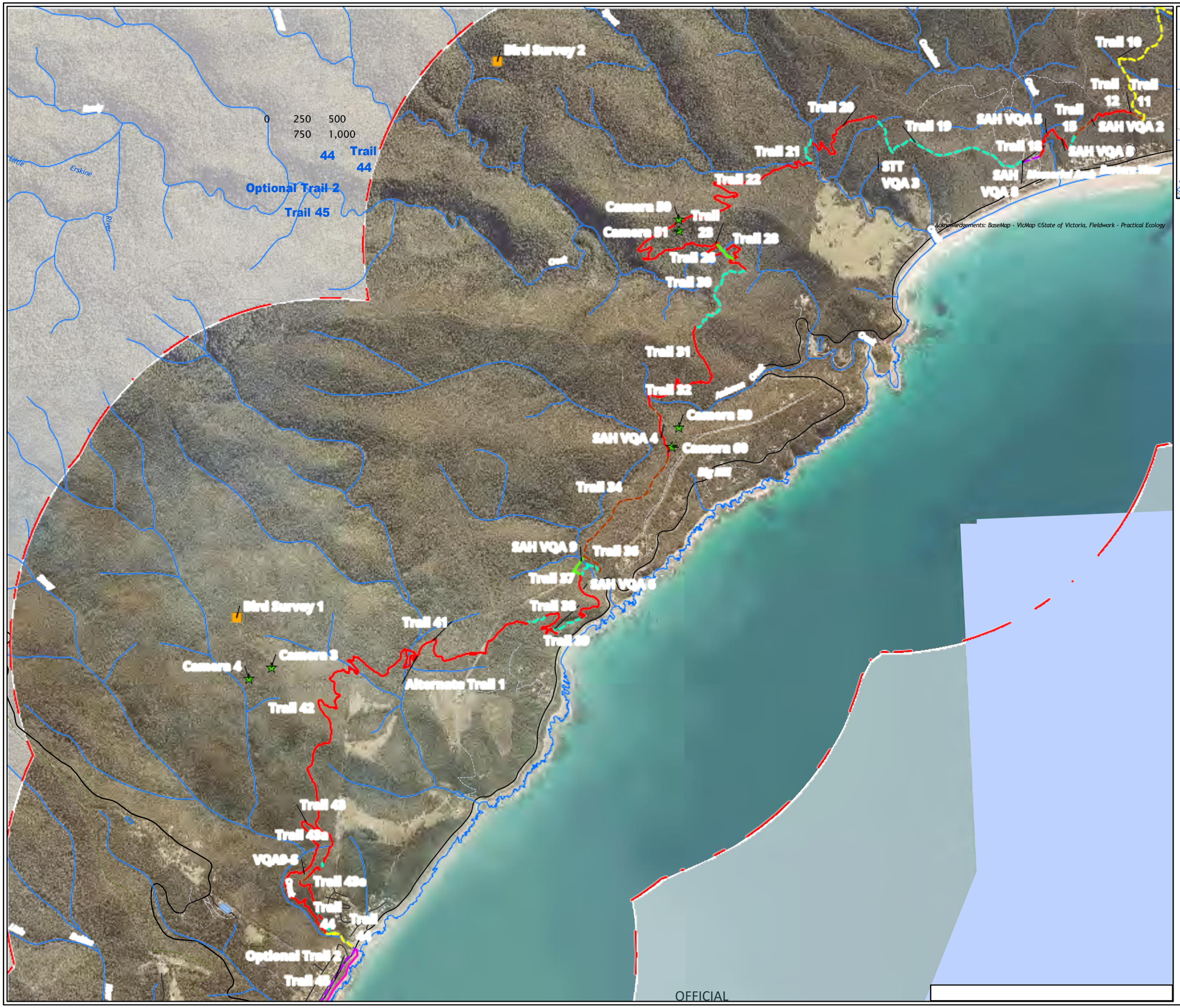


Figure 3.3 Survey effort in the project area


0 250 500
750 1,000
Trail 44
Optional Trail 2
Trail 45
Little
Erskine
River
Bird Survey 2
Trail 21
Trail 22
Trail 23
Trail 25
Trail 26
Trail 29
Trail 19
SAH VQA 5
Trail 15
Trail 12
Trail 11
Trail 10
SAH VQA 2
SAH VQA 8
STT VQA 3
SAH VQA 7
Camera 50
Camera 51
Trail 31
Trail 32
Jetsam Creek
Camera 59
SAH VQA 4
Camera 60
Trail 34
SAH VQA 9
Trail 36
Trail 37
SAH VQA 10
Trail 38
Trail 39
Bird Survey 1
Trail 41
Camera 3
Camera 4
Alternate Trail 1
Trail 42
Trail 43
Trail 43a
VQA9-6
Trail 43c
Trail 44
Optional Trail 2
Trail 45
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Metres
Scale: 1:25,000 @ A3
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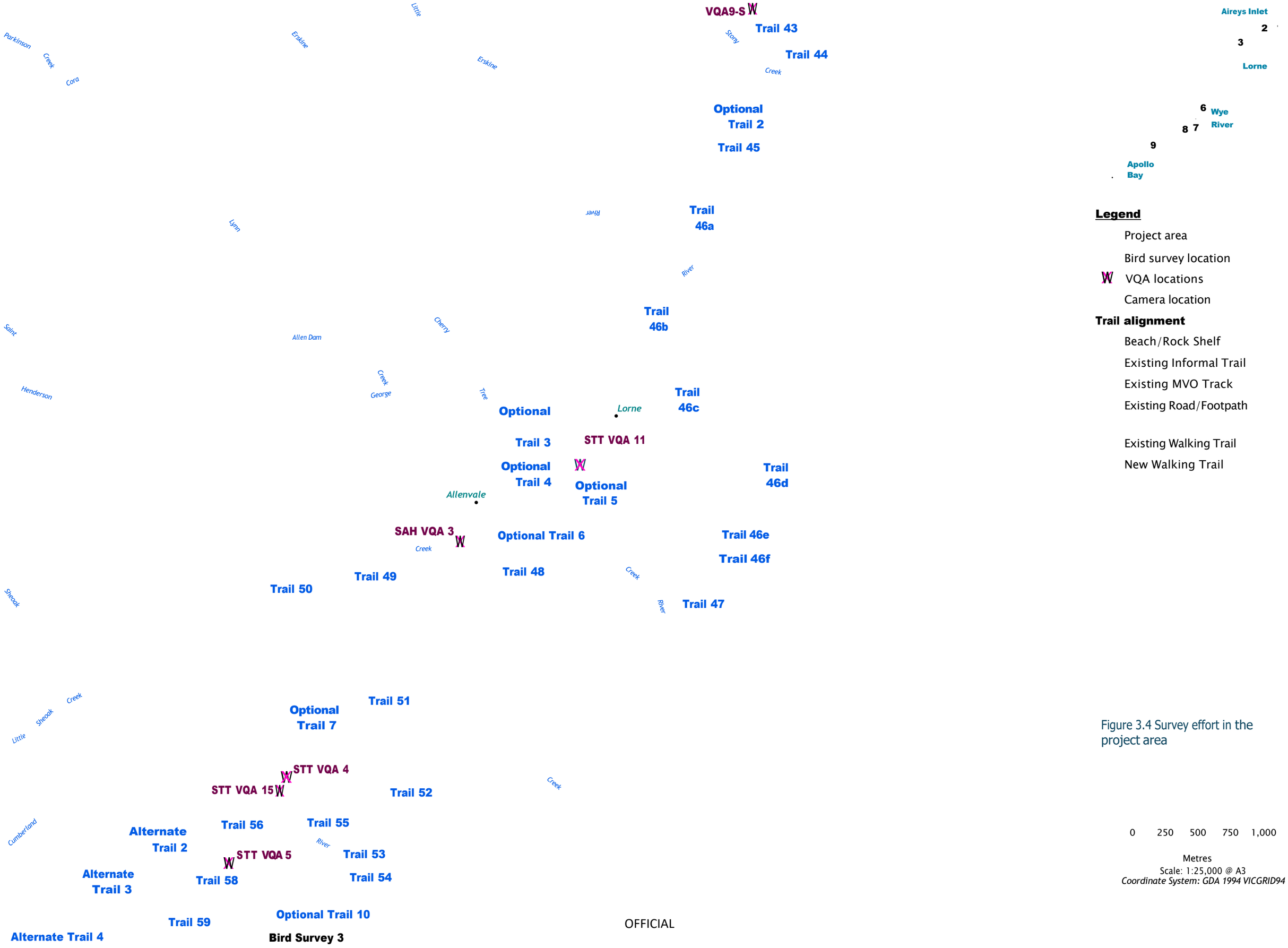


Legend

- Project area
- Bird survey location
- VQA locations
- Camera location

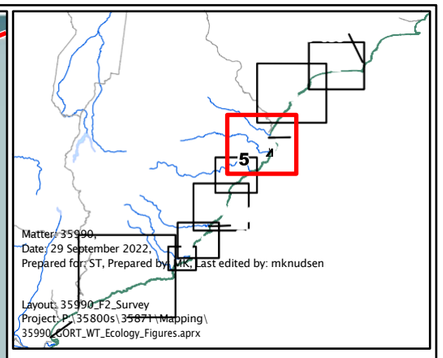
Trail alignment

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

Figure 3.4 Survey effort in the project area

0 250 500 750 1,000

Metres
Scale: 1:25,000 @ A3
Coordinate System: GDA 1994 VICGRID94



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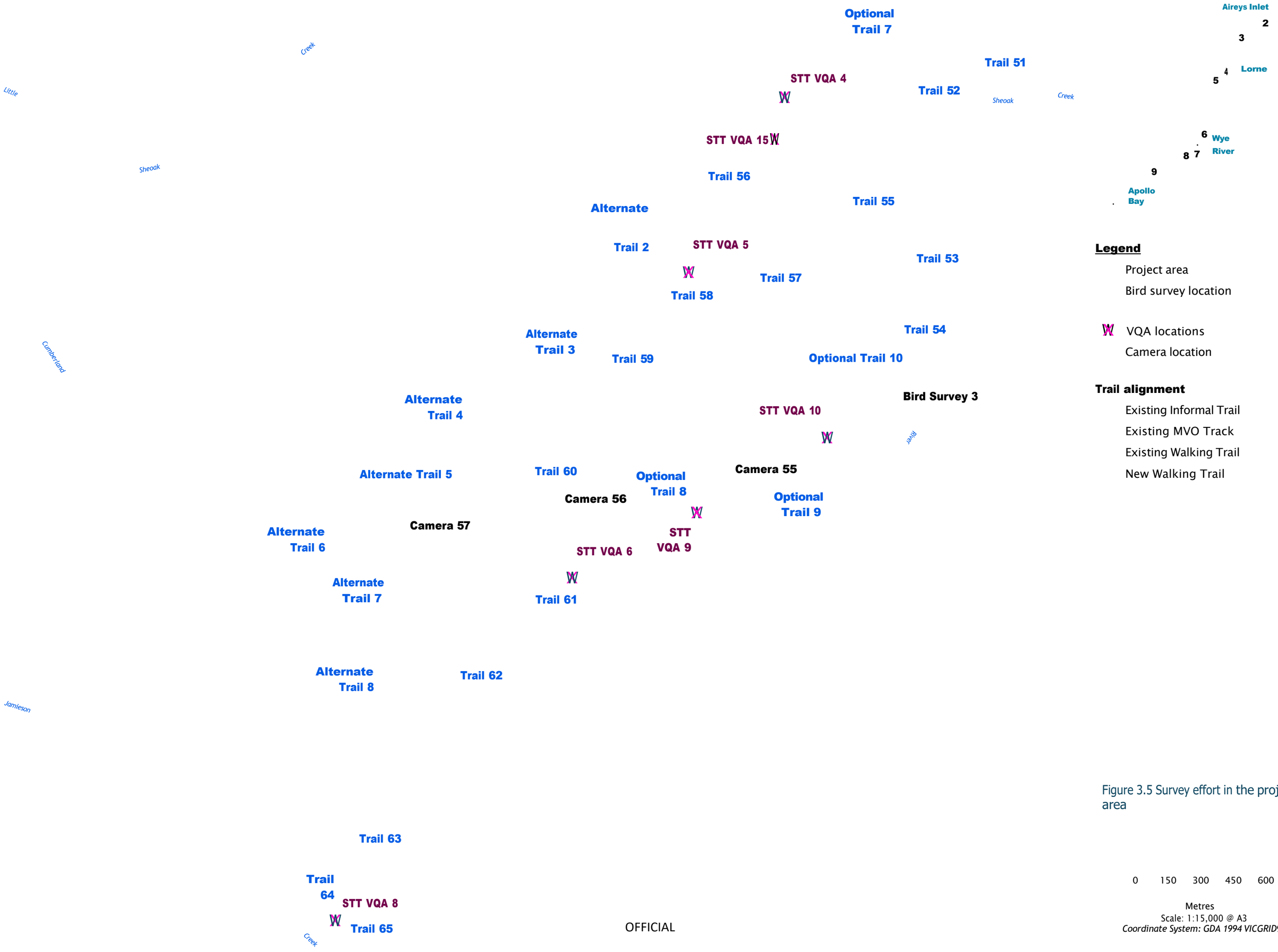

Legend

- Project area
- Bird survey location
- VQA locations
- Camera location

Trail alignment

- Existing Informal Trail
- Existing MVO Track
- Existing Walking Trail
- New Walking Trail

Figure 3.5 Survey effort in the project area

0 150 300 450 600

Metres
Scale: 1:15,000 @ A3
Coordinate System: GDA 1994 VICGRID94


Optional Trail 7
Trail 51
STT VQA 4
STT VQA 15
Trail 52
Trail 66
Trail 56
Trail 53
Alternate Trail 2
STT VQA 5
Trail 57
Trail 58
Trail 55
Trail 54
Alternate Trail 3
Trail 59
Optional Trail 10
Bird Survey 3
Alternate Trail 4
STT VQA 10
Camera 55
Alternate Trail 5
Trail 60
Optional Trail 8
Optional Trail 9
Camera 56
Camera 57
Alternate Trail 6
STT VQA 9
STT VQA 6
Trail 61
Alternate Trail 7
Alternate Trail 8
Trail 62
Trail 63
Trail 64
STT VQA 8
Trail 65
Trail 66
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Matter: 35990,
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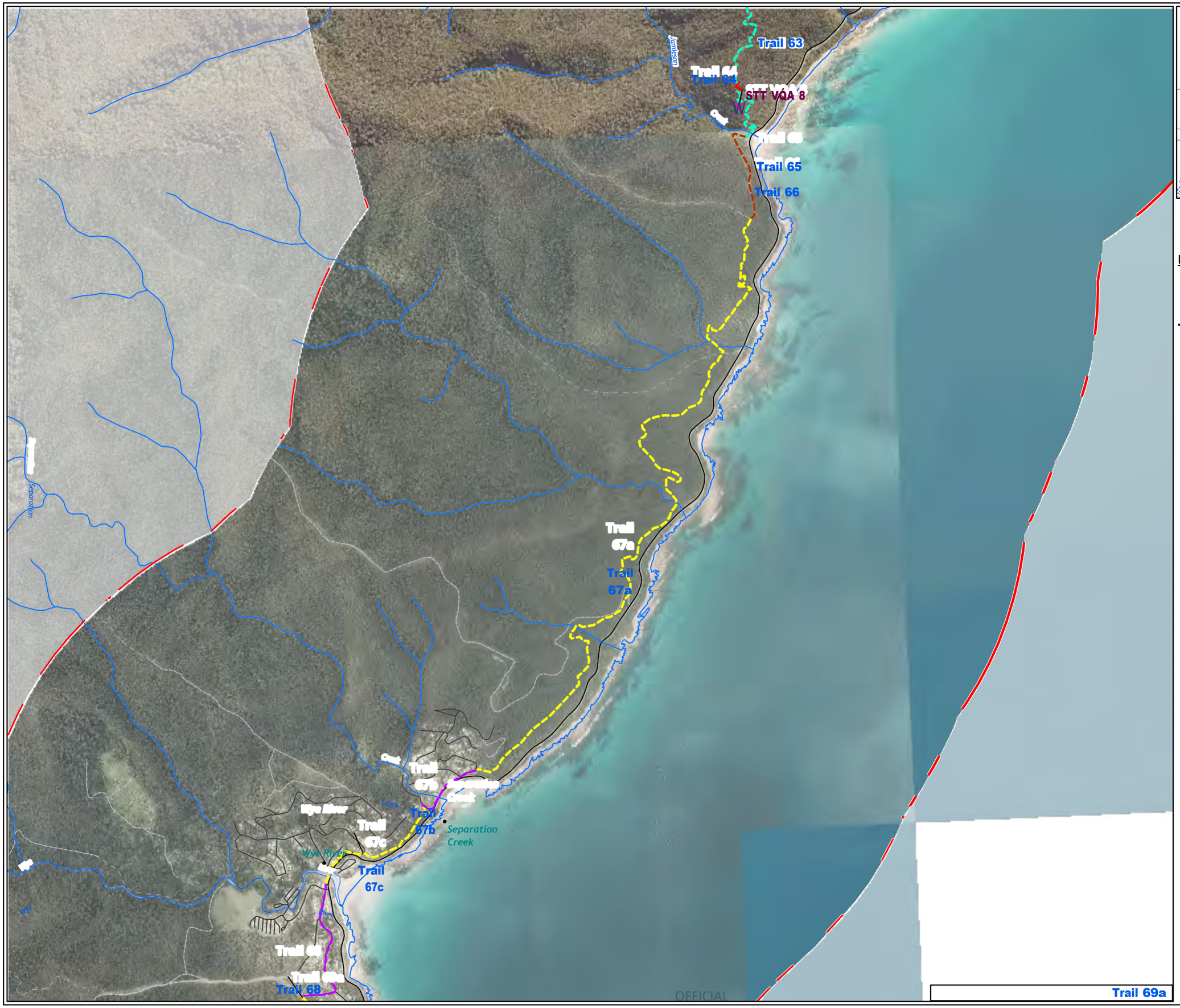

Figure 3.6 Survey effort in the project area

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Date: 29 September 2022,
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Project: P:\35800s\35871\Mapping\ 35990_CORT_WT_Ecology_Figures.aprx

Legend

Project area

Trail alignment

Existing MVO Track

Existing Road/Footpath

Existing Walking Trail

New Walking Trail

Figure 3.7 Survey effort in the project area

0 150 300 450 600

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 VICGRID94

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Matter: 35990,
Date: 29 September 2022,
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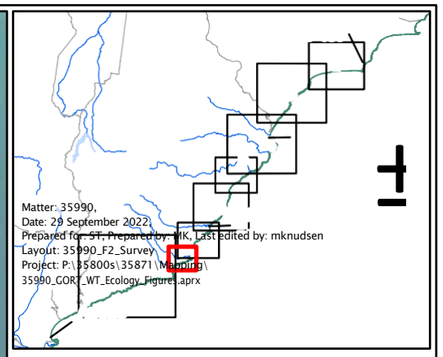
Figure 3.8 Survey effort in the project area



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35990_GORT_WT_Ecology_Figures.aprx

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Legend

- Project area
- Bird survey location
- Camera location

Trail alignment

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

Figure 3.9 Survey effort in the project area

0 350 700 1,050 1,400

Metres
Scale: 1:35,000 @ A3

Coordinate System: GDA 1994 MCGRID94

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2.4.4 Permits

Biosis undertakes flora and fauna assessments under the following permits and approvals:

- Wildlife Authorisation issued by DELWP under the *Victorian Wildlife Act 1975* (Permit Number 10010193)
- Permit to Take/Keep Protected Flora issued by DELWP under the *Flora and Fauna Guarantee Act 1988* (FFG Act) (Permit Number 10010194)
- Permit to Take Protected Fish issued by DELWP under the *Flora and Fauna Guarantee Act 1988* (FFG Act) (Permit Number 10010195)
- Permit to Conduct Research in areas managed by the Parks Victoria issued by DELWP under the *National Parks Act 1975*, *Crown Land (Reserves) Act 1978* and *Parks Victoria Act 2018* (Permit Number 10010071)
- Permit to catch and release fish issued by the Victorian Fisheries Authority under the *Victorian Fisheries Act 1995* (Permit Number RP 1220, Personal File Number 13041)
- Approvals 18.21 and 20.21 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).

2.4.5 Expert consultation

During this ecological assessment, World Trail and Biosis contacted local experts to discuss and identify biodiversity values that may be impacted by the construction of the proposed walking trail. The intent of meetings was to identify local biodiversity values and propose mitigation measures for their protection. Specific consultation included:

- Site meeting at Coalmine Creek with World Trail, Dr Barbara Wilson, Dr Mark Garkaklis and Corangamite CMA (small mammal refuges and Cinnamon Fungus).
- Consultation with Biosis and Dr Barbara Wilson (small mammal refuges, and mitigation measures).
- Consultation with Biosis and Dr Mark Garkaklis (*Phytophthora cinnamomi* and the disease Phytophthora dieback, and the vectors, mitigation methods and Priority Protection Areas).

2.5 Qualifications

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected at a site during survey, such as low abundance, patchy distribution, species dormancy, seasonal conditions, and migration and breeding behaviours. In many cases these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

The flora and fauna assessment was conducted across multiple seasons. The detailed flora assessment occurred in late autumn/early winter, which is not an optimal time for survey. Many flora species do not have any reproductive material available for identification to the species level. The survey effort is considered sufficient to assess the general values of the project area and undertake biodiversity impact assessments that are required. It is also deemed sufficient for the detection of habitat for threatened flora species, and in some cases, their identification, which will help inform future targeted surveys and trail alignment changes. Weather conditions were mostly fine during the detailed flora assessment with one day of poor conditions

(i.e. drizzle) during the May survey. All trail alignments that were labelled as 'new trail' or 'existing informal trail' as defined by the World Trail Pty Ltd georeferenced alignment were walked. One section beneath a proposed bridge was not assessed as the height was deemed in excess of impacting the vegetation and habitat below. Here the vegetation was assessed until the edge of the gorge (trail 58). Furthermore, late design changes to GTR 1 resulted in the following trails not being assessed: alternate 4 to alternate 8.

The location of remote camera traps and owl/bird surveys were limited due to poor condition of roads after heavy rainfall. The timing of surveys was suitable for mammals, however diurnal bird surveys were conducted outside of the optimal time of year (spring) and time of day (sunrise/early morning). Incidental observations were recorded to capture any potential missing species data.

Native Vegetation Removal Reports are prepared through DELWP's NVIM system or requested through DELWP's Ensym NVR Tool Support team. Biosis supplies relevant site-based spatial information as inputs to DELWP and we are entirely reliant on DELWP's output reports for all assessment pathway applications. Biosis makes every effort to ensure site and spatial information entered into the NVIM, or supplied to DELWP, is an accurate reflection of proposed native vegetation removal. The Native Vegetation Removal Report can be viewed in Appendix 7.

2.6 Legislation and policy

The implications for the project were assessed in relation to key biodiversity legislation and policy including:

- 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* including the Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017a).
- *Procedure for the removal, destruction or lopping of native vegetation on Crown land* (DELWP 2018).
- 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.*

Other pieces of legislation relating to biodiversity, and are addressed in the project planning approvals strategy (Biosis 2022c), include:

- *Marine and Coastal Act 2018.*
- *Great Ocean Road and Environs Protection Act 2020.*

2.7 Mapping

World Trail Pty Ltd supplied the georeferenced centreline trail alignment (GTR 1 and GTR 2), and all trails were marked with orange flagging tape by the trail designers before Biosis' detailed field work. Biosis applied a 10 metre buffer (termed: assessment corridor) to the centreline to define the area relevant for the detailed assessment.

Mapping was conducted using hand-held GPS-enabled tablets and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the tablets (generally ± 3 to 7 metres depending on terrain and tree canopy cover) and dependent on the limitations of aerial photo rectification and registration.

Mapping has been produced using a Geographic Information System (GIS). Electronic GIS files which contain our flora and fauna spatial data are available to incorporate into design concept plans. However this mapping may not be sufficiently precise for detailed design purposes.

3. Results

This section summarises the key ecological values identified within the assessment corridor and broader GTR 1 project area and assessment corridor, where relevant.

The ecological features of the project area and assessment corridor are described below, summarised in Table 4 and mapped in Figure 5. Species recorded during the flora and fauna assessment are listed in Appendix 1 (flora) and Appendix 2 (fauna). Unless of particular note, these species are not discussed further. Those species recorded or predicted to occur in the local area are also provided in those appendices, along with an assessment of the likelihood of the species occurring within the project area.

3.1 Landscape context

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 occurring from the coastline to 200 metres in elevation (VRO 2022). The region has a temperate climate, dominated by westerly winds and receives an average annual rainfall ranging between 552 – 899 millimetres (VRO 2022). However, the Otway ranges to the south-west 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 (RBGV 2022a), 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. 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 2022a).

The Otway Ranges

The Otway Ranges 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 (VRO 2022).

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 Ranges experiencing annual rainfall greater than 1800 millimetres (Pitt 1981).

In the project area, vegetation within the Otway Ranges Bioregion is largely comprised of forests and woodlands. These vegetation types include Cool Temperate Rainforest that is widespread in the region, however has declined markedly since European settlement (RBGV 2022b). 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 2022b).

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 Flora and vegetation

The project area is located on public land, primarily across conservation reserves such as the Great Otway National Park and various coastal conservation reserves. The area supports extensive tracts of native vegetation with all major structural components intact. Introduced flora were primarily recorded near settlements and areas of frequent human use such as adjacent to car parks, viewing platforms, picnic areas and roads. Introduced flora are discussed in more detail in Section 3.6.

The majority of the project area occurs on moderate to steep slopes that are largely excluded from public use. Evidence of unsanctioned dirt bike trails are scattered throughout the project area, as well as official management vehicle trails. The landscape has been subjected to differing fire regimes as a result of prescribed burning and natural bushfires. Sections of heathland within the Otway Plain are subjected to regular burning regimes, and the forested communities present in the Otway Ranges have been burnt less regularly. Although, it was evident that some forested areas were undergoing post-fire generation at different stages of recovery. Recent prescribed burns were evident around Lorne as well as bush fire recovery predominantly on the ridges west of the Cumberland River. The result is mosaic of vegetation types with various condition responses to the natural and prescribed burn regimes. Consequently, understorey shrubs can be over represented in some EVCs and dominant in regenerating communities three to five years post-burn, making the transition between EVCs more complex and difficult to detect.

A range of EVCs were recorded across the assessment area, their distribution largely driven by aspect and topography. Within the Otway Plain, heathy EVCs dominate the landscape. The vegetation communities are generally open woodland with a low canopy height. The most dominant EVCs within the assessment corridor are EVC 48 – Heathy Woodland and EVC 21 – Shrubby Dry Forest. Canopy species include Red Ironbark *Eucalyptus tricarpa*, Messmate Stringybark *Eucalyptus obliqua* and Southern Blue-gum *Eucalyptus globulus*. The understorey species within the Otway Plain are largely comprised of heathy species such as Austral Grass-tree *Xanthorrhoea australis*, Erect Guinea-flower *Hibbertia riparia* and Horny Cone-bush *Isopogon ceratophyllus*. Grasses are usually dominant as well, including Silvertop Wallaby-grass *Rytidosperma pallidum*.

The Otway Ranges Bioregion features characteristically steep topography intersected with major river systems. The vegetation communities are comprised mainly of tall wet forests supporting a mixed canopy of Southern Blue-gum, Mountain Grey-gum *Eucalyptus cypellocarpa*, Scentbark *Eucalyptus aromaphloia* and Messmate Stringybark. The ridges and drier slopes usually support EVC 21 - Shrubby Dry Forest which grades into EVC 45 – Shrubby Foothill Forest on the sheltered and lower slopes. The distinguishing features between the two EVCs is the composition of understorey shrubs. Shrubby Dry Forest is dominated by Fabaceae including Large-leaf Bush-pea *Pultenaea daphnoides*, Prickly Bush-pea *Pultenaea forsythiana* and Narrow-leaf Wattle *Acacia mucronata* subsp. *longifolia*. Whereas EVC 45 - Shrubby Foothill Forest is characterised by a denser shrub layer comprised of a mesic species, usually Musk Daisy-bush *Olearia argophylla* Snowy Daisy-bush *Olearia lirata* and Blanket Leaf *Bedfordia arborescens*.

Other EVCS occurring throughout the Otway Ranges include EVC 201 - Shrubby Wet Forest occupying sheltered gullies and is dominated by ferns such as Water Ferns *Blechnum* spp. and Rough Tree-fern *Cyathea*

australis. EVC 18 – Riparian Forest occupies the margins of the major river and creek systems. EVC 16 – Lowland Forest is also present in the damper, sheltered gullies at higher elevations on gentle slopes, and supports a varied shrub layer with heathy influences and a tall canopy of Messmate Stringybark. EVC 22 – Grassy Dry Forest is dominated by Common Tussock-grass *Poa labillardierei* and a canopy of scattered Southern Blue-Gum. This EVC was recorded in single location east of Lorne. EVC 48 – Heathy Woodland is largely confined to north-east of the Otway Range. EVC 161 – Coastal Headland Scrub is the dominant EVC along the coastline. It is a generally a treeless community with a very dense cover of shrubs and grasses on rocky headlands.

In summary, the flora and vegetation assessment recorded within the assessment corridor includes:

- Two EVCs within the Otway Plain Bioregion:
  - EVC 21 – Shrubby Dry Forest.
  - EVC 48 – Heathy Woodland.
- Eight EVCs within the Otway Ranges Bioregion:
  - EVC 16 – Lowland Forest.
  - EVC 18 – Riparian Forest.
  - EVC 21 – Shrubby Dry Forest.
  - EVC 22 – Grassy Dry Forest.
  - EVC 45 – Shrubby Foothill Forest.
  - EVC 48 – Heathy Woodland.
  - EVC 161 – Coastal Headland Scrub.
  - EVC 201 – Shrubby Wet Forest.
- 245 indigenous plant species (Appendix 1).
- 53 introduced plant species (including 10 noxious weed species, Appendix 1).
- Four threatened plant species (Appendix 1):
  - *Eucalyptus brookeriana* Brooker's Gum (FFG Act listed).
  - *Eucalyptus globulus* subsp. *globulus* Southern Blue-gum (FFG Act listed).
  - *Leiocarpa gatesii* Wrinkled Buttons (EPBC and FFG Act listed).
  - *Thomasia petalocalyx* Paper Flower (FFG Act listed).

Photos of EVCs and vegetation condition states are provided in Appendix 5. EVC descriptions are presented in Table 4.

3.2.1 Fauna and habitat types

Sixty-five native fauna species were recorded within the project area during the present assessment. A list of these species is provided in Appendix 2 (fauna), along with an assessment of the likelihood of occurrence of threatened species.

A diversity of habitat types occur in the project area within or nearby the assessment corridor. These habitat types are broadly described in the below sections, along with the predicted, recorded or known presence of locally common and threatened fauna.

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, recorded or considered to have a medium or higher likelihood to occur within the assessment corridor, are summarised in Table 5.

Wet forests

Wet forest types such as EVC 45 - Shrubby Foothill Forest and EVC 201 - Shrubby Wet Forest dominate the project area and GTR 1 assessment corridor; predominantly occurring at higher elevations in the wettest parts of the range where they are sheltered from coastal winds. These EVCs consist of a medium to tall dense or scattered eucalypt forest over a variety of mid and understories comprised of shrubs, ferns, tree-ferns, graminoids and/or herbs.

Dense mid and groundstoreys of wetter forest types provide habitat for a diversity of ground-dwelling mammals including potential habitat for threatened species Long-nosed Potoroo *Potorous tridactylus tridactylus* and Broad-toothed Rat *Mastacomys fuscus*. These dense mid and groundstorey environments also provide habitat for a variety of locally common bird species, as well as threatened and/or migratory species such as Rufous Fantail *Rhipidura rufifrons* and Rufous Bristlebird *Dasyornis broadbenti*.

Tree canopies of Mountain Ash *Eucalyptus regnans*, Messmate Stringybark and Mountain Grey Gum provide nesting, perching and/or seasonal foraging resources (nectar and/or source of insects) for a diversity of common birds, including threatened and/or migratory species such as Gang-gang Cockatoo *Callocephalon fimbriatum*, Grey Goshawk *Accipiter novaehollandiae* and Satin Flycatcher *Myiagra cyanoleuca*.

A number of canopy trees throughout the project areas of GTR 1 and the project area were observed to contain hollows. These ecological features provide roosting and/or nesting opportunities for a range of common hollow-dependent birds, such as threatened species Powerful Owl *Ninox strenua* and Masked Owl *Tyto novaehollandiae*, arboreal mammals, i.e. Yellow-bellied Glider *Petaurus australis,* and microbats.

Seasonally wet depressions containing an abundance of logs and forest leaf litter provide habitat for reptiles and invertebrates, including threatened species; Southern Toadlet *Pseudophryne semimarmorata*, Otway Black Snail *Victaphanta compacta* and Otway Burrowing Crayfish *Engaeus fultoni*.

Dry forests

Drier forest habitat types such as Shrubby Dry Forest and Grassy Dry Forest occur on exposed aspects such as ridge-lines and medium to steep upper slopes within the project area and nearby the GTR 1 assessment corridor. Both EVCs are dominated by a low to medium height of forest eucalypts, with Shrubby Dry Forest comprised of a medium to low shrub layer and Grassy Dry Forest dominated by a high diversity of drought-tolerant grasses and herbs.

Consistent with wetter forest types, the dense mid and groundstoreys of Shrubby Dry Forest provide habitat for a diversity of ground-dwelling mammals and birds, including potential habitat for Long-nosed Potoroo, Rufous Fantail and Rufous Bristlebird.

Tree canopies of Southern Blue Gum within drier forest types provide preferred habitat for Koala *Phascolarctos cinereus* and were observed to contain hollows. These ecological features may provide habitat for a diversity of locally common avifauna including threatened species such as the Barking Owl *Ninox connivens*. Open ground layers comprised of a high diversity of drought-tolerant grasses and herbs provide habitat and basking opportunities for a diversity of locally common reptiles.

Heath and heathy woodlands

Heath and heathy woodland types such as EVC 6 - Sand Heathland and EC 48 - Heathy Woodland predominantly occur in adjacent patches within the eastern section of the project area and nearby the GTR 1 assessment corridor. Both the midstorey and ground layer of EVC 6 and EVC 48 are extensive and rich in sedges, grasses, low shrubs and herbs, providing a dense cover for a diversity of ground or mid-storey dwelling mammals including Swamp Antechinus *Antechinus minimus maritimus*, White-footed Dunnart *Sminthopsis leucopus*, Southern Brown Bandicoot *Isoodon obesulus*, Broad-toothed Rat and Long-nosed Potoroo.

The dense mid and groundstorey environment also provides habitat for a variety of locally common birds, reptiles and frogs and may provide habitat for threatened and/or migratory species such as Rufous Bristlebird, Chestnut-rumped Heathwren *Calamanthus pyrrhopygius*, Southern Toadlet and Bibron's Toadlet *Pseudophryne bibronii*.

Coastal scrub and woodlands

Coastal Dune Scrub occurs on exposed foredunes and secondary dunes, along costal escarpments within the southern boundary of the GTR 1 project area. This EVC is characterized by a mosaic of grassland shrubs heavily influenced by coastal processes including wind, sand deposition and salt spray. In adjacent areas where soil moisture is higher in depressions associated with shallow water tables, a rich ground layer of herbs of grasses occurs under an overstorey of Manna Gum *Eucalyptus viminalis*, consistent with Damp-sands Herb-rich Woodland.

Coastal scrub and woodland environments provide habitat for a diversity of fauna including Swamp Antechinus, Southern Brown Bandicoot and White-footed Dunnart.

Aquatic habitats

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 Riparian Forest or Coastal Dune Scrub. The limited modification of terrestrial riparian habitat is highlighted by limited disturbance or modification to channel and instream habitats, which were observed 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, mammals (e.g. Rakali *Hydromys chrysogaster*), 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 provide habitat for FFG Act listed species Otway Burrowing Crayfish (a terrestrial species that is reliant on subsurface riparian water).

Wetlands located within forested and undisturbed environments observed nearby or within the assessment corridor were observed to contain macrophytes and provide high quality foraging and breeding habitat for a diversity of locally common waterbirds, fish and frogs.

Some sections of the indicative trail alignments within the assessment corridor are adjacent to larger rivers and creeks which connect 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.

Coastal beaches

Coastal environments within the GTR 1 project area include sandy beaches, escarpment cliffs and intertidal areas. Sandy beaches and rock pools provide habitat for a diversity of locally common raptors, sea or shorebirds including threatened species White-bellied Sea-eagle *Haliaeetus leucogaster* and Hooded Plover *Thinornis cucullatus*.

Table 4 Summary of vegetation and habitat types within the assessment corridor

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
Otway Plain Bioregion			
EVC 21 - Shrubby Dry Forest (**Photo 1**) **Bioregional Conservation Status (BCS):** Least Concern **Significant Ecological Community:** No	**Condition State:** High **Description:** Tall, dry forest to 30 m tall. The characteristic canopy trees include Red Ironbark, and Messmate Stringybark. The understorey supports a diversity of taxa including Varnish Wattle *Acacia verniciflua* and Prickly Moses *Acacia verticillata*. The ground flora is sparse and consist of Honey-pots *Acrotriche serrulata* and other heath species. The grass and herb component consists of Common Raspwort *Gonocarpus tetragynus,* Pennywort *Hydrocotyle* spp., and Hairy Rice-grass *Tetrarrhena distichophylla.* Open areas of Inter-tussock spaces are comprised of leaf litter and a diversity of mosses.	Usually occupying drier slopes and ridges.	Habitat for the following threatened and/or migratory fauna: • Long-nosed Potoroo • Southern Brown Bandicoot Habitat for the following threatened flora: • Wrinkled Buttons

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
EVC 48 – Heathy Woodland (Photo 2) **Bioregional Conservation Status (BCS):** Least Concern **Significant Ecological Community:** No	**Condition State:** High **Description:** Low woodland dominated by Messmate Stringybark and Brown Stringybark. The understorey is characterised by abundant Austral Grass-tree, and a diverse range of heaths including Erect Guinea-flower and Bundled Guinea-flower *Hibbertia fasciculata* var. *prostrata.* **Condition State:** Moderate **Description**: As for high condition state, however the mid layer (shrubs and heaths) has been removed to function as a strategic fuel break. Scattered weeds are present in low densities and include Bluebell Creeper *Billardiera heterophylla*, and Flatweed *Hypochaeris radicata.*	Low to mid-slopes,a common EVC of the Otway Plains, particularly along the coast.	Provides suitable habitat for a wide range of threatened flora and fauna including: • Dense Leek-orchid • Green-striped Greenhood • Spiral Sun-orchid • Paper Flower (recorded) • Long-nosed Potoroo • Broad-toothed Rat • Chestnut-rumped Heathwren • White-footed Dunnart • Southern Brown Bandicoot • Swamp Antechinus • Southern Toadlet • Rufous Bristlebird • Other FFG Act listed species (Table 6)

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
The Otway Ranges Bioregion			
EVC 16 Lowland Forest **(Photo 3)** **Bioregional Conservation Status (BCS):** Depleted **Significant Ecological Community:** No	**Condition State:** High **Description:** Forest to 25 m tall, usually dominated by Messmate Stringybark, and often accompanied by Scent Bark and Blue Gum. The understorey is characterised by scattered shrubs and heaths including Prickly Moses and Common Heath. The ground layer consists of Thatch Saw-sedge *Gahnia radula* and a range of herbs including orchid species Small Mosquito-orchid *Acianthus pusillus* and Greenhoods *Pterostylis* spp. on a rich loamy soil.	Elevated ridges and saddles.	Habitat for the following threatened and/or migratory fauna: • Long-nosed Potoroo • Swamp Antechinus • Rufous Fantail • Satin Flycatcher • Gang-gang Cockatoo • White-footed Dunnart • Grey Goshawk • Powerful Owl • Masked Owl Suitable habitat for the following threatened flora species: • Green-striped Greenhood
EVC 18 – Riparian Forest **(Photo 4)** **Bioregional Conservation Status (BCS):** Least Concern **Significant Ecological Community:** No	**Condition State:** High **Description:** Tall forest to 40 m tall dominated by Manna Gum *Eucalyptus viminalis* spp. *viminalis* with mesic sub-canopy or tall understorey species that include Blackwood *Acacia melanoxylon* and Hazel Pomaderris *Pomaderris aspera*. Understorey also supports ground ferns and a range of graminoids such as Spiny-headed Mat-rush *Lomandra longifolia* and Tall Sedge *Carex appressa.* **Condition State:** Low **Description:** Similar to high condition	Usually adjacent to major river systems and large tributaries.	Habitat for the following threatened and/or migratory fauna: • Otway Snail • Otway Burrowing Crayfish • Platypus • Long-nosed Potoroo • Swamp Antechinus • Broad-toothed Rat • Spot-tail Quoll • Rufous Fantail • Satin Flycatcher • Gang-gang Cockatoo • Grey Goshawk • Powerful Owl

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
	state, however, the mid storey may have been removed through historical clearing and the ground flora is largely comprised of weeds such as Sweet Vernal *Anthoxanthum odoratum* and White Arum-lily *Zantedeschia aethiopica.*		• Masked Owl
EVC 21 – Shrubby Dry Forest **Bioregional Conservation Status (BCS):** Least Concern **Significant Ecological Community:** No	**Condition State:** High **Description:** Tall, dry forest to 30 m tall. The characteristic canopy trees include Red Ironbark, and Scent Bark. The understorey supports a diversity of taxa from Fabaceae but usually Prickly Bush-pea and Large-leaf Bush-pea. The ground flora is floristically diverse however has high inter-tussock space comprised of leaf litter and mosses. Ground flora species consist of Honey-pots, Common Heath and a large variety of herbs including Ivy-leaf Violet *Viola hederacea*, Raspwort and Kidney Weed. Some sections had been burnt within the last 5 years and are experiencing post-fire recovery. These areas had very dense understorey of Hop Wattle *Acacia stricta*, Large-leaf Bush-pea and Hop Goodenia *Goodenia ovata*. **Condition State:** Moderate **Description:** As for high condition state, however the understorey consisted of a	Usually along the ridges and drier slopes of the ranges, particularly those with a north or west aspect.	The EPBC Act listed Wrinkle Buttons was recorded in the high quality habitats of this EVC. Habitat for the following threatened and/or migratory fauna: • Long-nosed Potoroo • Southern Brown Bandicoot • Powerful Owl • Barking Owl

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
	higher proportion of high threat weeds that include Sweet Pittosporum *Pittosporum undulatum* and Boneseed *Chrysanthemoides monilifera.*		
EVC 22 – Grassy Dry Forest (Photo 5) **Bioregional Conservation Status (BCS):** Depleted **Significant Ecological Community:** No	**Condition State:** Moderate **Description:** Tall forest with a Southern Blue-gum canopy. This EVC had a dominance of Common Tussock-grass as the understorey species. Scattered shrubs occurred through including Shrubby Spurge *Phyllanthus gunnii* and Sticky Boobialla *Myoporum petiolatum*. Weeds included scattered Sweet Pittosporum and Boneseed, and abundant Panic Veldt-grass *Ehrharta erecta* and herbaceous weeds.	Elevated drier aspects and ridges.	Habitat for the following threatened and/or migratory fauna: • Powerful Owl
EVC 45 – Shrubby Foothill Forest (Photo 6) **Bioregional Conservation Status (BCS):** Least Concern **Significant Ecological Community:** No	**Condition State:** High **Description:** A tall forest dominated by a range of canopy species including Messmate Stringybark, Mountain Grey-gum and Southern Blue-gum. Understorey to 5 m dominated by mesic shrubs including Hop Goodenia, Musk Daisy-bush, and Snowy Daisy-bush. The ground layer is usually dominated by a mix of graminoides including Forest Wire-grass *Tetrarrhena juncea* and Weeping Grass *Microlaena stipoides* var. *stipoides.* **Condition State:** Moderate	Mid to low, sheltered slopes, particularly with a southern or eastern aspect. Distributed broadly across the project area.	Habitat for the following threatened and/or migratory fauna: • Long-nosed Potoroo • Swamp Antechinus • Rufous Fantail • Yellow-bellied Glider • Satin Flycatcher • Gang-gang Cockatoo • Grey Goshawk • Powerful Owl • Masked Owl • Barking Owl • Southern Toadlet

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
	Description: As for high condition state, except the patch contains a higher proportion of weeds (usually Boneseed and Sweet Pittosporum) contributing to approximately 20% Projective Foliage Cover (PFC). **Condition State:** Low **Description:** This condition state has been significantly modified. The key canopy species are present (Mountain Grey-gum and Messmate Stringybark). The mid-storey has been removed and the ground flora has been slashed to function as a strategic fuel break. Weeds have colonised the majority of the ground flora and is now comprised of Blue Periwinkle *Vina major*, English Ivy *Hedera helix* and Cocksfoot.		Habitat for the following threatened flora: • Western Peppermint • Dwarf Silver-wattle (particularly around Lorne) Threatened flora recorded: Wrinkle Buttons (at the higher elevations of the high condition state where the EVC grades to EVC 21 – Shrubby Dry Forest)
EVC 48 – Heathy Woodland **Bioregional Conservation Status (BCS):** Least Concern **Significant Ecological Community:** No	**Condition State:** High **Description:** as for Otway Plain description. **Condition State:** Moderate **Description:** as above however with a higher proportion of weeds including Flatweed and Large Quaking-grass *Briza maxima.*	Low to mid-slopes, of the Otway ranges. Primarily around Eastern View.	Provides suitable habitat for a wide range of threatened flora and fauna including: • Dense Leek-orchid • Green-striped Greenhood • Spiral Sun-orchid • Long-nosed Potoroo • Chestnut-rumped Heathwren • White-footed Dunnart • Southern Brown Bandicoot • Swamp Antechinus

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
			• Southern Toadlet • Rufous Bristlebird • And many FFG Act listed flora (Table 6)
EVC 161 – Coastal Headland Scrub (Photo 7) **Bioregional Conservation Status (BCS):** Depleted **Significant Ecological Community:** No	**Condition State:** High **Description:** Low shrubland to 4m tall, includes Drooping Sheoak *Allocasuarina verticillata*, Common Boobialla *Myoporum insulare*, Coast Beard-heath *Leucopogon parviflorus* and Tree Everlasting *Ozothamnus ferrugineus* with occasion Eucalypts such as Messmate Stringybark and Coast Manna-gum *Eucalyptus viminalis* subsp. *pryoriana*. The ground layer is diverse and characterised by Common Tussock-grass and a variety of lilies, herbs and forbs including Milkmaids *Burchardia umbellata,* Southern Tick-trefoil *Desmodium gunnii,* and Clustered Everlasting *Chrysocephalum semipapposum.* **Condition State:** Moderate **Description:** As for high condition state, however, the proportion of woody weeds increases such as Sweet Pittosporum and Panic Veldt Grass. **Condition State:** Low **Description:** as above, however the native ground layer is largely absent and the shrub layer has a dominance of invasive	On exposed rocky headlands and steep slopes adjoining the coastline.	Provides suitable habitat for a wide range of threatened flora and fauna including: • Swamp Antechinus • Long-nosed Potoroo • Southern Brown Bandicoot • White-footed Dunnart • Chestnut-rumped Heathwren • Rufous Bristlebird

Vegetation or habitat type	Description	Location	Fauna habitat and significant values
	woody weeds, particularly dense patches of Sweet Pittosporum.		
EVC 201 – Shrubby Wet Forest (Photo 8) **Bioregional Conservation Status (BCS):** Least Concern **Significant Ecological Community:** No	**Condition State:** High **Description:** Tall forest with a canopy of Messmate Stringybark or Mountain Grey Gum. Ground ferns dominate the understorey including Water Fern and Rough Tree-fern. It comprises a higher diversity and cover of herbs including Forest Starwort *Stellaria flaccida* and Geraniums *Geranium* spp. due to increased light reaching the forest floor.	Gullies in lower areas near the coast and slopes in elevated higher rainfall areas.	Habitat for the following threatened and/or migratory fauna: • Otway Snail • Otway Burrowing Crayfish • Long-nosed Potoroo • Rufous Fantail • Rufous Bristlebird • Gang-gang Cockatoo • Grey Goshawk • Powerful Owl • Masked Owl • Southern Toadlet
Predominantly introduced vegetation	Cover of woody species such as Sweet Pittosporum and ground covers dominated by Sweet Vernal Grass dominate heavily disturbed areas.	Under powerline easement and along roadsides where native vegetation has been cleared.	Provides habitat for common bird species and known to be utilised by Southern Brown Bandicoot and Rufous Bristlebird.
Riparian and aquatic habitats	The assessment corridor contains a small number of wetlands and intercepts numerous rivers and creeks (e.g. Cumberland River, Coalmine Creek, Spout Creek, Cherry Tree Creek, Reedy Creek).	Broadly across the project area	The creeks provide habitat for frogs, reptiles, fish, Platypus and the Rakali. They also provide flyways and foraging habitat for microbats. Instream aquatic habitats traversed by the assessment corridor may provide habitat for the following threatened species: • Platypus • Otway Bush Yabby

3.3 Threatened species and ecological communities

Threatened species recorded or predicted to occur within 10 kilometres of the project area or from the relevant catchment (aquatic species) are listed in Appendix 1 (flora) and Appendix 2 (fauna) and displayed in Figure 6. An assessment of the likelihood of these species occurring in the project area and an indication of where within the site (i.e. which habitats or features of relevance to the species) is included. A summary of those species recorded or with a medium or higher likelihood of occurring in the project area is provided in Table 5.

Table 5 Summary of EPBC and FFG Act listed species most likely to occur in the project area

Species name	Listing status	Area of value within the project area

Anglesea Grevillea

Wrinkled Buttons (Photo 9)

Green-striped Greenhood

Spiral Sun-orchid

Vulnerable under EPBC Act Endangered under FFG Act

Endangered under EPBC Act Critically endangered under FFG Act

Vulnerable under EPBC Act Endangered under FFG Act

Vulnerable under EPBC Act Critically endangered under FFG Act

Database records are primarily within heathland habitats of Anglesea.
Suitable heathy woodland of high quality within project area, particularly around Fairhaven and Mogg's Creek.

Recorded within the assessment corridor from Moggs Creek to the Cumberland River area where populations were the greatest. Likely to occur within EVC 21 – Shrubby Dry Forest across the project area.

Habitat for this species is diverse and consist of forest and woodland habitats with a shrubby understorey. Local database records occur nearby within the project area around Moggs Creek. Suitable habitat for this species includes the EVC 48 - Heathy Woodland and EVC 16 - Lowland Forest north-east of Lorne.

There are recent records around Fairhaven. Likely habitat includes the high-quality remnants of EVC 48 – Heathy Woodland that occur near Moggs Creek, Eastern View and Fairhaven. The species can also tolerate and respond to low levels of disturbance such as slashing or along track edges.