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Warburton Mountain Bike Destination
Yarra Ranges Council
14-09-2021

Technical Report F: Transport

Environment Effects Statement

Revision 4.0 – 14-September-2021

Prepared for – Yarra Ranges Council – ABN: 21 973 226 012

Technical Report F: Transport

Environment Effects Statement

Client: Yarra Ranges Council

ABN: 21 973 226 012

Prepared by

AECOM Australia Pty Ltd
Level 10, Tower Two, 727 Collins Street, Melbourne VIC 3008, Australia
T +61 3 9653 1234 F +61 3 9654 7117 www.aecom.com

ABN 20 093 846 925

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Quality Information

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Prepared by	Katelyn Richter, Ariana Salimi
Reviewed by	Callan Jones

Contents

Executive Summary

Overview

Warburton Mountain Bike Destination ('the project') is a proposed world class mountain biking destination centred around Warburton, approximately 70 kilometres east of Melbourne. The proponent for the project is Yarra Ranges Council.

Under section 3 of the *Environment Effects Act 1978 (Vic)* ('EE Act'), the project requires an Environment Effects Statement (EES) to be prepared to allow stakeholders to understand the likely environmental impacts of the project and how they are proposed to be managed.

AECOM was commissioned to undertake a traffic and transport impact assessment to inform the EES. This technical report presents the findings of the assessment and is an attachment to the EES.

With the implementation of the mitigation measures proposed throughout this assessment, potential adverse impacts on amenity and land use at local and regional scales associated with traffic and transport changes have been minimised.

Existing conditions

The study area is a popular location for cyclists who ride on-road, utilise existing mountain bike trails and the shared paths of the Lilydale-Warburton Rail Trail and O'Shannassy Aqueduct Trail. There is however limited cycling infrastructure with the exception of these trails in the study area. In the Warburton town centre pedestrians have footpaths and bridges to cross the Yarra River and connect into the Yarra River Walk and other walking trails. Footpaths are limited outside the town centre.

There is one bus route currently operating in the vicinity and within the study area. Bus route 683 travels between Chirnside Park and Warburton via Lilydale Station and extends to East Warburton during the weekdays.

The road network around the Project consists of declared and local roads in proximity to the rural townships including Warburton which is a popular tourist destination. Based on an analysis of existing traffic volumes, all roads within the study area are currently performing well below road capacity levels with negligible delays experienced by motorists.

A crash analysis within the study area showed a relatively low level of incidents, although over the period from 2014 to 2019 recorded crashes included multiple serious injury crashes involving motorcycles on Donna Buang Road and two pedestrian crashes in the town centre of Warburton. There were not seen to be locations of five or more crashes and thus no crash black spots in the study area.

Impact assessment findings - construction

As the scale and duration of construction proposed for the Warburton Mountain Bike Destination is relatively modest, the potential construction transport impacts are confined and manageable. Nevertheless, the Project related activities during the construction phase are likely to temporarily impact road safety and traffic operations. The key construction transport issues and the management and mitigation identified include:

- **Public road network and intersection accessibility for heavy vehicles:** There is the potential that the existing road and intersection infrastructure required to be used during construction is inadequate for the required heavy vehicle movements leading to increased crashes. To manage this risk and the potential impacts a Traffic Management Plan is to be implemented and pre-construction checks to measure and manage the risk associated with heavy vehicles (and potential over dimensional vehicles) prior to the commencement of construction activities.
- **Traffic impacts during road/lane closure for bridge construction**: There is the potential that construction traffic and road/lane closures would increase delays and impact access for the local residential and business community. Several lane and road closures would take place during construction although limited to 4 hours at a single time and there are suitable detours available. To manage potential impacts a Traffic Management Plan would be implemented, road/lane closures are limited to occurring in off-peak periods to maintain access for impacted residents and

emergency vehicles and no more than one road closure a day would occur to minimise any impact related to the closures. In addition, a Stakeholder Communication Plan is proposed to be implemented which would include road and lane closures notification to impacted residents and emergency services while vehicular passage may not be available or be limited.

- **Road surface/pavement deterioration**: Heavy vehicles, machinery and equipment movements are anticipated to occur on a number of local roads during the construction phase. While these movements are expected to be low in volumes, they are expected to occur on several local roads which are not part of the B-Double approved road network. To manage the risk and potential impacts to the local roads the Traffic Management Plan is to include undertaking a pavement condition survey prior to construction activities occurring and improvement works undertaken after completion of construction to upgrade the road/surface pavements to existing or better than existing conditions after construction. In addition, a Stakeholder Communication Plan would also be implemented and include regular meetings with Yarra Ranges Council.

The extent of traffic impacts would depend on the design of the works and construction methodology adopted. Different combinations of lane closures, road closures, changes to intersection signalling and construction traffic volumes and routing would result in different impacts to traffic operations during construction. Careful consideration would therefore be required of the cumulative impacts during the development of the TMP when traffic specifications are confirmed.

Implementation of the identified mitigation measures would lead to efficient and safe operation of the transport network during construction, reducing the likelihood of unacceptable impacts on road safety, road capacity and transport infrastructure and operations due to heavy vehicle usage.

Impact assessment findings – operation

The Warburton Mountain Bike Destination is anticipated to generate significant additional vehicle and cycle traffic around Warburton from the visitors attracted to use the facilities. The impact assessment has been carried out at the expected full project maturity in 10 years and that traffic would build over time. As the current transport infrastructure has available capacity and the traffic volumes would increase gradually, transport impacts are expected to be manageable. Nevertheless, the Project related activities during the operations phase have the potential to impact road safety, cyclist safety, parking and traffic operations. The key operations transport issues and mitigation measures identified include:

- **Cyclist interactions with vehicles:** There would be increased interactions between vehicles and cyclists at crossing points, intersections, on-road usage, trail head layout and shuttle drop off points. This increases the potential for crashes between cyclists and vehicles or pedestrians. To manage this risk cyclist and pedestrian safety improvements would be required, a Road Safety Audit and investigation into improvements to increase cyclist safety.
- **Risk of crashes due to increased interactions on paths and bridges:** There is the potential for increased crashes between cyclists and pedestrians on the proposed bridges and existing shared paths given the increase in cyclists volumes due to the project. To manage this risk a Road Safety Audit would be undertaken of the existing Lilydale-Warburton Rail Trail to determine improvements required and the bridge widths are to standard.
- **Emergency vehicle access and evacuation during project operations:** All trail heads would remain accessible via the existing public roads which would also be used by emergency services. A Road Safety Audit will include consideration of emergency access, any road improvement works be undertaken if deemed to be required. An emergency management plan including an evacuation plan will be developed and implemented for the project in consultation with stakeholders prior to project opening.
- **Adequacy of road network infrastructure to accommodate operations traffic in the local road network:** A Road Safety Audit is proposed to be undertaken for Cemetery Track and Edwardstown Road prior to the commencement of operation to determine if any road improvements are required.
- **Parking at trail heads and Warburton town centre :** Given the increase in vehicles due to the project there is a risk that there is unacceptable parking congestion at trail heads and in

Warburton town centre. For the trail heads it is proposed that Operational parking management plan to include using the Wesburn Park car park as an overflow car park to accommodate visitors during peak periods and events. Appropriate signage and wayfinding would be provided to adequately direct visitors. To prevent parking congestion in the town centre it is proposed to investigate a shared use path between the Lilydale-Warburton Rail Trail and Warburton Highway to promote use of cycling between destinations. An operational parking management plan would also include monitoring of the town centre parking, installing bike parking and considering previous recommendations as part of SALT's 2019 Movement and Transport Strategy.

Implementation of the mitigation measures would lead to efficient and safe operation of the transport network during operation, reducing the likelihood of impacts on cyclist safety, road safety, parking and transport infrastructure.

Management of potential impacts

Potential impacts on traffic and transport due to the project would be avoided, mitigated or managed to required standards through the proposed mitigation measures.

The proposed mitigation measures for the construction and operation of the project include the following:

- Traffic Management Plan (TMP) – MM-TP1

  Prior to the commencement of construction activities, a TMP is proposed to be developed and implemented to minimise disruption (to the extent practicable) to affected local land uses, traffic, car parking, on-road public transport, pedestrian and bicycle movements and existing public facilities during all stages of construction. The TMP would manage the risk and potential impacts to the local roads. It would be developed in consultation with the relevant road management authorities and be informed and supported by an appropriate level of transport analysis. Approvals from Council and DoT is expected to be required prior to commencement of mitigating work measures comprised in the TMP. This would include, but not limited to, the management of road and lane closures, surveys, improvement works undertaken after completion of construction to upgrade the road/surface pavements to existing or better than existing conditions after construction and traffic management measures to manage the risk associated with construction heavy vehicles movements.

- Stakeholder communication plan – MM-TP2

  A Stakeholder communication plan is proposed to be implemented to ensure that appropriate consultation and advanced notice is provided to communities and stakeholders prior and during construction. Communication strategies would be established as part of the TMP and would include relevant stakeholders such as the Yarra Range Council, road authorities, bus operators, business operators and residents. A close-out meeting is also proposed to take place at the end of construction with Yarra Ranges Council and relevant road authorities (VicRoads and DELWP) to ensure that roads anticipated to be utilised by construction traffic is restored to prior or improved conditions.

  During operation, regular meetings with the Council and DELWP would occur to confirm potential pavement upgrades and measures related to road maintenance of impacted local roads around the study area and ensure appropriate measures are provided for the maintenance of roads anticipated to be utilised by project-generated traffic.

- Road safety audit – MM-TP3

  A Road Safety Audit is proposed to be undertaken to ensure that roads and intersections anticipated to be utilised by project related traffic for both construction and operation are designed and constructed to provide safe vehicle movements to the satisfaction of the responsible road management authorities. The audit is also proposed to include the Lilydale-Warburton Rail Trail to provide safer movements of pedestrians and cyclists along the trail.

- Improvement works – MM-TP4

  Improvement works are proposed to be undertaken where necessary based on the pavement conditions survey (MM-TP1) and the Road Safety Audit results that would be conducted. Physical improvements are likely required along Cemetery Track and Edwardstown Road. In addition, physical improvements may also be required along the Lilydale-Warburton Rail Trail, subject to the Road Safety Audit (MM-TP3).

- Cyclist and pedestrian safety improvements – MM-TP5

  Several mitigation measures are proposed to be implemented to ensure safe pedestrian and cyclist movements within the study area during the operational phase of the project. Proposed measures include crossing treatments at the Lilydale-Warburton Rail Trail, provision of supporting cyclist infrastructure such as designated shared use paths, bicycle parking provision, drinking taps and signage.

- Operational parking management – MM-TP6

  A parking management plan is proposed to be established by Yarra Ranges Council to implement appropriate measures for the operation of the Mountain Bike Project to ensure that parking congestion does not exceed acceptable limits for visitors or residents. Proposed measures include, but not limited to, using the Wesburn Park car park as an overflow car park and installation of bicycle parking.

- Emergency management plan – MM-TP7

  An emergency management plan will be established for the project and approved before opening. This includes staff training and evacuation procedure.

Abbreviations

Abbreviation	Title
AADT	Average Annual Daily Traffic
AECOM	AECOM Australia Pty Ltd
AT	Access Tracks
AWDT	Average Weekday Daily Traffic
CEMP	Construction Environmental Management Plan
DOS	Degree of Saturation
EES	Environment Effects Statement
EMF	Environmental Management Framework
HML	Higher Mass Limits
LOS	Level of Service
Km	Kilometre
Km/hr	Kilometres per hour
NHVAS	National Heavy Vehicle Accreditation Scheme
NHVR	National Heavy Vehicle Regulator
OD	Origin to Destination
OEMP	Operational Environmental Management Plan
OSMP	Operational Safety Management Plan
OSOM	Oversize Overmass
SISD	Safe Intersection Sight Distances
TIA	Transport Impact Assessment
TMP	Traffic Management Plan
VTS	Victorian Transmission System
YRC	Yarra Ranges Council

Glossary

Term	Definition
AADT	Average annual daily traffic. This measurement provides the total volume of vehicle traffic of a road for a year divided by 365 days.
AWDT	Average weekday traffic volume between Monday and Friday.
Average delay	This is the average amount of time it takes a vehicle to negotiate an intersection, including the time to negotiate corners and the time stopped in queues or waiting for a green signal.
DOS	Ratio of demand to capacity. A DOS of 1.0 or more in theory represents saturated conditions where the demand exceeds the capacity. For a signalised intersection, a DOS of 0.9 is usually adopted as the capacity threshold.
LOS	This is an alpha-numeric rating of the overall performance of an intersection, ranging from LOS A (very good) to LOS F (very poor).
Mid-block	A location around the mid-point between two intersections.
Other Injury	Injury sustained in a road crash for which a person did not require hospitalisation.
Peak hour(s)	The hour(s) of the day having the highest traffic volume; there may be multiple peak hours in the day or week because of different directional peaks.
Serious Injury	Injury sustained in a road crash for which the person was admitted to hospital.
Transport Impact Assessment	Assessment of project impacts on vehicles, cyclists and pedestrians

1.0 Introduction

The Warburton Mountain Bike Destination ('the project') is a proposed world class mountain biking destination centred around Warburton, approximately 70 kilometres east of Melbourne. It consists of approximately 177 kilometres of mountain bike trails providing a variety of mountain bike experience to suit all levels of riding.

Yarra Ranges Council has identified mountain biking as an opportunity for tourism growth within this region which would also support the economy of the township and the health and well-being of its residents. It seeks to create iconic trails eligible for International Mountain Bike Association Gold Ride Centre status which would position Warburton as an internationally significant mountain bike destination.

On 21 May 2020, The Victorian Minister for Planning issued his decision that an Environment Effects Statement (EES) is required under the *Environmental Effects Act 1978 (Vic)* ('EE Act'). On 16 June 2020 the Commonwealth Department for Agriculture, Water and Environment issued a decision that the project is a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* ('EPBC Act') and that the project would be assessed under the assessment bilateral agreement with the State of Victoria.

The purpose of this report is to assess the potential traffic and transport impacts associated with the project to inform the preparation of the EES required for the project.

2.0 Scoping requirements

2.1 EES evaluation objectives

The *Final Scoping Requirements for Warburton Mountain Bike Destination Environment Effects Statement* ('scoping requirements') by the Minister for Planning set out the specific environmental matters that need to be addressed by Yarra Ranges Council in order to satisfy the Commonwealth and Victorian assessment and approval requirements.

The scoping requirements include a set of evaluation objectives. These objectives identify the desired outcomes to be achieved in managing the potential impacts of constructing and operating the project in accordance with the *Ministerial guidelines for assessment of environmental effects* under the EE Act.

The following evaluation objective is relevant to the traffic and transport study:

- To minimise potential adverse social, economic, amenity and land use effects at local and regional scales.

The key issues of this evaluation objective include:

- Positive and adverse socio-economic effects, at local and regional scales, potentially generated by the project, including potential for increased employment, traffic, tourism and visitation as well as pressures on existing housing and community infrastructure (including health services).
- Relocation or other impacts to existing infrastructure.
- Potential for temporary or permanent changes to use of or access to existing infrastructure and land in the project area and in its vicinity.
- Potential for impacts on reasonably foreseeable upgrades to public infrastructure.

2.2 EES scoping requirements

The aspects from the scoping requirements relevant to the evaluation objective are shown in Table 1, as well as the location where these items have been addressed in this report.

Table 1 Scoping requirements relevant to traffic and transport

Aspect	Scoping Requirement	Section addressed
Key issues	Potential for socioeconomic impacts on the township of Warburton, including increased traffic and pressures on existing housing and community infrastructure.	Technical Report E: Socio-economic Construction impacts Operational impacts 11.0
Priorities for characterising the existing environment	This would include description of existing roads	Existing conditions 7.4
	Describe proposed transport routes during construction and operations (for employees, construction equipment and other project-related transportation).	Traffic generation, distribution and assignment 8.0
	Existing roads and their ability to accommodate traffic generated by the project.	Low risk construction impacts 10.1 Low risk operational impacts 11.1
Design and mitigation measures	Identify potential and proposed design responses and/or other mitigation measures to avoid, reduce and/or manage any significant effects for sensitive receptors during project construction and operation arising from specified air pollution indicators, noise, vibration, traffic and lighting, in the context of applicable policy and standards.	Mitigation measures 13.0
	Describe and evaluate the proposed traffic management and safety principles to address changed traffic conditions during construction and operation of the project.	Mitigation measures 13.0
	Outline the required transport infrastructure works or upgrades required to address adverse impacts of the project construction and operation, including impacts on accessibility (e.g. access road construction and upgrades).	Mitigation measures 13.0
Assessment of likely effects	Assess likely noise, vibration, traffic, lighting and visual impacts at sensitive receptors adjacent to the project during project construction and operation (both with and in the absence of the proposed mitigation measures), relative to standards.	Construction impacts 10.0 Operational impacts 11.0
Approach to manage performance	Describe the approach to monitor effects and develop contingency measures to be implemented in the event of adverse residual effects on social, economic, amenity and land use values requiring further management.	Mitigation measures 13.0

3.0 Project Description

3.1 Project overview

The project is a proposed world class mountain biking destination centred around Warburton, approximately 70 kilometres east of Melbourne as shown in Figure 1. A significant informal network of mountain bike trails exists within the region and there is evidence of increasing use of these trails by local and visiting riders. Mountain biking in this locality started around 15 years ago and was concentrated in the Yarra State Forest in the vicinity of Mount Tugwell.

Yarra Ranges Council has identified mountain biking as an opportunity for tourism growth within the region which would also support the region and the health and well-being of its residents. The project would create iconic trails eligible for International Mountain Bike Association Gold Level Ride Centre status which would position Warburton as an internationally significant mountain biking destination.

The project objectives are to:

- Facilitate tourism growth and associated positive economic and jobs growth in the Yarra Valley region
- Create iconic mountain bike trails eligible for International Mountain Bike Association Gold Ride Centre status
- Create spectacular riding experiences that have a competitive advantage over existing mountain bike destinations and leverage Warburton's beautiful township, rural valley and surrounding forested slopes
- Enhance the health and well-being of the community
- Maintain the significant biodiversity and heritage values within the project area and provide opportunities for the community to connect with and appreciate their importance.

The project consists of up to approximately 177 kilometres of mountain bike trails providing a range of mountain bike experience to suit all levels of riding as shown in Figure 2. The project also includes a new Visitor's Hub and main trail head at the Warburton Golf Course and other trail heads at Mount Tugwell, Mount Donna Buang and Wesburn Park.

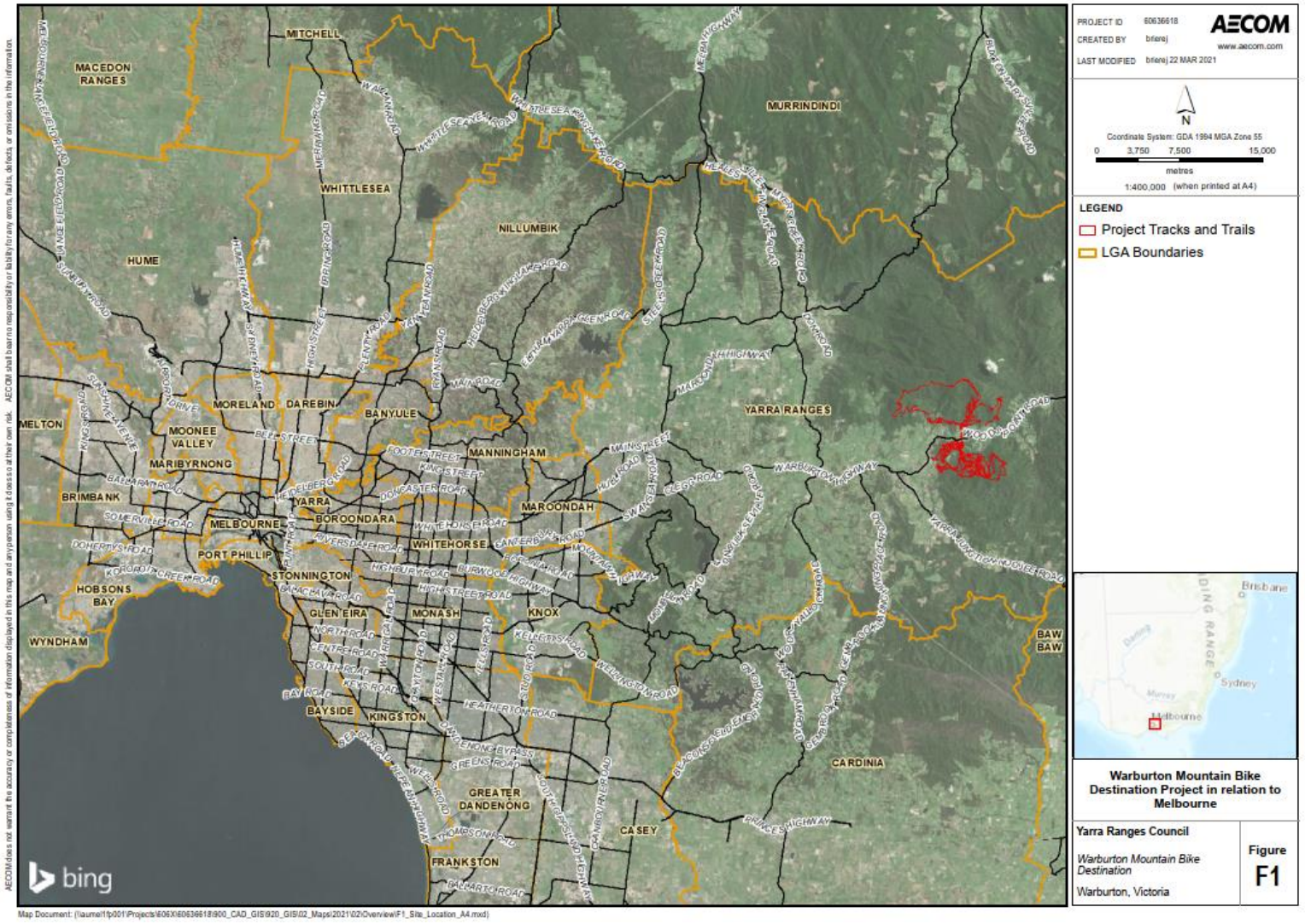


Figure 1 Warburton Tracks and Trails in relation to Melbourne CBD

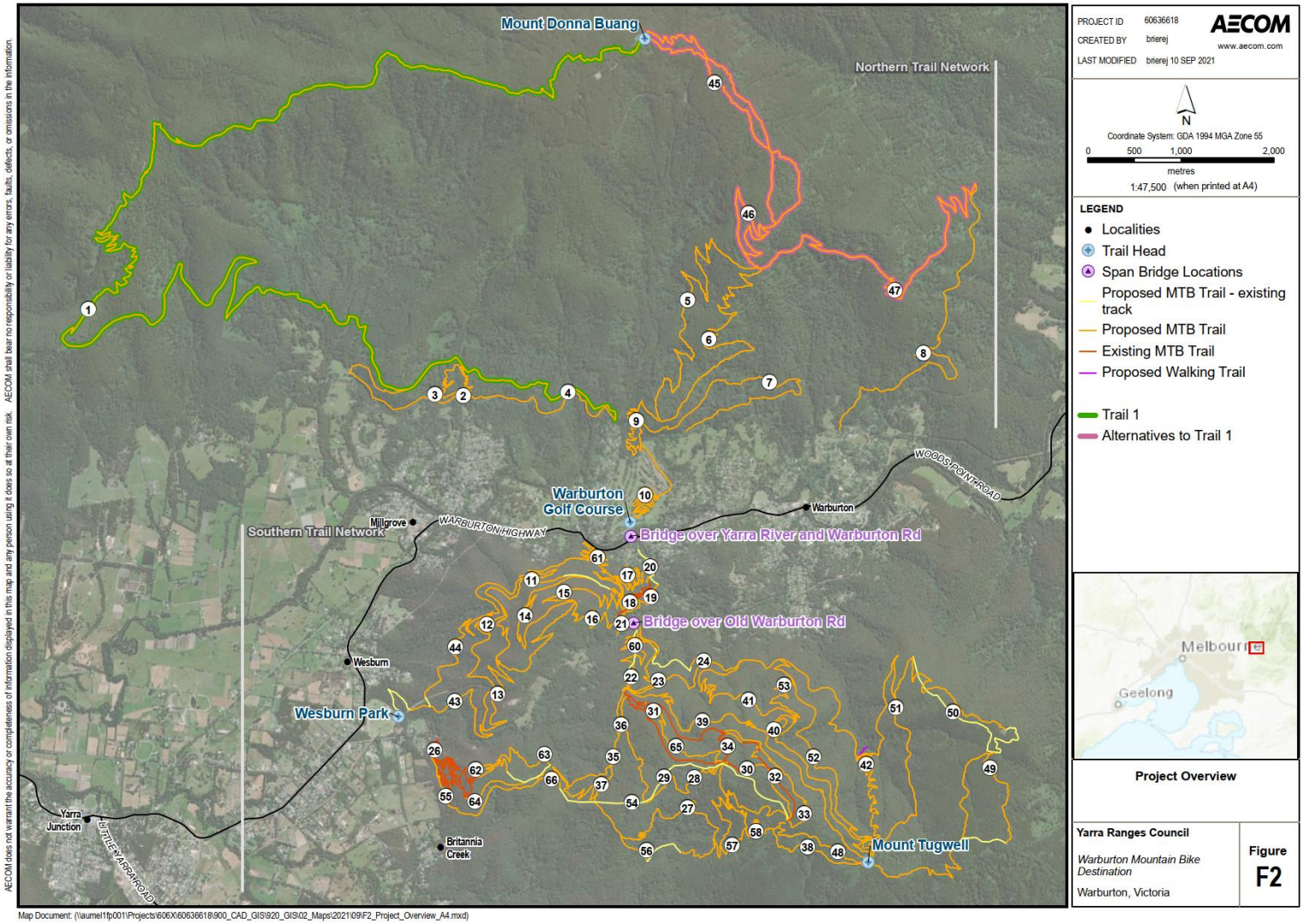


Figure 2 Project overview

3.2 Project development

It is recognised that there are opportunities to avoid and minimise environmental impacts during the many stages of project development. During project inception and early design development stages of the project, decisions on the location of the project, its design and construction techniques have enabled impacts to be significantly avoided and minimised in accordance with the hierarchy presented in Figure 3.

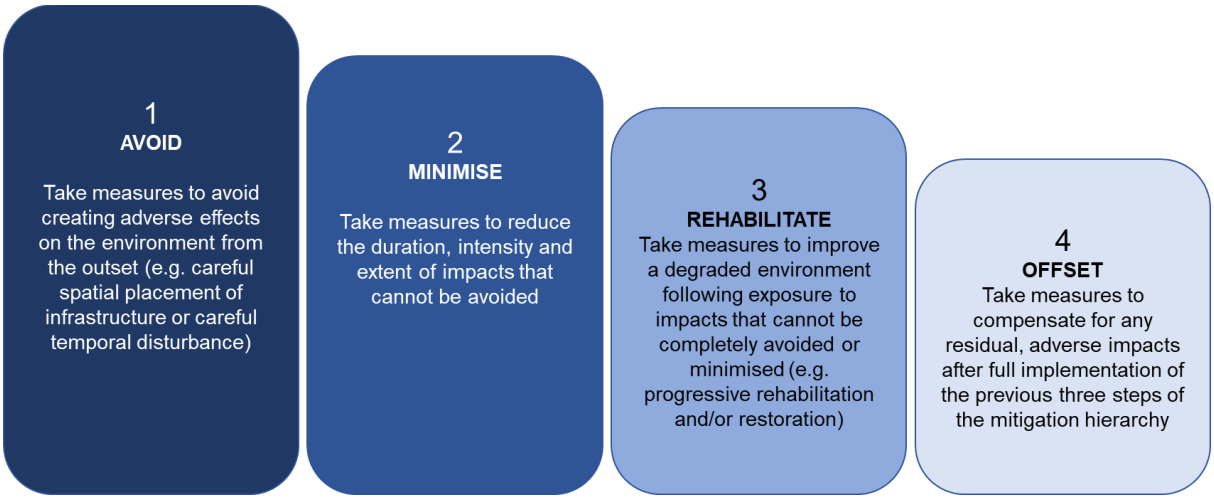


Figure 3 Mitigation hierarchy

Avoidance of impact has been a key focus of development of the trail network and has culminated in the preparation of a project description which is found at Chapter 3 of this EES. A description of how avoidance of impact has informed the design in relation to the traffic and transport study can be found at Section 14.0

Examples of this include the decision to design waterway crossings without directly impacting waterways, creating trails on previously disturbed areas wherever possible and adoption of a construction technique which avoids impacts to large trees.

After opportunities to avoid impact were exhausted, minimisation and rehabilitation measures were developed. These are described in the construction and operation impact assessment sections below.

3.3 Main project components

The main project components proposed are as follows:

- Upgrade of existing mountain bike trails - approximately 12 kilometres (seven per cent of project length)
- New mountain bike trails – up to approximately 155 kilometres (87 per cent of project length)
- Upgrade of existing vehicle tracks - upgrade approximately 10 kilometres (six per cent of project length)
- New Visitor's hub and main trail head at the Warburton Golf Course and new trail head facilities at Mount Tugwell, Mount Donna Buang and Wesburn Park. An additional network access point to the network would be provided at Dee Road.

The network would comprise of 61 trails, each with a length of between 100 metres and 22 kilometres. Each trail has a trail difficulty rating assigned, ranging from easy over intermediate, to difficult and extreme. Some of the trails are returning loops, while others are point-to-point trails. All trails have also been categorised into six different styles including, adventure, air flow, downhill, flow country, gravity and wilderness, as described in the project description chapter of the EES.

The northern trail network (located on the north side of the valley) consists of around 36 per cent of the trails. The southern trail network (located on the south side of the valley) consists of around 64 per cent of the trails.

The trails would have a bench width of approximately 1.2 metres with a ride line of approximately 400-1200 millimetres except for the trail on Cemetery Track. The development footprint to be assessed is based on a maximum width of two metres (one metre for the trail corridor with a trail buffer of 0.5 metres on each side). A head-height clearance of 2.5 metres has been assumed.

The trail network would include built form elements such as bridges, platforms, culverts, rock armour, jumps and berms. Minimal signage is proposed to be associated with the trail and trail heads and this would consist of small maps at strategic intersections and along with safety and name signage. Some trail sections would include elevated structures and drainage works to avoid and minimise impacts to waterways and associated biodiversity values.

The grade of individual trail sections would vary according to the local topography. Typically, the maximum trail grade would be less than 15 per cent, with most of the trails having grade under 10 per cent.

The new Visitor's Hub and main trail head is proposed to be developed at the south of Warburton Golf Course, where the existing carpark is to be upgraded and extended to accommodate around 180 cars with room for future expansion if required. A new shelter and a bike wash down station would be established for the use of mountain bike riders. Run-off from the wash bays would be captured by a sump and recirculated where practicable. Excess silt and soil would be captured by a silt retention system which would also serve the car park. This system would be designed to meet Melbourne Water requirements. The Visitor's Hub would be the main trail head and would allow direct access to the north and south trail zones.

Three other trail heads are proposed as follows:

- A new trail head would be established on top of Mount Tugwell, off Mount Bride Road and would include a carpark, a bus turnaround bay, a bike wash down station, toilets and picnic area
- The existing trail head at Mount Donna Buang would be upgraded with improvements to the car park, toilets and picnic area and installation of a bike wash down station
- An additional 120 car parks would be established at Wesburn Park to facilitate access to connecting trails.

Drainage would be upgraded at the other trail head locations to meet current Melbourne Water requirements.

3.4 Alternative to Trail 1

During the project development process, consideration was given to feasible trail alternatives for key trails where there is potential for significant environmental impact. Through a screening process that focussed on ecological, heritage and socioeconomic factors, the need to investigate alternative trail alignments was identified in order to ensure a network design that minimises the potential for significant environmental impact.

Further information on this work is provided in the **Chapter 4: Project development and alternatives.**

The investigations identified Trail 1, nicknamed Drop-a-K, as a candidate for consideration of alternative alignments.

Trail 1 is approximately 23 kilometres in length and traverses the Yarra Ranges National Park from the summit of Mount Donna Buang travelling in a westerly direction through forested land alongside Road

2 before meandering generally south east through forested land towards the Warburton township, also intersecting Woiwurrung State Forest.

The project identified an alternative to this trail, being the combination of Trail 45, Trail 46 and Trail 47, with a combined length of approximately 15 kilometres.

Trails 45 and 46 are within the Yarra Ranges National Park and commence at the summit of Mount Donna Buang, following a south easterly direction through forested land towards the Warburton township, before tying into trails 5 and 6. Trail 47 commences at Mount Donna Buang Road and travels east within the National Park to tie into trail 8. The trails are respectively of length four kilometres (Trail 45), 5.5 kilometres (Trail 46) and 5.6 kilometres (Trail 47).

At this stage the Transport Impact Assessment assumes that the visitor volumes would be the same or potentially less for the alternative trail alignment. However, there would be a crossing of Donna Buang Road required to join trails 46 and 47. The standards and safety requirements are investigated within this TIA.

3.5 Project timing

The timing of the key project phases is proposed as follows:

- Project development and approval: mid 2022
- Project construction, Stage 1 (approximately 110 kilometres): progressively from mid-2022
- Project operations and maintenance: staged opening during 2022 and beyond.

4.0 Legislation, policy, guidelines and strategy

The legislation, policy and guidelines relevant to this assessment are summarised in Table 2.

Table 2 Legislation, policy and guidelines relevant to the assessment

Legislation/policy/ guidelines	Key policies/strategies	Implications for the Project
Commonwealth		
AS1742.3 2009 – Traffic control for works on road	The Australian Standards are nationally agreed standards documents. This standard outlines the use of traffic control devices on the road network and has been adopted by all jurisdictions, including VicRoads.	This standard sets out all matters to be considered for a Traffic Management Plan (TMP) such as traffic demand, traffic routing, traffic control, special vehicle requirements and over-dimensional vehicles.
Austroads – Guide to Road Design Part 4: Intersections and Crossings	The Guide to Road Design is one of a set of comprehensive Austroads Guides developed to provide a primary national reference for the development of safe, economical and efficient road design solutions.	AGRD Part 4 provides guidance on intersection design such as design considerations, design process, choice of design vehicle, pedestrian and cyclist crossing treatments, provision for public transport and property access. This is relevant to the Project as it is anticipated to impact road access.
State		
Road Management Act 2004 (Victoria)	Road Management Act (General) Regulations 2016. Road Management Act (Works and Infrastructure) Regulations 2015. Code of Practice – Worksite Safety Traffic Management.	This Act and associated Regulations must be complied with for all public roads of the Victorian road network. The Act sets out general principles and obligations for which the road authority is responsible for administering. The Road Management Act requires approval for any construction project that may impact or change access of a controlled access road. This is relevant to the Project as it is anticipated to require road closures temporarily impacting access.

Legislation/policy/ guidelines	Key policies/strategies	Implications for the Project
Transport Integration Act 2010	The Act provides a legislative framework for transport in Victoria. The Act seeks to integrate land use and transport planning and decision-making by applying the framework to land use agencies whose decisions can significantly impact on transport. The Act requires agencies, including the Department of Transport and relevant planning authorities, to consider the potential impact of land use planning proposals on transport.	This Act sets out six transport system objectives and eight decision-making principles. The objectives include triple bottom line assessment: economic prosperity, social and economic inclusion and environmental sustainability. Other objectives include: • Integration of transport and land use • Efficiency, coordination and reliability • Safety and health and wellbeing The objectives and principles need to be considered in the evaluation of this project.
Road Safety Act 1986	Road Safety Road Rules, 2017.	These Rules provide road rules that are substantially consistent across Australia. They also specify behaviour for all road users. This framework is used in this assessment as the basis to assess safe and efficient traffic movements on roads.
	Road Safety (Traffic Management) Regulations, 2009.	These Regulations set out requirements for authorisation for implementing traffic control devices on roads (including for traffic management for worksites) This assessment uses this framework as a reference to prescribe traffic management requirements.
Towards Zero 2016-2020 – Victoria's Road Safety Strategy & Action Plan	This strategy aims to reduce fatalities and serious injuries by 15 per cent, with the aim of bringing the annual road toll under 200 per year by 2020.	This strategy references making local and busy places safer and using roads more safely. Safety considerations represent a critical focus of this assessment.

When any works are planned on a road, lane, street or footpath, a TMP needs to be submitted to the relevant road authority (VicRoads and local council) for review. This requirement is in accordance with the *Road Management Act 2004 (Vic)*, the *Road Safety Act 1986 (Vic)* and the Australian Standard AS 1742.3 2009 *Traffic control devices for works on roads*.

During the development of the TMP and associated sub-plans, consultation with key stakeholders would be undertaken. At this stage, the necessary approvals would be discussed and agreed, including:

- **Road works permits:** Functional and detailed design plans would be submitted to the road authority for approval prior to the commencement of any upgrade. A 'works within the road reserves permit', 'road opening permits' and 'vehicle crossing permits' would be sought as required.
- **Over-size vehicle permits:** The National Heavy Vehicle Regulator (NHVR) issues permits for oversized vehicles. VicRoads, on behalf of NHVR, would require at least 28 days to assess any route.

4.1 National policy

Over-dimensional loads, policies and guidelines

Over-dimensional loads are likely to be used to transport large equipment and plant to the Project area, as part of the construction phase of the Project.

The National Heavy Vehicle Regulator (NVHVR) outlines requirements for the movement of oversize loads and provides dimensional limits depending on vehicle types. Where the dimensions or mass limits exceed those outlined on NHVR guidelines, a specific permit must be requested from the road authority. VicRoads, on behalf of NHVR, would require at least 28 days to assess any route.

It would be necessary that all relevant stakeholders are involved at the outset of obtaining necessary permits and the above information would be used as a guide only in relation to those discussions.

In addition to the above, pilot and escort vehicles ensure the safe movement of oversize vehicles on the road. Pilot vehicles, certified pilot vehicles and escort vehicles typical requirements are shown in Figure 3.

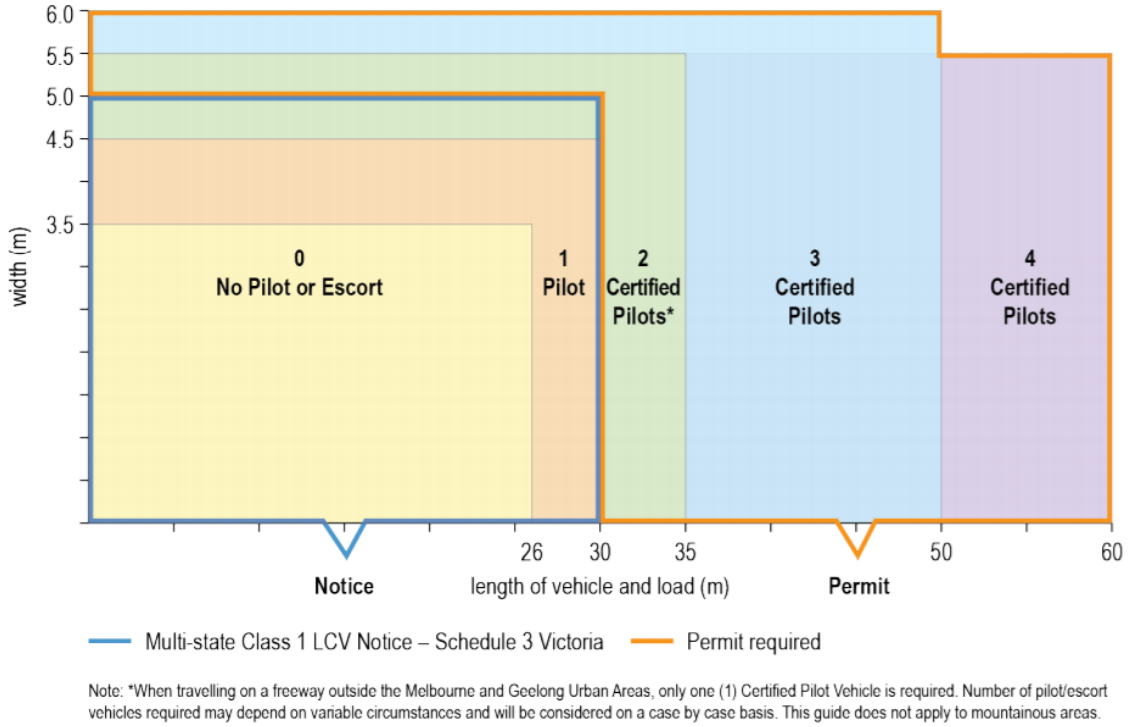


Figure 4 Pilot and escort graph guide

Source: NHVR, 2017

The above typical requirements are dependent on a number of parameters to ensure safe and efficient movement of oversize loads including:

- vehicle and load width and length
- location of movement
- traffic volumes and variations
- other associated risks such as road congestion or crash risk.

4.2 State policy

In addition to policies described above The Local Movement and Transport Report 2019 outlines the following state policies:

- Plan Melbourne 2017– 2050
- Victorian Cycling Strategy 2018 – 2028
- Victorian Visitor Economy Strategy 2016

4.3 Local policy

In addition to policies described above. The Local Movement and Transport Report 2019 outlines the following local policies:

- Vision 2020 Community Plan
- Council Plan 2017 – 2021
- Yarra Ranges Health & Wellbeing Strategy 2017-2021
- Yarra Ranges Equity, Access and Inclusion Strategy 2013-2023
- Yarra Ranges Environment Strategy 2015-2025
- Economic Development Strategy 2012 - 2022
- Recreation and Open Space Strategy 2013 - 2023
- Yarra Ranges Activity Centre Network Strategy (2012)
- Road Management Plan (2018)
- Warburton Mountain Bike Feasibility Study (2013)

4.4 Relevant studies and strategies

4.4.1 The Local Movement and Transport Report, SALT, 2019

SALT was engaged by Yarra Ranges Council in 2018 to produce the Warburton Local Movement and Transport Report. This report reviews the issues and opportunities regarding access, connectivity and parking within the Warburton township and surrounds. The issues that SALT identified were:

- Pedestrian routes connecting to destinations outside the core are indirect and discontinuous, including towards the golf course and accommodation areas to the north and west of the Warburton township
- Some sections of footpath are too narrow to allow wheelchairs or prams to pass one another, including along Warburton Highway between the two commercial areas of Warburton
- There is limited connectivity between the Warburton Lilydale Rail Trail and the Warburton town centre, and no guidance for cyclists when navigating these areas
- It is often unclear which road user has priority where the Rail trail crosses the road network, creating a potential conflict point for vehicles, pedestrians and cyclists
- There are bridges and shared use paths within the study area that have a width of less than 2 metres wide, preventing cyclists and other road users from passing
- Bus services are indirect and infrequent, with some routes not running outside peak periods or on weekends
- There are currently no public or community transport services to the surrounding tourist areas, including Healesville and Marysville, and no routes to the proposed mountain bike trail heads
- Through traffic is directed through the core of the Warburton, Wesburn and East Warburton townships, increasing vehicle volumes and reducing pedestrian amenity

- Some roads away from the key road connections may not be able to support additional traffic due to winding routes and roadside vegetation without intervention
- Off-street parking areas are not well signposted, making it difficult for tourists and visitors to find off-street parking across Warburton township
- Demand for parking increases over weekends and during peak tourist periods, reducing the availability for local traders and customers
- The growth in tourist volumes is expected to place pressure on existing transport infrastructure, with visitors, customers and staff competing for a limited number of parking spaces

SALT developed a number of key actions in response to the issues identified. The actions related to this Transport Impact Assessment (TIA) are listed below.

Improve roads and public space in the area:

Action 1 - Undertake conceptual planning and design for a streetscape upgrade of Warburton Highway in order to adapt the road and its traffic to the needs of the Warburton township, focusing on:

a. The western commercial precinct between the Warburton Tennis Club and Brett Road;
b. The eastern commercial precinct, between the Warburton Recreational Reserve and Riverside Drive;

Action 2 - Develop an on-going plan of streetscape improvements and use every opportunity to make improvements to the public realm, especially during any routine refurbishment.

Action 3 - Reduce the speed limit along Warburton Highway to 40kilometres per hour in areas where pedestrian activity is encouraged, including within the commercial areas of Wesburn and Warburton.

Action 4 - Consider opportunities to redistribute unused road space to pedestrians and the public realm, including at:

a. The intersection of Brett Road/Brisbane Bridge and Warburton Highway.
b. The intersection of Station Road and Warburton Highway.
c. The intersection of Scotchmans Creek Road and Warburton Highway.
d. The intersection of Park Road and Warburton Highway.
e. The intersection of Riverside Drive and Warburton Highway.

Action 5 - Ensure the safety of all road users is considered in new infrastructure works by undertaking a Road Safety Audit of the design prior to construction.

Improve pedestrian access and connectivity in the area:

Action 6 - Ensure the footpath network is continuous, clear of fixed objects and other obstacles and is at least 1.8m wide, so two people using wheelchairs can comfortably pass each other.

Action 7 - Look at opportunities to improve and extend the pedestrian footpath network beyond each township, including:

- Along Woods Point Road towards the Warburton Holiday Park.
- Between Warburton Highway and Backstairs Track
- Along Dammans Road towards the Golf Course

Action 8 - Provide pedestrian crossing opportunities through the township including:

- On Warburton Highway at Scotchmans Creek Road
- On Warburton Highway at Station Road
- On Warburton Highway at Warburton Reserve, near the current end of the Lilydale-Warburton Rail Trail
- On Warburton Highway near Park Road.

- At the intersection of Warburton Highway, Woods Point Road and Donna Buang Road.

Improve cyclist access and connectivity in the area:

Action 9 - Consider expanding the cycling network to include:

- Along Dammans and Blackwood Avenue
- A cycling connection between Warburton and East Warburton which may include shared or separated facilities along Riverside Drive
- A cycling connection between East Warburton and Redwood Forest. This may require an upgrade of the existing Yarra River bridge crossing to accommodate cyclists

Action 10 - Consider improving connections between the rail trail and destinations within the study area, including;

- Providing a formal shared use path connection between the Rail Trail in Wesburn along Station Road to the township and Wesburn Park
- Providing a formal shared use path connection between the rail trail and the western commercial precinct of Warburton along Station Road
- Extending the rail trail to the eastern commercial precinct of Warburton, including around the Warburton Recreational Reserve.

Action 11 - Provide improved shared use path crossings across major roads including:

- Along the rail trail at Station Road in Wesburn
- Along the rail trail at Hooks Road, Warburton
- Along the rail trail at Station Road, Warburton
- At the end of the rail trail at Warburton Highway, Warburton.

Action 12 - Consider providing end-of-trip facilities within the Warburton township for public use

Action 13 - Consider providing electric bike charging stations within the Warburton township.

also be considered to further improve cyclist safety e.g. speed humps or one-lane slow points with bicycle cut through.

Improve public transport in the area:

Action 14 - Advocate improvements to the frequency, coverage and accessibility of public bus services within the Warburton township and surrounding area, including:

- The introduction of a public transport route connecting key tourist destinations, including Healesville and Warburton
- Improved frequency of bus services to Warburton and East Warburton. particularly during off-peak commuter periods
- The introduction of bicycle racks to bus routes within the study area.

Action 15 - Encourage and support community and private providers to provide shuttle services to key destinations within the study area.

Action 16 - Plan for a future bus interchange that allows for the safe and efficient movement for passengers between public and community transport services. This could be located at the main trail head of the Warburton Mountain Bike Destination, or within the Warburton township.

Actions 17-33 focus on improving car parking for the Warburton town centre as well as education, information and wayfinding.

4.4.2 Warburton Mountain Bike Destination Project Traffic Impact Assessment, SALT, 2019

SALT was engaged by Yarra Ranges Council to undertake a traffic impact assessment for the primary trail head at Warburton Golf Course and secondary trail heads at Mount Donna Buang and Mount Tugwell in association with the broader Warburton Mountain Bike Destination.

SALT's investigations included the review of relevant project information and patronage projections supplied by Council, collation of traffic volume data, traffic modelling and assessment of parking and traffic implications within the subject sites and surrounding environs.

4.4.3 Warburton Mountain Bike Destination Master Plan, January 2020, YRC

The final draft Master Plan has been prepared to assist the community and stakeholders in understanding the Warburton Mountain Bike Destination and enable them to provide feedback that would assist in delivering a successful outcome.

The Master Plan summarises previous studies for the project including trail locations, design, infrastructure, the area of Warburton and how the project would operate.

5.0 Consultation

Development of the project and preparation of the EES have been informed by consultation with stakeholders and the community. Table 3 lists specific community and stakeholder feedback and how this feedback has been considered by the project or in the transport impact assessment.

Table 3 Stakeholder engagement undertaken for traffic and transport

Community and stakeholder feedback	Consideration in project design or impact assessment
Concern about parking availability, specifically: - Along Old Warburton Road - Throughout Old Warburton and Warburton generally - Illegal parking near trails - Wesburn Park - Mount Donna Buang	Parking has been considered in Sections 11.2.5 and 11.2.6 at the trail heads and within Warburton town centre.
Concern about increased congestion due to the project, specifically: - Old Warburton Road - Donna Buang Road - Warburton Highway	Congestion in construction and operation have been discussed in Section 10.1 and 11.1.
Concern about increase in congestion on some roads decreasing public safety, specifically: - Park Road - Donna Buang Road - Settlement Road - Station Road - Dee Road - Dammans Road	Project related traffic generation and distribution for roads within the study area is presented in Section 8.0. Assessment of potential impacts to roads within the study area is considered in Sections 10.0 and 11.0.
Concern about emergency egress due to increased traffic, specifically: - Dammans Road - Warburton Highway (through townships)	Project related traffic generation and distribution for roads within the study area is presented in Section 8.0. Impacts related to emergency vehicle access are considered in Section 11.2
Concern about safety due to increased interactions between cyclists, pedestrians and vehicles on road network, trail heads and crossing points	Assessment of potential impacts related to increased interactions between cyclists, pedestrians and vehicles is considered in Section 10.0 and 11.0.
Concern about bike travel between the new Visitor's Hub and the other trail heads	Assessment of potential impacts related to trail heads and cyclists safety is discussed in Section 11.0.
Requests for information about the traffic distribution of people accessing the trails	Traffic generation, distribution and assignment is within Section 8.0.
Shuttle routes	Shuttle operational traffic generation and distribution is discussed in Section 8.0. Impacts related to shuttle operations are discussed in Section 11.0.
Increased traffic due to project on residential streets	Assessment of potential impacts related to increased traffic within Warburton during operation is discussed in Section 11.0.

Specific stakeholder engagement undertaken as part of this transport impact assessment is summarised in Table 4.

Table 4 Stakeholder engagement

Activity	When	Matters discussed	Outcome
VicRoads/DoT	21 August 2020	For Warburton Highway and Donna Buang Road: ● Any road safety improvements planned ● Any asset management works planned ● Any known safety issues ● Any other relevant notes	● Speeding issues and reckless driving has been witnessed on Donna Buang Road given the 100 kilometres per hour speed limit. ● Safety issues on Warburton Highway for pedestrians/cyclists crossing the road. The road is 80 kilometres per hour in non-urban sections and 60 kilometres per hour through townships, there are large volumes of heavy vehicles.
DELWP	18 August 2020	● Available data to assist with assessment on roads within the study area managed by DELWP	● Mount Bride Road traffic volumes survey 2016 data provided ● DELWP road classifications for Edwardstown Road, Cemetery Track and Mount Bride Road ● There are no major upgrades planned for any of these roads ● Edwardstown Road is a marginal 5C road. Parts of it are quite narrow. ● Cemetery Track may require upgrading if it were to be used for trail access. However, it is close to significant heritage values.
YRC	18 August 2020	● Proposed road closures ● Planned road upgrades ● Available data to assist with assessment	● Melbourne Water Upper Yarra Dam upgrades may occur concurrently
Melbourne Water	21 August 2020	● Potential interactions with the Upper Yarra Dam Upgrade project (including heavy vehicle and workforce travelling along Warburton Highway)	● No information was provided about the Upper Yarra Dam Upgrade project by Melbourne Water

6.0 Method

6.1 Overview of method

This section describes the method that was used to assess the potential impacts of the project. Figure 5 shows an overview of the assessment method. A risk-based approach was applied to prioritise the key issues for assessment and inform measures to avoid, minimise and offset potential effects.

The approach used in the assessment has been guided by the evaluation framework that applies to the Project comprising the regulatory framework (that is, applicable legislation and policy) as well as the scoping requirements set by the Victorian Minister for Planning, which include the Commonwealth Department of Agriculture, Water and Environment assessment guidelines.

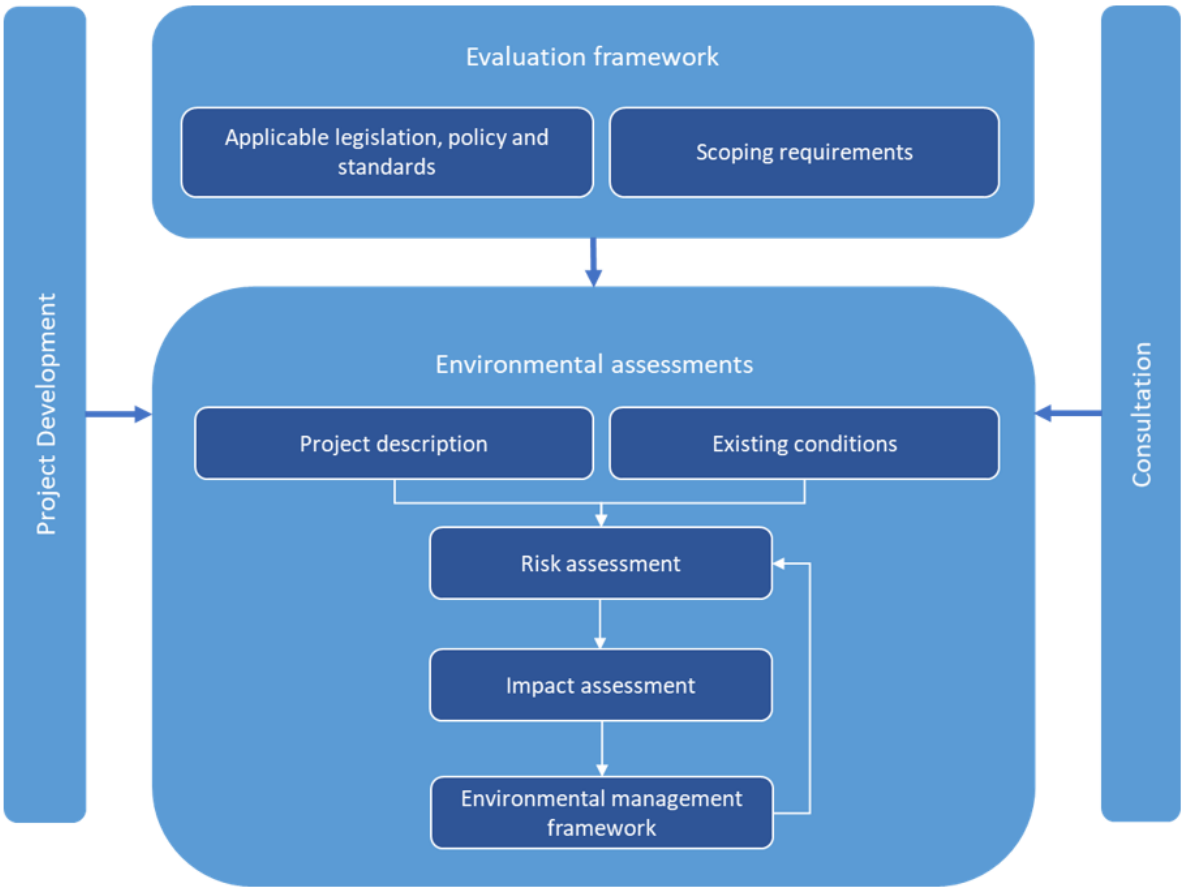


Figure 5 Overview of EES assessment framework

The environmental assessment undertaken encompasses consideration of physical systems, ecological systems, human communities, land use effects and economic effects as relevant to the Project. It has been undertaken using a precautionary approach according to the following steps:

- Review of the project design and the proposed construction and operation activities in the context of the existing conditions to determine the location, type, timing, intensity, duration and spatial distribution of project components and activities in relation to sensitive receptors.
- Measures adopted in relation to the design, construction and operation of the project to avoid and minimise impacts
- An initial risk assessment to evaluate the likelihood and consequence of proposed project activities in the context of initial mitigation measures to determine the relative importance of environmental risks associated with the project.

- Assessment of potential direct and indirect environmental impacts to analyse the spatial and temporal extent, magnitude and nature of the potential impacts giving consideration to the sensitivity and significance of affected receptors.
- Evaluation of the predicted outcomes against applicable legislation, policy and standards.
- Evaluation of the potential for cumulative impacts caused by impacts of the project in combination with impacts of other projects that are taking place or are proposed nearby.
- Identify mitigation measures where necessary, to address potentially significant environmental effects.
- Identification and evaluation of the residual environmental effects including magnitude, duration and extent, taking into account the proposed mitigation measures and their likely effectiveness.

Based on the findings of the environmental assessments, an environmental management framework has been established to monitor and evaluate environmental management and contingency measures in relation to the residual environmental effects. The environmental management framework specifies the committed mitigation and management measures and describes the roles and responsibilities for implementation throughout project construction, operation and decommissioning. The environmental management framework is described fully in **Chapter 15: Environmental management framework.**

The specific methods adopted during the key steps are described in the sections below.

6.2 Existing conditions

A desktop assessment was undertaken to understand the existing transport network and traffic conditions and review potentially affected roads within the study area. It should be noted that previous investigations conducted by SALT in 2019 for the Warburton Mountain Bike Destination were reviewed and used to form the basis of this analysis. Given that not all roads and trail heads were included in this previous study the gaps in information were supplemented with a desktop review and information from Yarra Ranges Council and VicRoads. No site visit was undertaken for this assessment by AECOM due to COVID-19 restrictions.

The existing conditions assessment comprised:

- An initial desktop study, including network jurisdiction and classifications
- Investigation of road safety data (sourced from VicRoads' CrashStats), bus routes (sourced from Public Transport Victoria) and designated heavy vehicle routes and restrictions (sourced from VicRoads)
- Analysis of available traffic data (sourced from Yarra Ranges Council, DELWP, VicRoads and traffic counts carried out by SALT)
- Review of relevant policies and legislation.

6.3 Avoidance and design

Relevant to this topic, the following measures have been adopted in relation to the design, construction and operation of the project to avoid and minimise impacts:

- Provision of additional parking at Warburton Golf Course and Wesburn Park to cater for peak parking demand
- Use of shuttle buses from key parking areas to minimise traffic on roads
- Building trails to achieve a balance of cut and fill in trail construction, meaning that surplus spoil would not require disposal and fill would not be imported

6.4 Risk assessment

6.4.1 Overview of risk assessment method

An environmental risk assessment has been completed to identify environmental risks associated with construction and operation of the project. The risk-based approach is integral to the EES as required by the Scoping Requirements and the *Ministerial guidelines for assessment of the environmental effects under the Environment Effects Act 1978*.

Specifically, the EES risk assessment aimed to:

- Provide a consistent evaluation tool that is used for all assessments to systematically rate the key issues associated with the project.
- Identify key risks associated with the project that may require further examination through the detailed impact assessments
- Inform project development and/or development of measures to avoid, mitigate and manage environmental impacts

The risk assessment process adopted is consistent with AS/NZS ISO 31000:2018 Risk Management Process. The following tasks were undertaken to identify, analyse and evaluate risks:

- Use existing environmental conditions and identify applicable legislation and policy to establish the context for the risk assessment
- Develop likelihood and consequence criteria and a risk matrix
- Consider construction, operational and decommissioning activities in the context of existing conditions to determine risk pathways
- Identify standard controls and requirements to mitigate identified risks
- Assign likelihood and consequence ratings for each risk to determine risk ratings considering design, proposed activities and standard mitigation.

6.4.2 Assigning a consequence level

Consequence refers to the outcome of an event affecting an asset, value or use. Table 5 presents the consequence framework describing the consequence levels from ‘insignificant’ to ‘severe’. The consequence criteria have been developed in the form of project-wide criteria rather than discipline specific, to enable a consistent assessment of consequences across a range of potential environmental effects.

Consequence criteria is assigned based on the maximum credible consequence of the risk pathway occurring. Where uncertainty regarding consequences existed, a conservative approach to assessing risk has been adopted.

Consequence criteria considered the following characteristics:

- Spatial extent of impact
- Duration and reversibility of potential impacts
- Sensitivity and significance of the receiving environment
- Magnitude, or severity of potential impact.

Each risk pathway would be assigned a level of consequence taking into account the guidance in Table 5. That consequence level, together with the likelihood level would be used to determine a risk rating in accordance with the risk matrix presented in Section 6.4.4.

Table 5 Guide to consequence levels

Level	Criteria
Insignificant	● No detectable changes or very short-term and localised ● Readily reversible (insignificant) impact (<1 year for recovery). ● Resilient or highly disturbed receiving environment or population. ● No impact to native vegetation or habitat. ● No impact to Cool Temperate Rainforest, Mount Donna Buang Stonefly or Leadbeater's Possum. ● Heritage: No observable impact to heritage, sites remain intact and unaffected. ● Social: No measurable impact to local character, amenity and access to public space/facilities. General community support, no impact to economy. ● Transport: Existing transport services unaffected and transport infrastructure can comfortably accommodate the project. Transport safety unaffected. ● Surface water / groundwater: No detectable changes to water levels, flow or quality with no measurable effect on assets, values or uses. ● Geotechnical hazards: No detectable changes to land stability/erosion.
Minor	● Short-term localised detectable changes. ● Impact likely to be readily reversible (within 5 years for recovery). ● Resilient or disturbed receiving environment or population. ● No impacts on critical habitats such as Cool Temperate Rainforest, Mount Donna Buang Stonefly or Leadbeater's Possum. ● Heritage: Low degree of disturbance or low degree of observable impact to locally significant heritage. No impact to state or nationally significant heritage. ● Social: Low degree of impact to local character, amenity and access to public space/facilities. Individual opposition to project, short term isolated economic issues. ● Transport: Existing transport services experience isolated and short-term disruption and transport infrastructure can accommodate the project. Transport safety not materially affected. ● Surface water / groundwater: Changes to water levels, flow or quality with isolated and short-term effect on assets, values or uses. ● Geotechnical hazards: Changes to land stability/erosion with isolated and short-term effect on assets, values and uses.
Moderate	● Short or medium-term detectable changes at a number of locations within the study area. ● Impact likely to be medium-term and reversible (5–10 years for recovery). ● Undisturbed receiving environment or population. ● Short-term, localised impacts on critical habitats such as Cool Temperate Rainforest, Mount Donna Buang Stonefly or Leadbeater's Possum. ● Heritage: Limited degree of impact to heritage values of state or local significance. ● Social: Limited degree of impact to local character, amenity and access to public space/facilities, some community resistance, economic pressure on community. ● Transport: Existing transport services and function experience moderate but ongoing disruption. Transport infrastructure can accommodate the project except for occasional short periods and isolated locations. Transport safety reduced somewhat but safety levels are satisfactory. ● Surface water / groundwater: Changes to water levels, flow or quality with moderate effect on assets, values or uses. ● Geotechnical hazards: Changes to land stability/erosion with moderate effect on assets, values or uses.
Major	● Long-term changes that are significant regionally ● Impact likely to be medium to long-term and potentially irreversible (> 10 years to recover). ● Sensitive receiving environment or population. ● Material impacts on critical habitats such as Cool Temperate Rainforest, Mount Donna Buang Stonefly or Leadbeater's Possum. ● Heritage: High degree of impact to heritage values of State or local significance. ● Social: High degree of impact to local character, amenity and access to public space/facilities. Vocal community conflict, declining economic stability.

Level	Criteria
	● Transport: Existing transport services and function experience major and ongoing disruption on declared roads. Transport infrastructure is strained for extended periods on regionally significant assets. Transport safety reduced with the potential for injuries. ● Surface water / groundwater: Significant changes to water levels, flow or quality with assets, values or uses significantly compromised. ● Geotechnical hazards: Significant changes to land stability/erosion with assets, values or uses significantly compromised.
Severe	● Permanent changes that are significant at a State or Commonwealth level. ● Impact likely to be long-term and irreversible. ● Highly sensitive receiving environment or population. ● Significant impacts on critical habitats such as Cool Temperate Rainforest, Mount Donna Buang Stonefly or Leadbeater's Possum. ● Heritage: Very high degree of heritage destruction or loss of heritage values. ● Social: Very high degree of impact to local character, amenity and access to public space/facilities. Public backlash, economic distress. ● Transport: Existing transport services and function cease to operate. Transport infrastructure is constantly overextended due to the project on assets of state or national significance. Transport safety reduced with the potential for fatalities. ● Surface water / groundwater: Extensive changes to water levels, flow or quality with assets, values or uses irreversibly compromised. ● Geotechnical hazards: Extensive changes to land stability/erosion with assets, values or uses irreversibly compromised.

6.4.3 Assigning a likelihood level

'Likelihood' to the combination of the chance of an event and the chance of the identified consequence occurring. The likelihood criteria ranges from 'rare' where the event and consequence may occur only in exceptional circumstances to 'almost certain' where the event and consequence is expected to occur in most circumstances. Likelihoods are assigned for the maximum credible consequence according to the levels presented in Table 6.

Table 6 Guide to likelihood levels

Level	Description
Rare	The event could occur but only in exceptional circumstances
Unlikely	The event could occur but is not expected in the course of normal circumstances
Possible	The event may occur in the course of normal circumstances
Likely	The event would probably occur in the course of most normal circumstances
Almost Certain	The event is expected to occur in the course of most normal circumstances

6.4.4 Assigning a level of risk

Risk is defined as a combination of the likelihood of an event occurring and the consequence of that event occurring. A risk rating was determined by these factors using the risk matrix, presented in Table 7.

Table 7 Risk matrix

		Consequence rating				
		Insignificant	Minor	Moderate	Major	Severe
Likelihood rating	Rare	Very Low	Very Low	Low	Medium	Medium
	Unlikely	Very Low	Low	Medium	Medium	High
	Possible	Very Low	Low	Medium	High	High
	Likely	Low	Medium	High	High	Very High
	Almost certain	Low	Medium	High	Very High	Very High

When risks are rated as medium or above, the impacts associated with the risk pathway are assessed in an increasing level of detail and would prompt further exploration of potential mitigation and management actions to reduce the overall impact.

6.5 Traffic generating activities

The transport specific elements of the Project were extracted and this formed the basis of the impact assessment.

The construction activities related to transport are:

- Construction of new trail heads at Warburton Golf Course and Mount Tugwell
- Construction of new shared use bridges over Old Warburton Road and Warburton Highway
- Upgrades of existing facilities at Mount Donna Buang and Wesburn Park trail heads
- Upgrade and construction of existing and new mountain bike trails.

Yarra Ranges Council provided estimated construction vehicle traffic volumes and worker commuting traffic volumes.

The operation activities related to transport are:

- Day visitors and Yarra Ranges mountain bikers driving directly to each trail head
- Shuttle buses operating between trail heads
- Workforce commuting trips for the primary trail head
- Overnight visitors staying within Warburton and surrounds cycling to trails
- Yarra Ranges mountain bikers cycling to the trails for a day visit.

For the operation phase the estimated day and overnight visitor volumes were provided by Yarra Ranges Council hour (annual, monthly, weekly and daily volumes). The shuttle bus routes and frequency were also provided as well as worker commuting traffic volumes.

6.6 Impact assessment method

Following a review of the existing conditions, and an understanding of the anticipated construction and operation traffic generation, distribution and assignment was undertaken to assess potential impacts for identified risks. The risks rated as low and very low were discussed but not assessed in detail given their low risk ratings. Risks rated medium and above were subject to the impact assessment. The significance of potential impacts identified has been assessed and discussed in Teh, 11.0, 12.0 and 13.0.

A detailed overview of the methodology applied to the Project construction and operation phases is provided below.

6.6.1 Construction phase

Establishing baseline

The baseline traffic year used is 2020. To determine growth rates for roads within the study area, growth rates for arterial roads within and adjacent to the study area were compiled using the DoT Open Data Hub. Traffic volume data available includes growth rates which all represented less than one per cent per year. As such, a growth factor of one per cent was applied for conservative purposes to roads within the study area. Traffic volumes as listed below were used to estimate 2020 volumes by applying a growth factor of one per cent:

- SALT traffic counts undertaken in 2018
- 2020 Annual Average Daily Traffic obtained from VicRoads for the declared road network.
- DELWP 2016 count on Mount Bride Road. Road category volumes were applied for Cemetery Track and Edwardstown Road.

It is typically considered that peak hour traffic volumes usually represent 10 per cent of daily traffic. As such, to convert Average Annual Daily Traffic (AADT) to peak hour, the assumption was made that 10 per cent of AADT equates to the peak hour demands.

Identifying peak construction traffic

A preliminary construction program provided by Yarra Ranges Council was used as the basis of the analysis. A worst-case scenario/conservative approach was applied which assumes that all construction activities occur at once.

Identifying impacted routes/roads

Construction heavy vehicles were assumed to originate from the west where potential contractors are anticipated to be located and travel to each of the construction activity locations. The vehicles would then return the way they arrived via the same route. Construction workers are assumed to commute to the construction locations from Warburton and surrounds.

A breakdown of the overall construction traffic generation which includes return trips for all construction activities is provided in Section 8.1.1 for all roads that are anticipated to be used by the generated construction traffic.

Assessing impact

Following identification of the routes that would be impacted by the Project, an assessment was undertaken for the risks rated medium and above.

As part of the impact assessment process, various treatments were considered to avoid, mitigate and manage the impacts and the residual impact following application of the proposed controls was then described.

6.6.2 Operation phase

Establishing baseline

The baseline traffic year used is 2031 which is 10 years after opening of the Project. Traffic volumes were sourced and growth factor of one per cent applied to produce the estimated 2031 volumes.

Identifying peak operation traffic

The peak traffic was assumed to be the highest visitor month in January and the peak day of the week was a Saturday. The visitor volumes applied for this assessment are 10 years in the future in the year 2031. Assumptions were adopted on how many visitors would travel together in a car and those that would cycle from surrounds and accommodation.

Identifying impacted routes

Origin of the visitors driving are expected to predominantly come from the west of Warburton and travel to each trail head and return on the same route. Shuttle buses were applied to routes in which they would operate between trail heads. The overnight visitors and Yarra Ranges mountain biking enthusiasts were assumed to cycle to/from each trail access point via the public road network and Lilydale-Warburton Rail Trail.

A breakdown of the overall operational traffic generation which includes return trips for all operation vehicles and cyclists is provided in Section 8.2.2 for all roads and shared use path that are anticipated to be used by the generated operation traffic.

Assessing impact

Following identification of the routes that would be impacted by the Project, an assessment was undertaken for the risks rated medium and above.

As part of the impact assessment process, various treatments were considered to avoid, mitigate and manage the impacts and the residual impact following application of the proposed controls was then described. This includes the plan to monitor the town car parking threshold of 85per cent occupancy.

6.7 Limitations, uncertainties, assumptions

This assessment adopted conservative inputs as indicated in Section 6.6. In this context, estimates that represent 'worst case' upper percentiles of parameter distribution during construction and operation peaks.

6.7.1 Limitations

The following limitations may impact the findings and conclusions of this TIA:

- This assessment used previous analysis and findings contained in the TIA for the Warburton Mountain Bike Destination as well as a Movement and Transport Strategy prepared in 2019 by SALT
- This assessment is based on a number of project assumptions that may be subject to change
- As this study occurred during COVID-19 restriction period, no site visit was undertaken by the AECOM team and a desktop assessment has been relied on. Constraints and risks identified are mainly based on publicly available information and data provided by the Yarra Ranges Council including previous studies conducted by SALT. It is proposed that a site assessment be undertaken as part of the TMP development to verify and complement findings from this study
- The potential traffic impacts associated with mountain biking events have not been considered as part of this TIA. Specific Traffic Management Plans (TMPs) are envisaged for events, developed in consultation with key stakeholders when the specifics of those events are known
- No vertical geometry of the roads has been considered
- No existing cyclist volumes on roads were available
- The cyclist generation, distribution and assignment only accounts for visitors travelling between accommodation and trail heads not between trails or trail heads.

This methodology is intended as a cautious approach to evaluate and manage the uncertainty inherent to impact assessments but also to take into consideration that the Project is still under development thus subject to potential change.

6.7.2 Assumptions

There have been multiple previous assessments and plans for the Warburton Mountain Bike Destination and as such there are assumptions which have been included from these studies. Assumptions have also been supplied by Yarra Ranges Council during requests for information and others developed by the AECOM team to use in this assessment. The assumptions are listed in Table 8 and a reference provided as to where these have been sourced from.

Table 8 Assumptions

Assumption	Reference
General	
Traffic volumes on Dammans Road are assumed to be as per Mayer Bridge	AECOM
Traffic volumes on Cemetery Track and Edwardstown Road are assumed to be as per their DELWP road classification average daily volumes. Survey volumes were provided from DELWP for Mount Bride Road.	AECOM
A growth factor of one per cent per annum has been applied to traffic volumes to consider growth between the count year and subject year. One per cent was used as this was seen to be in line with the study area road growth rates as per DoT/VicRoads AADT Open Data information.	AECOM
Where assessments were based on peak hour conditions, for conversion from Average Annual Daily Traffic (AADT) to peak hour, the assumption was made that 10 per cent of AADT equates to the peak hour demands. This is a common traffic engineering assumption which is considered to be conservative.	AECOM
For the cumulative impact assessment of the Warburton Water World the following assumptions were applied: ● There are 2.6 visitors per vehicle ● All visitors would arrive by car, there would be no cyclists or pedestrians traffic generation.	YRC & AECOM
Construction workers would be staying in Warburton	YRC
Construction compound is likely to be in Yarra Junction and existing YRC Depot	YRC
Construction period for Stage 1 would be 18 months and Stage 2 an additional 18 months	YRC
Construction heavy vehicles would be coming from the west via Warburton Highway	YRC
Assumed that all construction activity would occur concurrently as a worst case	AECOM
The trail head areas at Mount Donna Buang Road summit and Wesburn Park would undergo minor improvement works which would require light truck and trailer only. Mount Tugwell would require two heavy vehicle deliveries per day	YRC
Operations	
Visitor volumes have been adopted from the *Warburton Mountain Bike Destination Revised Economic Impact Assessment Draft Report*, January 2021, Table 6 for 2031. For the local visitors from within Yarra Ranges the following distribution assumptions were applied: ● The sub-area populations of Yarra Ranges were used to establish the origin points for the volume of mountain bike visitors provided by YRC to determine direction of travel. ● Beginner and novice mountain bikers within Yarra Ranges are assumed to drive ● Intermediate, advance and expert mountain bikers within Yarra Ranges are assumed to cycle ● Local visitors from 'Warburton & surrounds' were assumed to be from the east (24per cent) and west (76per cent) based on the residential area comparison between Warburton and East Warburton. ● Local visitors' volumes from 'Rural south & east' were assumed to arrive 50per cent from the east and 50per cent from the west For the visitors from Victoria (outside of Yarra Ranges) and interstate/overseas the following distribution assumptions were applied: ● Visitors staying overnight would stay in accommodation and cycle to/from the trails the following weekend day ● Visitors undertaking a day trip would drive to/from the trail heads ● Interstate and international would fly into Victoria and originate from Melbourne Airport or Melbourne and travel from the west into Warburton	YRC & AECOM

Assumption	Reference
● If driving from the west assume use of Warburton Highway West, from the east Warburton Highway east and from the north Mount Donna Buang as entry points into the study area Overall, the assumptions developed from the above for the visitor driving origin was east 0.42per cent, west 99.15per cent and north 0.43per cent. For cycling origins 79per cent are estimated to be from a place of accommodation and 21per cent from within their residence in Yarra Ranges.	
In the peak hour of the daily operation is assumed to be 25per cent of the overall daily visitors arrive/depart. This is assumed to be between 12:00 -1:00pm for a weekend day.	AECOM & SALT
Shuttle buses would operate between the primary trail head at Warburton Golf Course to Mount Donna Buang and Mount Tugwell (with a pick-up/drop off at Wesburn Park on the way to Mount Tugwell). 16 shuttle buses would operate per day over 8 hours to each of Mount Donna Buang and Mount Tugwell. Each shuttle bus carries 25 people.	YRC Masterplan 2020
New parking spaces would be provided as follows: ● The Golf course trail head to have 165 car parks ● Mount Tugwell to have seven spaces for drop off/pick up only ● Wesburn park to have an additional 120 car parks (340 total) Car parking space numbers remain the same as existing at Mount Donna Buang (240).	YRC, Masterplan
Dee Road trail head would be used by visitors and has 20 car parking spaces	AECOM & YRC
Assumption for day visitors driving directly to the Golf Course Trail head is 55per cent, 5per cent to Mount Tugwell, 7.5per cent to Mount Donna Buang, 30per cent to Wesburn Park and 2.5per cent to Dee Road trail head. This was provided from YRC.	YRC & AECOM
Locations in which trails cross over roads and a bridge is not proposed to be constructed, a signed road crossing would be provided. Mountain bike riders would be required to stop moving before the road crossing.	YRC
Shuttle drop off points at Victoria Spur, Edwardstown Road and Donna Buang Road would consist of a gravelled roadside area in which the shuttles can pull into and drop riders and their bikes	YRC
Cemetery Track (off Old Warburton Road) between Old Warburton Road and Edwardstown Road would be closed to public use and used for trail riders and shuttle buses only once the project opens	YRC
There would be a vehicle occupancy rate of 2.8 visitors per vehicle as per the previous TIA by SALT in 2019 "Based on information provided by Council on the likely travel habits of users, it is expected that there would be typically 2 – 4 cyclists per vehicle and an average occupancy rate of 2.8 cyclists per vehicle."	SALT 2019 TIA
Overnight visitors would cycle to the trails and would take the same path back to their accommodation as they came.	AECOM
Overnight visitors distribution is based on residential land use within an approximate five kilometre radius of Warburton which corresponds to an approximate 20-30 minutes cycling catchment. Land usage for localities within this radius was determined by using planning zone and overlay information available on VicPlan and Victoria Government Database. Residential planning overlays were extracted and corroborated using aerial imagery to obtain a residential cycling catchment area for each locality. Using the extracted information, a ratio for each locality was determined based on the overall residential land surface within the 5kilometre radius. Based on the above, it is assumed that 51per cent of overnight visitors would cycle from Warburton, 16per cent from East Warburton, 19per cent from Millgrove and 14per cent from Wesburn	AECOM
For local and regional events both spectators and participants would drive to the trail heads.	AECOM

7.0 Existing conditions

This section of the report characterises and summarises the existing road network, traffic conditions and findings from the desktop review in the study area. This would provide context for the remainder of the study.

7.1 Study area

The study area for this assessment is shown in Figure 6. It comprises the primary trail head located at the Warburton Golf Club, secondary trail heads on the Mount Donna Summit and Mount Bride Road, Mount Tugwell and Dee Road. The study area extends from the localities of Wesburn and Millgrove to East Warburton which are within the immediate vicinity of the head trails and include the roads used for construction and operation of the project.

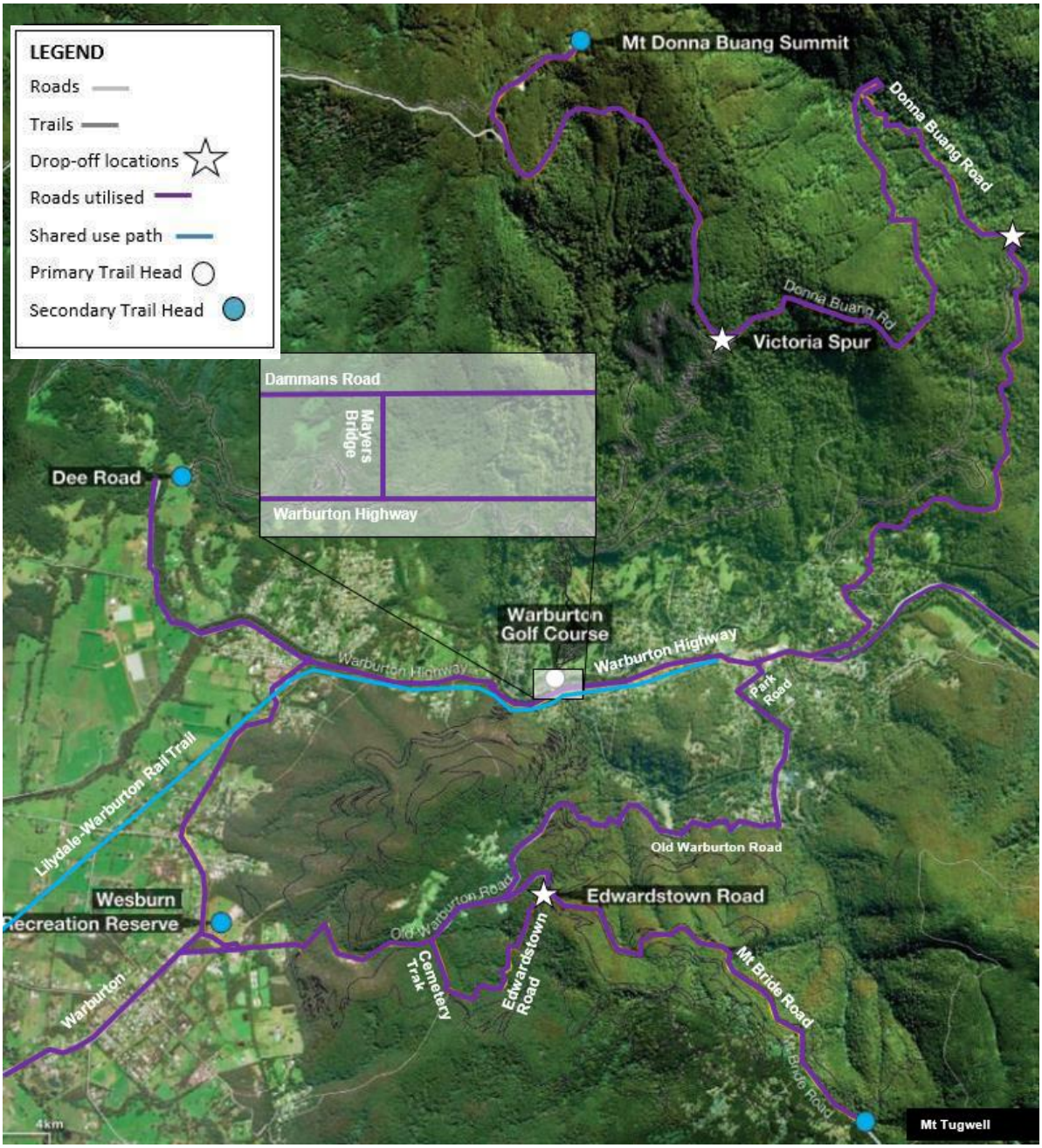


Figure 6 Study area

7.2 Pedestrians and cyclists

Warburton is a tourist and visitor township and the area features a number of footpaths and safe crossing points and there are walking trails in the surrounds of Warburton such as Yarra River Walk, Backstairs Track and Mount Little Joe Track.

Pedestrian and cyclist counts were taken as part of the SALT Local Movements and Transport Strategy investigations at three locations along the Lilydale- Warburton Rail Trail between 7:00 am and 9:00 pm on both a Friday and a Saturday. Saturday had the peak volumes and the daily volumes of the survey are shown in Table 9 along with the locations of each survey point in Figure 7.

Table 9 Lilydale-Warburton Rail Trail survey Saturday 26 October 2018 *Source: SALT 2018*

Location on rail trail	Type	Eastbound	Westbound	Total
Scotchmans Creek Road	Pedestrians	24	24	48
	Cyclists	112	85	197
Station Street	Pedestrians	34	28	62
	Cyclists	112	87	199
Warburton Highway	Pedestrians	39	29	68
	Cyclists	24	18	42

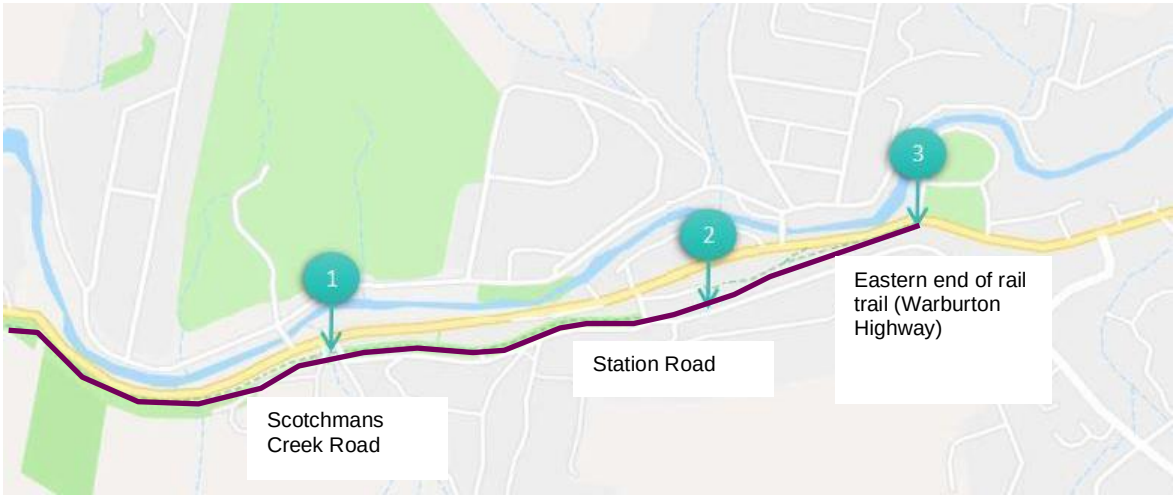


Figure 7 Locations of Lilydale-Warburton Rail Trail cyclists and pedestrian survey *source: SALT 2018*

Cyclists also use the road network in the study area. This is evident in the cyclist heat map in Figure 8, it can be seen that cyclists travel along the arterials and collector roads in the area. In particular Donna Buang Road is popular in the Yarra Ranges road cycling community, with cyclists ascending from Warburton (2013 Feasibility Report).

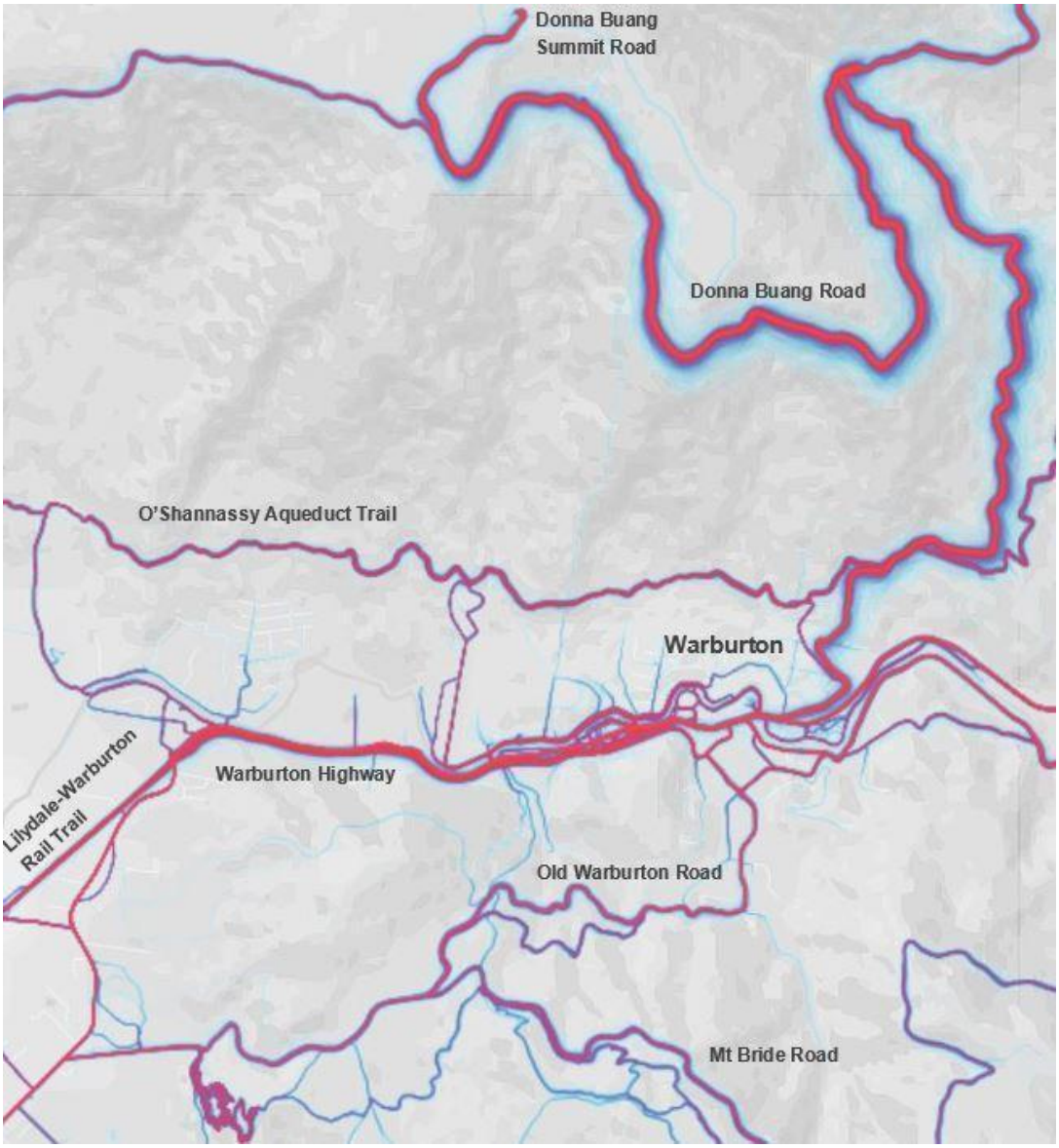


Figure 8 Cyclist heat map study area *Source: Strava*

There are no bicycle lanes on any roads in the study area. However, there are a number of existing off-road bicycle trails and shared use paths located within the study area.

- The Lilydale-Warburton Rail Trail is a popular tourist trail which provides a key cycling connection. Overall, it is 40 kilometres in length and used by pedestrians, cyclists and horse riders. In 2018, nearly 84,000 cyclists travelled along the trail into Warburton (SALT). In proximity to the study area, it is located on the south side of Warburton Highway with the trail ends to the east. The trail is a part of both the Principal Cycling Network (PBN) and Strategic Cycling Corridor (SCC). Measured at approximately 3.2 metres wide in proximity to Scotchman Creek Road
- The O'Shannassy Aqueduct Trail is also located within the study area, approximately 2 kilometres east of the Warburton Golf Course. This trail starts at Warburton Main Street, heads east from Warburton. It crosses Mount Donna Buang Road east of the trail.

The SALT site visit conducted as part of the Local Movements and Transport investigations in 2018 found that while there are pedestrian routes connecting to destinations within Warburton, they are in poor condition and form discontinuous pedestrian routes towards the Warburton Golf Course. Though there are no footpaths along Dammans Road, there is a footpath connecting the Warburton Golf

Course Yarra River Walk to the south of Dammans Road which goes from Mayer Bridge to the east north along the river.

A footpath is provided on the north side of Warburton Highway in proximity to the township shopping strip. SALT also noted that some sections of footpaths were observed to be too narrow to allow safe bidirectional pedestrian traffic, specifically for wheelchairs or prams to pass one another. These observations included sections along Warburton Highway between the two commercial areas of Warburton.

There are three signalled pedestrian crossings in proximity to Warburton including:

- Western section of the town centre of Warburton over Warburton Highway
- East of the town centre of Warburton in proximity to Donna Buang Road over Warburton Highway
- West of Warburton where the Lilydale-Warburton Rail Trail crosses Warburton Highway

There are no other formal crossing points across Warburton Highway.

There are no footpaths along Donna Buang Road, Old Warburton Highway or Mount Bride Road. As such, the potential project trail heads at Mount Tugwell and Mount Donna Buang cannot be formally accessed by pedestrians. The primary trail head at the golf course would be accessible via the Lilydale-Warburton Rail Trail and the proposed Warburton Highway bridge which would connect into the trail head.

Warburton Highway does not have pedestrian footpaths with the exception of the townships of Warburton and Wesburn where there are community facilities and shops. Dammans Road has no footpaths.

7.3 Bus routes

There is one bus route currently operating in the vicinity and within the study area. Bus route 683 travels between Chimside Park and Warburton via Lilydale Station and extends to East Warburton during the weekday, connecting the study area to train services towards Melbourne at Lilydale Station. There are 29 bus stops along this route on Warburton Highway within the study area.

This bus line operates from 6:00 am - 10:30 pm during weekdays and operates with a 30-minute frequency during peak hours. The bus line also provides services from 9:00 am - 10:30 pm on Saturdays and 11:00 am - 10:30 pm on Sundays.

While there are no school bus routes, bus route 683 services a number of schools in the Yarra Junction area.

Patronage data provided by PTV which was used in the SALT Movement and Transport Strategy outlines that the most frequently used bus stops are as listed below:

- Marion Park Gardens / Woods Point Road
- Park Road / Warburton Highway
- Yarra View Retirement Village / Warburton Highway
- Warburton Reserve

7.4 Road network

7.4.1 Declared road network

The responsible authority for the operation and management of the declared road network is VicRoads. Declared roads are classified as Freeways, Arterial Roads and Non-Arterial State Roads under the *Road Management Act 2004*.

Declared roads are categorised by VicRoads in four classes: M, A, B and C. Each class reflects the quality and function of the route in the state road network and has a set of minimum physical standards in regard to the width of lanes and shoulders, number of lanes, shoulder surface type and traffic volumes. The physical standard for road classes for declared roads are provided in Table 10.

Table 10 Physical characteristics for road classes for declared roads

Classification (5) (AADT)	Lane Widths (m)	Shoulder Widths (m)	Sealed Shoulder (m)	Total Seal (m)	Carriageway (m)
M	Divided carriageway 2 x 3.5 each	LHS 3.0 RHS 1.0	LHS 3.0 RHS 1.0	11.0 each	11.0 (1) each
A (AADT < 1500) (AADT > 1500)	Single carriageway 2 x 3.1 2 x 3.5	2.0 2.0	1.5 1.5	9.6	10.6 12 (1)
B (AADT < 1500) (AADT > 1500)	2 x 3.3 2 x 3.5	2.0 2.0	0 1 (3)	6.6 7.0 (3)	10.6 (1) 11.0
C (6) (AADT < 1500) (AADT > 1500)	2 x 3.1 2 x 3.5	2.0 2.0	0 (3) 0 (3)	6.2 7.0 (2)	10.2 11.0
Local Access (51 – 150)	1 x 4.0	1.5	NA	4.0	7.0
Private Access (1 – 50)	1 x 3.0	2.0	NA	Unsealed	7.0

Notes:

(1) Minimum standard prescribed in *Victoria's Rural Network Strategy – Draft (VicRoads, 2010)*.

(2) Where road radius is less than 200 m, sealed width should be increased to provide tracking width in Table V7.3 of V*icRoads Supplement to the AustRoads Guide to Road Design Part 3 – Geometric Design*.

(3) One metre sealed shoulder on designated tourist routes, designated tourist cycle routes, Principal Freight Network and where warranted by accident record.

(4) For definitions of M, A, B, C Roads see Section 2.2 of *VicRoads Supplement to the AustRoads Guide to Road Design Part 3 – Geometric Design*.

(5) On routes less than 200 vehicles per day, generally maintain existing pavement and widths on 'C' roads unless upgrading is warranted by exceptional traffic volumes or by crash records. New works in excess of 100m length will be constructed to the specified standards.

Source: VicRoads Supplement to the AustRoads Guide to Road Design Part 3 – Geometric Design, VicRoads (2016)

The declared road network within the study area is as follows:

- Warburton Highway is classified by VicRoads as a B Class road. It is sealed with a single 3.5-metre-wide lane each way and has gravel shoulders through Warburton and sealed shoulders through Wesburn. There is parking on either side of Warburton Highway in the Warburton town centre catering to business on the northern side. There are also several Yarra River bridges which the road crosses and guard railing provided on the north side of the road
- Donna Buang Road is classified as a C Class road. This road is sealed and has approximately 2.8-metre-wide lane in each direction. It has a sealed shoulder on the southern side of the road. The road is seen to be mountainous in type and has several sharp curves along its length. Donna Buang Road to the west of the intersection with Donna Buang Summit Road becomes a gravel road shortly after which is signed as narrow
- Donna Buang Summit Road is classified as a C Class road. The road is sealed and has approximately a 2.8 metres wide lane in each direction. There are no shoulders along its length.

The posted speed limits within the study area are shown on Figure 9:

- Warburton Highway, Warburton has a speed limit of 50 kilometres per hour through the Warburton township and 60 kilometres per hour outside of this
- Warburton Highway, Wesburn is 70 kilometres per hour, 50 kilometres per hour in the town centre, 80 kilometres per hour to the north of the town centre and is reduced to 60 kilometres per hour before entering Warburton

- The Donna Buang Road speed limit between Warburton Highway and Acheron Way is 100 kilometres per hour with the speed reducing down to 70 kilometres per hour and 60 kilometres per hour as the road approaches the intersection with Warburton Highway. Between Acheron Way and Donna Buang Summit Road the speed limit is 80 kilometres/h
- Donna Buang Summit Road has a speed limit of 100 kilometres per hour.

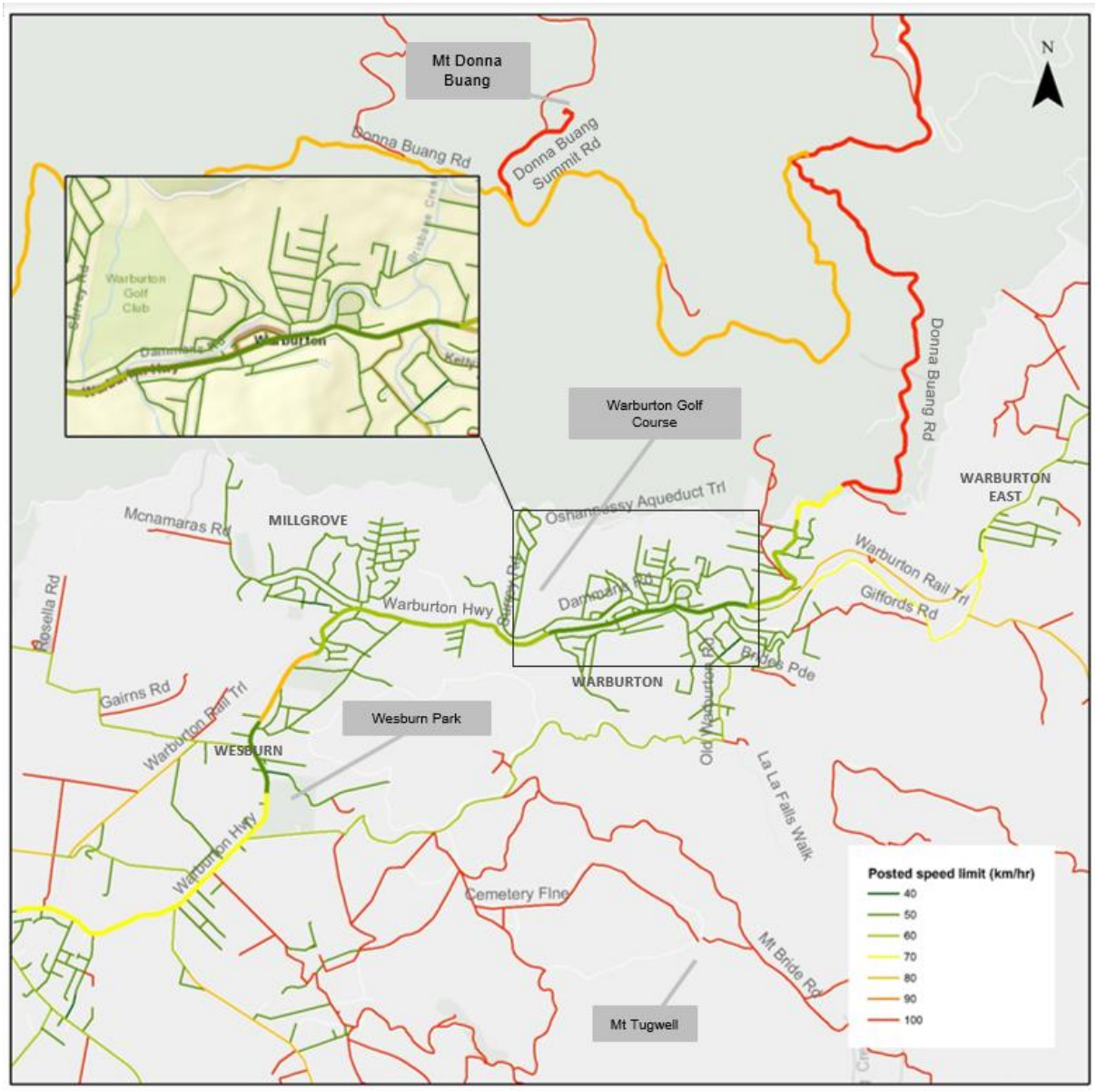


Figure 9 Posted speed limits in the study area *source: VicRoads*

Declared roads planned upgrades

As part of developing an understanding for the existing conditions of the declared road network, it is necessary to review the current proposals within the study area.

There are currently no planned road upgrades on the declared road network.

However, there are several potential road improvements on Warburton Highway listed as part of the Department of Transport Network Prioritisation Program which are currently under consideration. These suggestions include the following:

- Pedestrian operated signal development for Warburton Trail SCC and Barack Drive bus stop (serviced by bus line 683) on Warburton Highway, Yarra Junction, near Barak Drive
- Construction of pedestrian operated signal at the school crossing near Caltex Launching Place Warburton Highway.

It is to be noted that these potential improvements are located on the periphery of the study area and are not committed projects as they are still subject to consideration.

7.4.2 Local road network

The local road network comprises non-declared roads that are the responsibility of Yarra Ranges Council or DELWP. These roads are generally used to provide local access and connect abutting properties to the road network.

Each of these roads is classified by the relevant authority according to a road hierarchy that considers the function of the road, accessibility, traffic volumes and types of users using the road. The local road network hierarchy can be found in the Yarra Ranges Council's road management plan and described in Appendix B.

The Yarra Ranges Planning Scheme Clause 56.06 contains *Table C1 Design of Roads and Neighbourhood Streets* which denotes the type of road with its maximum traffic volumes and expected width. DELWP has their own road classification system for roads which they manage, the road classes and corresponding descriptions. Both are outlined in Appendix B.

The local road network which would be used for the project consists of the roads listed and described in Table 11. Mount Bride Road, Cemetery Track, Edwardstown Road and Dee Road are narrow and do not fit two-way traffic, vehicles are required to slow to pass each other in the space provided. Site photos for the local roads were provided by YRC and are in Appendix A.

Table 11 Local road network existing conditions

Road name	Responsibility	Class	Lanes	Surface	Approximate Width	Shoulder	Posted Speed (kilometres per hour)	85th Percentile Speed* (kilometres per hour)
Mayer Bridge	YRC	Local	One in each direction	Sealed	6 metres	None	50	25.1
Park Road	YRC	Local	One in each direction (unmarked)	Sealed	7 metres	None	50	47.4
Old Warburton Road (East of Warburton Highway)	YRC	Collector	One in each direction	Sealed	6 metres	None	60	69
Old Warburton Road (East of Mount Bride Road)	YRC	Collector	One in each direction	Sealed	6 metres	None	60	56.9
Dammans Road	YRC	Collector	One in each direction (unmarked)	Sealed	6 metres	Gravel	50	-
Mount Bride Road	DELWP	5C - Minor	Single two-way lane	Gravel	5 metres	None	100	-
Cemetery Track	DELWP	5E - Tracks	Single two-way lane	Gravel	4 metres	None	100	-
Edwardstown Road	DELWP	5C - Minor	Single two-way lane	Gravel	4 metres	None	100	-
Dee Road	YRC	Local	Single two-way lane incl. one-way bridge	Partially sealed and gravelled	4 metres	None	50	-

** 85th Percentile Speed only available for roads which were subject to traffic survey conducted by SALT*

7.4.3 Traffic volumes

The following section provides an overview of the existing traffic volumes in the vicinity of the study area.

Warburton Highway is the primary traffic entry and exit point to Warburton. The SALT 2018 traffic counts for Warburton Highway are thus able to provide the approximate peak hour of road traffic for the area. It can be seen in Figure 10 that Saturday is the highest weekend day (in addition to the peak day of the week) and Friday is the highest weekday.

Saturday had a daily peak hour of 11:00 am, Friday had an AM Peak at 9:00am and a PM Peak at 4:00pm which was also the overall daily peak hour.

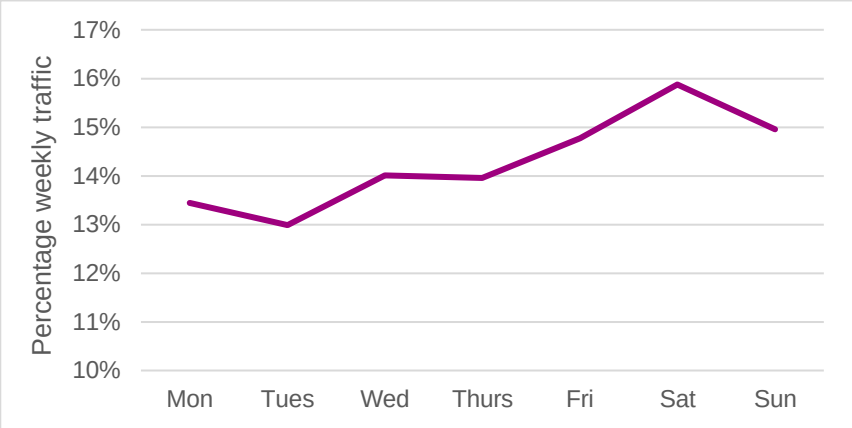


Figure 10 Warburton Highway weekly traffic profile *Source: SALT*

The traffic volumes for the local roads have been adopted from:

- the SALT 2018 tube counts undertaken between Tuesday 23 October 2018 to Monday 29 October 2018 and
- DELWP counts undertaken between Wednesday 23 November 2016 to Tuesday 13 December 2016.
- Daily traffic volume for Dee Road has been adopted from a 2019 traffic count survey by YRC between Westley and Bridge Adjustment as the 7-day average.

Warburton Water World opened in September 2020 and the traffic volumes associated have not been able to be included in the existing traffic volumes.

The volumes have had an annual growth factor of one per cent applied to estimate the 2020 existing daily volumes on each road which are shown in Table 12.

Table 12 Summary of local road traffic volumes (2020)

Road name	Class	Friday daily traffic volumes	Saturday daily traffic volumes	Heavy vehicles*
Mayer Bridge	Local	1,100	1,110	5.1%
Park Road	Local	1,030	1,150	4.5%
Old Warburton Road (East of Warburton Highway)	Collector	340	390	6.6%
Old Warburton Road (North of Mount Bride Road)	Collector	130	170	6.3%

Road name	Class	Friday daily traffic volumes	Saturday daily traffic volumes	Heavy vehicles*
Old Warburton Road (South of Park Road)	Collector	460	500	8.4%
Dammans Road	Collector	1,100	1,110	-
Mount Bride Road	Non-maintained	30	40	-
Cemetery Track	Non-maintained	10	10	-
Edwardstown Road	Non-maintained	50	50	-
Dee Road	Local	420	420	-

^ *A growth factor of one per cent per annum has been applied to take into account growth between the count year and 2020*

* *Seven-day average heavy vehicle percentage SALT 2018*

Volumes have been rounded to the nearest 10 vehicles

Declared road traffic volumes are summarised in Table 13. The VicRoads Average Annual Daily Traffic (AADT) was used for Warburton Highway (Wesburn) and Donna Buang Summit Road as these were higher than the SALT 2018 tube counts.

Table 13 Summary of declared road traffic volumes (2020)

Road name	Class	Friday daily traffic volumes	Saturday daily traffic volumes	Heavy vehicles
Warburton Highway (Warburton)	State Arterial B Class	6,600	7,000	7.1%
Warburton Highway (Wesburn)	State Arterial B Class	7,100*	7,100*	9.9%
Donna Buang Road	State Arterial C Class	900	1,300	2.8%
Donna Buang Summit Road	State Arterial C Class	4,200*	4,200*	14%*

^ *A growth factor of one per cent per annum has been applied to take into account growth between the count year and 2020*

**Source: VicRoads 2020 AADT OpenData*
Volumes have been rounded to the nearest 100 vehicles

SALT previously undertook a traffic turning movement survey at the intersection of Warburton Highway and Mayer Bridge on Friday 17 May (3:00 pm – 6:00 pm) and Saturday 18 May 2019 (10:00 am – 4:00 pm). The data showed that 2:00 pm – 3:00 pm on the Saturday was the peak traffic period for the intersection and the volumes are shown in Figure 11.

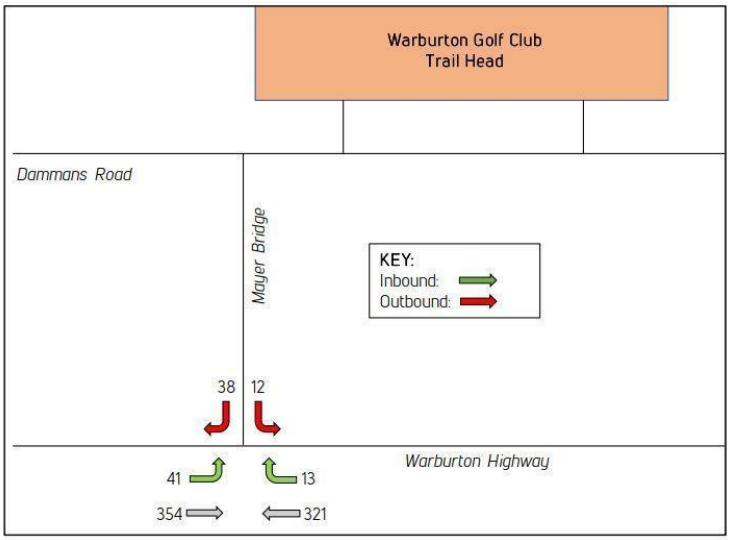


Figure 11 Intersection count Warburton Highway / Mayer Bridge Saturday 18 May 2019 *source: SALT*

7.5 Crash history

The crash analysis was based on the most recent available data based on reported casualty crashes recorded over the last five-year period (2014 – 2019) in the VicRoads CrashStats database. There were no fatal accidents recorded in the study area in this period.

There have been 16 crashes recorded along the length of Warburton Highway (between Wesburn Park and Donna Buang Road), these are mapped in Figure 12.

Notably in the Warburton town centre:

- Two crashes involved a cyclist, one was a vehicle strikes door of parked/stationary vehicle which resulted in an 'other injury' crash. This occurred in the vicinity of the eastern shopping strip. The other was on Station Street which provides access to the Lilydale-Warburton Rail Trail
- Two crashes involved pedestrians (pedestrian hit from the right): one 'other injury' and one 'serious injury'. Both were hit by vehicles while crossing the road within the shopping strip area. However, these crashes did not occur at a formalised road crossing.

Along Donna Buang Road and Donna Buang Summit Road (between Warburton Highway and Donna Buang Summit) 11 crashes have been recorded, including:

- Five 'serious injury crashes' and six 'other injury crashes'
- No pedestrian, cyclist or heavy vehicle crashes
- Six motorcycle crashes
- Nine run-off road crashes
- Donna Buang Summit Road has three crashes in the first 340 metres, these consist of a 'serious injury' off road left bend crash, a 'serious injury' off road right bend crash and an 'other injury' out of control crash.

The narrow carriageway, lack of shoulders and mountainous conditions are likely the cause of the runoff road crash trend seen on Donna Buang Road and the summit road. It is also noted that tourists who are unfamiliar with the mountainous, windy and potentially snowy conditions of this road are also potential explanatory factors in the number of crashes.

Old Warburton Road has had three crashes recorded between Mount Bride Road and Park Road, two were an 'other injury crash' and a single 'serious injury crash'. Mount Bride Road was seen to have two 'other injury crashes' both involved motorcycles.

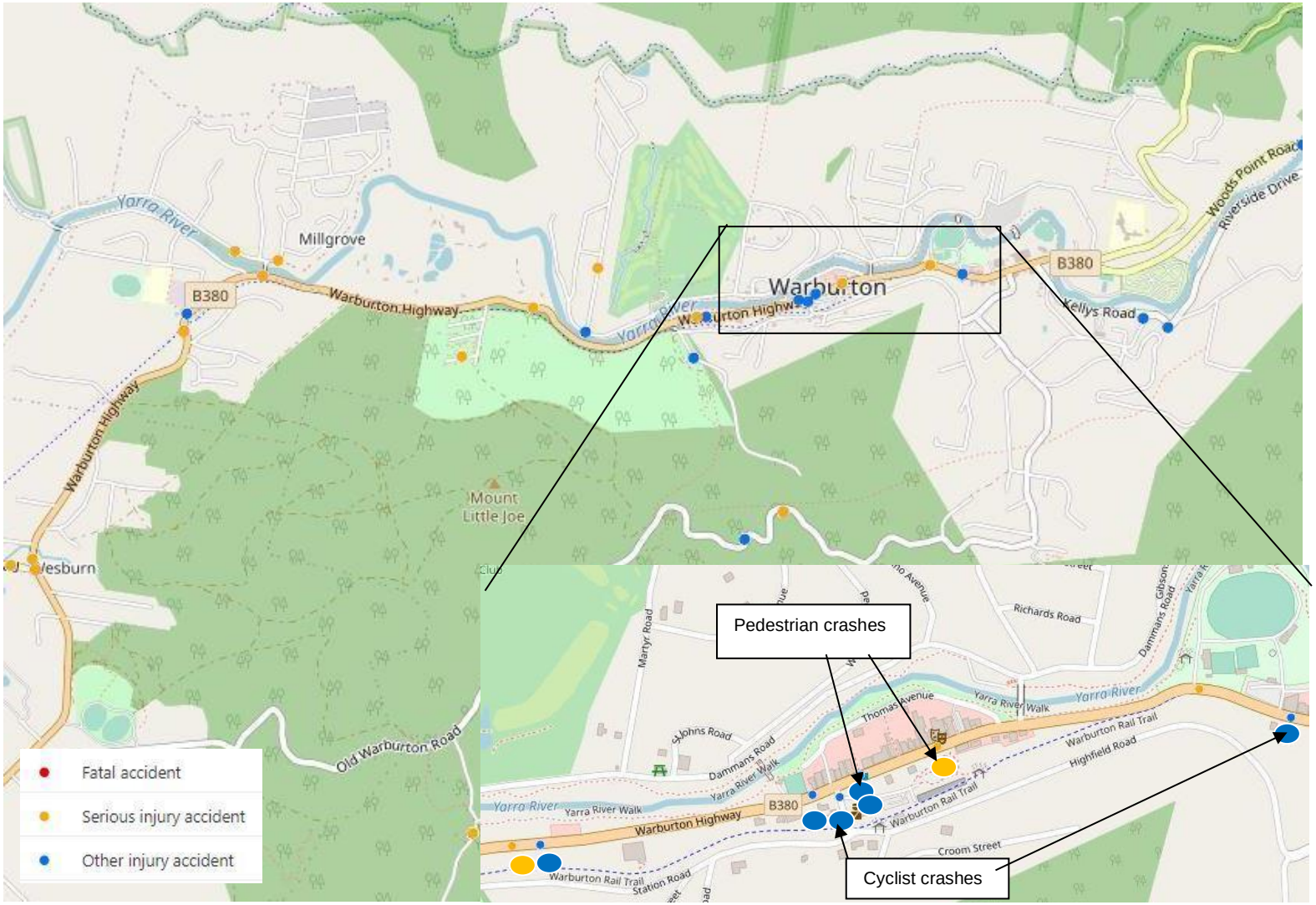


Figure 12 Crash locations (2014 – 2020) Warburton Highway and surrounds

7.6 Parking

Parking within the Warburton township is provided for a wide range of users, including public transport, taxis, service and emergency vehicles, private employee parking and public parking. In 2019 as part of the Movement and Transport Strategy, SALT undertook a parking survey of the township between 25 October and 3 November 2018 (which included a long weekend). The surveys were conducted between 7:00 am and 7:00 pm at hourly intervals. The following findings were made:

- 416 formalised public parking spaces are available
- 300 parking spaces are located on-street with the remaining 116 spaces located in off-street car parks
- Parking restrictions include time limited parking, loading zones, taxi zones, disabled parking, and no stopping restrictions
- Parking in the area is typically unrestricted after 6:30 pm Monday to Saturday
- Peak parking demand occurred at 12:00 pm on Saturday 27 October 2018. 207 vehicles were observed to be parked within the study area, representing a parking occupancy rate of 50 per cent. Generally, car parking occupancy is considered 'at capacity' when occupancy reaches 85per cent during the peak period.

At the locations of the proposed trail heads there is existing parking at Mount Donna Buang, Wesburn Park and Dee Road. Mount Donna Buang parking is gravelled and there are two areas which are mainly used for snow season car parking (and underutilised outside of this time) as shown in Figure 13. Parks Victoria advise that the secondary car parks each hold 120 car parks. The existing parking area at Wesburn Park is gravelled and spaces are unknown. Dee Road has approximately 20 gravelled car parking spaces as shown in Figure 14.

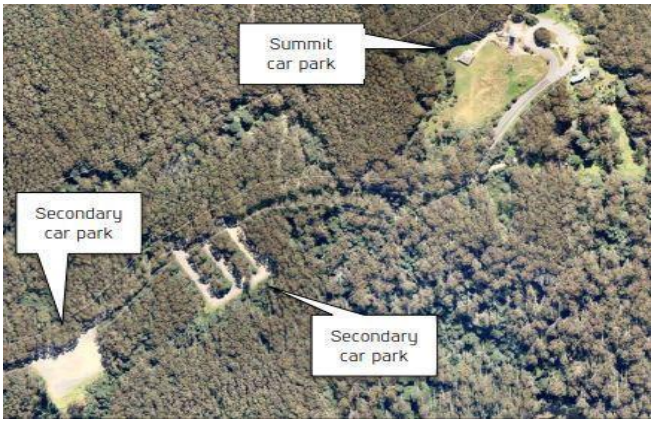


Figure 13 Mount Donna Buang Summit car park locations *source: SALT 2019 TIA*

Figure 14 Dee Road trail head car park *source: YRC*

7.7 Freight network

Access for B-double and higher mass limits (HML) trucks on the road network is outlined by the National Heavy Vehicle Regulator (NVHR).

HML classification enables particular heavy vehicles to access additional mass entitlements and allows for a significant increase in the productivity of road freight transport vehicles. Operators of vehicles or combinations running HML on tri-axle groups are accredited under the National Heavy Vehicle Accreditation Scheme (NHVAS). Vehicles must be fitted with certified road friendly suspension and must be on an authorised HML route.

Operators of HML and B-Double vehicles need to obtain permits from the relevant road manager to operate on any roads which are not part of the approved networks. Typical B-Doubles range from 19 to 25 metres in length depending upon the number of axles. Once the final vehicle specifications have been established, subsequent transport impacts for this Project would be analysed as part of the Traffic Management Plan (TMP).

Oversize Overmass (OSOM) vehicles are exempted of permitting requirements if they travel on the designated roads and approved routes and comply with the NHVR requirements. This is typically applicable to low loader/dolly combinations that operate up to 100 tonnes gross mass, five metres high, five metres wide, and 30 metres long. Access permits are required for non-approved roads or roads approved with conditions.

Permits can be applied for through NHVR which must seek consent from all road managers involved in a proposed permit route. Councils generally allow the gazetted pre-approved local road network to be used by various types of heavy vehicles. Pre-approved local routes for each type of vehicle are outlined by VicRoads which maintains a list of the B-Double and HML network in Victoria.

Restricted B-Double and HML roads within the study area are shown in Table 14 and Figure 15.

Table 14 B-double and HML approved roads

Road	Road authority	B-doubles	HML
Donna Buang Road	VicRoads	Restricted	Approved
Warburton Highway	VicRoads	Approved	Approved

Source: Victoria's gazetted B-Double Network, Victoria's HML Network Map and Victoria's OSOM Network Map

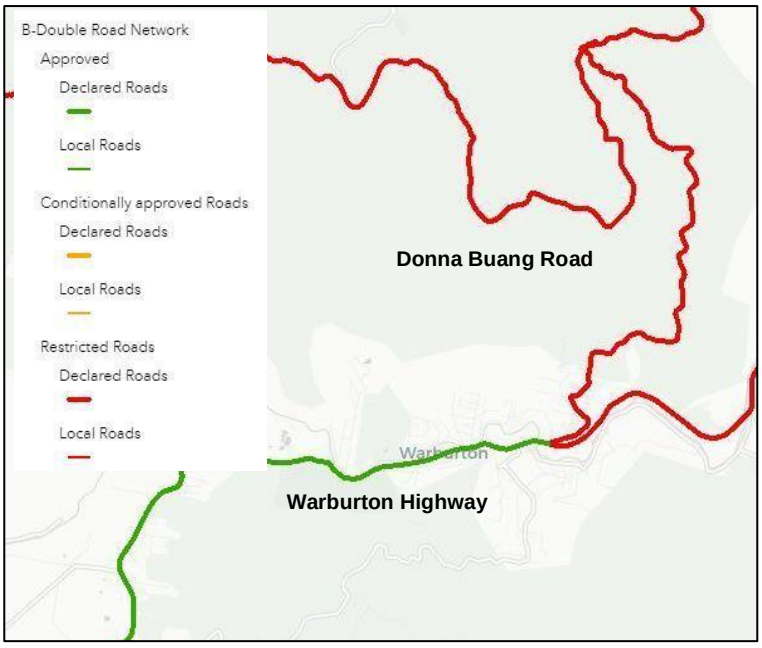


Figure 15 Study area B-double approved roads *Source: VicRoads, 2020*

8.0 Project traffic generation, distribution and assignment

8.1 Traffic generation

8.1.1 Construction

The construction activities related to transport are:

- Construction of new trail heads at Warburton Golf Course and Mount Tugwell
- Construction of new cyclist bridge over Old Warburton Road and shared use bridge over Warburton Highway
- Upgrades of existing facilities at Mount Donna Buang and Wesburn Park trail heads
- Upgrade and construction of existing and new mountain bike trails.

The traffic generation for the construction phase of the Project is made up of workforce which is anticipated to generate light vehicle movements and the movement of plant and equipment which generate heavy vehicle movements. It is assumed for this assessment that the construction activities would all occur at the same time as the construction schedule is unknown, this is a conservative approach.

Each construction activity is estimated to have a workforce of four personnel. These personnel are expected to each drive to site separately and thus would produce a traffic generation of eight daily light vehicle movements per activity, corresponding to four one-way movements in the peak hour. The Golf Course Trail Head has two separate construction activities occurring at the same time requiring two teams of four personnel. Trail construction may have up to eight teams of four workers on separate trail construction locations.

The details of the heavy vehicles required to complete each construction activity have been provided by Yarra Ranges Council and the corresponding traffic generation is outlined in Table 15. The trail construction is not expected to require any heavy vehicles movements as any equipment such as the excavator would be taken to site via a car trailer and left on site. The total daily traffic generation during construction is thus 166 movements.

Table 15 Construction daily traffic generation

Construction activity	Workers required per day	Workers daily traffic generation	Plant and equipment required (one-way)	Plant and equipment daily movements
Golf Course trail head (includes detention pond construction)	8	16	13	26
Mount Donna Buang trail head	4	8	2	4
Mount Tugwell trail head	4	8	2	4
Wesburn Park trail head	4	8	2	4
Warburton Highway Bridge	4	8	2	4
Old Warburton Highway Bridge	4	8	2	4
Trail construction	32	64	0	0
Total	**60**	**120**	**23**	**46**

8.1.2 Operation

The operation activities related to transport are:

- Day visitors who drive directly to each trail head
- Day visitors considered intermediate, advanced and expert mountain bikers within Yarra Ranges who cycle directly to the trails
- Shuttle buses operating between trail heads
- Workforce trips at the primary trail head
- Overnight visitors staying within the area and cycling to the trails the following day

AECOM was provided the draft *Warburton Mountain Bike Destination Economic Assessment,* January 2021. This established the estimated number of visitors to the trails per year based on the likelihood of different groups visiting the trails, of those visitors the average trail visits they would undertake per year and the type of visit (day or overnight). This assessment considers the visitor volumes 10 years post opening of the Warburton Mountain Bike Destination which is estimated to be 2031. These volumes are shown in Figure 16 and are broken down into origins and anticipated day and overnight visits.

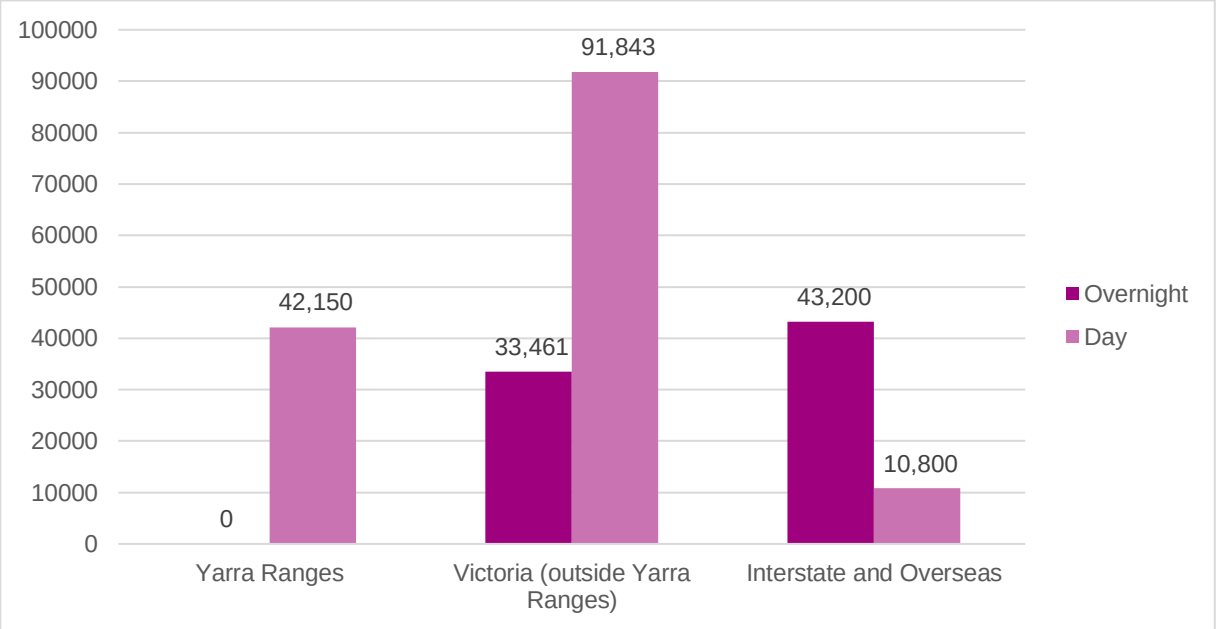


Figure 16 2031 annual visitor projection

To breakdown these annual figures into a peak day the annual seasonal distribution was applied, shown in Figure 17. January is shown as the month of peak usage at 11per cent of the expected annual visitation and would be used as the month of assessment.

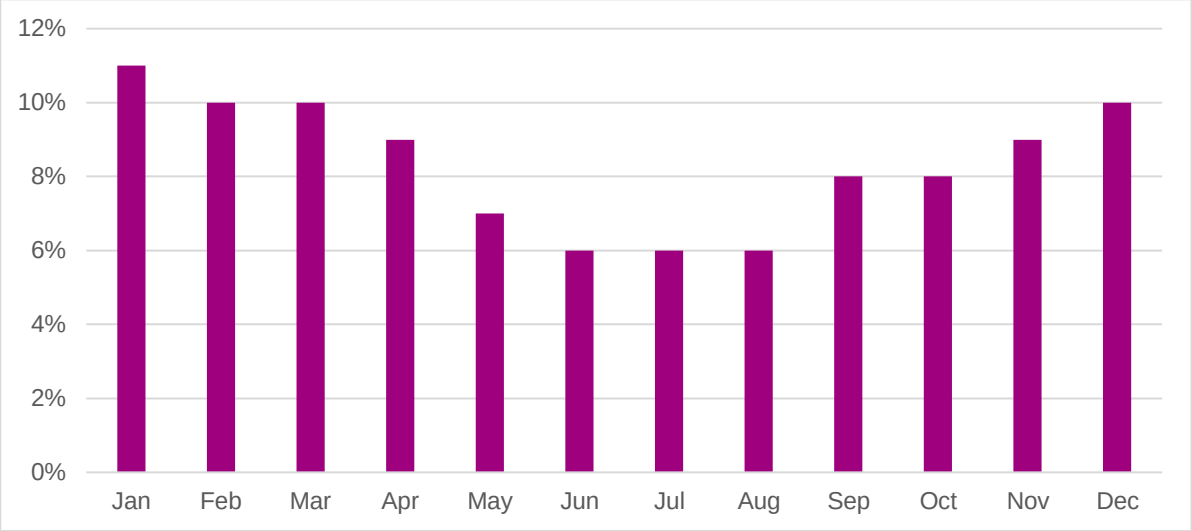


Figure 17 Estimated annual seasonal distribution Warburton Mountain Bike Destination

The January volumes were then applied evenly per week and the weekend was assumed to have 50per cent of the weekly visitor volumes. Saturday and Sunday were assumed to have the same visitor volumes. Thus, a weekend day in January 2031 is the peak annual day and the day of assessment. For assessment purposes, we have assumed:

- Day visitors would drive directly to a trail head to park their car and then utilise the trails or shuttle buses to move between trail heads
- Overnight visitors would travel from their accommodation to the trails via their mountain bikes, having arrived in their place of accommodation via driving on a previous day and leaving their vehicles at their place of accommodation
- Intermediate, advanced and expert mountain bike riders who are day visitors from within Yarra Ranges would cycle to the trails.

Given these assumptions the breakdown of visitor travel mode on the peak day is shown in Figure 19.

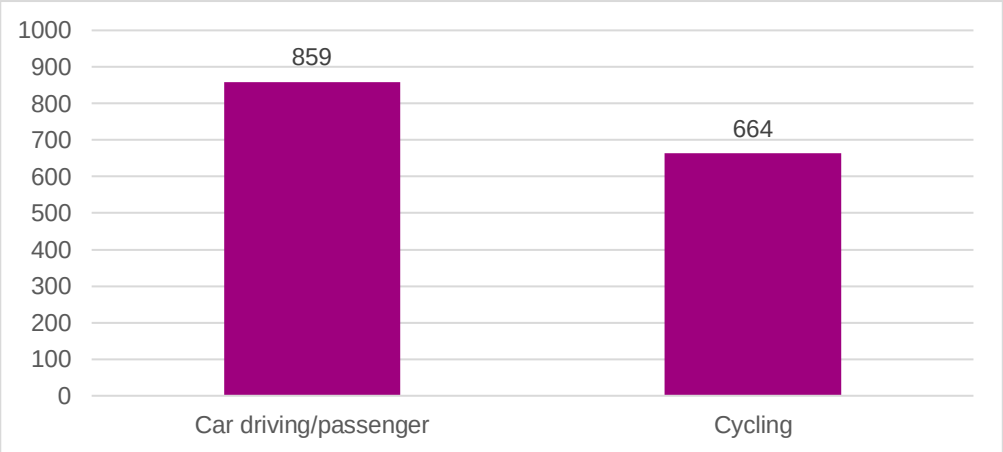


Figure 18 2031 peak weekend daily visitors by mode

Day visitors

The peak day visitor volumes who would travel by car on a weekend day in January is 859. An occupancy rate of 2.8 visitors per car is assumed as per the SALT TIA and thus two-way trips per day is 614. Those travelling by cycling on the peak weekend day from within Yarra Ranges is 136, thus 272 trips per day.

Shuttle buses

Shuttle buses are assumed to operate every half hour over eight hours starting at the primary golf course trail head and travelling to/from the secondary trail heads at Wesburn Park, Mount Tugwell and Mount Donna Buang. This equates to a total daily traffic generation of 160 trips.

Workforce

A workforce of six are expected at the primary golf course trail head and would travel from their residence in Warburton via their private vehicle, arriving in the morning and departing late afternoon seven days a week. This equates to trips per day of six and daily traffic generation of 12 daily.

Overnight visitors

For the visitors staying overnight in Warburton and surrounds on the peak weekend day it is anticipated that 527 visitors would stay overnight, hence generating 1054 daily cycling trips.

Summary

The traffic generation by mode for operations is summarised in Table 16.

Table 16 Traffic generation during operations by mode

Mode	Trips (one-way) per day	Daily trip generation
Car	305	610
Shuttle bus	80	160
Cycling	664	1327

8.2 Traffic distribution and assignment

8.2.1 Construction

The construction workforce would originate in Warburton and travel to their construction site via the study area roads in the morning peak period and depart site in the early evening peak period. Heavy vehicles would originate from the west of Warburton and travel to site via Warburton Highway. Heavy vehicle movements would occur throughout the day to deliver plant, equipment and deliveries to site. The destinations and the roads utilised for the construction movements are summarised in Table 17.

Table 17 Construction traffic distribution

Destination	Plant and equipment – heavy vehicles	Workforce – light vehicles
Trail construction	None required	Trail access points in different points of the study area and accessed via most council, DELWP and VicRoads roads.
Golf Course Trail Head	Via Warburton Highway, Mayer Bridge and Dammans Road	
Mount Donna Buang Trail Head	Via Warburton Highway, Mount Donna Buang Road, Mount Donna Buang Summit Road	
Mount Tugwell Trail Head	Via Warburton Highway (Wesburn), Old Warburton Road, Mount Bride Road	Via Warburton Highway, Park Road, Old Warburton Highway, Mount Bride Road
Wesburn Park Trail Head	Via Warburton Highway (Wesburn)	Via Warburton Highway
Bridge construction Warburton Highway	As per the golf course trail head	
Bridge construction Old Warburton Highway	Via Warburton Highway (Wesburn), Old Warburton Road	Via Warburton Highway, Park Road, Old Warburton Highway

The daily and peak hour heavy vehicles during construction are shown on Figure 19. The light vehicle movements of the workers are very low in comparison to the existing traffic and would create a negligible traffic volume impact to the study roads and intersections, thus the map only displays the heavy vehicle traffic distribution and assignment.

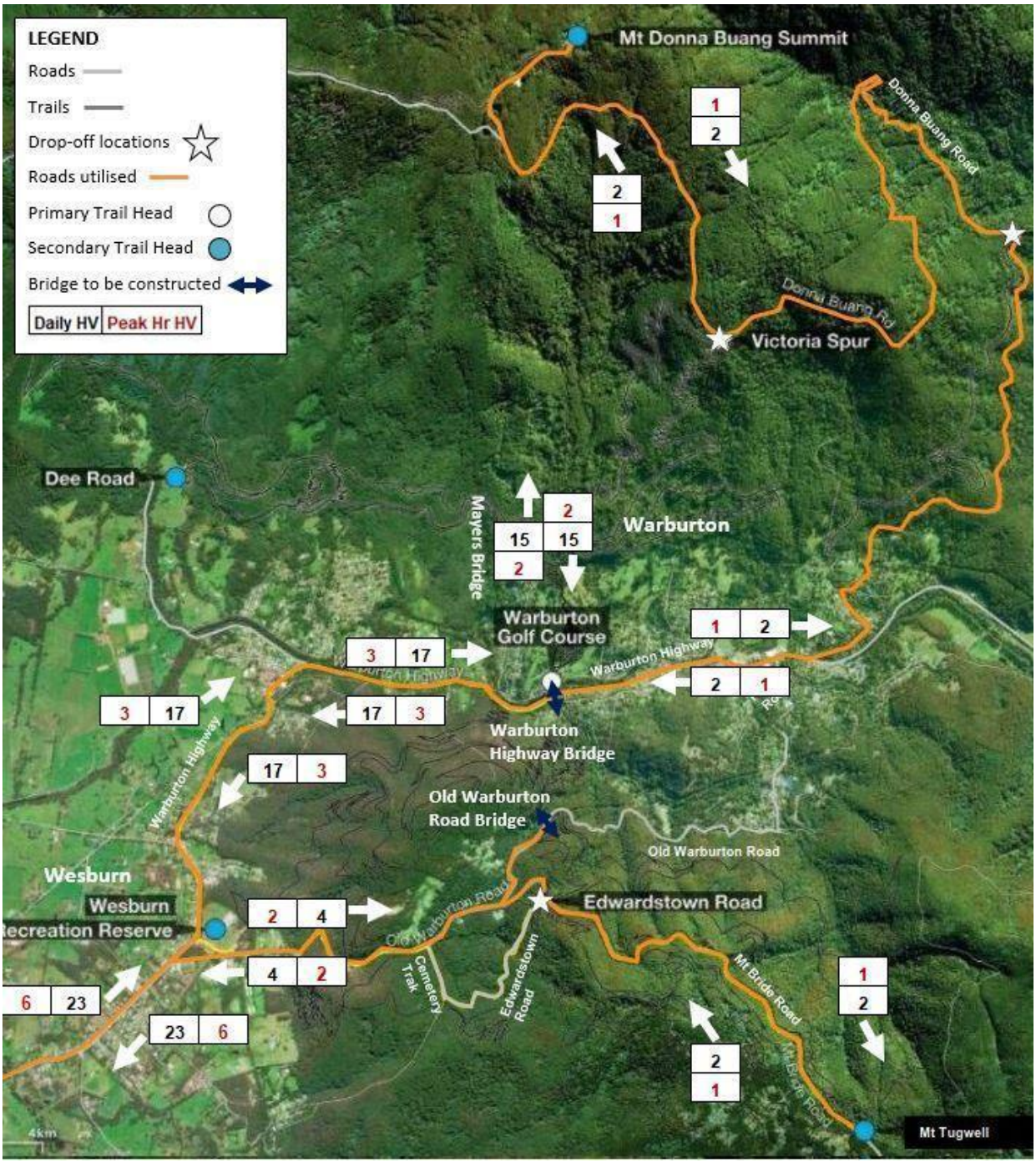


Figure 19 Construction heavy vehicle volumes distribution and assignment

8.2.2 Operation

Cars and shuttle buses

Day visitors who drive to Warburton would arrive from the east, west or north of Warburton and drive directly to the primary and secondary trail heads using the study area roads as per Table 18.

Table 18 Operations distribution

Destination	Origin		
	West of Wesburn	East of Warburton	North of Warburton
Primary head golf course trail head	Warburton Highway (west), Mayer Bridge, Dammans Road	Warburton Highway (east), Mayer Bridge, Dammans Road	Donna Buang Road, Warburton Highway (east), Mayer Bridge, Dammans Road
Mount Donna Buang trail head	Warburton Highway (west), Donna Buang Road, Donna Buang Summit Road	Donna Buang Road, Donna Buang Summit Road	Donna Buang Road, Donna Buang Summit Road
Mount Tugwell trail head	Warburton Highway, Old Warburton Road, Cemetery Track, Edwardstown Road, Mount Bride Road	Warburton Highway, Park Road, Old Warburton Road, Mount Bride Road	Donna Buang Road, Warburton Highway, Park Road, Old Warburton Road, Mount Bride Road
Wesburn Park trail head	Warburton Highway	Warburton Highway	Donna Buang Road, Warburton Highway
Dee Road trail head	Warburton Highway, Dee Road	Warburton Highway, Dee Road	Donna Buang Road, Warburton Highway, Dee Road

The split of day visitors driving and originating from the west via Warburton Highway is determined to be 99.15per cent as per assumptions listed in Section 6.7.2.

As provided by YRC it is assumed that 55 per cent of day visitors who drive would head directly to the Primary Golf Course trail head, 30per cent to Wesburn Park, 7.5 per cent to Mount Donna Buang, five per cent to Mount Tugwell and 2.5 per cent to Dee Road. The assumptions of the distribution are listed in Section 6.7.2. Based on these assumptions the daily traffic per location is outlined in Table 19.

Table 19 Operations destination volumes per day

Location	Cars per day	Shuttle buses per day	Daily trips (one-way)	Daily trips (two-way)
Golf Course trail head	175	32	207	413
Mount Tugwell trail head	15	16	31	63
Mount Donna Buang trail head	23	16	39	78
Wesburn Park trail head	92	16	108	216
Dee Road trail head	8	0	8	15

The volumes were then assigned as per the distribution roads in Table 18. The estimated base case 2031 volumes are the volumes of the study area roads expected without the Warburton Mountain Bike Destination (background growth only). The project case includes the operation volumes and have been applied for the purposes of this assessment, these are shown in Table 20 (the roads with 10 or less difference in volumes have not been included). The peak hour and daily total of project volumes (which only consist of light vehicles) during operation for a weekend day have been shown in Figure 20 and Figure 21.

Table 20 Daily traffic volumes for study area roads

Roads	Road Authority	Peak weekend day	
		2031 base case	2031 project case
Mayer Bridge	YRC	1,236	1,650
Old Warburton Road – East	YRC	428	490
Dammans Road	YRC	1,236	1,650
Dee Road	YRC	470	485
Mount Bride Road	DELWP	46	108
Cemetery Track	DELWP	11	43
Edwardstown Road	DELWP	56	88
Warburton Highway – Warburton (west)	VicRoads	7,828	8,241
Warburton Highway - Warburton (east)	VicRoads	7,828	7,922
Warburton Highway – Wesburn (south)	VicRoads	7,881	8,474
Warburton Highway – Wesburn (north)	VicRoads	7,881	8,477
Donna Buang Road	VicRoads	1,404	1,483
Donna Buang Summit Road	VicRoads	4,662	4,741

^ A growth factor of one per cent per annum has been applied to take into account growth between the count year and 2031

**Cemetery Track (between old Warburton Road and Edwardstown Road) would be closed to the public for use of project shuttles and mountain bike riders only*

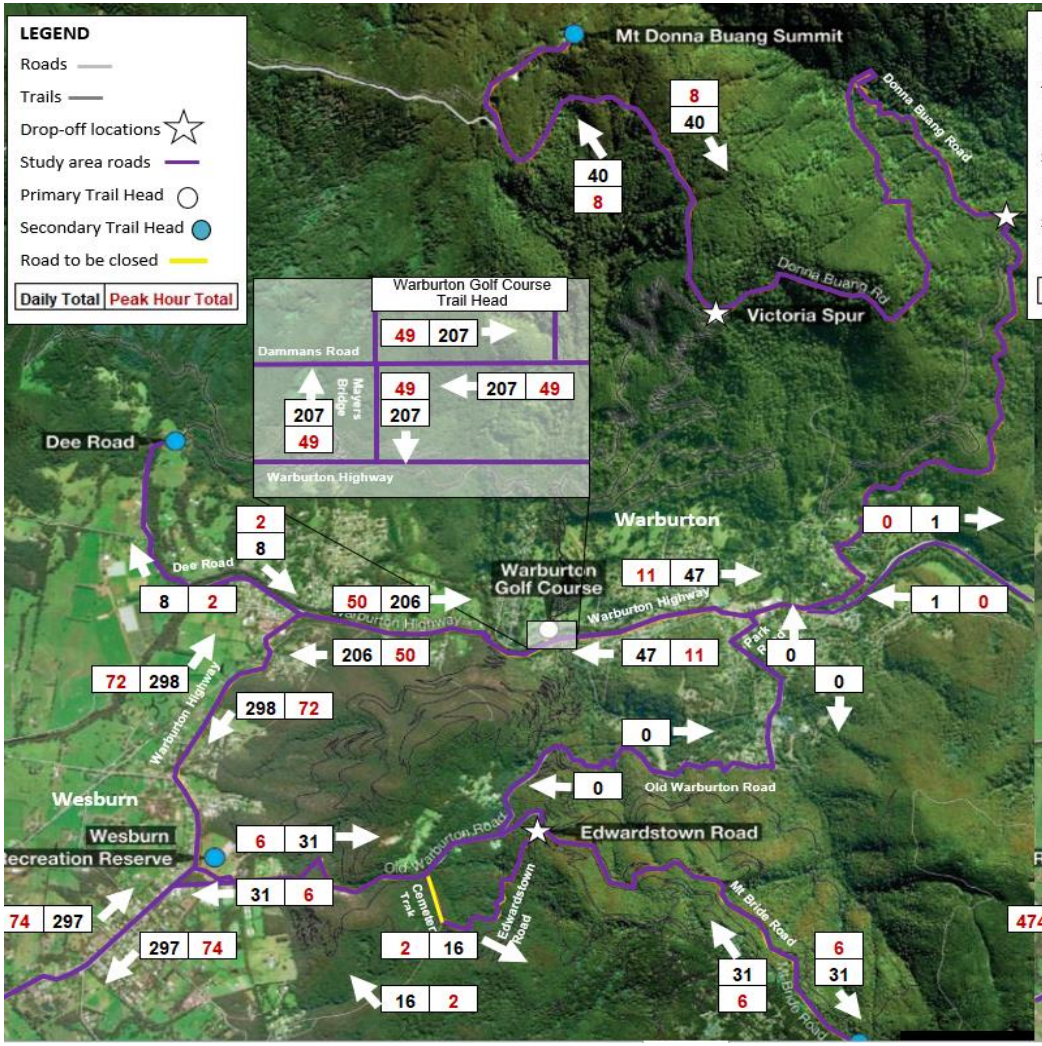


Figure 20 2031 project traffic distribution and assignment

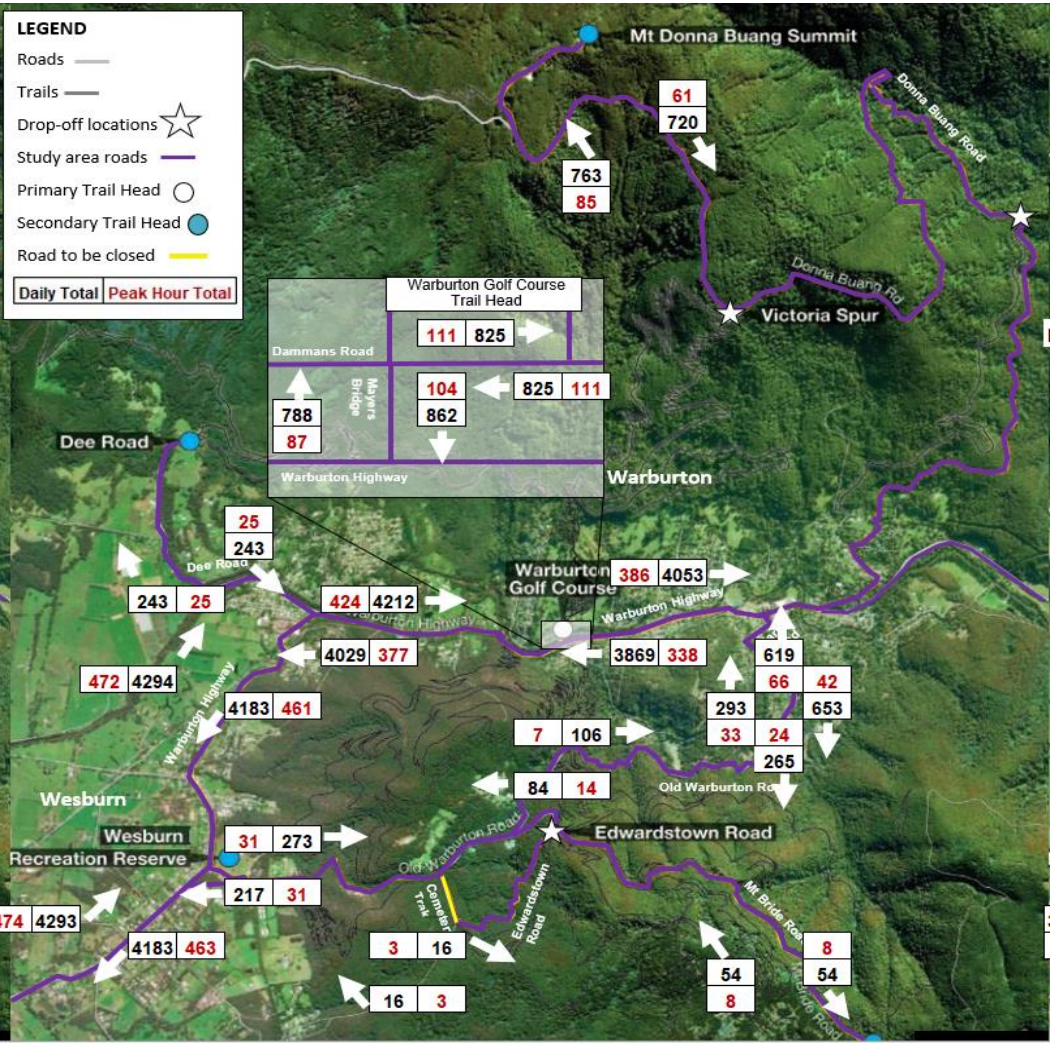


Figure 21 2031 traffic volumes with project traffic

Cyclists

The overnight visitors who cycle to each trail head would use available cyclist routes or the public road network depending on where their place of accommodation is. To determine potential locations of accommodation a five-kilometre radius of Warburton town centre was established. The areas of Wesburn, Millgrove, Warburton and East Warburton were within this radius. Residential land use of each area was then compared to establish an estimated percentage of overnight visitors at each location, this is shown in Figure 22.

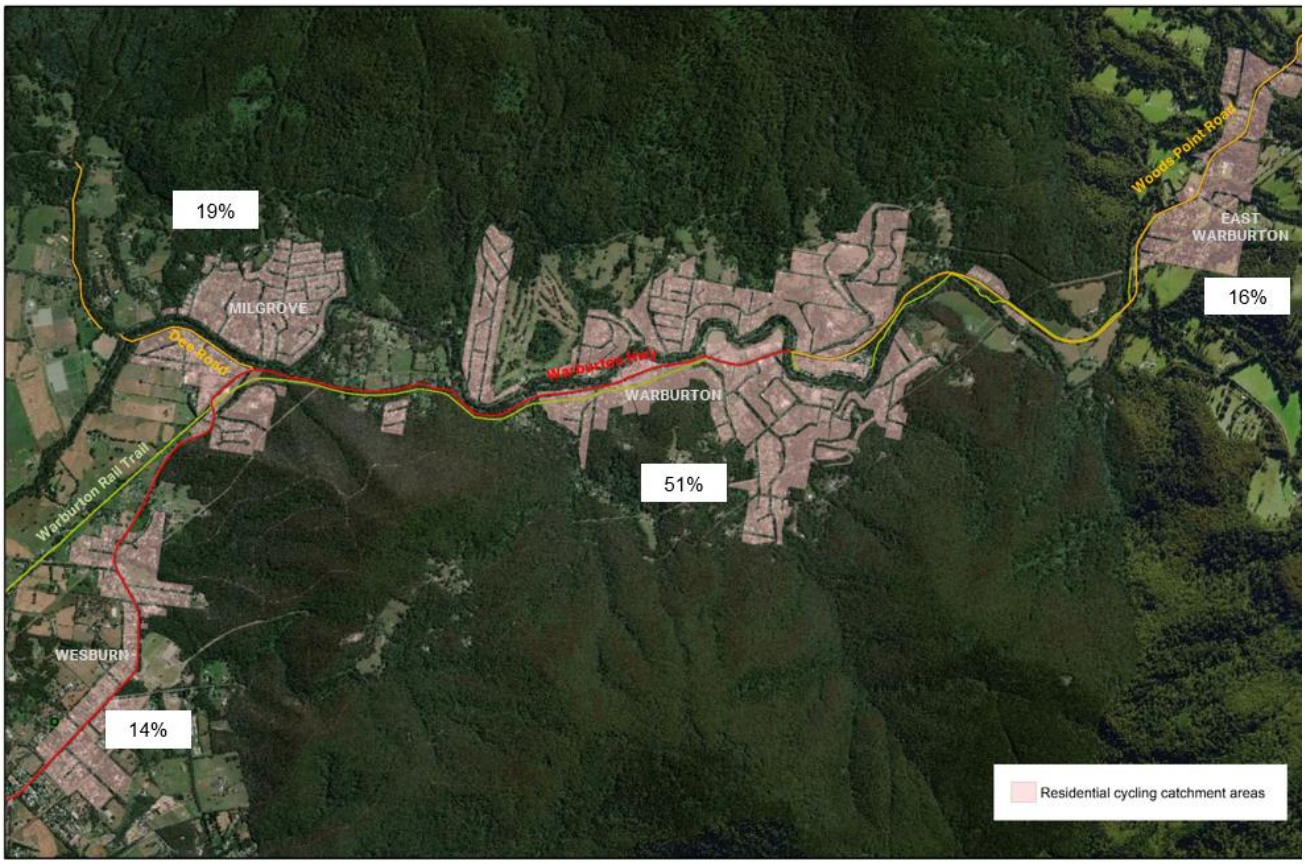


Figure 22 Estimated accommodation areas and split of overnight visitors

The areas of accommodation are the origin points for the cyclists, with the cyclists travelling to either of the destinations of the northern trails or southern trails. The breakdown of how many cyclists staying in each accommodation area would start at the northern or southern trails is noted in Table 21. For Millgrove, Warburton and East Warburton it is assumed that cyclists would travel 50 per cent to the northern trails and 50 per cent to the southern trails, this is based on the access to either being of approximately the same distance. For Wesburn the southern trails starting at Wesburn Park are in close proximity in comparison to the northern trails, based on distance comparison it is assumed that 84 per cent would start in the southern trails. Millgrove and Warburton were broken up into further sub-areas as there was seen to be multiple route options within the areas.

Table 21 Overnight cyclist origin and destination breakdown

Accommodation	Destination	Cyclists per day	Daily trip generation
Wesburn	North trails	12	23
	South Trails	62	124
Millgrove	North trails	50	100
	South Trails	50	100

Accommodation	Destination	Cyclists per day	Daily trip generation
Warburton	North trails	134	269
	South Trails	134	269
East Warburton	North trails	42	84
	South Trails	42	84
	Total	527	1054

The intermediate, advanced and expert mountain bike visitors who reside in Yarra Ranges are assumed to cycle from their place of residence to the trails. To determine the origins of these visitors the population of the sub-areas of Yarra Ranges were proportioned against the 136 anticipated day beginner and novice cyclist volumes. This established that three per cent of these cyclists would originate from the east and 97 per cent from the west.

Cyclists were then distributed to the trails via the public roads and cyclist trails. The details of the cyclist distribution is in Appendix D, the traffic assignment is as shown in Figure 23 for the two-way daily and peak hour, daily volumes are listed in Table 22. It is assumed that cyclists would travel the same path to and from the mountain bike trails. As part of the Warburton Mountain Bike Destination a grade-separated pedestrian and cyclist bridge between the golf course primary trail head and the Lilydale-Lilydale-Warburton Rail Trail would be constructed. It would allow safe two-way passage over Dammans Road, the Yarra River and Warburton Highway.

Table 22 Total project cyclist distribution and assignment

Location	One-way volume	Daily volumes
On-road		
Station Road	11	22
Dee Road	25	50
Riverside Road	121	242
Old Warburton Road (east)	10	21
Old Warburton Road (west)	10	21
Dammans Road (east)	50	99
Dammans Road (west)	25	50
Warburton Highway, Warburton - west of golf course	61	122
Warburton Highway, Warburton - east of golf course	258	516
Warburton Highway, Wesburn - south of reserve	62	124
Warburton Highway, Wesburn - north of reserve	12	23
Donna Buang Road	30	61
Shared use path		
Lilydale-Warburton Rail Trail (from west)	244	488
Lilydale-Warburton Rail Trail (from east)	242	484
Warburton Highway Bridge	344	689

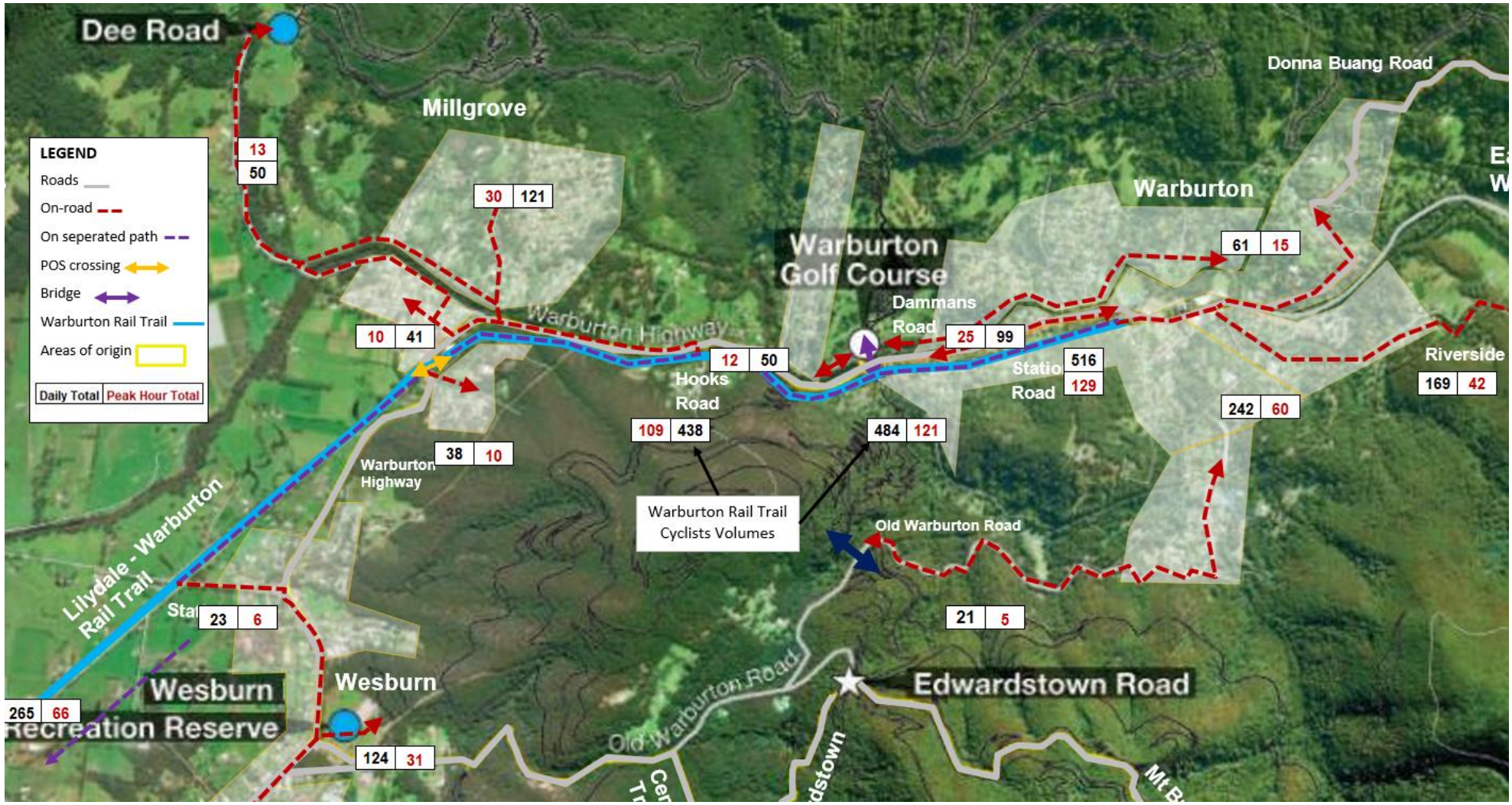


Figure 23 2031 project cyclist distribution and assignment

9.0 Risk assessment

A risk assessment of project activities was performed in accordance with the methodology described in Section 6.4. The risk assessment has been used as a screening tool to prioritise the focus of the impact assessments and development of mitigation measures. The risk pathways link project activities (causes) to their potential effects on the environmental assets, values or uses that are considered in more detail in the impact assessment. Risks were assessed for the construction and operation phases of the project.

The identified risks and associated residual risk ratings are listed in Table 23. The likelihood and consequence ratings determined during the risk assessment process and the mitigation measures to be achieved are presented in Appendix C. The identified risks and associated residual risk ratings after implementation of mitigation measures are listed in Table 23.

Table 23 Traffic risks

Risk No. – Construction	Potential threat and effect of the environment	Residual risk rating
TP1	Construction activity for the Warburton Highway Bridge may result in increased crash risks to road users	Very Low
TP2	Risk of crash at intersection of public roads. Insufficient road network infrastructure to accommodate safe movement of over-dimensional and over-mass loads	Low
TP3	Additional traffic during construction may result in increased congestion exceeding level of service D.	Very Low
TP4	Road/lane closure results in impacts on residential, business and emergency vehicle access.	Low
TP5	Lane closures result in the road network increased congestion exceeding level of service D.	Very Low
TP6	Local roads experience deterioration in the quality of the pavement due to the movement of heavy vehicles, machinery and plant	Low
TP7	Closures to the Rail Trail and heavy vehicles movements impact pedestrians and cyclists resulting in a reduction in public safety and amenity	Low
TP8	Plant and spoil trucks deposit construction debris on public roads leading to dust generation and perceived loss of amenity and public health and safety issues.	Low
TP9	Movement of heavy vehicles and potential lane closure impacts safety and bus operations along Warburton Highway.	Low
Risk No. – Operation	**Potential threat and effect of the environment**	**Residual risk rating**
TP10	Risk of crashes due to increased interactions on road network, trail heads and crossing points and non-compliant intersections	Medium
TP11	Facilities for mountain bike visitors are not adequate	Low
TP12	Risk of crashes due to increased interactions on paths and bridges	Low
TP13	Additional traffic during operation may result in increased congestion exceeding level of service D.	Low
TP14	Inadequate emergency vehicle access at trail heads or trails	Low
TP15	Deficient road surface along Cemetery Trak and Edwardstown Road for shuttles	Low
TP16	Local roads experience deterioration in the quality of the pavement due to the movement of shuttle buses and visitor vehicles	Low
TP17	Parking is congested at the trail heads and at capacity due to the project	Low
TP18	Parking is congested at the Warburton town centre and at capacity	Low
TP19	Events would cause unacceptable road and parking congestion	Low

10.0 Construction impact assessment

A high-level assessment was undertaken for identified risks rated low. Risks rated medium or high risks were subject to further assessment. For risks which were seen to be low or very low reasoning is provided to why these ratings were adopted as part of this study.

10.1 Low or very low risk construction impacts

Safety impacts to road users due to the Warburton Highway bridge construction

The crash risks to road users due to construction activity for the Warburton Highway Bridge is anticipated to be low as a Traffic Management Plan (MM-TP1) would be developed to include traffic management measures to manage safe bidirectional vehicular passage during any temporary closures which are not expected to last for more than a few hours at a time.

Proposed mitigation measures:

- The closures are proposed to occur during off peak periods only, further decreasing risk of crashes to road users.
- Stakeholder Communication Plan (MM-TP2) to inform the local community and road users of the closures.

With the implementation of the mitigation measures, the residual safety impact to road users due to the Warburton Highway bridge construction is considered to be minimal as it would be temporary. The mitigation measures will reduce the impact to minor significance.

Capacity of road network to accommodate workforce and heavy vehicle movements during construction

Additional traffic during construction is not expected to increase congestion on the public road network above acceptable levels – typically level of service D. Figure 19 shows that low construction traffic volumes are expected to occur with 34 daily construction vehicle movements along Warburton Highway, west of the Golf Course. This represents approximately two construction movements during the peak hour. As the road network has ample capacity to absorb the small number of additional vehicles, the impact is anticipated to be very low and therefore no mitigation measure would be necessary.

No mitigation measures were identified. The residual impact to the road network due to workforce and heavy vehicle movements during construction is expected to be of negligible significance as the road network is expected to be sufficient to accommodate the anticipated project generated traffic volumes.

Traffic impacts during lane closures for bridge construction at Warburton Highway

Lane closures expected to take place during the bridge construction on Warburton Highway are not anticipated to increase congestion to above level of service D. With standard traffic management measures for the lane closures, the impact on traffic is anticipated to be low and therefore no mitigation measure would be necessary.

No mitigation measures were identified. As traffic impacts during the proposed lane closures are expected to be temporary, no residual impact is expected to be associated with these lane closures and is expected to be of negligible significance

Pedestrian and cyclist safety and connectivity

Construction activities are expected to have a minimal impact on pedestrian and cyclist safety and connectivity. The Lilydale-Warburton Rail Trail is expected to be partially closed for a short duration on two occasions during the bridge construction. During the partial closures which are not anticipated to last more than three hours, a path diversion around the works would be available during the normal course of construction events. It is to be noted that the Lilydale-Warburton Rail Trail may need to be closed in one or both directions for only a few minutes at a time for safety reasons. Would this occur, the contractor would use appropriate signage and manual traffic controls. As shown in Figure 24, there

is space available for this to allow pedestrians and cyclists to continue around the works where the bridge would tie into the left of this photo.

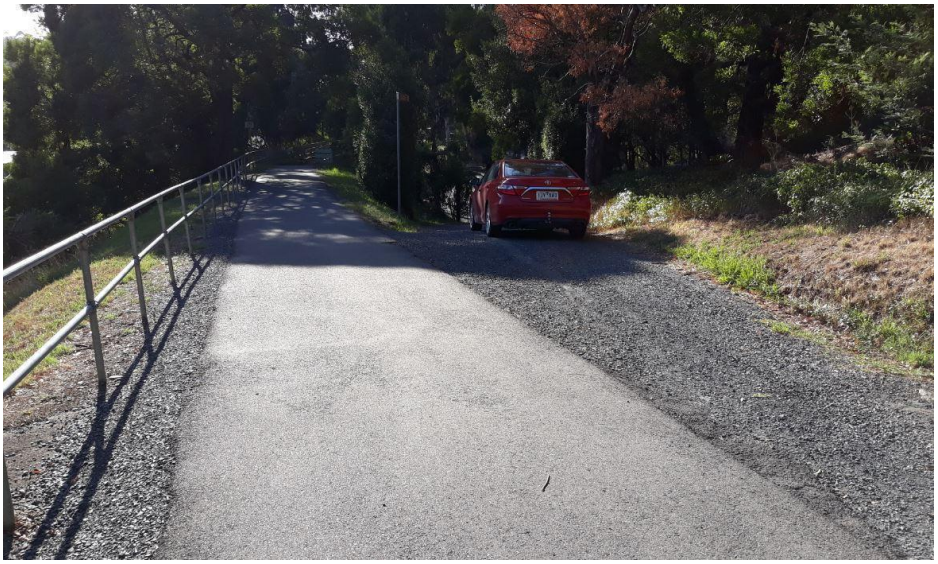


Figure 24 Lilydale-Warburton Rail Trail location of bridge where partial closure is anticipated to occur during the bridge construction

Proposed mitigation measures:

- Traffic Management Plan (MM-TP1) to include connectivity of shared path users and appropriate traffic management measures would be incorporated in the TMP, in accordance with relevant road design standards and in consultation with landholders and any other relevant third parties.
- Stakeholder Communication Plan (MM-TP2) to inform the local community and road users of the closure.

With the implementation of the mitigation measures, the residual safety and connectivity impact to pedestrians and cyclists users is expected to be minimal and of moderate significance

Dirt on roads from construction vehicles

There is limited removal of spoil anticipated to occur from any of the trails via truck as all cut soil would be placed in the same area as any cut bench. As such, spoil trucks deposit construction debris potentially causing perceived loss of amenity and public health and safety issues are expected to be low.

Proposed mitigation measure:

The Traffic Management Plan (MM-TP1) would include the development of dust and debris management strategies and would include dust suppression methods such as covering vehicle loads and street sweeping if necessary.

With the implementation of the mitigation measures, the residual impact on the road network is expected to be minimal and of moderate significance

Public bus safety and performance impacts

Construction traffic is not expected to impact the operation of bus route 683 including during the anticipated lane closure along Warburton Highway as these would last a few hours at a time and would occur during off-peak periods. As shown in Section 8.2.2, low construction traffic volumes are expected to occur with approximately two construction vehicle movements during the peak hour.

Proposed mitigation measures:

- Traffic Management Plan (MM-TP1) would include traffic management measures to manage road closures and safe bidirectional vehicular passage.

- Stakeholder Communication Plan (MM-TP2) would include consultation with Yarra Ranges Council and bus operators would be undertaken during the development of the TMP.

With the implementation of the mitigation measures, the residual impact to public transport is expected to be minimal and to be of minor significance

10.2 Medium or high-risk construction impacts

10.2.1 Public road network and intersection accessibility for heavy vehicles

During construction heavy vehicles would be using existing road intersections and roads, some of which might not be conforming to current design and safety standards. Investigation into sight lines, stopping distance, lighting and intersection layout are required to ensure safe vehicle movements to the satisfaction of the responsible road management authority.

The movement of articulated vehicles are required at several locations for construction, including at the Golf Course Trail Head, Mount Tugwell and bridge construction at both Warburton Highway and Old Warburton Road. Articulated vehicles are typically 19 to 25 metres long including truck and dog, low loaders, log removal trucks and crane trucks.

The construction works undertaken at the Golf Course Trail Head require the use of articulated vehicles such as truck and dog crushed rock deliveries and low loader excavator deliveries. It is also expected to experience the highest volumes of heavy vehicle movements during construction with 26 daily movements.

Swept path assessment was undertaken for the two intersections of Mayer Bridge using a 19m semi-trailer to determine if an articulated 19 metre vehicle can safely and successfully make the required turning movements. AutoTURN Pro 10.2 software has been used for the two selected intersections. Vehicle dimensions are as per AustRoads 2006 AP-G34-06 Design Vehicles and Turning Path Templates. The four swept path movements assessed are shown on aerials in Figure 25 to Figure 28 and it can be seen that:

- The northbound movement entering Mayer Bridge from the south shows that the vehicle must enter into the oncoming westbound traffic lane of Warburton Highway to avoid the Mayer Bridge eastern footpath and western railing Figure 25
- At the intersection of Dammans Road the truck heading southbound would drive over the shoulder of the turn lane onto vegetation Figure 27
- Movements onto Mayer Bridge would enter the opposing traffic lane

An articulated vehicle of 25 metres was tested at these two intersections and was unable to make the turns required. Aerial imagery is not available to assess the intersections impacts for heavy vehicle movements to/from Mount Tugwell or Old Warburton Road bridge construction due to their locations and roads being in heavily forested areas.

OD vehicles may be required during construction such as the self-propelled crane for bridge construction. Should there be over-dimensional construction vehicles needed, they would be coming on site prior to the commencement of construction activities and would remain on site throughout the duration of construction activities. As such, they would not be daily recurring movements.

Where the dimensions or mass of the vehicle/load combination requires it, a route audit is proposed to be carried out to assess route options, safety and clearance to potential obstructions such as wires, structures and trees. Accordingly, the alignment, cross section, pavement design and bridge design of these roads would require consideration of the anticipated width, length, height and mass of the over-dimensional loads.

However, the movement of loads would need to adhere to the relevant road authority permit conditions and/or policies and guidelines to provide for the safe movement of the over-dimensional loads and manage the impact to other road users.

Figure 25 Warburton Highway onto Mayer Bridge (northbound)

Figure 27 Dammans Road onto Mayer Bridge (southbound)

Figure 26 Mayer Bridge onto Warburton Road (westbound)

Figure 28 Mayer Bridge onto Dammans Road (eastbound)

Proposed mitigation measures

Traffic Management Plan (MM-TP1) to include traffic management measures for heavy vehicles including:

- Traffic management and controllers to stop vehicles entering Mayer Bridge before and during heavy vehicle movements.
- Traffic management measures to manage the risk associated with heavy vehicles, including over dimensional vehicle movement
- Avoid peak hour in order to minimise disruptions or delays on regular traffic, heavy vehicles which require traffic management impacting the traffic flow of roads
- Prior to construction on-site checks will be completed to assess route options and intersections which are not part of the B-Double approved network for safety and clearance to potential obstructions, such as wires, structures, and trees for heavy vehicles. Checks will also include ensuring that heavy vehicle movements at intersections are able to be performed safely and efficiently. Intersections to be included but are not limited to:
    - Intersections along Warburton Highway
    - Old Warburton Road and Mount Bride Road
    - Mayer Bridge at Warburton Highway and at Dammans Road (for heavy vehicles which exceed the size of the 19m semi-trailer)
    - Warburton Highway and Old Warburton Road (Wesburn)
    - Edwardstown Road and Mount Bride Road

Should OSOM construction vehicles be used a permit would need to be required from DoT. This would require construction on-site checks for these vehicle types include assessment of route options, safety and clearance to potential obstructions for these vehicles as well.

Implementation of these measures during construction would reduce residual impacts on transport infrastructure and operations, the residual impacts would be:

- *Reduced likelihood and severity of crashes between light and heavy vehicles*
- *Reduced likelihood and severity of construction vehicles damaging the surrounding road network*
- *Delays of up to two minutes for light vehicles using Mayers Bridge who would require to stop for heavy vehicle movements*

10.2.2 Traffic impacts during road/lane closure for bridge construction

Several lane and road closures would take place during construction. These closures are due to the construction of pedestrian/cyclist crossing bridges which are anticipated to be located over Warburton Highway, Yarra River and Dammans Road (Figure 29) and on Old Warburton Road.

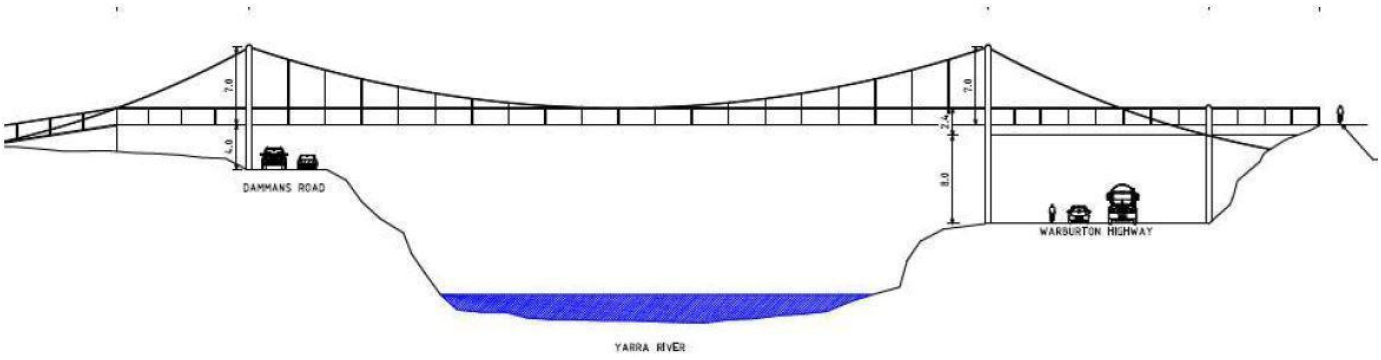


Figure 29 Warburton Highway bridge concept

Lane closures

Disruption to Warburton Highway is anticipated to last a maximum of two hours, up to three separate times during the construction of the bridge. Traffic would remain unaffected as only one lane would be closed at a time to allow vehicular passage to continue. It is anticipated that the temporary lane closure would require a speed restricted controlled construction environment with nets erected under the structure during construction. In addition, appropriate traffic passage and signals at each end of the closure would also be required. Potential height restriction elements may also be required for consideration as well as any further controls as per VicRoads requirements. Although the road is not expected to be over capacity with one lane closed for a short duration, major delays may still occur during peak periods due to the relatively high traffic volumes. As such it is proposed that the lane closure occurs during the off-peak period.

A lane closure is to occur along Dammans Road during the pylon and cable stringing operation with safety barrier and manual traffic control in place. Minor delays as a result may occur during peak periods and as such it is proposed that the road closure occurs during the off-peak period.

Road closures

Warburton Highway would require closure for a maximum duration of two-three hours on three occasions during construction of the bridge. Similarly, Dammans Road would also require road closure in addition to Warburton Highway during bridge construction. It would be a two-three hour closure on two occasions; these closures are proposed to occur during off-peak periods to reduce the number of road users potentially impacted.

It is anticipated that Old Warburton Road would be closed for a maximum duration of approximately half a day during the pylon and cable stringing operation required for the placement of the bridge. While Old Warburton Highway is a collector link in the area, it has low traffic volumes and minimal development along its length. As such, this road closure is anticipated to impact a small number of people. Alternative access via Warburton Highway would be available to road users. This may lead to increased travel time and reduced travel time reliability due to longer travel distances on alternative routes for a limited duration.

The summary of road closure impacts for the two bridges construction is in Table 24.

Table 24 Road closure for bridge construction

Road	Road classification	Daily traffic (weekday)	Duration	Consequence
Warburton Highway	Arterial	6,560	2 hours on 3 occasions	Alternative access available via Old Warburton Road with motorists experiencing major detour/delays (approximately 10 kilometres) *
Dammans Road	Collector	1,100	3 hours on 2 occasions	Alternative access available via Brett Road with motorists experiencing minor detour/delays (approximately 2 kilometres) *
Old Warburton Road	Collector	132	4 hours on 3 occasions	Alternative access available via Warburton Highway with motorists experiencing moderate detour/delays (approximately 10 kilometres) *

*approximate distance between the origin of road closure and location of alternative access road

Proposed mitigation measures

- Traffic Management Plan (MM-TP1) to include temporary measures such as:
  - Alternative detour via Warburton Highway would be managed as part of the TMP for the Old Warburton Road closure

- Traffic management measures to mitigate the road closures may include signage, traffic controllers
- VMS boards would also be provided ahead of the closures with indication of the detour route to inform road users
- Warburton Highway and Old Warburton Road would not be closed at the same time and no more than one road closure a day would occur to minimise any impact related to the closures
- Road and lane closures are proposed to occur during off-peak periods
- Closures for key connecting roads such as Warburton Highway would be avoided during bushfire season. Similarly, procedures would be investigated and put in place to ensure that access to these roads can still be provided should there be an emergency.
- Limiting number and duration of road and lane closures

- Stakeholder Communication Plan (MM-TP2) to include road and lane closures notification to impacted residents and emergency services where vehicular passage may not be available or be limited.

Implementation of these measures during construction would reduce residual impacts on transport infrastructure and operations. Anticipated residual impacts would be:

- *Reduced congestion and delay caused by road closures*
- *Reduced likelihood of residents being unaware of road closures and thus reducing vehicles travelling during the closure periods*
- *Emergency access retained*
- *Minor delays to vehicles taking detours during the road closures*

Doing this will reduce the impact to negligible significance.

10.2.3 Road surface/pavement deterioration

Heavy vehicles, machinery and equipment movements are anticipated to occur on a number of local roads during the construction phase. While these movements are expected to be low in volumes as shown in Figure 19 they are expected to occur on several local roads which are not part of the B-Double approved road network, including:

- Mayer Bridge
- Dammans Road
- Old Warburton Road
- Mount Bride Road

These local roads may experience deterioration in the quality of their surfaces due to the movements of heavy vehicles during the construction period and are designed to a lower standard than declared roads. Mayer Bridge and Dammans Road may experience up to 15 heavy vehicle movements daily for approximately 8 months, Old Warburton four movements daily for approximately 3 months and Mount Bride Road two daily for six weeks.

Proposed mitigation measures:

- Traffic Management Plan (MM-TP1) is to include a survey to document the condition of pavements and other road infrastructure such as bridges and culverts prior to construction commencement for roads that are not B-Double approved including:
  - Mayer Bridge
  - Dammans Road
  - Old Warburton Road
  - Mount Bride Road

- Stakeholder Communication Plan (MM-TP2) is to include regular meetings with Yarra Ranges Council and DELWP during the construction period
- Improvement works (MM-TP4) including restoration of the road pavement, bridges and culverts within the study area may be required to restore to existing or better than existing conditions after construction.

Implementation of these measures during construction would reduce residual impacts on transport infrastructure and operations; the residual impacts would be that any road damage to be identified and rectified early through stakeholder communication over the construction period and no remaining damage to the road network after construction. Doing this will reduce the impact to moderate significance.

11.0 Operation impact assessment

This section discusses the potential impacts of the project as a result of operation of the project and the associated mitigation measures that aim to reduce impacts to as low a level as possible. A high-level assessment was undertaken for identified risks rated low. Risks rated medium or high risks were subject to further assessment. For risks which were seen to be low or very low reasoning is provided to why these ratings were adopted as part of this study.

Mitigation measures referred to are defined in Section 14.0.

11.1 Low and very low risk operational impacts

11.1.1 Safety and amenity risks to pedestrians and cyclists due to inadequate end of trip facilities

Facilities for mountain bike visitors are expected to be provided at each trail head these being:

- The Golf Course and Wesburn trail heads would have mains water to fill drink bottles
- Bike parking
- Toilets (excluding Dee Road trail head)
- Bike wash stations (excluding Dee Road trail head)

The trail heads are anticipated to have sufficient bike parking to accommodate the projected number of visitors, however details on bike parking supply are not known at the time of assessment. As such, it is proposed that parking provision is assessed throughout the operational life of the Project to ensure that adequate bike parking spaces are available.

Proposed mitigation measures:

Cyclist and pedestrian safety improvements (MM-TP5) to include requirements for:

- Yarra Ranges Council to assess bike parking provision after 12 months of operation in busier summer months to ensure that adequate bike parking is available to visitors. Additional bike parking would be provided, subject to the results of this assessment.
- Drink taps/water bottle filling locations would be located in close proximity to the car park and bike path for the Golf Course and Wesburn trail heads to prevent dehydration.

With the implementation of the mitigation measures, the residual impact to pedestrians and cyclists is expected to be minimal. The mitigation measures will reduce the impact to moderate significance.

11.1.2 Capacity of road network to accommodate workforce, shuttles and visitor traffic generated by the project

Investigation of intersection and road capacity within the study area was undertaken by SALT to analyse the cumulative effects of the combination of traffic generated by operational activities and existing traffic on the road network. All roads within the study area are expected to accommodate the traffic generated within current capacity limits.

In 2019 SALT undertook a SIDRA model of the intersection of Warburton Highway and Mayer Bridge, this intersection would experience the greatest increase of traffic volumes due to the project in the study area due to it being the access point of the Golf Course Trail Head. The SIDRA model project volumes included the assumption that 85% of the average 845 visitors (based on 165,000 per year divided by 40 weeks of operation) drive directly to the golf course trail head and the peak hour turnover of car parks was 25 per cent. Based on the SIDRA modelling, the intersection of Warburton Highway and Mayer Bridge is expected to perform at level of service A except for right turns out of Mayer Bridge which is anticipated to be at level of service B for both existing and future conditions. This represents a very good to excellent level of service, well above the typical maximum level of service D.

The road network is expected to accommodate appropriately/comfortably the additional traffic volumes anticipated to be generated by the project due to the relatively low traffic volumes anticipated during operation as shown in Section 8.2.2. The highest increase in traffic volume related to the Project is expected to represent an additional 70 vehicles on Warburton Highway during the peak hour.

As the typical mid-block capacity of a single lane of traffic is 1,800 per hour, impact on the road network performance is subsequently expected to be low within the study area and no mitigation measures would be required.

No mitigation measures were identified. As the road network is expected to accommodate adequately the project generated traffic volumes, minor significant residual impact to the road network is expected to occur.

11.1.3 Road surface/pavement deterioration

The majority of traffic during operation is expected to be light vehicle movements. No heavy vehicles are anticipated to be used. Given the relatively low daily volumes as shown in Section 8.2.2, it is expected that impacts to the quality of pavements would remain very low and minor on the roads within the study area during operation.

No mitigation measures were identified and residual impacts to the road network are anticipated to be minimal with minor significance

11.2 Medium and high risk operation impacts

11.2.1 Cyclist interaction with vehicles

Increased volumes of cyclists within the study area are expected to occur due to visitors cycling between trails, trail heads and places of accommodation. This assessment considers cyclists travelling between accommodation or residence to/from trails only. The cyclist distribution outlined in Section 8.2.2 established an expected estimate of cyclists on the road network, shared use paths and intersections. There is a risk of crashes due to increased interactions on the road network, trail heads, crossing points and shared use paths. This has been assessed in the sections below.

Cyclist intersections

There are several intersection points cyclists would encounter as visitors to the Warburton Mountain Bike Destination including:

- where the Lilydale-Warburton Rail Trail shared use path intersects with the public road network
- intersections on the road network used by cyclists
- mountain bike trails crossing the public road network.

Lilydale-Warburton Rail Trail intersections

The Lilydale-Warburton Rail Trail is part of the SCC network and would experience an increase in cyclists' volumes due to the project and as identified by the cyclist traffic distribution in Section 8.2.2. Currently the rail trail crosses the following roads in the study area which have no road crossing treatments:

- Station Road, Wesburn
- Hooks Road, Warburton
- Station Road, Warburton
- The eastern end point of the Lilydale-Warburton Rail Trail at Warburton Highway, Warburton.

There is an existing signalised crossing on Warburton Highway, Millgrove where the trail currently crosses the road. For the roads listed above, daily vehicle and cyclist volumes are outlined in Table 25. The SALT 2018 cyclist rail trail counts at Scotchmans Creek Trail were used as existing cyclist numbers for Station Road, Wesburn and Hooks Road, Warburton. The other two intersections had cyclist counts in proximity. The project cyclist volumes are based on the cyclist traffic distribution presented in Section 8.2.2.

Table 25 Cyclist anticipated 2031 volumes at Lilydale-Warburton Rail Trail intersections during operation

Intersection with Lilydale-Warburton Rail Trail	Road volumes 2031 (weekend daily)	Cyclists		
		Existing daily cyclist volumes*	Project case daily cyclist volumes	Total
Station Road, Wesburn	Unknown – collector road – up to 8,000	200	265	465
Hooks Road, Warburton	Unknown – local road – up to 3,000	200	438	638
Station Road, Warburton	170	200	484	684
Warburton Highway, Warburton	7,900	40	516	556

**SALT 2018 counts Lilydale-Warburton Rail Trail, rounded to the nearest 10 cyclists*

Given the scale of this project on cyclist generated trips, it is proposed that these crossings be upgraded to SCC standard. Along the Lilydale-Warburton Rail Trail the volumes of cyclists would increase by up to three times the existing on a weekend day, for context at the section in proximity to Hooks Road this is equivalent to one cyclist every 20 seconds from either direction.

SCC's must have priority crossing on low volume, low speed roads or signalised crossings on busier roads. Providing adequate safety measures and priority at these crossings would help to prevent crashes between vehicles and cyclists. There has been one serious injury crash in the last five years identified on Station Road, Warburton which occurred when a vehicle hit a cyclist.

In the SALT 2019 Movement and Transport Strategy it was also highlighted that these intersections are points of conflict and described proposed mitigations under Action 11. This included raised priority crossings at said roads above and a zebra crossing at Warburton Highway along with concept designs in Appendix 4 of the strategy. Cyclists would however need to dismount their bikes at a zebra crossing and it is thus not a suitable intersection treatment.

Proposed mitigation measures

Cyclist and pedestrian safety improvements (MM-TP5) would include:

- Prior to opening of the project signage would be installed to warn drivers of cyclist presence in accordance with road standards
- Given the scale of this project on cyclist generated trips, YRC would develop a plan to upgrade road crossings along the Lilydale-Warburton Rail Trail to Strategic Cycling Corridor (SCC) standard beginning with crossings deemed more critical. This plan would identify critical crossings which need to be implemented prior to opening of the Project and less critical crossings that can be implemented in a staged approach post opening.
- The YRC Paths and Trails Strategy would investigate collection of data and monitoring cyclist road crossing locations to determine when and what type of formalised crossing is required at the following locations and as shown in Figure 30:
    - Station Road, Wesburn
    - Hooks Road, Warburton
    - Station Road, Warburton
    - Warburton Highway, Warburton (This treatment would require approval from DoT)

Figure 30 Formalised crossing locations

A Road Safety Audit (MM-TP3) prior to project opening at:

- Detailed design of the Lilydale-Warburton Rail Trail/road crossings being proposed
- Existing Warburton Highway signalised crossing

Implementation of these measures would reduce residual impacts on transport infrastructure and operations, the residual impacts would be reduced likelihood and severity of pedestrian and cyclist crashes occurring at crossing points with the road network. Impact significance is reduced from severe to major with these mitigation measures.

Intersections on the road network used by cyclists

The cyclist traffic distribution in Section 8.2.2 showed that cyclists are likely to travel on road at several points and be required to use intersections to arrive at their destinations. No roads in the study area are part of the SCC network. The intersections which cyclists may use as part of their travel to/from the trail heads are listed in Table 26, the volumes of the major roads in which cyclists need to cross and estimated cyclist volumes from the project are also shown.

Table 26 Cyclist anticipated volumes at on road intersections during operation

Intersection	Major road volume 2031 (weekend daily)	Minor road project case daily cyclist volumes
Warburton Highway / Wesburn Park access road	8,400	124
Warburton Highway and Station Road, Wesburn	8,400	23
Gillis Street / Dee Road / Warburton Highway	8,200	41

Intersection	Major road volume 2031 (weekend daily)	Minor road project case daily cyclist volumes
Bacchus Crescent / Hearse Road / Warburton Highway	8,200	38
McKenzie King Drive / Warburton Highway	8,200	121
Warburton Highway / Hooks Road	8,200	122
Station Road, Warburton / Warburton Highway	8,000	22
Riverside Drive / Warburton Highway	8,000	242

Proposed mitigation measures

Cyclist and pedestrian safety improvements (MM-TP5) to include YRC Paths and Trails Strategy would investigate:

- Collection of data and monitoring cyclist road locations to determine if future formalised crossings or upgrades for cyclists need to be implemented. This would also help inform other mitigation measures in the future where there are risks of cyclist interactions with vehicles.
- Implement wayfinding to guide cyclists to formal safer intersections and links

A Road Safety Audit (MM-TP3) prior to project opening at key road intersections that would experience an increase in cyclist volumes (given aspects of these intersections are unknown such as sight lines).

Implementation of these measures during operation would reduce residual impacts on transport infrastructure and operations, the residual impacts would be reduced likelihood and severity of cyclist crashes occurring at intersections on the road network. Impact significance is reduced from severe to major with these mitigation measures.

Mountain bike trail crossing points

There are several crossing points between the proposed bike trails and the road network. Roads where these crossing points would be located are summarised in **Table 27**.

Table 27 Location of bike trails crossing points with the road network

Trail	Road	Cyclist crossing direction	Location	Road classification	Daily traffic volume (weekend) *	Posted speed limit (kilometres per hour)
1	Donna Buang Road	Southbound	West of Donna Buang Summit Road	Arterial (narrow, unsealed)	1,500	80
38	Mount Bride Road (south)	East and westbound	Mount Tugwell Trail Head	5C - minor	120	100
22, 23	Mount Bride Road (north)	East and westbound	Junction with Edwardstown Road			
30, 35	Edwardstown Road	North and south bound	Junction with Mount Bride Road	5E - trail	90	100

*Anticipated daily traffic volumes under the mature case, volumes rounded to the nearest 10 vehicles

It is important for safe operation that adequate sight distances are provided at trail road crossing points especially because of the high-speed limit on these narrow rural roads and the potential for high-speed conflicts to occur. The eye height of a cyclist is typically assumed to be 1.4 metres and road crossings would be designed and constructed to meet geometric requirements to provide the

greatest sight distance possible at any given location. Experienced bike riders are known for trail riding during dusk/dawn where light conditions may be poor.

Infrastructure must be provided to ensure that cyclists crossing do not have collisions with high speed vehicular traffic, with both motorists and cyclists provided with sufficient visual and/or physical cues to advise them of the approaching road crossing and any speed limit reductions.

Proposed mitigation measures:

A Road Safety Audit (MM-TP3) prior to project opening at the trail road crossing points before project opening of trails which cross over roads. Consideration to be given to visual obstructions to ensure a safe crossing location for cyclists.

Implementation of this measure during operation would reduce residual impacts on transport infrastructure and operations; the residual impacts due to the likelihood and severity of cyclist crashes occurring at trail crossings with the road network would be reduced. Impact significance is reduced from severe to major with these mitigation measures.

Cyclists on-road

An increased volume of cyclists is anticipated to use the road network in and around Warburton to access the various head trails and bike trails within the study area. Estimated cyclist distribution along the road network within the study area as shown in Section 8.2.2.

Sections of roads where there are high speed and volumes of vehicles with minimal cyclist provisions lead to increased crash risk which would be compounded by increased cyclist volumes over the lifespan of the Project. In particular Warburton Highway between Mount Donna Buang Road and Lilydale-Warburton Rail Trail in the eastern section of Warburton, Warburton Highway through Wesburn and Warburton Highway west of the Golf Course are high risk sections of road.

The roads anticipated to be used by cyclists are provided in Table 28 and the guideline for cyclist facilities AustRoads AP-G88-14 Cycling Aspects provides a guideline to what type of bicycle facility may be required depending on the road speed and traffic volumes which is shown in Appendix B.

Existing cyclist volumes are not known and were only able to be estimated for Station Road, Warburton and Warburton Highway from the 2018 rail trail counts. All of these roads are used by cyclists currently and would be utilised as part of the Project.

Lots of cyclists use Donna Buang Road currently based on Strava data, the current posted speed limit is 80 kilometres per hour and there is mountainous terrain and tight corners. Multiple serious injury crashes have occurred along the length of this road.

Table 28 Anticipated roads used by cyclists during operation

Road	Road classification	Daily traffic 2031 (weekend)	Posted speed (kilometres per hour)	85th Percentile speed (kilometres per hour)	Existing cyclist facilities	Guideline	Estimated existing cyclists per day	Anticipated project cyclists per day
Station Road	Local	150	50	46	None	Mixed traffic	157	22
Dammans Road	Collector	1,650	50	Unknown	None	Mixed traffic	Unknown	149
Old Warburton Road (south of Park Road)	Collector	560	60	56	None	Mixed traffic	Unknown	21
Riverside Drive	Local	Unknown - up to 3,000	50	Unknown	None	Mixed traffic	Unknown	242
Warburton Highway, Wesburn (south Wesburn Park)	Arterial	8,480	70	Unknown	None	Separated path	Unknown	124
Warburton Highway, Wesburn (town centre)	Arterial	8,400	50	55	Partial paved shoulders	Separated path	Unknown	23
Warburton Highway, Wesburn (north Wesburn Park)	Arterial	8,480	80	Unknown	None	Separated path	Unknown	23
Warburton Highway, Warburton (west of golf course)	Arterial	8,240	60	Unknown	None	Separated path	Unknown	122
Warburton Highway, Warburton (east of golf course)	Arterial	7,920	50	42	None	Bicycle lanes	42	516
Donna Buang Road	Arterial	1480	80	Unknown	None	Separated path	Unknown	61
Dee Road	Local	490	50	Unknown	None	Mixed traffic	Unknown	50

*percentile speed based on Saturday 85th percentile average both ways SALT survey 2018, where 85th percentile speed was not available the posted speed limit was considered

Vehicle volumes have been rounded to the closest 10 or 100 vehicles

It is proposed that connections between trails and key destinations be improved within the study area to ensure safe passage of cyclists on the local road network. SALT provided a number of proposed connection Improvements (Action 10) including:

- Providing a formal shared use path connection between the Rail Trail in Wesburn along Station Road to the township and Wesburn Park
- Providing a formal shared use path connection between the rail trail and the western commercial precinct of Warburton along Station Road
- Extending the rail trail to the eastern commercial precinct of Warburton, including around the Warburton Recreational Reserve.

Proposed mitigation measures

Cyclist and pedestrian safety improvements (MM-TP5) to include:

- YRC Paths and Trails Strategy would investigate how and when to implement:
  - shared streets along local roads within Warburton
  - safe cyclist connections between Wesburn, East Warburton, Warburton and Millgrove to/from the trails
  - Implement wayfinding to guide cyclists to formal safer intersections and links
- A sealed shoulder feasibility study along the length of Donna Buang Road to advocate safer cyclist connection with DoT

Implementation of these measures during operation would reduce residual impacts on transport infrastructure and operations; the residual impacts due to the likelihood and severity of cyclist crashes occurring on road would be reduced. Impact significance is reduced from severe to major with these mitigation measures.

Shuttle drop off points

During operation, there would be shuttle drop off points outside of the trail heads. These would be located at two separate points on Donna Buang Road (Victoria Spur and one other unnamed) and one at the intersection of Mount Bride Road and Edwardstown Road. These locations are shown visually in Figure 6. The shuttle drop off points are expected to be gravelled areas which the shuttle buses would pull into to allow visitors to exit, gather their bikes off the trailer and access the entry point for the trail. Careful planning is required for shuttle drop off points to manage the risk of crashes between vehicles using the road and the shuttle buses and cyclists who are accessing the trails.

DoT has proposed that the drop off points are formalised with appropriate signage and hardstand area/shelter so it is prominent in the road environment to all road users.

Proposed mitigation measures

A Road Safety Audit (MM-TP3) would be performed at the proposed shuttle drop off locations. Consideration would be taken into the sight distance of road traffic and their ability to see the drop off points to avoid the risk of crashes.

Implementation of these measures during operation would reduce residual impacts on transport infrastructure and operations; the residual impacts due to likelihood and severity of cyclist and vehicle crashes at the shuttle drop off locations would be reduced. Impact significance is reduced from severe to major with these mitigation measures.

Trail head facilities layout

The Golf Course Trail Head would supply car parking, shuttle bus access, access to the Lilydale-Warburton Rail Trail and to northern mountain bike trails among other facilities. The proposed layout for the trail head does not supply a direct or clear path for cyclists who are travelling between the car park to/from the shuttle buses or Warburton Highway Bridge and the northern trails. The design has the mountain bike visitors travelling to a path on the north and then through the golf course car park to get to the shuttle bus bays and bridge access. Alternatively, the riders may use Dammans Road to

travel to the shuttle bus bays and bridge. These arrangements create potential conflict between cyclists and cars within the golf course car park or on Dammans Road.

Mount Donna Buang Trail Head is located at the summit of Mount Donna Buang. There is currently an existing picnic and viewing area at this location. The existing site would be upgraded to provide improved facilities for bike riders and visitors and would include upgraded toilet facilities, visitor signage and maps and improved car park. The overflow car parking areas to the south of Mount Donna Buang may also be used. Mountain bike riders would park and ride on Donna Buang Summit Road to head north and access the trails.

Located off Mount Bride Road, the Mount Tugwell Trail Head would provide bays for shuttle bus loading and unloading, shelter and toilet facilities. It is expected that 37 daily movements each way would occur. Given the relatively low volumes expected, the current proposed layout for the trail head has sufficient turning radius for the anticipated buses. A dedicated pedestrian gravel pathway would be available adjacent to the parking bays ensuring clear separation of pedestrians from parking movements.

Proposed mitigation measures

Cyclist and pedestrian safety improvements (MM-TP5) to include at the Golf Course Trail Head a designated shared use path (not mixed with golf users) which matches the desire lines of those heading to the trails would be provided including raised priority treatments at intersections with the private roads. Path(s) would be wide enough to accommodate golf carts, pedestrians and cyclists. The design of the paths would be developed in consultation with stakeholders and would likely have minimum width of 3.5 metres.

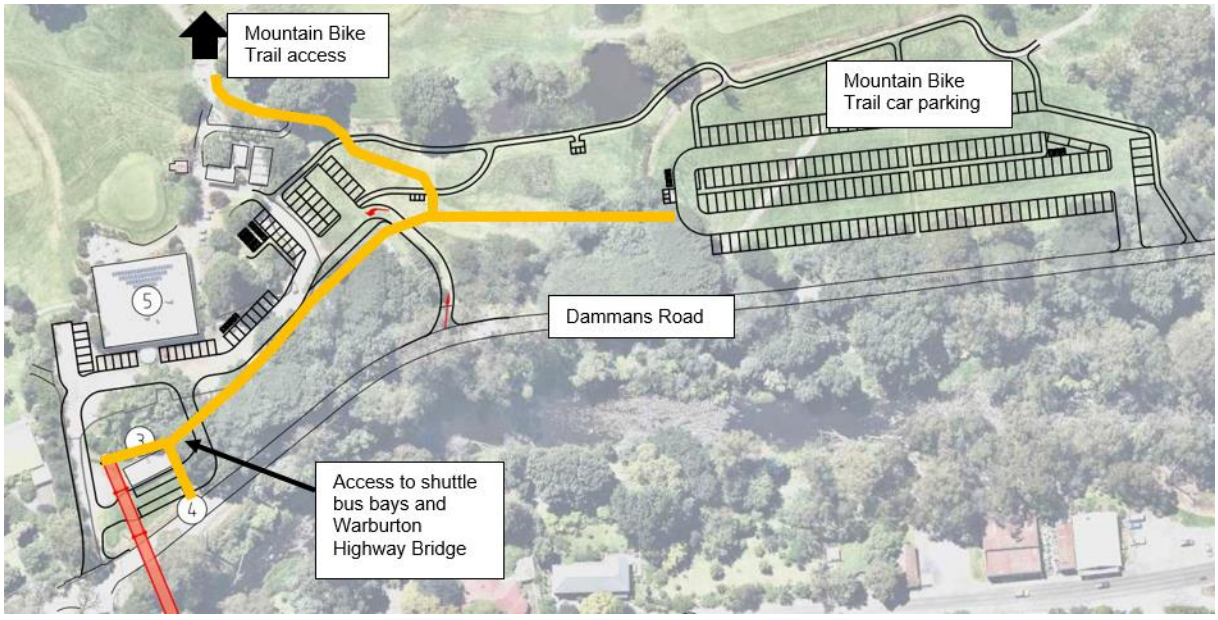


Figure 31 Potential shared use path location at the Golf Course Trail Head

Implementation of these measures during operation would reduce residual impacts on transport infrastructure and operations; the residual impacts due to the likelihood and severity of cyclist, pedestrians and vehicles crashes occurring at trail heads would be reduced. Impact significance is reduced from severe to major with these mitigation measures.

11.2.2 Risk of crashes due to increased interactions on paths and bridges

AustRoads provides guidance on the width of shared use paths for pedestrians and cyclists under *AustRoads Guide to Road Design (AGRD) Part 6A – Pedestrian and Cyclist Paths*. The standards have been used to determine the required width of the two proposed bridges at Warburton Highway and Old Warburton Road.

The Warburton Highway bridge is to cater for pedestrians and cyclists as a SUP. It would be classified as a “recreational bridge” and would be subject to frequent use by both mountain bike riders and pedestrians accessing the Lilydale-Warburton Rail Trail. Based on AGRD Part 6A (refer Appendix B) the width of the SUP bridge is to be:

- Desirable width of 5.5 metres (3.5m wide plus 1.0m clearance to handrail)
- Minimum width of 4.0 metres (3.0m wide plus 0.5m clearance to handrail)

If the handrail has smooth finishes, the clearances can reduce to 0.3 metres and the bridge can reduce to 3.6 metres wide (excluding handrail width).

The Old Warburton Bridge is connecting trails and does not fit as “Local access” or “Regional path” as titled in AGRD Part 6A. Given a bicycle envelope of 1 metre each way, 0.5 metre clearance between and 0.5 metre clearance to the fence/rails can be adopted. The minimum width is thus 3.5 metres wide. If the handrail has smooth finishes, the clearances can reduce to 0.3 metres and the bridge can reduce to 3.1 metres wide (excluding handrail width).

With the addition of the Warburton Mountain Bike Destination the Lilydale-Warburton Rail Trail would experience increases in usage by tourists as both pedestrians and cyclist volumes are expected to increase over the years. The Main Yarra Trail in Melbourne experiences a similar volume of cyclists per day at an average of 750 daily in 2019 (VicRoads Cycling Dashboard). The Lilydale-Warburton Rail Trail may require upgrade and improvements to allow for a similar volume

The shared use path is to be 3.0 metres in width plus clearances for safe bidirectional movements. On the western side of the Scotchmans Creek bridge the trail is approximately 3.2 metres wide, however the width and surface quality along the length is unknown and if there are narrow or poor-quality sections there is potential for crashes between pedestrians and cyclists.

Proposed mitigation measures:

As part of the cyclist and pedestrian safety improvements (MM-TP5) the bridges to be constructed are required to be to AustRoads standards:

- The Warburton Highway bridge minimum space for cyclists and pedestrians to be adopted if the handrail has a smooth finish is 3.6 metres in width.
- The Old Warburton Highway bridge the minimum space for cyclists to be adopted if the handrail has a smooth finish is 3.1 metres in width.

A Road Safety Audit (MM-TP3) prior to project opening of the Lilydale-Warburton Rail Trail between Station Road, Wesburn and the eastern end of the rail trail at Warburton Highway, Warburton prior to project opening. The audit would focus on surface quality, areas of narrow width and poor sight distance.

Implementation of these measures during operation would reduce residual impacts on transport infrastructure and operations, the residual impacts due to the likelihood and severity of cyclist and pedestrian crashes occurring on paths and bridges would be reduced. Impact significance is moderate with these mitigation measures.

11.2.3 Emergency vehicle access and evacuation during project operations

All trail heads would remain accessible via the existing public roads which would also be used by emergency services. It is to be noted that the mountain trails would not be operating during snow season or when there is fire risk within the area (high/severe to catastrophic fire risk level). If required, a helicopter could land at Wesburn Park in response to an emergency in relation to a cyclist accident.

Edwardstown Road and Cemetery Track have narrow cross-sectional width with no shoulders. However, road width equal or greater than four metres still allows bidirectional vehicular passage provided that vehicles slow down to allow opposing vehicles to pass by. As these are minor roads with low anticipated traffic volumes, these roads are considered to be adequate for emergency vehicle access.

An evacuation plan will be detailed as part of an emergency management plan to be developed by YRC in consultation with stakeholders (including the CFA).

Proposed mitigation measures:

- A Road Safety Audit (MM-TP3) to be conducted along the length and intersections of Edwardstown Road and Cemetery Track to confirm adequate emergency access and identify any sight and surface issues.
- Improvement works (MM-TP4) to include potential road surface upgrades subject to results of the proposed road safety audit and emergency vehicle access would be taken under consideration.
- Emergency management plan (MM-TP7) and staff training for the Project would be established and approved before opening.

Implementation of these measures during operation would reduce residual impacts on transport infrastructure and operations, the residual impacts would be that the road network can service emergency vehicles during operation of the project. Impact significance is reduced from moderate to minor with these mitigation measures.

11.2.4 Adequacy of road network infrastructure to accommodate operations traffic in the local road network

The local road network infrastructure assessment included the following considerations:

- Existing road cross sections (refer to Appendix B)
- Anticipated traffic volumes associated with the operation of the Project
- Desktop analysis of pavement and infrastructure conditions
- Any issues that may affect road safety such as sight distance, horizontal and vertical geometry

Relevant VicRoads design guidelines, Yarra Ranges Council and DELWP guidelines for cross-sections of local roads are also available in Appendix B.

Based on these considerations, road links have been categorised as per Table 29 with regards to their suitability for traffic movements, access to the facilities.

Table 29 Road network assessment categories

Category	Description
Preferred regional routes	Declared roads designed for the regional movement of people and goods Generally, satisfy cross section design requirements. No significant road pavement or infrastructure issues. No observed road safety issues.
Alternate regional routes	Declared roads designed for the regional movement of people and goods that may have: ● some sections of road that do not satisfy the cross-section requirements ● some significant areas of poor road pavement condition or infrastructure issues ● some minor road safety issues observed
Preferred local roads	Generally, satisfy cross section design requirements outlined in Appendix B No significant road pavement or infrastructure issues No significant road safety issues
Alternate local roads	Roads with some cross-section limitations or safety issues that can be managed through temporary traffic management controls such as portable traffic signals, reduced speed limits, temporary road closures for one-way movements, minor localised grass clearing, or widening for passing etc No significant road pavement or infrastructure issues
Inappropriate for use	Local roads that may have: ● significantly deficient cross section ● significant areas of poor road pavement condition or infrastructure issues ● significant road safety issues observed.

Table 30 provides a summary of the results of the categorisation of the road network within the study area.

Warburton Highway in Warburton (east of the golf course) has been categorised as 'Alternative Regional Route'. This is due to some sections of the highway that do not satisfy the cross-section requirements as the shoulders along some of the highway length in Warburton are less than the required one metre on each side.

Gravel shoulders were observed on the majority of the lengths of these roads however these were not observed to be at the desired two metres as per the guidelines.

A number of local roads are categorised 'Alternate Local Roads' as they do not have the desired 1.25 metres shoulder width required on each side as per the Yarra Ranges Council rural road cross section requirement (provided in Appendix B). In addition, Dammans Road may require road management controls such as line markings in order to facilitate safe traffic movements in both directions.

Table 30 Road network assessment findings

Study road	Road network assessment
Mayer Bridge	Alternate local road
Park Road	Alternate local road
Old Warburton Road (west)	Alternate local road
Old Warburton Road (north Mount Bride RD)	Alternate local road
Old Warburton Road (east)	Alternate local road
Dammans Road	Alternate local road
Mount Bride Road	Alternate local road
Cemetery Track	**Inappropriate for use (mitigation required)**
Edwardstown Road	**Inappropriate for use (mitigation required)**
Warburton Highway, Warburton - west of golf course	Preferred regional routes
Warburton Highway, Warburton - east of golf course	Alternative regional route
Warburton Highway, Wesburn - south of reserve	Preferred regional route
Warburton Highway, Wesburn - north of reserve	Preferred regional route
Donna Buang Road	Alternative regional route
Donna Buang Summit Road	Alternative regional route
Dee Road	Alternative local road

Cemetery Track

Cemetery Track is a 4-metre-wide two-way dirt track (unformed) with no shoulders along its length. Some sections of Cemetery Track have poor road condition due to irregular road surface and potholes which could lead to safety issues as shown in Figure 32. During operation, this road would cater to shuttle movements and mountain bike users. As such, it is expected that approximately 32 vehicle movements would occur daily along the road along with cyclists. Given the low anticipated volumes, the current width is adequate for safe bidirectional vehicle access including emergency services. However, given its current condition, the road surface would require ongoing monitoring and repairs prior and during project use to accommodate safe traffic movements for shuttle movements and cyclists.

Figure 32 Cemetery Track - August 2020

Edwardstown Road

Edwardstown Road is a 4-metre-wide two-way unsealed formed road with a width of approximately four metres and no shoulders along its length. During the operational phase of the Project, traffic volumes are expected to be relatively low with 32 daily traffic movements occurring along its length which are shuttle buses. DELWP has indicated that sections of this road are narrow in width as indicated during the consultation process with stakeholders. Given the low anticipated volumes, the current width is adequate for safe bidirectional vehicle access including emergency services. However, given its current condition, the road surface would require ongoing monitoring and repairs prior and during project use to accommodate safe traffic movements for shuttle movements and cyclists.

Figure 33 Edwardstown Road - August 2020

Proposed mitigation measures:

- Improvement works (MM-TP4) to include monitoring and improvement of the road surface conditions along Cemetery Track and Edwardstown Road prior to project opening and on an ongoing basis.
- A Road Safety Audit (MM-TP3) is proposed to be undertaken for Cemetery Track and Edwardstown Road prior to the opening of the project to identify any safety issues.

Implementation of these measures during operation would reduce residual impacts on transport infrastructure and operations, the residual impacts would be that the road network can service emergency vehicles during operation of the project. Impact significance is reduced from moderate to minor with these mitigation measures.

11.2.5 Vehicle parking at trail heads

A parking assessment has been undertaken to determine the capacity of the proposed car parks at each of the trail heads. It is assumed for the purpose of this assessment that visitors on-site at any one time is 75 per cent of the peak day visitor volumes on a weekend day in January 2031.

The parking requirement assessment considers the anticipated peak parking demand against the parking spaces which are to be provided. This is compared to the current trail head design provided by Yarra Ranges Council shown in Table 31.

Table 31 2031 parking assessment trail heads

Trail head	Anticipated visitors driving	Vehicles parking	Parking spaces available
Main Golf Course	354	127	165
Mount Tugwell	32	12	7 (drop off/pick up only)
Mount Donna Buang	48	17	240
Wesburn Park	193	69	340
Dee Road	16	6	20
Total	644	230	765

The assessment has shown that there would be capacity available at the trail heads, if the Golf Course or Mount Tugwell trail heads are to reach capacity visitors would be able to park at Mount Donna Buang or Wesburn Park instead where they can utilise the shuttle buses.

Due to the seasonal nature of mountain biking, the Warburton Mountain Bike Destination would have seasonal operation peaks. Should parking be over capacity due to high demand, Mount Donna Buang car park or Wesburn Park would be used as an overflow car park to accommodate visitors. It is expected that the Mount Donna Buang car park would remain under-utilised during the warmer months of the year as this car park is typically used to service the adjacent ski field. Driving visitors would be directed to park at Mount Donna Buang or Wesburn Park and utilise the shuttle buses to reach other head trails.

Proposed mitigation measures:

Operational parking management plan (MM-TP6) to include using the Wesburn Park car park as an overflow car park. Appropriate signage and wayfinding would be provided to adequately direct visitors, VMS boards would be placed at key locations to inform visitors on where to park in peak periods when the car parks are expected to be full.

Implementation of these measures during operation would reduce residual impacts on transport infrastructure and operations; the residual impacts would be that vehicles would be able to park in the overflow car park and not cause parking congestion or informal parking at the trail heads or town centre. Impact significance is reduced from moderate to minor with these mitigation measures.

11.2.6 Parking in Warburton town centre

The SALT 2019 Movement and Transport Strategy had a parking count survey commissioned in October 2018. For the survey the Warburton town centre was split into four precincts as shown in Figure 34.

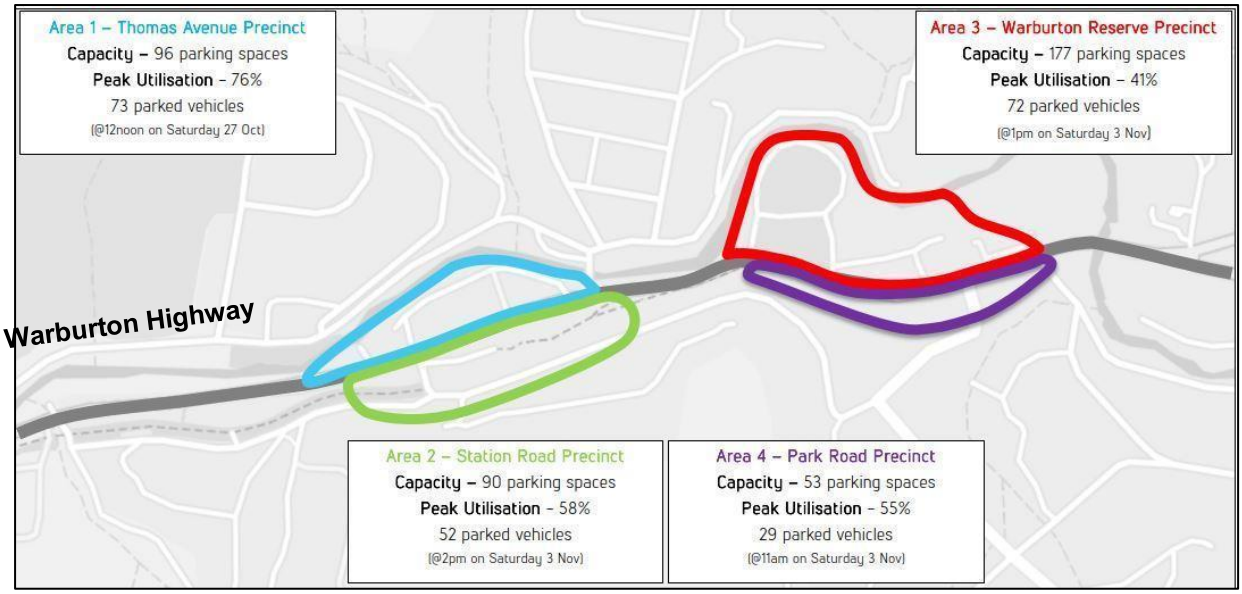


Figure 34 SALT 2019 parking survey area and results *Source: SALT 2019*

The car parking survey shows that the current total capacity of surveyed parking districts is 416. Of those 416 car parks, 226 were occupied during the weekly peak period, representing approximately an average occupancy of 59 per cent across the precincts. This average occupancy would however be less as each precinct has a different peak hour.

Analysis of anticipated Warburton Mountain Bike Destination visitor volumes during operation shows that the peak day visitor volumes on a weekend day in January 2031 is 859. With consideration of a car parking generation rate of 0.35 vehicles per user, this would represent 301 daily car parking spaces required to accommodate Project related visitors.

As a worst-case it is assumed that 25 per cent daily visitor volumes may leave within the same hour and park within Warburton town centre which would represent 75 additional car parking spaces during peak hours.

Applying the additional car parking spaces required equally to each of the four precincts the analysis shows that there would be sufficient parking spaces available to accommodate Project related visitors during peak periods. The average capacity during peak periods within the precincts would be 79 per cent as shown in Table 32, under the 85 per cent acceptable parking occupancy benchmark.

Table 32 Town centre car parking capacity

Location	Parking supply available for the project	Parking demand	Occupancy
Thomas Avenue Precinct	23	19	96%
Station Road Precinct	38	19	79%
Warburton Reserve Precinct	105	19	51%
Park Road Precinct	24	19	90%
		Total	79%

Consideration would also be given to future land use development and growth of Warburton as this may impact the capacity of existing car parking within Warburton. As the proposed Warburton Mountain Bike Destination develops over the years, it may encourage further development within the township such as accommodation and food and drink related services. A high-level analysis of future development was undertaken by SALT within the Local Movements and Transport report. Results from this assessment show that there would be a low increase in demand related to commercial growth in Warburton.

While the existing parking capacity is currently sufficient to accommodate existing visitors to Warburton, the need for improved infrastructure in and around the town centre would be monitored into the future. Part of Council's standard asset management process is the suitability of wider transport infrastructure around Warburton. This would be periodically reviewed including consideration of the SALT report recommendations.

Proposed mitigation measures:

- Operational parking management plan (MM-TP6) to include:
  - Installation of bike parking in the town centre to allow visitors to safely park their bikes
  - A monitoring plan to be implemented to monitor the occupancy of the town centre parking against the 85 per cent threshold quarterly in the first 12 months of project opening and yearly after this period.
  - SALTs actions and strategy on improving car parking in Warburton would be considered to improve the utilisation of parking currently and into the future.
- As part of the YRC Paths and Trails Strategy for cyclist and pedestrian safety improvements to include investigation into a connection between the Lilydale-Warburton Rail Trail at Station Road and the northern side of Warburton Highway

Implementation of these measures during operation would reduce residual impacts on transport infrastructure and operations, the residual impacts would be that:

- *There would be better access and facilities to cycle to/from the town centre, reducing the amount of people driving and parking vehicles*
- *Constant improvements to parking availability would be done as per the operational parking management plan to maintain parking availability in the town centre*

Impact significance is reduced from moderate to minor with these mitigation measures.

11.2.7 Increased congestion and potential parking impacts as a result of events

The Warburton Mountain Bike Destination Project is expected to hold events at various times through the year. These events range from local events to national events.

It is anticipated that participants and spectators would drive to the trail heads. The main trails heads which would be used for events are the Golf Course Trail Head and Wesburn Park.

Table 33 Anticipated events and vehicle volumes

Event type	Frequency	Participants	Spectators	Total visitors per day	Total vehicles per day
Local events	30 per year	300	50	350	125
Regional events	10 per year	400	600	1000	357
State events	Every two years	1400	1600	3000	1071
National events	Every four years	2700	4500	7200	2571

State and National events would not be assessed in this traffic impact assessment. These events would require additional traffic assessment per event given their scale. Regional events have been assessed based on available data and assumptions below.

Peak and daily one-way vehicular volumes for regional events were determined and compared to the volumes assessed for a peak weekend day in January 2031 in Table 34. The regional events generated traffic volumes are 14 per cent higher than the weekend peak day assessment in this TIA. The roads utilised to access the trail heads have the capacity for these additional vehicles.

Table 34 Regional event traffic comparison

Event type	Peak hour one-way	Daily one-way
Regional events	89	357
Operations peak weekend day (January 2031)	77	307
Additional traffic volumes		+50

A parking assessment for the regional events has been done in Table 31 using the same principles as Section 11.2.5; however, it does not include access to Dee Road or Mount Tugwell. Vehicles distribution without these trail heads is 59 per cent to the Golf Course Trail Head, eight per cent to the Mount Donna Buang Trail Head and 32 per cent to the Wesburn Park Trail Head. The assessment shows that there is anticipated to be ample parking spaces available at the trail heads for local and regional events.

Table 35 Regional event parking assessment

Trail head	Vehicles parking	Parking spaces available
Main Golf Course	159	165
Mount Donna Buang	22	240
Wesburn Park	87	340
Total	268	745

This event assessment is high-level, all events would require a specific Traffic Management Plan (MM-TP1) and in the case of state and national events specific traffic impact assessments would also be required. Impact significance is reduced from moderate to minor with these mitigation measures.

12.0 Assessment of alternative to Trail 1

The assessment and comparison of the alternative to Trail 1 is based on the existing conditions information provided in Section 7.0

The comparison is based on the residual impact of these options assuming effective implementation of the proposed mitigation and contingency measures outlined in Section 14.0

The alternative trails to Trail 1 would include a trail crossing point on Donna Buang Road to connect Trails 45 and 47. The location of this crossing point is at the shuttle bus drop off point at Victoria Spur (as shown in Figure 6 and Figure 35 below).

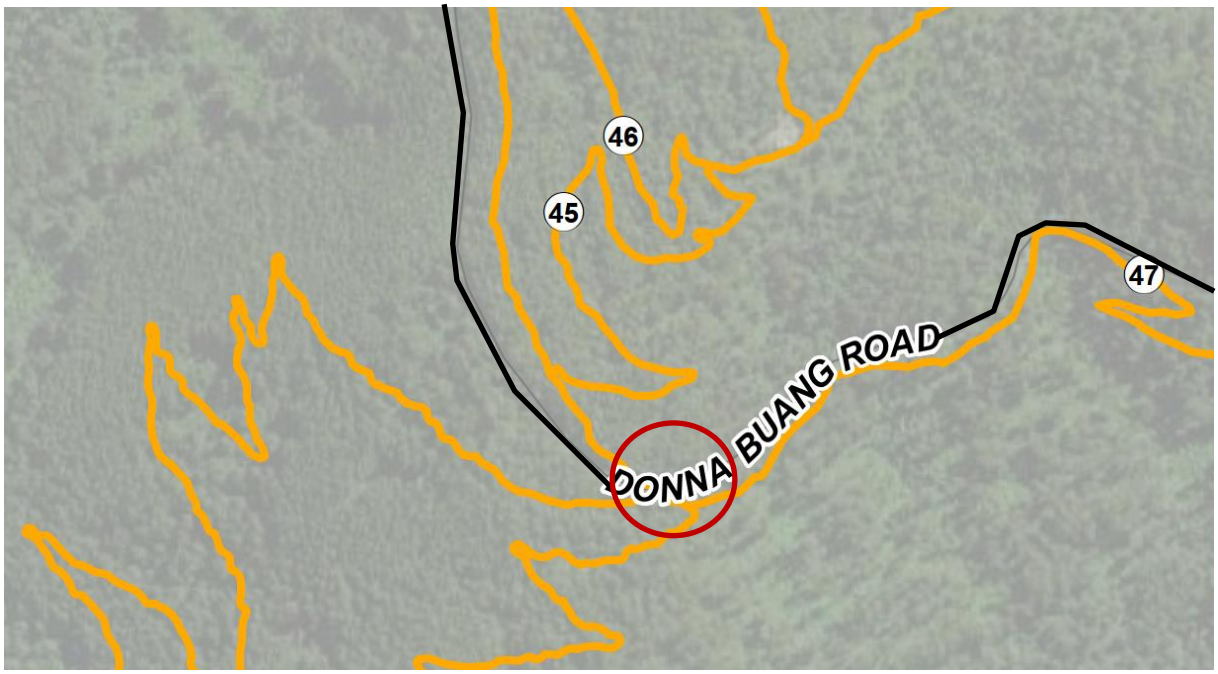


Figure 35 Trail crossing point Donna Buang Road

Donna Buang Road has a posted speed limit of 80km/hr and volumes of 1480 vehicles/day two-way. Currently it is understood that YRC would implement a one-way cyclist bridge to be placed over Donna Buang Road to connect Trails 45 to 47. If an at-grade crossing solution were to be used extensive mitigation measures would be required given the high-speed and high-volume nature of Mount Donna Buang Road as well as extensive crash history and mountainous surrounds. These mitigation measures would include reduced speeds on approach to the cyclist crossing, signage and warnings to motorists and extensive removal of trees for cyclist sight distance. Following an audit, it may be concluded that an at-grade crossing is not acceptable at this location.

12.1 Construction impacts

At the time of the assessment, the one-way cyclist bridge is considered the preferred crossing solution. As such, it is assumed for this assessment that vehicles required for bridge construction and construction method would be the same as the Old Warburton Bridge construction.

Donna Buang Road would be closed for a maximum of four hours on three occasions during the six-month construction period for bridge construction. During closure Donna Buang Road would be closed off and alternate access to Mount Donna Buang Observation Tower would be available to road users via Warburton Highway, Don Road and the western section of Donna Buang Road. Donna Buang Road is a tourist road and other links are available to travel between Warburton and Healesville.

Construction mitigation measures would be undertaken as per the Old Warburton Road closures with a TMP (including pre-construction on site checks for heavy vehicles) and a Stakeholder communication plan.

Implementation of these measures during construction and operation would reduce residual impacts on transport infrastructure and operations, anticipated residual impacts would be:

- *Reduced congestion and delay caused by road closures*
- *Reduced likelihood of residents being unaware of road closures and thus reducing vehicles travelling during the closure periods*
- *Emergency access retained*
- *Moderate delays to vehicles taking detours during the road closures*

12.2 Operation impacts

During operation the proposed crossing solution is expected to ensure that cyclists crossing do not collide with high speed vehicular traffic. Currently Donna Buang Road has narrow lane in each direction with sharp curves along its length, a posted speed limit of 80km/hr and volumes of 1480 vehicles/day two-way. Given the speed limit and traffic volumes as well as to the current road conditions at the proposed crossing location, the one-way cyclist bridge is considered as the safest crossing solution.

Donna Buang Road bridge would be used for one-way trail connection. The bridge would require 1 metre width for cyclist movement and a clearance between the handrails of 0.3 metres each side assuming the handrail features are smooth as per *AGRD Part 6A*.

The residual impacts due to the likelihood and severity of cyclist crashes occurring on the bridge would be reduced.

12.3 Comparison

Comparing construction impacts between Trail 1 and the alternative to Trail 1 (Trails 45, 46 and 47), whilst each option would have different crossing points over Donna Buang Road, these are comparable from a safety perspective.

During operation however, the crossing at the alternative to Trail 1 (Trails 45, 46 and 47) requiring extensive mitigation measures given the high-speed and high-volume nature of Mount Donna Buang Road, would equate to a higher impact than the Trail 1 crossing..

The construction impacts do not differ substantially between Trail 1 and the alternative to Trail 1. Because of the safety challenges with the crossing of Mount Donna Buang Road associated with the alternative, Trail 1 is slightly preferred from a transport perspective during operation. As such, when considering the above comparison of impacts the alternative to Trail 1 would present a slightly preferred option over Trail 1. The comparative impacts for Trail 1 and the alternative (Trails 45, 46 and 47) are presented in Table 1.

Table 1 Comparative transport assessment of Trail 1 and Trails 45, 46 and 47

Potential impact	Trail 1	Alternative (Trail 45, 46 and 47)	Conclusion
Construction	Construction of the entire project including Trail 1 would generate modest amounts of traffic that would not cause significant congestion on the road network.	In the context of the whole project, the amount of traffic generated for the construction of the alternative would not differ greatly from the traffic generated for construction of Trail 1. The transport impacts associated with bridge construction would be unchanged for the alternative.	No discernible difference in level of impact between Trail 1 and the alternative.

Potential impact	Trail 1	Alternative (Trail 45, 46 and 47)	Conclusion
	Construction of bridges over the Yarra River and Old Warburton Road would cause temporary localised disruption.		
Operation	Whilst visitor traffic generated by the project is within the capacity of the road network, careful management of parking would be required. The potential for conflict between motor vehicles and cyclists at intersections between mountain bike trails and roads is an important issue. Trail 1 involves a crossing of Donna Buang Road which has an estimated traffic volume of 1500 vehicles per day and a posted speed of 80km/hr. Mitigation measures are proposed to ensure that this crossing is safe.	Visitor numbers are predicted to be greater for the trail network with Trail 1 or with Trails 45, 46 and 47. Nevertheless, because there is sufficient capacity in the transport network, no change is expected in operational traffic impacts (including those related to parking) for the alternative compared to Trail 1. The alternative to Trail 1 would also have a crossing point on Donna Buang Road to connect Trails 45 and 47. The location of this crossing is at the shuttle bus drop off point at Victoria Spur. The crossing is in a different place to that for Trail 1 and due to having a posted speed of 80km/hr and compromised sight lines, substantial mitigation measures are likely to be needed to ensure safety at a crossing at this location. If following further investigation an at grade crossing is not considered desirable, a bridge crossing could be contemplated.	Because of the safety challenges with the crossing of Mount Donna Buang Road associated with the alternative, Trail 1 is slightly preferred from a transport perspective.

13.0 Cumulative impact assessment

Warburton Water World (WWW) opened in September 2020 in Warburton on Woods Point Road. The park is opened between 10am-7pm on weekdays and weekends.

It is deemed necessary to determine the cumulative impact on the transport network on a weekend day in 2031 for the Warburton Mountain Bike Project and Warburton Water World as there is potential for impacts to the roads and town parking.

AECOM was provided visitor assumptions for WWW as shown in Table 36. The visitor volume assumptions are based on daily temperature, with the highest visitor volumes occurring over 35 degrees. It is expected that mountain bike visitors would be less likely to undertake mountain bike activities in this weather due to physical discomfort and safety risks. The WWW visitor volumes for days between 30-35 degrees has thus been adopted as 4,000 visitors per weekend day for assessment.

Table 36 Warburton Water World visitor volume assumptions *(source: YRC)*

Case per day	< 30 degrees	30 - 35 degrees	> 35 degrees
Dec, Feb & Mar mid-weekdays	500 - 1,000	1,000 - 2,000	2,000 - 3,000
Jan mid-week per day	1,000 – 2,000	2,000 – 3,000	3,000 – 4,000
Weekends per day	1,500 – 3,000	3,000 – 4,000	4,000 – 5,000

Applying 2.6 visitors per vehicle which was provided by YRC (research undertaken shows each vehicle averages 2.6 people entering the park), it is estimated that 1,538 vehicles would travel to WWW on a weekend day. The WWW visitor arrival peak is assumed to be 25 per cent of the total daily arrival and thus it is estimated that 385 vehicles arrive in the peak hour.

To undertake the cumulative impact assessment the operational traffic peak for the Warburton Mountain Bike Project and WWW occurs for both visitor destinations within the same peak hour on a Saturday in January. WWW would have 385 vehicles arriving in the peak hour. Using the same assumptions used for the Mountain Bike Destination Project assessment, 99.15 per cent would arrive from the West via Warburton Highway and Woods Point Road.

Woods Point Road is not included as part of this TIA assessment as it is not expected to be utilised by the Mountain Bike Destination Project. Road impacted by both projects are shown below in Table 37 with the daily and peak hour traffic volumes due to both projects.

Table 37 2031 Cumulative impact to study area roads

Road	Type	Daily vehicles				Peak hour (2-way)			
		2031 base volumes	WMBP	WWW	Total	2031 base volumes	WMBP	WWW	Total
Warburton Highway (west)	VicRoads B-Class arterial road	7,828	+413	+3,051	10,879	702	+99	+763	1,564
Warburton Highway (east)		7,828	+94	+3,051	10,879	702	+23	+763	1,487
Warburton Highway (south)		7,881	+593	+3,051	10,932	788	+148	+763	1,699
Warburton Highway (north)		7,881	+596	+3,051	10,932	788	+145	+763	1,696
Donna Buang Road	VicRoads C-Class arterial road	1,404	+79	+7	1,411	156	+16	+3	175

The WWW would add traffic to the arterial roads also utilised by the visitors to the mountain bike trails, road infrastructure upgrades may be required due to the high visitor volumes YRC anticipate from WWW.

The WWW would also impact on parking in the town centre. An updated assessment with assumptions as per mountain bike project is shown in Table 38. The town parking exceeds the 85per cent acceptable parking occupancy benchmark when the WWW visitor volumes are considered.

Table 38 Cumulative impact town centre parking

Location	Remaining car parks	Mountain Bike Project usage		Warburton Water World usage		Percentage cumulative car parking usage
		No. car parks used	Percentage car parks used	No. car parks used	Percentage car parks used	
Thomas Avenue Precinct	23	4	96%	-34	136%	155%
Station Road Precinct	38	19	79%	-19	121%	142%
Warburton Reserve Precinct	105	86	51%	48	73%	84%
Park Road Precinct	24	5	90%	-33	163%	198%
Total	**190**	115	79%	-39	123%	145%

The Warburton Water World impacts to surrounding roads and town centre car parking is currently being managed by YRC and no mitigation measures are required as part of this EES.

14.0 Summary of mitigation and contingency measures

This section outlines the proposed mitigation measures for transport identified as a result of the impact assessment.

The proposed mitigation measures that have been proposed to avoid, mitigate or manage traffic and transport impacts associated with the project are defined in Table 39.

In the course of finalising this technical report, consultation was undertaken with Yarra Ranges Council so that proposed mitigation measures would be achievable and compatible with those proposed by other specialists.

Table 39 Mitigation and contingency measures

Mitigation measure number	Project phase	Mitigation and contingency measures
MM-TP1	**Construction**	Traffic Management Plan (TMP) Prior to the commencement of construction (excluding preparatory works), a TMP would be developed and implemented to minimise disruption to existing land uses, traffic, car parking, on-road public transport, pedestrian and bicycle movements and existing public facilities during construction. The TMP would be developed in consultation with the relevant road management authorities and would include: ● A program, to monitor impacts of construction activities on all modes of transport. Where monitoring identifies adverse impacts, practicable mitigation measures would be developed and implemented ● Consideration of cumulative impacts of other major projects occurring concurrently in the local area ● Route options for construction vehicles travelling to and from the construction sites, recognising sensitive receptors and minimising the use of local streets where practicable ● Prior to construction on-site checks will be completed to assess route options and intersections which are not part of the B-Double approved network for safety and clearance to potential obstructions, such as wires, structures, and trees for heavy vehicles. Checks will include ensuring that heavy vehicle movements at intersections are able to be performed safely and efficiently. ● Survey to document the condition of pavements and other road infrastructure such as bridges and

Mitigation measure number	Project phase	Mitigation and contingency measures
		culverts prior to construction commencement for roads that are not B-Double approved including: - Mayer Bridge - Dammans Road - Old Warburton Road - Mount Bride Road ● Measures to minimise disruption due to road and lane closures including limiting the number and duration of road closures and planning closures to occur outside of peak traffic periods. Temporary alternative routes would be identified during road closures to maintain local access to properties. Warburton Highway and Old Warburton Road would not be closed at the same time and no more than one road closure would occur each day to minimise any impact. Management measures would include detours as required for the following roads: - Warburton Highway - Old Warburton Road - Dammans Road ● Management of Lilydale-Warburton Rail Trail partial closure by maintaining connectivity for road and footpath users in accordance with relevant design standards and in consultation with landholders and other relevant third parties ● Localised and temporary speed limit reduction for personnel and construction vehicles in the vicinity of works sites ● Traffic management measures including localised and temporary speed limit reduction and signage as appropriate ● Traffic management and controllers to restrict vehicles entering Mayer Bridge during heavy vehicle movements ● Traffic management measures to manage the risk associated with heavy vehicles, including over dimensional vehicle movement ● Consultation with PTV and private bus operators to inform them of transport changes anticipated as a consequence of construction

Mitigation measure number	Project phase	Mitigation and contingency measures
		● Measures, developed in consultation with emergency services to ensure emergency services access is maintained, especially during any public road closures ● Provision of safe access points to laydown areas and site compounds ● Provision of segregated access points for construction vehicles and public vehicles where appropriate ● Protocols to give the community and other stakeholders adequate notice of any anticipated changes to transport conditions ● Specified working hours and the periods within which heavy goods vehicles can access the works sites and deliveries made ● Minimisation of dirt and debris on roads by measures such as street sweeping, covering vehicle loads and vehicle cleaning ● Minimisation of the need to transport waste from the site by reuse of materials wherever possible. The TMP would include specific measures for discrete components or stages of the works as appropriate. The above list is indicative and further measures may be identified during the development of the TMP.
MM-TP2	**Construction and operation**	Stakeholder communication plan Prior to commencement of the construction works and any temporary road or lane closures, stakeholder consultation would be carried out and advanced notice given to affected residents, businesses or industries and emergency services. This includes measures such as letter notification to inform residents and businesses of upcoming works and road closures. Stakeholder engagement and communications strategies would be established in the TMP to be prepared for the Project. Stakeholders may include Councils, road authorities, bus operators, business operators and residents among others. At the end of the construction phase, a close-out meeting between Yarra Ranges Council and relevant road authorities (VicRoads and DELWP) would occur to

Mitigation measure number	Project phase	Mitigation and contingency measures
		discuss and manage the restoration of roads to prior existing (or improved). During operation, regular meetings would occur with Council and an agreement would be reached with DELWP to confirm pavement upgrades of impacted local roads around the study area, subject to the pavement strength survey results. Regular road maintenance and inspections would also be discussed for declared roads with VicRoads.
MM-TP3	**Operation**	Road Safety Audit To verify the risks in this TIA can be managed a Road Safety Audit (RSA) would be undertaken by a VicRoads accredited Road Safety Auditor at the following locations prior to project opening: ● Detailed design of the Lilydale-Warburton Rail Trail/road crossings being proposed ● Existing Warburton Highway signalised crossing. ● Key road intersections that experience an increase in cyclist volumes (given aspects of these intersections are unknown such as sight lines). ● At the trail/road crossing points. Consideration is to be given to visual obstructions to ensure a safe crossing location for cyclists. ● The Lilydale-Warburton Rail Trail between Station Road, Wesburn and the eastern end of the rail trail at Warburton Highway, Warburton. The audit would focus on surface quality, areas of narrow width and poor sight distance. ● At the proposed shuttle drop off locations. Consideration would be taken into the sight distance of road traffic and their ability to see the drop off points to avoid the risk of crashes. ● Along the length and intersections of Edwardstown Road and Cemetery Track to confirm adequate emergency access and identify any sight and surface issues. Road Safety Audits are to be carried out by a qualified road safety auditor independent of the project team.
MM-TP4	**Construction and operation**	Improvement works ● After construction restoration of the road pavement, bridges, and culverts within the study area would to be assessed and restored to the existing or better than existing condition if damage has occurred.

Mitigation measure number	Project phase	Mitigation and contingency measures
		This would be based on the survey results restore the roads to existing or better than existing conditions after construction ● Monitoring and improvement of the road surface conditions along Cemetery Track and Edwardstown Road prior to project opening and on an ongoing basis. ● Subject to the results of the RSAs undertaken at various locations in the study area, improvements may be required prior to project opening.
MM-TP5	**Operation**	Cyclist and pedestrian safety improvements A number of mitigation measures are proposed to ensure that safe pedestrian and cyclist movements within the study area during the operational phase of the Project. These include: ● Yarra Ranges Council to assess bike parking provision after 12 months of operation in busier summer months to ensure that adequate bike parking is available to visitors. Additional bike parking would be provided, subject to the results of this assessment. ● Drink taps/water bottle filling locations would be located in close proximity to the car park and bike path for the Golf Course and Wesburn trail heads to prevent dehydration ● Prior to opening of the project signage would be installed to warn drivers of cyclist presence in accordance with road standards ● Given the scale of this project on cyclist generated trips, YRC would develop a plan to upgrade road crossings along the Lilydale-Warburton Rail Trail to Strategic Cycling Corridor (SCC) standard beginning with crossings deemed more critical. This plan would identify critical crossings which need to implement prior to opening of the Project and less critical crossings that can be implemented in a staged approach post opening. ● The YRC Paths and Trails Strategy would investigate collection of data and monitoring cyclist road crossing locations to determine when and what type of formalised crossing is required at the following locations:

Mitigation measure number	Project phase	Mitigation and contingency measures
		- Station Road, Wesburn - Hooks Road, Warburton - Station Road, Warburton - Warburton Highway, Warburton (This treatment would require approval from DoT) ● Collection of data and monitoring cyclist road locations to determine if future formalised crossings or upgrades for cyclists need to be implemented. This would also help inform other mitigation measures in the future where there are risks of cyclist interactions with vehicles. ● Implement wayfinding to guide cyclists to formal safer intersections and links ● YRC Paths and Trails Strategy would investigate how and when to implement: - shared streets along local roads within Warburton - safe cyclist connections between Wesburn, East Warburton, Warburton, and Millgrove to/from the trails ● A sealed shoulder feasibility study along the length of Donna Buang Road to advocate safer cyclist connection with the DoT ● At the proposed shuttle drop off locations. Consideration would be taken into the sight distance of road traffic and their ability to see the drop off points to avoid the risk of crashes. ● At the Golf Course Trail Head a designated shared use path (not mixed with golf users) which matches the desire lines of those heading to the trails would be provided including raised priority treatments at intersections with the private roads. Path(s) would be wide enough to accommodate golf carts, pedestrians and cyclists. The design of the paths would be developed in consultation with stakeholders and would likely have minimum width of 3.5 metres. ● The shared path bridges need to provide a minimum of 2.5 metres between the handrails. ● YRC Paths and Trails Strategy to include investigation into a connection between the Lilydale-Warburton Rail Trail at Station Road and the northern side of Warburton Highway
MM-TP6	**Operation**	Operational parking management

Mitigation measure number	Project phase	Mitigation and contingency measures
		Yarra Ranges Council would establish a parking management plan for the operation of the Mountain Bike Project to ensure that parking congestion does not exceed acceptable limits for visitors or residents. It is proposed to include that: ● Operational parking management plan to include using the Wesburn Park car park as an overflow car park. Appropriate signage and wayfinding would be provided to adequately direct visitors, VMS boards would be placed at key locations to inform visitors on where to park in peak periods when the car parks are expected to be full ● Installation of bike parking in the town centre to allow visitors to safely park their bikes ● Monitoring to be developed to ensure adequate parking is available and monitoring of town centre parking via parking surveys recommended to be undertaken (quarterly in the first 12 months) and then once per year as week as event monitoring with consideration of 85 per cent occupancy thresholds to determine further action ● SALTs actions and strategy on improving car parking in Warburton would be considered to improve the utilisation of parking currently and into the future.
MM-TP7	**Operation**	Emergency management plan The emergency management plan for the Project would be established and approved before Project opening in consultation with stakeholders. This includes staff training for the Project and an evacuation plan.

15.0 Conclusion

The purpose of this report is to assess the potential traffic and transport impacts associated with the Warburton Mountain Bike Destination to inform the preparation of the EES required for the project. A summary of the key assets, values or uses potentially affected by the project, and an associated assessment of traffic and transport impacts and proposed mitigation measures, are summarised below.

With the implementation of the mitigation measures proposed throughout this assessment, potential adverse impacts on amenity and land use at local and regional scales associated with traffic and transport changes have been minimised.

15.1 Existing conditions

The existing traffic conditions for the study area roads were assessed. The review of existing conditions comprised of:

- An initial desktop study, including network jurisdiction and classifications
- Investigation of road safety data, bus routes and designated heavy vehicle routes and restrictions
- Analysis of available traffic data
- Review of relevant policies and legislation.

Based on these elements, an overview of the existing conditions was determined and provided the basis of the impact assessment. From the analysis, the existing traffic conditions were determined to have the following key characteristics:

- Cyclists: The study area is a popular location for cyclists who ride on-road, utilise existing mountain bike trails and the shared paths of the Lilydale-Warburton Rail Trail and O'Shannassy Aqueduct Trail. There is however limited cycling infrastructure with the exception of these trails in the study area. In the Warburton town centre pedestrians have footpaths and bridges to cross the Yarra River and connect into the Yarra River Walk and other walking trails. Footpaths are limited outside the town centre.
- Public transport: There is one bus route currently operating in the vicinity and within the study area. Bus route 683 travels between Chimside Park and Warburton via Lilydale Station and extends to East Warburton during the weekday
- Road network: The road network around the Project is comprised of declared and local roads in proximity to the rural townships including Warburton which is a popular tourist destination. Based on an analysis of existing traffic volumes, all roads within the study area are currently performing well below road capacity levels with negligible delays experienced by motorists.
- Crash assessment: A crash analysis within the study area showed a relatively low level of incidents, although over the period from 2014 to 2019 recorded crashes included multiple serious injury crashes involving motorcycles on Donna Buang Road and two pedestrian crashes in the town centre of Warburton. There were not seen to be locations of five or more crashes and thus no crash black spots in the study area.

15.2 Impact assessment findings – construction

As the scale and duration of construction proposed for the Warburton Mountain Bike Destination is relatively modest, the potential construction transport impacts are confined and manageable. Nevertheless, the Project related activities during the construction phase are likely to temporarily impact road safety and traffic operations. The key construction transport issues and the management and mitigation identified include:

- **Public road network and intersection accessibility for heavy vehicles:** There is the potential that the existing road and intersection infrastructure required to be used during construction is inadequate for the required heavy vehicle movements leading to increased crashes. To manage this risk and the potential impacts a Traffic Management Plan is to be implemented and pre-

construction site checks to measure and manage the risk associated with heavy vehicles (and potential over dimensional vehicles) prior to the commencement of construction activities.

- **Traffic impacts during road/lane closure for bridge construction**: There is the potential that construction traffic and road/lane closures would increase delays and impact access for the local residential and business community. Several lane and road closures would take place during construction although limited to four hours at a single time and there are suitable detours available. To a manage potential impacts a Traffic Management Plan would be implemented, road/lane closures are limited to occurring in off-peak periods to maintain access for impacted residents and emergency vehicles and no more than one road closure a day would occur to minimise any impact related to the closures. In addition, a Stakeholder Communication Plan is proposed to be implemented which would include road and lane closures notification to impacted residents and emergency services while vehicular passage may not be available or be limited.
- **Road surface/pavement deterioration**: Heavy vehicles, machinery and equipment movements are anticipated to occur on a number of local roads during the construction phase. While these movements are expected to be low in volumes, they are expected to occur on several local roads which are not part of the B-Double approved road network. To manage the risk and potential impacts to the local roads the Traffic Management Plan is to include the undertaking a pavement survey prior to construction activities occurring and improvement works undertaken after completion of construction to upgrade the road/surface pavements to existing or better than existing conditions after construction. In addition, a Stakeholder Communication Plan would also be implemented and include regular meetings with Yarra Ranges Council.

The extent of traffic impacts would depend on the design of the works and construction methodology adopted. Different combinations of lane closures, road closures, changes to intersection signalling and construction traffic volumes and routing would result in different impacts to traffic operations during construction. Careful consideration would therefore be required of the cumulative impacts during the development of the TMP when traffic specifications are confirmed.

Implementation of the identified mitigation measures would lead to efficient and safe operation of the transport network during construction, reducing the likelihood of impacts on road safety, road capacity and transport infrastructure and operations due to heavy vehicle usage.

In summary, it is considered that the Project would have a minimal and temporary impacts on the community, the local road network and road users during construction. Proposed mitigation measures such as the Traffic Management Plan and Improvement works are expected to manage and mitigate the expected impacts associated with construction activities. Consequently, potential residual impacts related to the Project are anticipated to be overall insignificant.

15.3 Impact assessment findings – operation

The Warburton Mountain Bike Destination is anticipated to generate significant additional vehicle and cycle traffic around Warburton from the visitors attracted to use the facilities. As the current transport infrastructure has available capacity and the traffic volumes would increase gradually, transport impacts are expected to be manageable. Nevertheless, the Project related activities during the operations phase have the potential to impact road safety, cyclist safety, parking and traffic operations. The key operations transport issues and mitigation measures identified include:

- **Cyclist interactions with vehicles:** There would be increased interactions between vehicles and cyclists at crossing points, intersections, on-road usage, trail head layout and shuttle drop off points. This increase the potential for crashes between cyclists and vehicles or pedestrians. To manage this risk cyclist and pedestrian safety improvements would be required which include upgraded formalised cyclist crossing points, improved signage and wayfinding, a Road Safety Audit and investigation into improvements to the surrounding roads to increase cyclist safety.
- **Risk of crashes due to increased interactions on paths and bridges:** There is the potential for increased crashes between cyclists and pedestrians on the proposed bridges and existing shared paths given the increase in cyclists volumes due to the project. To manage this risk a Road Safety Audit would be undertaken of the existing Lilydale-Warburton Rail Trail to

determine improvements required and the bridge widths are meet AustRoads standards including required clearances.

- **Emergency vehicle access and evacuation during project operations:** All trail heads would remain accessible via the existing public roads which would also be used by emergency services. A Road Safety Audit will include consideration of emergency access, any road improvement works be undertaken if deemed to be required. An emergency management plan including an evacuation plan will be developed and implemented for the project in consultation with stakeholders prior to project opening.
- **Adequacy of road network infrastructure to accommodate operations traffic in the local road network:** A Road Safety Audit is to be undertaken for Cemetery Track and Edwardstown Road prior to the commencement of operation to determine what surface improvements are required.
- **Parking at trail heads and Warburton town centre:** Given the increase in vehicles due to the project there is a risk that there is unacceptable parking congestion at trail heads and in Warburton town centre. For the trail heads it is recommended that Operational parking management plan to include using the Wesburn Park car park as an overflow car park to accommodate visitors during peak periods and events. Appropriate signage and wayfinding would be provided to adequately direct visitors. To prevent parking congestion in the town centre it is recommended to investigate a shared use path between the Lilydale-Warburton Rail Trail and Warburton Highway to promote use of cycling between destinations. An operational parking management plan would also include monitoring of the town centre parking, installing bike parking and considering previous recommendations as part of SALT's 2019 Movement and Transport Strategy.
- **Event impact assessment:** The Warburton Mountain Bike Destination Project is expected to hold events at various times through the year, ranging from local events to national events. Participants and spectators would subsequently be using the main trail heads. The assessment of the local and regional events showed that ample parking spaces are expected to be available at the Main Gold Course, Mount Donna Buang and Wesburn Park parking facilities. Similarly, anticipated traffic volumes which are expected to be relatively low would be fully accommodated on the road network. It is noted that specific traffic impact assessments would be required for state and national events.

15.4 Cumulative impact assessment findings

As the Warburton Water World (WWW) opened in September 2020 in Warburton on Woods Point Road, a cumulative impact assessment of the transport network was undertaken based on the operational traffic peak of visitor volumes for the project and the WWW. While the WWW would add traffic to the arterial roads also utilised by the visitors to the mountain bike trails, it is expected that the road network would have sufficient capacity to accommodate the cumulative volumes. Furthermore, while the assessment of the town parking capacity shows it would exceed acceptable levels, impact to the surrounding roads and town centre car parking is currently being managed by YRC and no mitigation measures are required as part of this EES.

15.5 Mitigation and contingency measures

Mitigation measures have been developed in response to the impact assessment to minimise risk during construction:

- Traffic Management Plan (TMP)
- Stakeholder consultation
- Road Safety Audit
- Improvement works
- Cyclist and pedestrian safety improvements
- Operational parking management including monitoring
- Emergency management plan

Implementation of the mitigation measures would lead to efficient and safe operation of the transport network during operation, reducing the likelihood of impacts on cyclist safety, road safety, parking and transport infrastructure.

15.6 Summary of residual impacts

Based on the implementation of the mitigation measures described above, the following residual impacts have been identified:

- Given the existing capacity of the transport network to easily accommodate the limited workforce required to deliver the project, construction impacts associated with the increase in transport are likely to be minimal and manageable. Following implementation of mitigation measures, residual impacts on traffic and transport due construction of the project would not be significant. The effects of the project would be mitigated by ensuring road and lane closures as a result of bridge construction are limited to a few hours for a number of separate occasions, meaning that road users would only be impacted for a small period of time. In addition, the number of road users that are impacted would be minimised by recommending that closing lanes and roads are only undertaken during off-peak periods. Road users would be notified prior to closures and would have access to alternate lanes or routes during these closures. With the implementation of careful and considered traffic management through the limitation of road and lane closures, residual impacts are not anticipated to be significant.
- The operation of the project would likely generate an increase in demand on the surrounding transport network. An assessment of the existing road capacity has determined that increases in traffic and parking could be generally accommodated within the existing network capacity. In addition, mitigation measures would be implemented to ensure residual impacts are avoided or minimised. The effects would be mitigated by:
    - Conducting a road safety audit to inform safety and connectivity improvements for both pedestrians and cyclist within the study area (including along the Lilydale-Warburton Rail Trail) to be completed prior to commencement of works
    - Appropriately prioritising cyclists along key cyclist routes shared with vehicles in order to minimise vehicle and cyclist interactions
    - Identifying locations with potential geometric or safety issues so improvements can be made to ensure safe bidirectional vehicular movements and improved emergency accessibility.
    - Provision of vehicle car parking and upgraded access and facilities to cycle to/from the town centre as part of the project to avoid exceedance of the acceptable parking occupancy benchmarks.
    - Ensuring that during local and regional events there is additional visitor capacity with respect to both the road network and parking availability. Events would be short in duration and infrequent, however each event would require a specific traffic management plan to manage impacts. State events are anticipated every two years and national events every four years. Specific TMPs would be developed for each event to further manage transport impacts.

Following implementation of mitigation measures, residual impacts to the transport network due to operational activities are expected to be minimal. Where residual impacts are expected, they would be localised, infrequent and short term (for example the duration of an event).

In summary, it is considered that the Project would have moderate residual impacts on the community, the local road network and road users during operation. Improvements proposed to mitigate potential impacts from operational activities are expected to be beneficial to road users and the local community as it would lead to increased safety for drivers, pedestrians and cyclists. Proposed operational parking management mitigation measures would also contribute to improving, in the long term, the efficiency and safety of the operation of the road network in Warburton.

Appendix A
Existing conditions

Revision G – 14-09-2021

Prepared for – Yarra Ranges Council – ABN: 21 973 226 012

Site photos

Warburton Highway - Wesburn *Source: Google Maps*

Warburton Highway – Warburton *Source: Google Maps*

Donna Buang Road *Source: Google Maps*

Donna Buang Summit Road *Source: Google Maps*

Site photos

Dammans Road (facing west) *Source: SALT TIA 2019*

Dammans Road (facing east) *Source: SALT TIA 2019*

	
Mayer Bridge (facing south) *Source: SALT 2019 TIA*	**Warburton Highway & Mayer Bridge Intersection (facing west)** *Source: SALT 2019 TIA*
	
Old Warburton Road *source: YRC*	**Old Warburton Road** *source: YRC*
	
Mount Bride Road *source: YRC*	**Cemetery Track** *source: YRC*

	
Cemetery Track near its intersection with Edwardstown Road *source: YRC*	**Edwardstown Road** *source: YRC*
	
Dee Road *source: YRC*	**Dee Road** *source: YRC*

Appendix B

Guidelines and standards

Yarra Ranges Council road hierarchy

Classification	Description	Responsible Authority
State Arterial Roads	Road classification for major routes used by commercial vehicles and large traffic volumes. These roads are the responsibility of VicRoads and include state highways, tourist roads and main roads.	VicRoads
Collector Roads	Road classification for links between arterial and local roads that have a higher traffic usage and speed rating and serve many properties or adjacent local roads. Collector Roads include both sealed and unsealed road surfaces.	Council
Local Roads	Road classification for access to private property. These roads have low traffic usage and speed ratings and generally do not perform a through road or alternative route function within the road system. Local Roads include both sealed and unsealed road surfaces.	Council
Non-Maintained Roads	Road classification for roads not maintained by Council and includes roads maintained by other responsible authorities such as Department of Environment Land Water and Planning. Also included in this classification are roads providing private access to a single or limited number of properties. A private access may exist along a road reserve from a public road before reaching a property access. This classification additionally relates to driveway/shared access/roadway created as part of an Owners Corporation subdivision.	Other

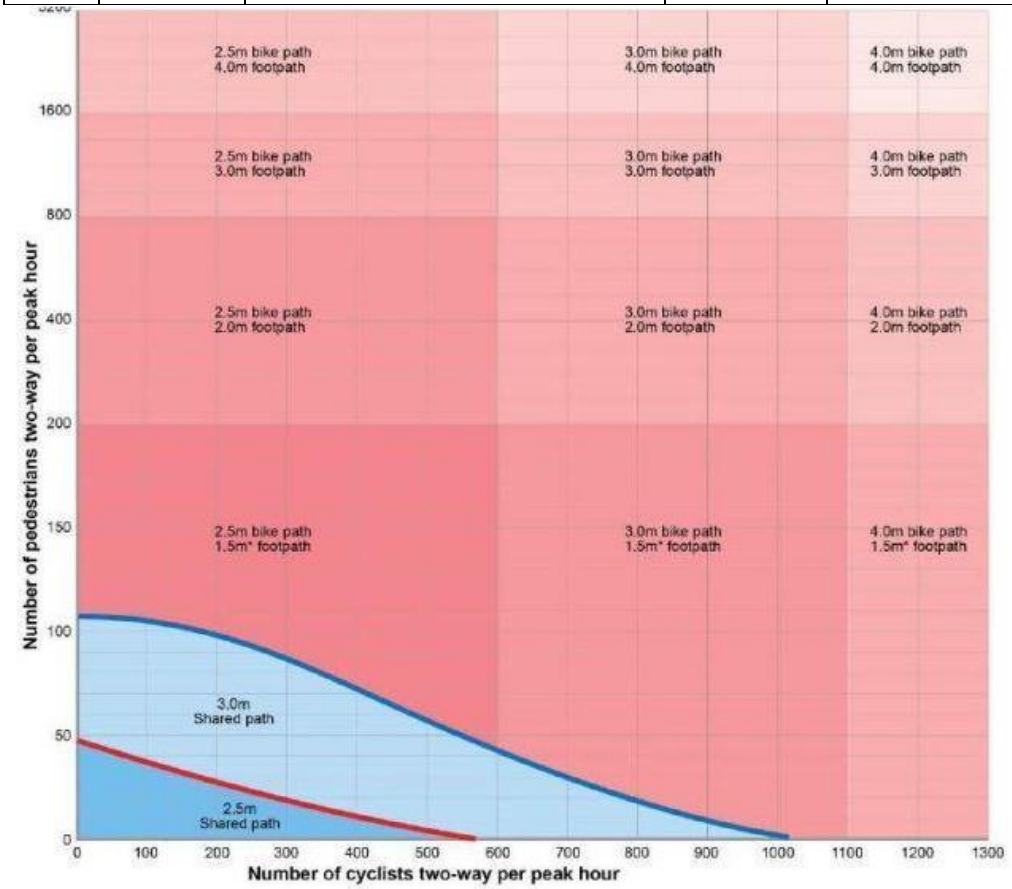
Yarra Ranges Planning Scheme Table C1

Classification	Description	Volume per day	Carriageway
Access Street - Level 1	A street providing local residential access where traffic is subservient, speed and volume are low and pedestrian and bicycle movements are facilitated.	1000 - 2000	5.5 metres
Access Street - Level 2		2000 - 3000	7 - 7.5 metres
Connector Street - Level 1	A street that carries higher volumes of traffic. It connects access places and access streets through and between neighbourhoods.	3000	3.5 metres minimum lane width
Connector Street - Level 2		3,000 - 7,000	3.5 metres minimum lane width

DELWP road classification and maintenance standards *source: Road Operational Guidelines 2007*

Road class	Class type	Description	Average Daily Traffic	Minimum carriageway	Design speed
5A	Primary	All-weather road, predominantly two lane and mainly sealed	> 100	7 metres	50 – 80 kilometres per hour

5B	Secondary	All-weather two-lane road, formed and gravelled or single lane sealed road with gravel shoulders	30 - 100	5.5 metres	30 – 70 kilometres per hour
5C	Minor	Generally all-weather, single lane two-way unsealed formed road, usually lightly gravelled	20 - 50	4 metres	20 – 60 kilometres per hour
5D	Access	Substantially single lane, two-way, generally dry weather formed (natural materials) track/road	< 20	4 metres	20 – 40 kilometres per hour
5E	Tracks	Predominantly single lane, two-way earth tracks (unformed) at or near the natural surface level	< 10	3 metres	-

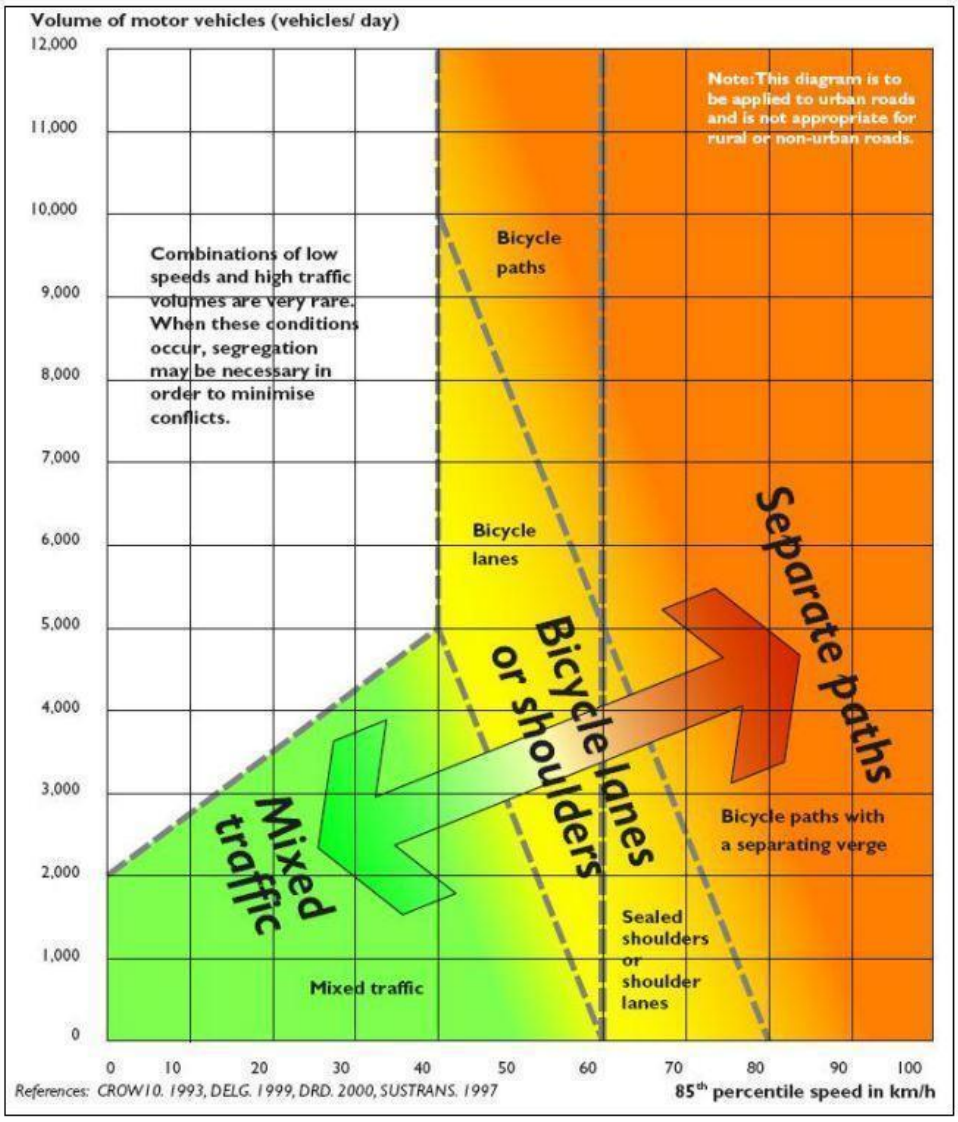


** Indicates that the 1.5 m footpath width is the low use minimum only and is not appropriate at higher pedestrian volumes.*

Notes: The chart is not to be used for pedestrian paths only.
In this guide, the term pedestrian path is used for a footpath.
Where the path widths are shown for a bicycle path and a pedestrian (footpath) path together, these are separated paths.
A 50/50 directional split is typical for most recreational paths which have high use in both directions.
The directional split refers to the proportion of the total number of path users travelling in each direction, e.g. a 50/50 directional split means that 50% of the total volume of path users travel in each direction.

Source: Queensland Department of Transport and Main Roads (2015a).

AustRoads Path widths for a 50/50 directional split



Separation of cyclist and motor vehicles by speed and volume *Source: Austroads (2014a) Figure 4.7, and Roads and Traffic Authority NSW (2005) Figure 3.2*

Appendix C
Risk assessment

Risk ID	Environmental value	Risk name	Risk pathway	Initial mitigation	Initial risk level			Final mitigation	Residual risk level		
					C	L	Risk		C	L	Risk
Construction											
TP1	Safety	Safety impacts to road users due to the Warburton Highway bridge construction	Construction activity for the Warburton Highway Bridge may result in increased crash risks to road users	MM-TP1 Traffic Management Plan MM-TP2 - Stakeholder Communication Plan	Minor	Possible	Low	MM-TP1 Traffic Management Plan - Construction activities and road closures to occur during off peak periods only	Minor	Rare	Very Low
TP2	Accessibility	Public road network and intersection accessibility for heavy vehicles	Risk of crash at intersection of public roads due to non-complying sight lines, stopping distance, lack of lighting and space restrictions. Insufficient road network infrastructure to accommodate safe movement of over-dimensional and over-mass loads	MM-TP1 Traffic Management Plan	Moderate	Possible	Medium	MM-TP1 Traffic Management Plan – pre-construction site checks	Minor	Unlikely	Low

Risk ID	Environmental value	Risk name	Risk pathway	Initial mitigation	Initial risk level			Final mitigation	Residual risk level		
					C	L	Risk		C	L	Risk
TP3	Road performance	Capacity of road network to accommodate workforce and heavy vehicle movements during construction	Additional traffic during construction may result in increased congestion exceeding level of service D.	No mitigation measures identified	Insignificant	Rare	Very Low	No additional mitigation measures identified	Insignificant	Rare	Very Low
TP4	Accessibility	Traffic impacts during road/lane closure for bridge construction	Road/lane closure results in impacts on residential, business and emergency vehicle access.	MM-TP1 Traffic Management Plan – Provision of temporary detours, roads closed in off-peak periods only, Notification of emergency services of closures MM-TP2 Stakeholder communication	Moderate	Possible	Medium	MM-TP1 Traffic Management Plan - Adequate signage of detours and VMS boards. Warburton Highway and Old Warburton Road would not be closed at the same time and no more than one road closure a day would occur to minimise any impact related to the closures.	Insignificant	Unlikely	Low
TP5	Road performance	Traffic impacts during lane closures for bridge construction at Warburton Highway	Lane closures result in the road network increased congestion exceeding level of service D.	MM-TP1 Traffic Management Plan – Provision of temporary detours, lanes closed in off-peak periods only	Minor	Possible	Low	No additional mitigation measures identified	Insignificant	Unlikely	Very Low

Risk ID	Environmental value	Risk name	Risk pathway	Initial mitigation	Initial risk level			Final mitigation	Residual risk level		
					C	L	Risk		C	L	Risk
TP6	Road network infrastructure performance	Road surface/ pavement deterioration	Local roads experience deterioration in the quality of the pavement due to the movement of heavy vehicles, machinery and plant	MM-TP1 Traffic Management Plan – pavement survey MM-TP2 Stakeholder communication – Regular meetings with road authorities	Moderate	Possible	Medium	MM-TP4 Improvement Works - upgraded road surface/pavement for all local roads within the study area to existing or better than existing conditions after construction (subject to the pavement survey results)	Minor	Unlikely	Low
TP7	Safety	Pedestrians and cyclists safety and connectivity	Closures to the Rail Trail and heavy vehicles movements impact pedestrians and cyclists resulting in a reduction in public safety and amenity	MM-TP1 Traffic Management Plan MM-TP2 Stakeholder Communication Plan	Minor	Unlikely	Low	No additional mitigation measures identified	Minor	Unlikely	Low
TP8	Road network infrastructure performance	Dirt on roads from construction vehicles	Plant and spoil trucks deposit construction debris on public roads leading to dust generation and perceived loss of amenity and public health and safety issues.	MM-TP1 Traffic Management Plan - including dust and debris management strategies. Dust suppression methods such as covering vehicle loads and street sweeping	Minor	Unlikely	Low	No additional mitigation measures identified	Minor	Unlikely	Low

Risk ID	Environmental value	Risk name	Risk pathway	Initial mitigation	Initial risk level			Final mitigation	Residual risk level		
					C	L	Risk		C	L	Risk
TP9	Road network infrastructure performance	Public bus safety and performance impacts	Movement of heavy vehicles and potential lane closure impacts safety and bus operations along Warburton Highway.	MM-TP1 – Transport Management Plan MM-TP2 Stakeholder communication – consultation with Yarra Ranges Council and bus operators	Minor	Unlikely	Low	No additional mitigation measure identified	Minor	Unlikely	Low

Risk ID	Environmental value	Risk name	Risk pathway	Initial mitigation	Initial risk level			Final mitigation	Residual risk level		
					C	L	Risk		C	L	Risk
Operation											
TP10	Safety	Cyclist interaction with vehicles	Risk of crashes due to increased interactions on road network, trail heads and crossing points and non-compliant intersections	MM-TP5 Cyclist and pedestrian safety improvements - including cyclist connection studies, implementing wayfinding and signage.	Severe	Possible	High	MM-TP5 Cyclist and pedestrian safety improvements - physical infrastructure such as priority crossings, shared use paths and signalised crossings. MM-TP3 Road Safety Audit - ● Lilydale-Warburton Rail Trail and crossing points. ● On road intersections in the study area that would experience an increase in cyclist volumes. ● Trail road crossing points. ● Shuttle drop off points	Major	Unlikely	Medium

Risk ID	Environmental value	Risk name	Risk pathway	Initial mitigation	Initial risk level			Final mitigation	Residual risk level		
					C	L	Risk		C	L	Risk
TP11	Safety	Safety and amenity risks to pedestrian and cyclists due to inadequate end of trip facilities	Facilities for mountain bike visitors are not adequate, this includes bike parking, drink taps, toilets and bike wash stations	MM-TP5 Cyclist and pedestrian safety improvements: ● Yarra Ranges Council to assess bike parking provision after 12 months of operation. ● Drink taps/water bottle filling locations would be located in close proximity to the car park and bike path for the Golf Course and Wesburn trail heads. This would include an assessment of bike wash station recycled water use risks and management (contaminated water) to ensure drinking taps have potable water supply and ensure new or existing toilet provision has capacity to manage wastewater loads.	Minor	Unlikely	Low	No additional mitigation measures identified	Minor	Unlikely	Low
TP12	Safety	Risk of crashes due to increased interactions on paths and bridges	Crashes occur between pedestrians and cyclists due to increased volumes and interactions on paths and bridges	MM-TP3 Road Safety Audit – Warburton-Lilydale Rail Trail MM-TP5 Cyclist and pedestrian safety improvements - bridge clearances would be provided.	Moderate	Possible	Medium	MM-TP4 Improvement works	Minor	Unlikely	Low

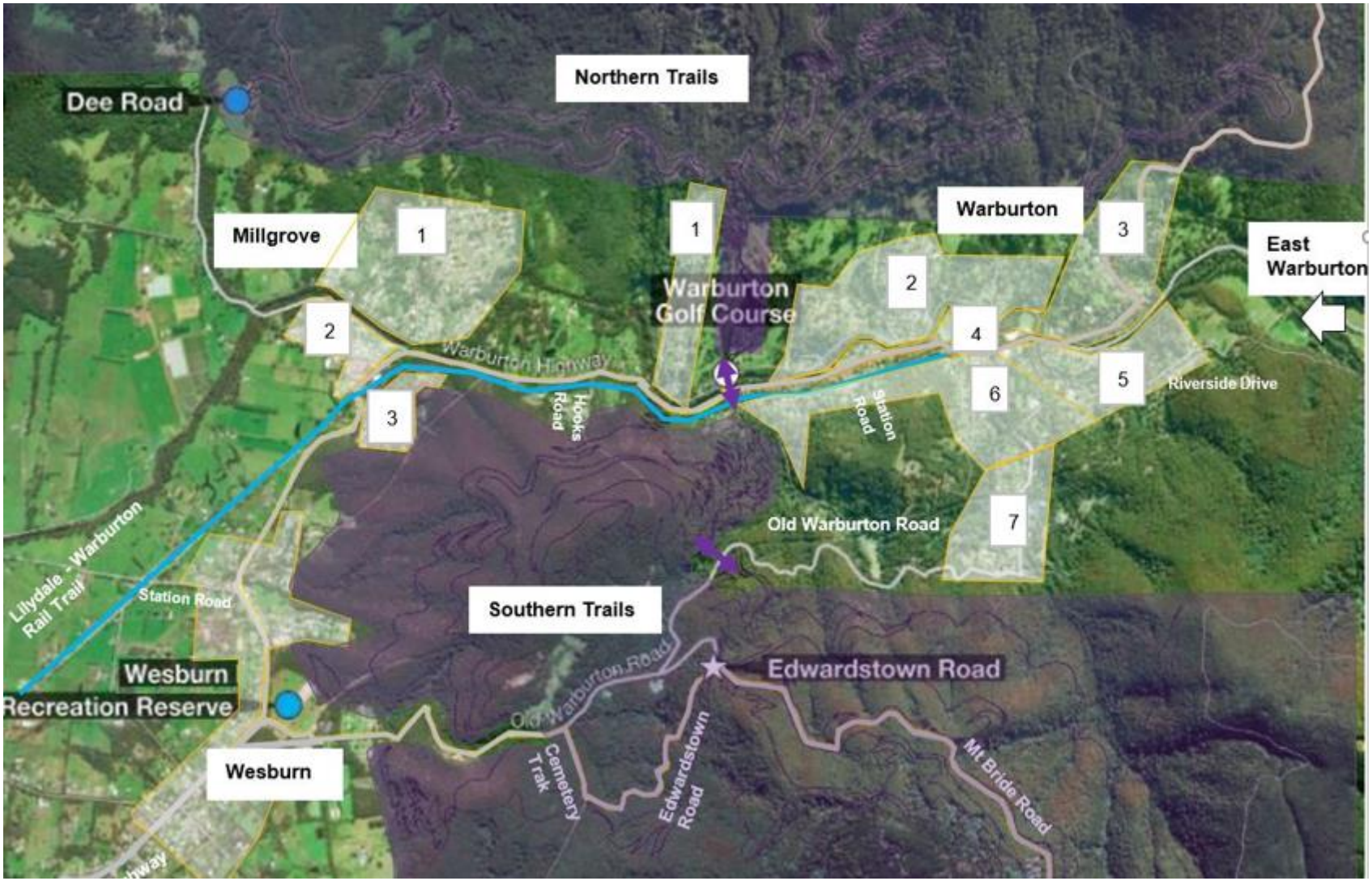
Risk ID	Environmental value	Risk name	Risk pathway	Initial mitigation	Initial risk level			Final mitigation	Residual risk level		
					C	L	Risk		C	L	Risk
TP13	Road network and intersection performance	Capacity of road network to accommodate workforce, shuttles and visitor traffic generated by the project	Additional traffic during operation may result in increased congestion exceeding level of service D.	No initial mitigation measures	Minor	Possible	Low	No additional mitigation measures identified	Minor	Unlikely	Low
TP14	Accessibility	Impacts to emergency access due to the project operations	Inadequate emergency vehicle access at trail heads or trails	MM-TP3 Road Safety Audit	Moderate	Possible	Medium	MM-TP4 Improvement Works – upgrade of roads subject to the results of the Road Safety Audit MM-TP7 Emergency management plan	Minor	Unlikely	Low
TP15	Road network infrastructure performance	Insufficient road network infrastructure to accommodate operations traffic in the local road network	Deficient width and road surface along Cemetery Trak and Edwardstown Road for shuttles.	MM-TP3 Road Safety Audit for Cemetery Track and Edwardstown Road	Moderate	Possible	Medium	MM-TP4 Improvement works - Subject to the Road Safety Audit findings, physical improvements to Cemetery Track and Edwardstown Road may be required.	Minor	Unlikely	Low
TP16	Road network infrastructure performance	Road surface/ pavement deterioration	Local roads experience deterioration in the quality of the pavement due to the movement of shuttle buses and visitor vehicles	No initial mitigation measures	Minor	Possible	Low	No additional mitigation measures identified	Minor	Possible	Low

Risk ID	Environmental value	Risk name	Risk pathway	Initial mitigation	Initial risk level			Final mitigation	Residual risk level		
					C	L	Risk		C	L	Risk
TP17	Road performance	Parking at trail heads	Parking supply at trail heads is insufficient leading to illegal parking impacting residents and business	MM-TP6 Operational Parking Management Plan	Moderate	Possible	Medium	MM-TP6 Operational Parking Management Plan – At/approaching, information and appropriate signage to be provided to redirect driving visitors to overflow at Wesburn Park.	Minor	Possible	Low
TP18	Road performance	Parking in Warburton town centre	Parking supply in Warburton town centre is insufficient and would be at-capacity due to the project	MM-TP6 Operational Parking Management Plan - ● Install bike parking in the town centre to allow visitors to safely park their bikes ● The impact on the town centre parking would be monitored in the first 12 months of project opening.	Moderate	Possible	Medium	MM-TP6 Operational Parking Management Plan	Minor	Possible	Low
TP19	Road performance	Events	Events would cause unacceptable road and parking congestion	All events would require a specific Traffic Management Plan (MM-TP1) and in the case of state and national events specific traffic impact assessments would also be required.	Moderate	Possible	Medium	No additional mitigation measures identified	Minor	Possible	Low

Appendix D
Cyclist distribution

Revision G – 14-09-2021

Prepared for – Yarra Ranges Council – ABN: 21 973 226 012


Northern Trails
Dee Road
Millgrove
1
2
3
Warburton
1
2
3
4
5
6
7
Warburton Golf Course
East Warburton
Warburton Highway
Hooks Road
Station Road
Riverside Drive
Old Warburton Road
Lilydale - Warburton Rail Trail
Station Road
Southern Trails
Wesburn Recreation Reserve
Wesburn
Old Warburton Road
Edwardstown Road
Cemetery Trak
Edwardstown Road
Mt Bride Road

Origin	Destination	Distribution	Volume
Wesburn	North trails	Warburton Highway, Highway track, Warburton Rail Trail, **Golf Course Head**	12
	Southern trails	Warburton Highway, **Wesburn Park**	62
Millgrove			
1	North trails Golf Course	McKenzie King Dr, Warburton Highway, informal crossing into Warburton Rail Trail, **Golf Course head**	15
	North trails Dee Road		15
	Southern trails	McKenzie King Dr, Warburton Highway, informal crossing into Warburton Rail Trail, **onto southern trails**	30
2	North trails	Gillis St , Warburton Highway, informal crossing into Warburton Rail Trail, **Golf Course head**	5
	North trails Dee Road		5
	Southern trails	Gillis St, Warburton Highway, informal crossing into Warburton Rail Trail, **onto southern trails**	10
3	North trails	Warburton Highway, POS onto Warburton Rail Trail, **Golf Course Head**	5
	North trails Dee Road		5
	Southern trails	Warburton Highway, POS onto Warburton Rail Trail, **onto southern trails**	10
Warburton			
1	North trails	Dammans Road west, **Golf Course Trail Head**	12
	Southern trails	Dammans Road west, Bridge, Warburton Rail Trail, **southern trails**	12
2	North trails	Blackwood Avenue, Dammans Road, **Golf Course Head**	25
	Southern trails	Blackwood Avenue, Dammans Road, Bridge, Warburton Rail Trail**, southern trails**	25
3	North trails	O'Shannasay Aqueduct Trail	30
	Southern trails	Donna Buang Road, Warburton Highway, Warburton Rail Trail, **southern trails**	30
4	North trails	Warburton Highway, Station Road, Warburton Rail Trail, **golf course head**	6

Origin	Destination	Distribution	Volume
	Southern trails	Warburton Highway, Station Road, Warburton Rail Trail, **southern trails**	6
5	North trails	Riverside Drive, Warburton Highway, Warburton Rail Trail, **Golf Course Head**	16
	Southern trails	Riverside Drive, Warburton Highway, Warburton Rail Trail, **southern trails**	16
6	North trails	Warburton Rail Trail, **golf course head**	35
	Southern trails	Warburton Rail Trail, **southern trails**	35
7	North trails	Old Warburton Road, Park Road, Warburton Highway, Warburton Rail Trail, **Golf Course Head**	10
	Southern trails	Old Warburton Road, **southern trails**	10
East Warburton	North trails	Riverside Drive, Warburton Highway, Warburton Rail Trail, **Golf Course Head**	42
	Southern trails	Riverside Drive, Warburton Highway, Warburton Rail Trail, **southern trails**	42

Cycling from within Yarra Ranges	136		
From east	3%	4	From Warburton Highway east
from west	97%	132	From Warburton Rail trail west