



WARBURTON MOUNTAIN BIKE DESTINATION PROJECT PROPOSED TRAIL HEADS

TRAFFIC IMPACT ASSESSMENT

SALT³

WARBURTON MOUNTAIN BIKE DESTINATION PROJECT PROPOSED TRAIL HEADS

Client: Yarra Ranges Council

Report Reference: 19137T

File Path: Y:\2019\19137T - Warburton Mountain Bike Destination Planning Application\08 Reports\19137TREP01F01.docx

Tuesday, August 06, 2019

Document Control

Version:	Prepared By:	Position:	Date:	Reviewed By:	Position:	Date:
D01	Lewis Collins	Undergraduate Engineer	16 July 2019	Jarrold Wicks	Associate Director	19 July 2019
F01	Jarrold Wicks	Associate Director	6 August 2019			

© Sustainable Transport Surveys Pty Ltd All Rights Reserved. Copyright in the whole and every part of this document belongs to Sustainable Transport Surveys Pty Ltd and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person without the prior written consent of Sustainable Transport Surveys Pty Ltd.

This document is produced by Sustainable Transport Surveys for the benefits and use by the client in accordance with the terms of engagement. Sustainable Transport Surveys does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document

MELBOURNE Level 3/51 Queen Street, Melbourne VIC 3000
+61 3 9020 4225

SYDNEY Level 17/40 Mount Street, North Sydney NSW 2060
+61 2 8415 9781

www.salt3.com.au

TRAFFIC ENGINEERS / WASTE ENGINEERS / TRANSPORT PLANNERS / ROAD SAFETY AUDITORS

2016 EAST GIPPSLAND BUSINESS AWARDS FINALIST Professional Services, Innovation, Child & Family Friendly

The logo for SALT3, featuring the word "SALT" in a bold, white, sans-serif font with a superscript "3" to its right, all contained within a black, irregular polygonal shape. This shape is part of a larger graphic composed of several overlapping triangles in shades of blue, teal, and orange.

CONTENTS

1	INTRODUCTION	1
2	EXISTING CONDITIONS	1
21	LOCATION & SITE DESCRIPTION	1
2.1	WARBURTON GOLF CLUB	1
2.2	MT DONNA BUANG	2
2.3	MT TUGWELL	3
22	ZONING & OVERLAYS	3
2.21	WARBURTON GOLF CLUB	3
2.22	MT DONNA BUANG	3
2.23	MT TUGWELL	3
23	SURROUNDING LAND USE	4
2.31	WARBURTON GOLF CLUB	4
2.32	MT DONNA BUANG	4
2.33	MT TUGWELL	4
24	ROAD NETWORK	4
2.41	WARBURTON GOLF CLUB	4
2.42	MT DONNA BUANG	6
2.43	MT TUGWELL	6
25	SUSTAINABLE TRANSPORT	6
2.51	WALKING	6
2.52	CYCLING	6
2.53	BUSES	7
26	EXISTING TRAFFIC VOLUMES	7
2.61	TUBE COUNT DATA	7
2.62	TURNING MOVEMENT DATA	8
27	CRASH HISTORY	9
3	PROPOSAL	11
4	CAR PARKING	13
41	PARKING GENERATION RATE	13
42	PARKING REQUIREMENTS	13
43	EVENT PARKING	14
5	CAR PARK DESIGN CONSIDERATIONS	15
5.1	WARBURTON GOLF CLUB	15
5.2	MT DONNA BUANG	15
5.3	MT TUGWELL	15
6	EXTERNAL ACCESSIBILITY AT GOLF CLUB	16
7	TRAFFIC GENERATION, DISTRIBUTION AND IMPACT	17
7.1	WARBURTON GOLF CLUB	17
7.1.1	TRAFFIC GENERATION	17
7.1.2	TRAFFIC DISTRIBUTION	17

7.1.3	TRAFFIC IMPACT	18
7.2	MT DONNA BUANG	20
7.3	MT TUGWELL	20
8	CONCLUSION	21
APPENDIX 1	SIDRA OUTPUTS	1



LIST OF FIGURES

Figure 1	Location of subject site.....	1
Figure 2	Aerial view of Warburton Golf Club Trail Head Location.....	2
Figure 3	Mt Donna Buang Trail Head Location.....	2
Figure 4	Mt Tugwell Trail Head Location.....	3
Figure 5	Dammans Road facing west.....	4
Figure 6	Dammans Road facing east.....	4
Figure 7	Mayer Bridge facing north.....	5
Figure 8	Mayer Bridge facing south.....	5
Figure 9	Warburton Highway facing west.....	5
Figure 10	Warburton Highway facing east.....	5
Figure 11	Mt Bride Road.....	6
Figure 12	Peak hour volumes Friday 17 May 2019 (3pm – 4pm).....	8
Figure 13	Peak hour volumes Saturday 18 May 2019 (2pm – 3pm).....	8
Figure 14	Crash Locations (last 5 years).....	9
Figure 15	Proposed extent of proposed new car parking area (approx.).....	12
Figure 16	Typical sharrow treatment (source: dpti.sa.gov.au).....	16
Figure 17	Peak hour traffic distribution.....	17
Figure 18	Future traffic volumes at Warburton Highway / Mayer Bridge (Saturday, 2pm – 3pm).....	18

LIST OF TABLES

Table 1	Traffic volume and speed count summary.....	7
Table 2	Parking demand scenarios (Mature operation 6 – 12 years).....	14
Table 3	Parking demand scenarios (Full Potential 13 – 18 years).....	14
Table 4	Level of Service Ratings.....	19
Table 5	SIDRA Outputs – Existing Conditions.....	19
Table 6	SIDRA Outputs – Future Conditions.....	19



1 INTRODUCTION

SALT has been engaged by Yarra Ranges Shire Council to undertake a traffic impact assessment for the proposed trail heads in association with the broader Mountain Bike Destination project. This includes a primary trail head at Warburton Golf Club and secondary trail heads at Mt Donna Buang and Mt Tugwell.

In the course of preparing this report, the following tasks have been undertaken:

- Relevant project information and patronage projections supplied by Council have been reviewed;
- The subject sites and surrounding environs have been inspected;
- Traffic volume data has been collected;
- Traffic modelling has been carried out to quantify the impacts of additional traffic flow on nearby roads and the key intersection of Warburton Highway / Mayer Bridge; and
- The parking and traffic implications of the proposal have been assessed.

The following sets out SALT’s findings with respect to the traffic engineering matters of the proposal.

2 EXISTING CONDITIONS

2.1 LOCATION & SITE DESCRIPTION

2.1.1 WARBURTON GOLF CLUB

The primary trail head, attracting the most patronage, would be located at the Warburton Golf Club, 17 Dammans Road, Warburton. **Figure 1** shows the location of the site with respect to the surrounding street network. An aerial view of the site is provided in **Figure 2**.

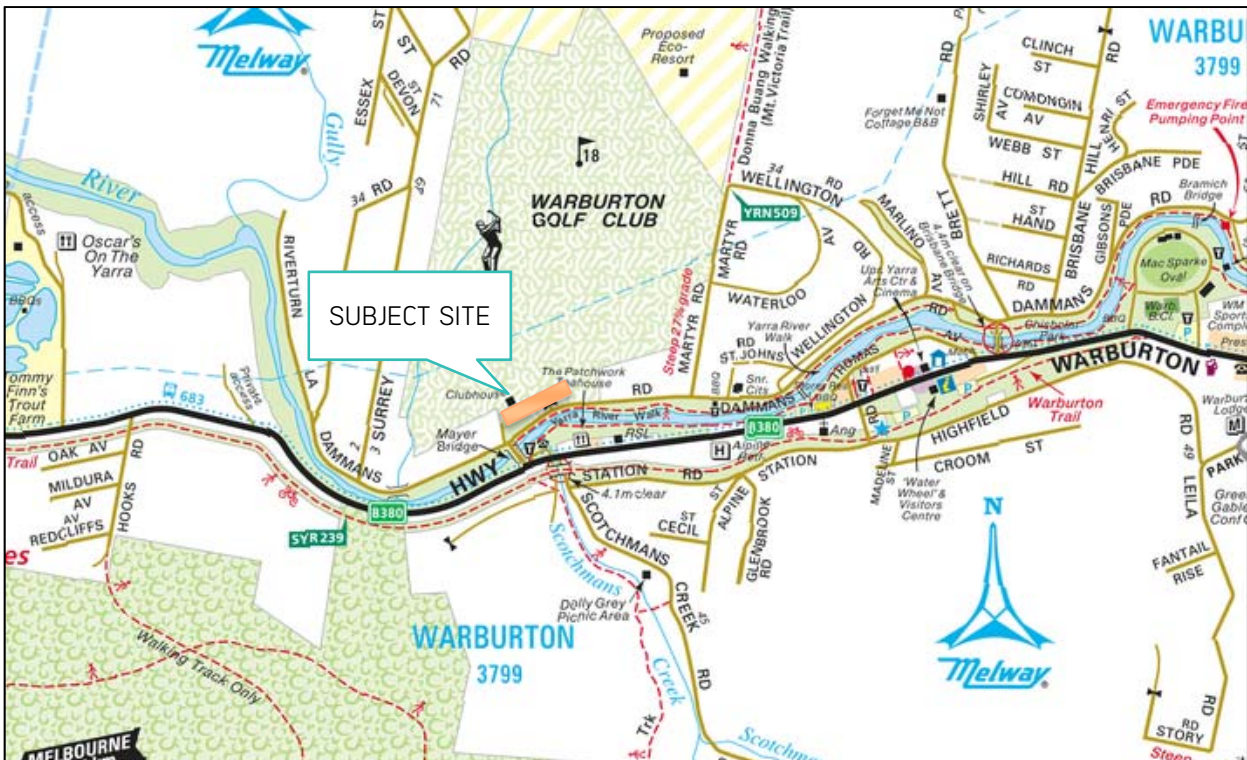


Figure 1 Location of subject site



Figure 2 Aerial view of Warburton Golf Club Trail Head Location

2.1.2 MT DONNA BUANG

A secondary trail head would be located on the Mt Donna Buang summit from which a number of trails will commence. Should the summit car park be fully occupied, the next two car parks down the mountain would be utilised – refer Figure 3.

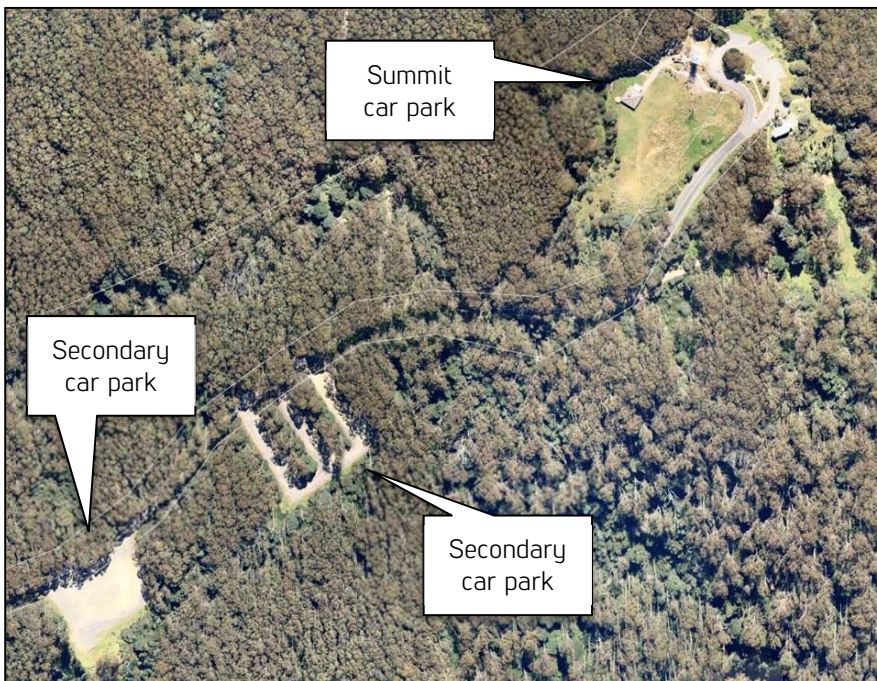
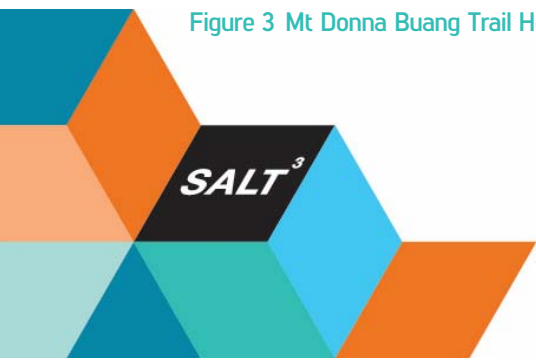


Figure 3 Mt Donna Buang Trail Head Location



2.1.3 MT TUGWELL

Another secondary trail head would be located on Mt Bride Road, Mount Tugwell, from which a number of trails would commence – refer **Figure 4**. There are no existing parking facilities or infrastructure at this location.

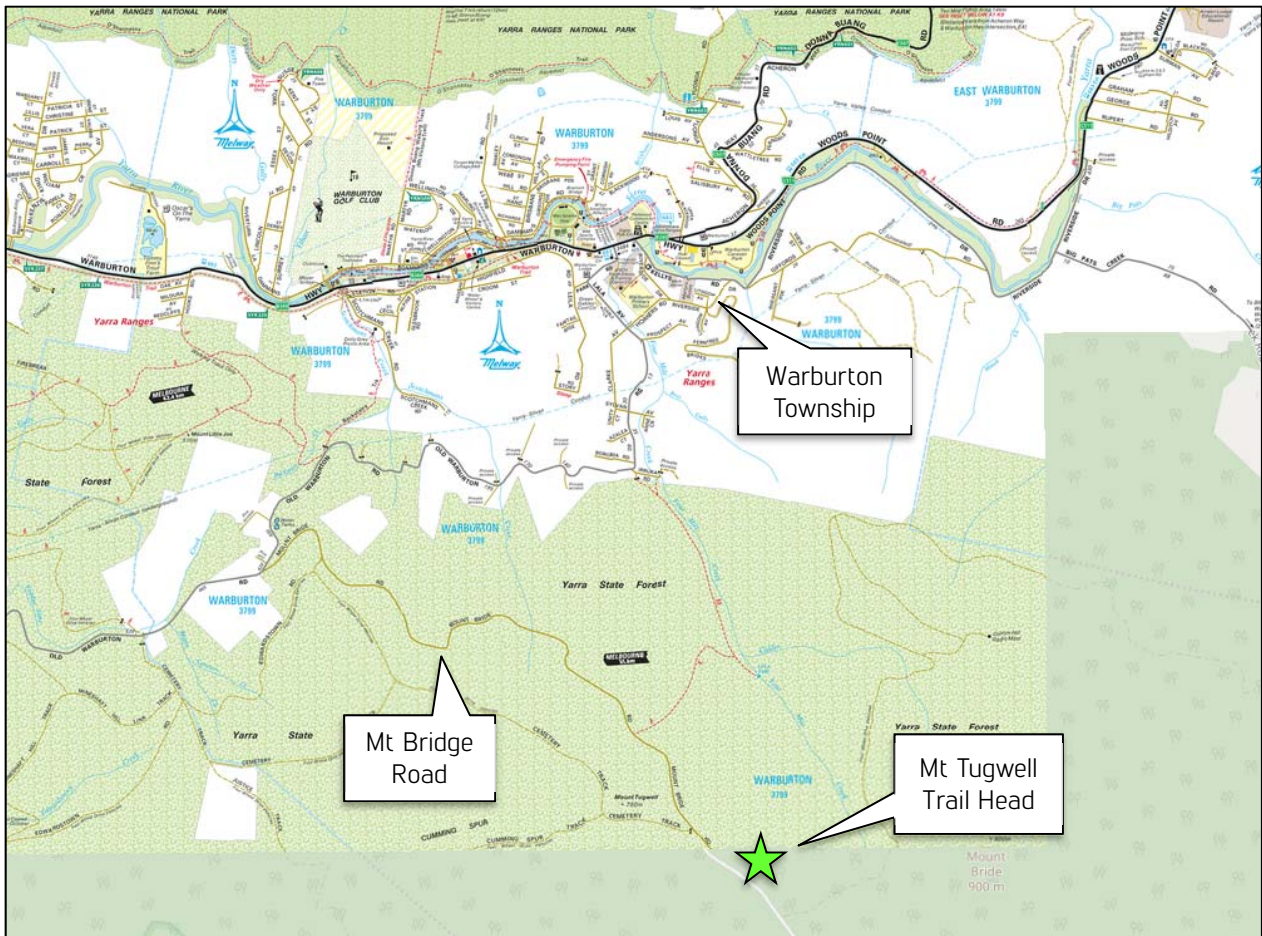


Figure 4 Mt Tugwell Trail Head Location

2.2 ZONING & OVERLAYS

2.2.1 WARBURTON GOLF CLUB

The Warburton Golf Club is located within a Public Use Zone – Service and Utility (PUZ1) and a Green Wedge Zone – Schedule 4 (GWZ4). Applicable overlays include:

- Bushfire Management Overlay (BMO);
- Environmental Significance Overlay (ESO) – Schedule 1;
- Erosion Management Overlay (EMO);
- Land Subject to Inundation Overlay (LSIO) – Schedule 1;
- Significant Landscape Overlay – Schedule 3 and 4.

2.2.2 MT DONNA BUANG

The Mt Donna Buang site is zoned Public Conservation & Resource Zone (PCRZ).

2.2.3 MT TUGWELL

The Mt Tugwell site is zoned Public Conservation & Resource Zone (PCRZ).

2.3 SURROUNDING LAND USE

2.3.1 WARBURTON GOLF CLUB

The surrounding land use consists of:

- Residential to the east and west;
- Yarra River to the south including walking trails;
- Warburton Bushland Reserve to the south of the site across Warburton Highway; and
- Shops / restaurants / cafes approximately 600 metres to the east along Warburton Highway.

2.3.2 MT DONNA BUANG

The Mt Donna Buang summit is a tourist destination that is currently and will continue to be visited by sightseers throughout the year.

2.3.3 MT TUGWELL

The surrounding area is heavily forested and there are no other nearby land uses.

2.4 ROAD NETWORK

2.4.1 WARBURTON GOLF CLUB

DAMMANS ROAD

The Warburton Golf Club is situated on Dammans Road, which is classified as a collector road under the Shire of Yarra Ranges Road Register. Council's Road Management Plan defines a collector road as:

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.

Dammans Road provides a route for areas located north of the Yarra River to gain access to/from Warburton Highway. Connections to the highway are available at Mayer Bridge (opposite the subject site) and at Brett Road approximately 1km east of the subject site. Drivers can also gain access to Warburton Highway via Blackwood Avenue (a continuation of Dammans Road) approximately 2km east of the subject site.

The unmarked carriageway is approximately 6.8m wide and supports one lane of traffic in each direction. On-street parking is permitted on both sides, and localised gravel shoulders provide opportunity to park clear of the carriageway in certain places.

As there is no posted speed limit, the default urban speed of 50km/h applies.

Views of Dammans Road in the vicinity of the subject site are provided in **Figure 3 & 4**.



Figure 5 Dammans Road facing west



Figure 6 Dammans Road facing east



MAYER BRIDGE

Mayer Bridge provides a link over the Yarra River between Dammans Road and Warburton Highway. The roadway has a width of 6.1m and supports one lane of traffic in each direction. A 1.7m footpath is also present on the eastern side of the bridge. It has an approximate length of 63m.

Views of Mayer Bridge are provided in **Figure 5 & 6**.



Figure 7 Mayer Bridge facing north



Figure 8 Mayer Bridge facing south

WARBURTON HIGHWAY

Warburton Highway is classified as a Primary State Arterial Road under the care and management of VicRoads. The carriageway consists of single lane approximately 3.5m wide in each direction. At the intersection of Warburton Highway and Mayer Bridge, there is a right turn lane for vehicles travelling from the east to gain protected entry onto Mayer Bridge.

Within the vicinity of the site, a posted speed limit of 50km/h applies east of the bridge, and a speed limit of 60km/h applies west of the bridge.

Views of Warburton Highway are provided below in **Figures 7 & 8**.



Figure 9 Warburton Highway facing west



Figure 10 Warburton Highway facing east



2.4.2 MT DONNA BUANG

DONNA BUANG ROAD / SUMMIT ROAD

Donna Buang Road and the Donna Buang Summit Road are both a Road Zone Category 1 under the care and management of VicRoads. They both provide one sealed traffic lane in each direction between Warburton Highway and the summit. Access is also available through to Don Road in the west with this section of Donna Buang Road featuring a single lane unsealed carriageway in part.

2.4.3 MT TUGWELL

MT BRIDE ROAD

Mt Bride Road provides access between Old Warburton Road and numerous tracks/roads across the mountain range that includes Mt Tugwell. The carriageway is unsealed and provides generally one wide lane with room for vehicles to slow and pass one another – refer **Figure 11**.



Figure 11 Mt Bride Road

OLD WARBURTON ROAD

Old Warburton Road runs between Warburton Highway at Wesburn and the Warburton township. The sealed carriageway provides one traffic lane in each direction. It principally provides access for rural dwellings and unsealed roads/tracks including Mt Bride Road.

2.5 SUSTAINABLE TRANSPORT

2.5.1 WALKING

There are no footpaths along Dammans Road. However, the subject site can be accessed by foot from the Warburton township via the Yarra River Walk trail and the footpath across Mayer Bridge.

2.5.2 CYCLING

The Lilydale to Warburton Rail Trail is located to the southern side of Warburton Highway approximately 100m south of the subject site. This will be a key route by which many cyclists are envisaged to arrive at the proposed trail head. However, connectivity between the rail trail and the subject site could be improved as there are no crossing facilities on Warburton Highway in the vicinity of Mayer Bridge.



2.5.3 BUSES

Bus route 683 (Chirnside Park – Warburton via Lilydale Station & Seville & Yarra Junction) has a stop on Warburton Highway approximately 220m (3-minute walk) from the subject site. Buses leave this stop approximately every 40 minutes to 1 hour. This bus service travels to Lilydale Station, which has train services to Melbourne’s CBD.

2.6 EXISTING TRAFFIC VOLUMES

2.6.1 TUBE COUNT DATA

SALT commissioned 24-hour tube counts at the locations shown in **Table 1** across a 7-day period from Tuesday 23 October 2018 to Monday 29 October 2018. A tube count records traffic volume, vehicle classification and speeds.

The results of these counts are presented in **Table 1**.

Table 1 Traffic volume and speed count summary

Location	Average Weekday Traffic Volume ¹ (vehicles per day, two-way)	Peak Weekend Traffic Volume (vehicles per day, two-way)	85% Speed ² (km/h)
Mayer Bridge, Warburton	1,057 vpd	1,092 vpd (Sat)	25.1 km/h
Warburton Highway, Warburton (near #3395)	6,039 vpd	6,914 vpd (Sat)	44.9 km/h
Donna Buang Road (near Warburton Highway)	859 vpd	1,392 vpd (Sun)	62.2 km/h
Old Warburton Highway (east of Warburton Highway)	348 vpd	378 vpd (Sat)	69.1 km/h
Old Warburton Highway (south of Prospect Avenue)	427 vpd	493 vpd (Sat)	56.9 km/h
Old Warburton Highway (north of Mt Bridge Road)	128 vpd	168 vpd (Sat)	55.1 km/h
Park Road (near #15)	910 vpd	1,124 vpd (Sat)	48.1 km/h

- Notes:
1. The Average Weekday Traffic Volume refers to the average number of vehicles recorded per day over a consecutive 5-day period (i.e. Monday to Friday)
 2. The 85% percentile speed is the speed at or below of which 85% of all vehicles are observed to travel at. This is an industry recognised measure of determining the level of compliance with the speed limit.

Given that Mayer Bridge funnels traffic to/from Dammans Road, it can be inferred from this data that the traffic volumes on Dammans Road to the east and west of Mayer Bridge will be less than the figures shown above. Under Clause 56.06 of the Planning Scheme, a Collector Road (also known as a Connector Street) has a target volume of between 3,000 – 7,000 vehicles per day. The existing volumes on Dammans Road and Mayer Bridge hence fall well under this figure and within the realms of a typical local access street rather than a collector road.

The traffic volume on Warburton Highway is well below the figure of 20,000 vehicles per day that is typically quoted as the limit at which a two-lane arterial road can comfortably operate without significant congestion.

Similarly, the volumes on Donna Buang Road, Old Warburton Highway and Park Road are also well below capacity.

2.6.2 TURNING MOVEMENT DATA

SALT engaged MHC Traffic to conduct a turning movement count on Friday 17 May and Saturday 18 May 2019 at the intersection of Warburton Highway and Mayer Bridge. The surveys took place between 3pm and 6pm on the Friday, and between 10am and 4pm on the Saturday. This was to coincide with peak weekday and weekend traffic periods within the area.

The peak hour volumes are depicted in **Figure 12 & 13**.

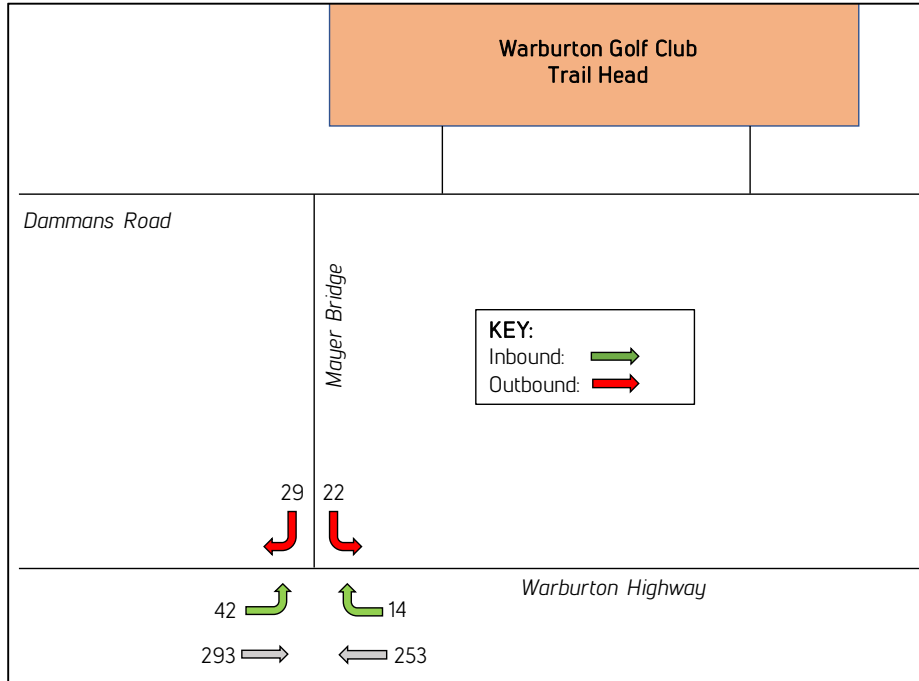


Figure 12 Peak hour volumes Friday 17 May 2019 (3pm – 4pm)

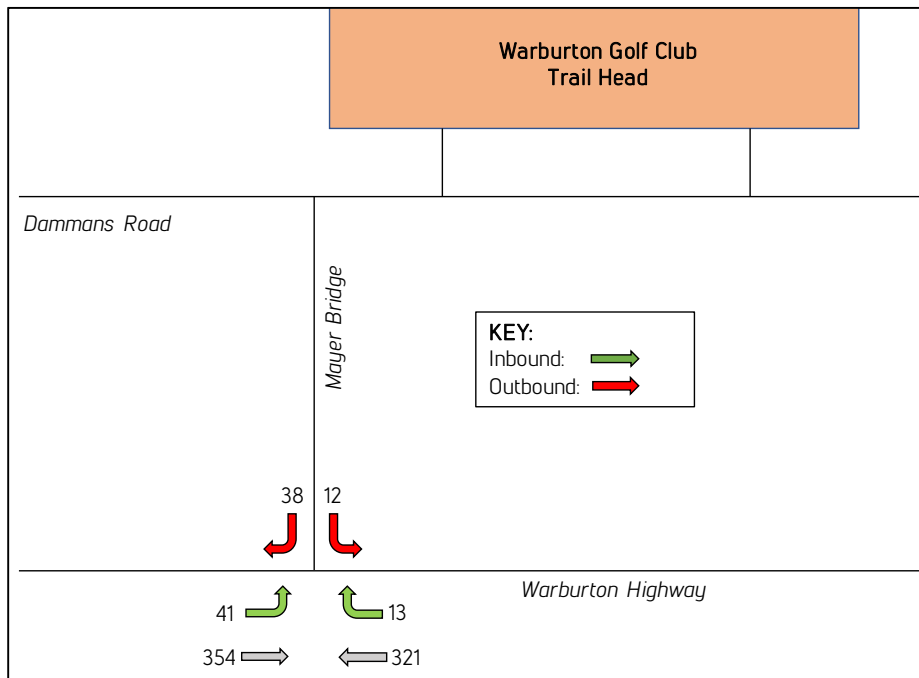
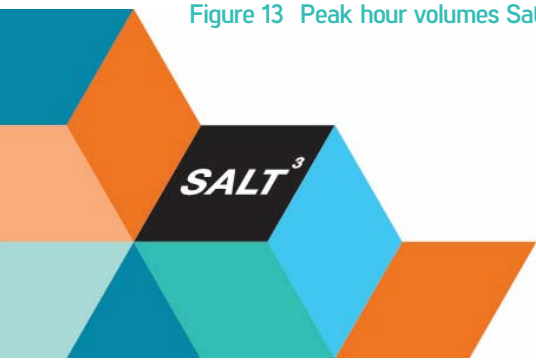


Figure 13 Peak hour volumes Saturday 18 May 2019 (2pm – 3pm)



It can be seen that the majority of traffic accessing Dammans Road does so to/from the west (i.e. in the Melbourne direction) which is to be expected.

Further, the traffic volumes are relatively low in traffic engineering terms with less than 1 vehicle per minute turning in or out of Mayer Bridge.

2.7 CRASH HISTORY

VicRoads CrashStats' database provides information on recorded casualty crashes on the road network where the police have attended, and a level of injury has occurred (classified as 'other', 'serious' and 'fatal').

Review of the database for the last five years of available data indicates that there have been no recorded casualty crashes on Dammans Road except one crash that occurred at the intersection of Surrey Road approximately 340m west of the subject site. This crash occurred at 1:30am on Saturday 10th September 2016 and involved the driver of a passenger vehicle running off the road into a fixed object. This resulted in an 'other' injury level.

On Warburton Highway there have been a total of nine (9) recorded casualty crashes at scattered locations within the township – refer **Figure 14**. This includes the following crash types:

- Vehicle left off carriageway into object/parked vehicle (Serious)
- Rear-end, vehicles in same lane (Other)
- Head on, not overtaking (Other)
- Right-far, i.e. vehicle turning right out of intersection struck by vehicle travelling on the entering road in same direction (Other)
- Pedestrian hit by vehicle from the right (Other)
- Pedestrian hit by vehicle from the right (Serious)
- Vehicle off right bend into object / parked vehicle (Serious)
- Rear-end, vehicles in same lane (other)
- Vehicle strikes door of parked/stationary vehicle (other)

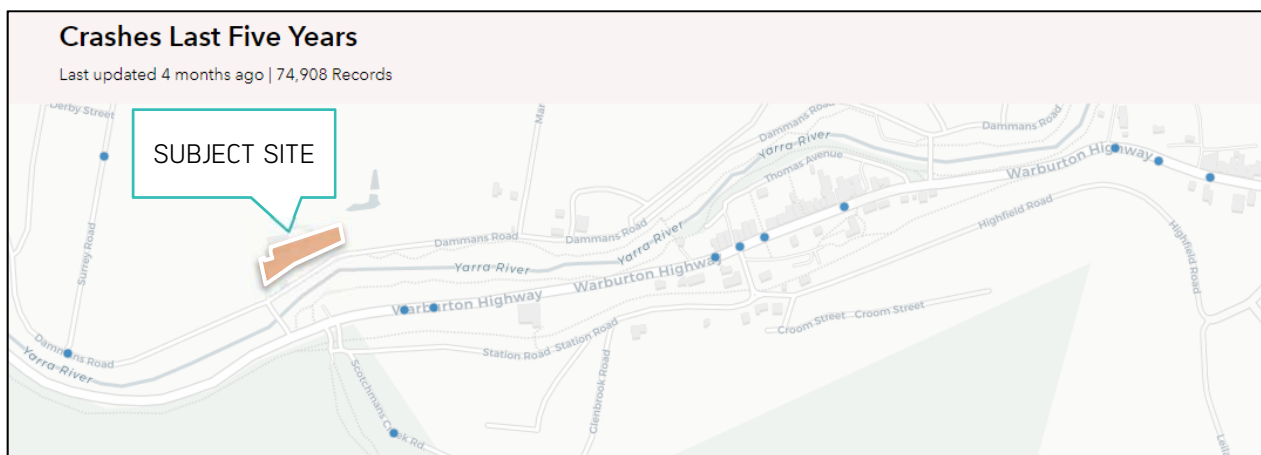


Figure 14 Crash Locations (last 5 years)

It can be seen that the type of crashes is varied with no particular pattern observed. Of note, cyclists are not represented within the recorded crashes.

On Donna Buang Road there has been a total of fourteen (14) recorded casualty crashes along the route between Warburton Highway and the summit. This includes:

- Vehicle off carriageway on left bend (Other)
- Off right bend into object / parked vehicle (Serious)
- Off left bend into object / parked vehicle (Serious)

- Out of control on carriageway on bend (Other)
- Off right bend into object / parked vehicle (Serious)
- Off carriageway on left bend (Serious)
- Out of control on carriageway on bend (Other)
- Head on, not overtaking (Other)
- Off carriageway on right bend (Other)
- Off carriageway on right bend (Other)
- Off carriageway on left bend (Other)
- Load or missile struck vehicle (Serious)
- Off right bend into object / parked vehicle (Serious)
- Out of control on carriageway on straight (Serious)

The high prevalence of run off road crashes is symptomatic of a windy mountain road and likely also a factor of weather conditions and tourists unfamiliar with driving on such roads.

On Mt Bride Road between Old Warburton Road and the trail head there have been a total of three (3) recorded casualty crashes, which includes:

- Vehicle collides with vehicle parked on left of road (Serious)
- Struck object on carriageway (Other)
- Out of control on carriageway on straight (Other)

This indicates no particular crash pattern.



3 PROPOSAL

The proposal would see the construction of a primary cycling trail head at the Warburton Golf Club including new carparking and bus facilities. Mountain bikers would use the trail head as a starting point from which to take a shuttle bus to mountain biking trails located on Mt Donna Buang and Mt Tugwell.

The existing car parking at the Mt Donna Buang summit would serve as a secondary trail head, and a new trail head car park would be constructed off Mt Bride Road near the summit of Mt Tugwell. The secondary trail heads would accommodate minibuses departing from the primary trail head at Warburton Golf Club, as well as riders who choose to drive to each summit

This project, in conjunction with the delivery of new trails, will see Warburton become one of Australia's premier mountain biking destinations.

Estimates of usage/patronage provided by Yarra Ranges Shire Council are as follows:

- 2,700 riders per week will use the trails based on 40 weeks of the year once the operation has matured (Years 6 – 12), which allows for bad weather in winter and closures due to fire or other environmental conditions that may be present;
- 3,375 riders per week at full potential (Years 13 – 20);
- Given weekends will be busiest, half of those users would ride on weekends providing close to 675 riders per day on weekends and approximately 270 on week days at Years 6 – 12, increasing to 845 and 337 riders respectively at Years 13 – 20.
- 85% of riders would use the primary golf club trail head, with 7.5% driving directly to the Mt Tugwell trail head and 7.5% to the Mt Donna Buang trail head;
- Approximately 24 – 30 shuttle buses will operate per day (12 – 15 trips to Mt Donna Buang and 12 – 15 trips to Mt Tugwell);
- 9 staff members will be stationed at the primary golf club trail head at any one time; and
- Operating hours from sun up to sun down.

Should events occur, the number of riders may swell to 2,000 riders but such events would occur infrequently.

The design of the golf club and Mt Tugwell trail heads is yet to be confirmed but SALT understands that the intention is to expand the existing car park at the golf club towards the east and to create one (1) additional car park access point to Dammans Road – refer **Figure 12**. The Mt Tugwell car park will be much smaller given its secondary status.

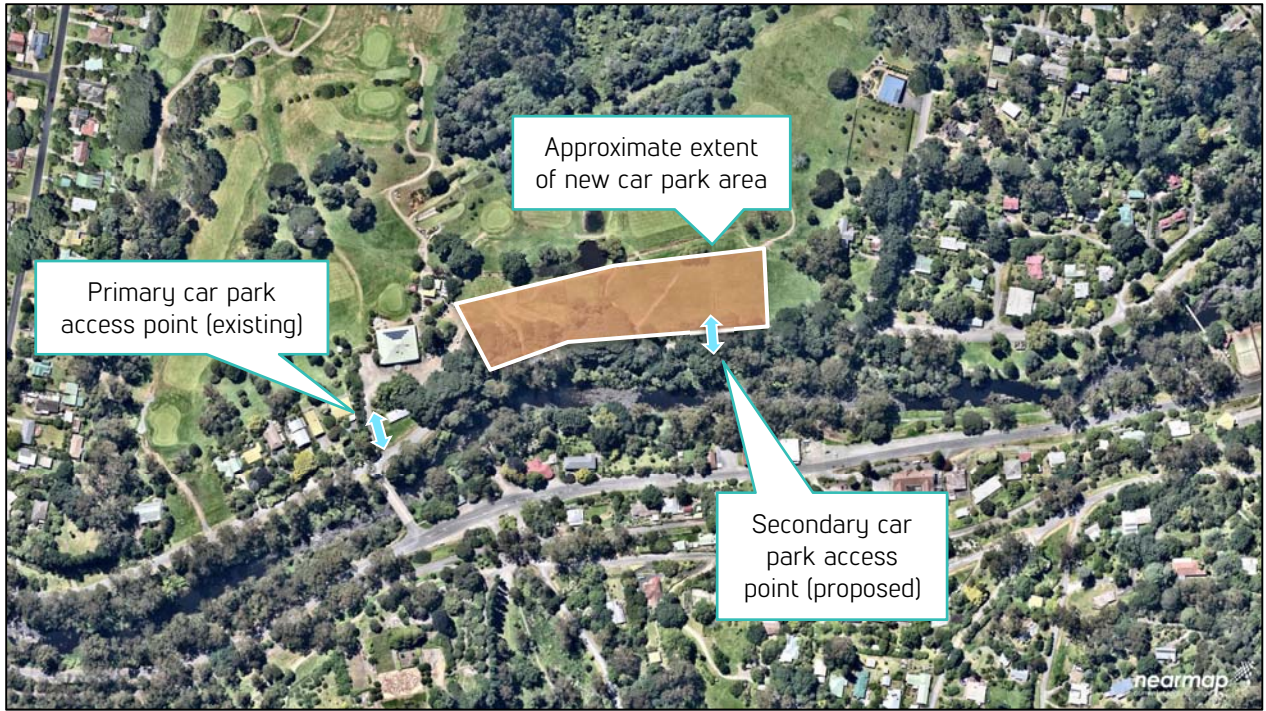


Figure 15 Proposed extent of proposed new car parking area (approx.)

This report aims to provide an assessment of the parking requirements for the trail head together with an assessment of the associated traffic impacts on the surrounding road network.



4 CAR PARKING

4.1 PARKING GENERATION RATE

It is expected that the majority of cyclists will be day trippers who drive to the trail head. In addition, a proportion may arrive from Melbourne via the Lilydale to Warburton Rail Trail or cycle from their place of accommodation if staying overnight in the region (e.g. interstate visitors).

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. This equates to a visitor parking generation rate of 0.35 vehicles per user.

4.2 PARKING REQUIREMENTS

There is no statutory car parking requirement under Clause 52.06 of the Planning Scheme for a facility of the type proposed and therefore parking is to be provided to the satisfaction of the responsible authority.

To estimate the likely peak parking demand a first principles assessment is considered appropriate.

For the mature operation scenario (Years 6 – 12), and based on the forecast splits between each trail head location, this amounts to:

- Golf Club (85%): 575 riders on a Saturday or Sunday
- Mt Donna Buang (7.5%) 51 riders on a Saturday or Sunday
- Mt Tugwell (7.5%) 51 riders on a Saturday or Sunday

On the most conservative estimate, it is assumed that every rider arrives in a vehicle and that all riders across the day are parked at the same time. This equates to peak car parking demands of:

- Golf Club (85%): 201 car spaces
- Mt Donna Buang (7.5%) 18 car spaces
- Mt Tugwell (7.5%) 18 car spaces

However, this is *very* conservative as it assumes that every rider is undertaking a full day of cycling activities rather than a part-day. Some riders may only use the facility from morning to lunch, after lunch to sunset or any time period in-between. It is estimated that the number of visitors *at any one time* is 75% of the peak daily figure. This equates to the following peak parking demands:

- Golf Club (85%): 151 car spaces
- Mt Donna Buang (7.5%) 13 car spaces
- Mt Tugwell (7.5%) 13 car spaces

The above assessment is summarised in **Table 2** (Mature Operation) and **Table 3** (Full Potential):

Table 2 Parking demand scenarios (Mature operation 6 – 12 years)

Scenario	Trail Head	Number of Cyclists / Visitors	Parking Demand Rate	Peak Car Parking Demand
100% of cyclists are undertaking full-day activities	Golf Club	575	0.35 spaces per person	201 spaces
	Mt Donna Buang	51	0.35 spaces per person	18 spaces
	Mt Tugwell	51	0.35 spaces per person	18 spaces
Some cyclists undertake part-day activities (No. of cyclists on-site at any one time is 75% of the daily figure)	Golf Club	431	0.35 spaces per person	151 spaces
	Mt Donna Buang	38	0.35 spaces per person	13 spaces
	Mt Tugwell	38	0.35 spaces per person	13 spaces

Table 3 Parking demand scenarios (Full Potential 13 – 18 years)

Scenario	Trail Head	Number of Cyclists / Visitors	Parking Demand Rate	Peak Car Parking Demand
100% of cyclists are undertaking full-day activities	Golf Club	718	0.35 spaces per person	251 spaces
	Mt Donna Buang	63	0.35 spaces per person	22 spaces
	Mt Tugwell	63	0.35 spaces per person	22 spaces
Some cyclists undertake part-day activities (No. of cyclists on-site at any one time is 75% of the daily figure)	Golf Club	539	0.35 spaces per person	189 spaces
	Mt Donna Buang	47	0.35 spaces per person	16 spaces
	Mt Tugwell	47	0.35 spaces per person	16 spaces

Having regard to the above assessment, it is recommended that car parking be provided as follows:

- Golf Club: 150 – 200 spaces in addition to parking required for golf club
- Mt Donna Buang: No additional parking (utilise existing)
- Mt Tugwell: Approx. 20 spaces

The above assessment accommodates the anticipated parking demands at the golf club for the mature operation (Years 6 – 12). The full potential scenario (Years 13 – 18) may or may not be reached, and therefore constructing car parking for this scenario at the very beginning may lead to unnecessary expenditure and loss of land. Instead, it is recommended that spatial allowance be made to expand the car park in future for a total of 250 spaces, should the need arise.

4.3 EVENT PARKING

Future large events may attract up to 2,000 visitors. However, it is *not* recommended that on-site parking be provided for this because the parking would go unused for most of the year. Therefore, it is appropriate that overflow parking demands be accommodated on-street in this scenario. Further, a Car Parking & Traffic Management Plan should be developed for large events to manage parking and traffic flows and minimise the impacts of additional vehicle trips on the surrounding road network.



5 CAR PARK DESIGN CONSIDERATIONS

5.1 WARBURTON GOLF CLUB

The car park is yet to be designed and as such the following general commentary is provided in order to guide the preparation of this plan:

- Vehicle access shall be provided via two locations to Dammans Road (including the existing golf course crossover). This provides added flexibility of access and reduces the extent of car park congestion and queueing. Each crossover would operate satisfactorily without provision of turn lanes given the relatively low traffic volumes on Dammans Road;
- The existing golf course crossover shall be upgraded and widened to more comfortably accommodate simultaneous two-way traffic flow;
- The car parking spaces and aisles shall be designed in accordance with either Clause 52.06 of the Yarra Ranges Planning Scheme or AS/NZS 2890.1:2004 for 'User Class 2' car parking;
- The car park shall be surfaced in compacted gravel or sealed;
- Accessible car parking spaces shall be provided in accordance with the applicable Building Code of Australia requirements and designed as per AS/NZS 2890.6:2009;
- A separate shuttle bus parking area shall be provided to minimise conflict between shuttle bus operations and general traffic;
- Bicycle storage facilities shall be provided to enable cyclists to secure their bicycle whilst waiting for shuttle buses or using on-site facilities. Double-sided flat top rails are recommended, set out as per AS2890.3:2015; and
- Appropriate pedestrian pathways and connections shall be provided to facilitate safe pedestrian access between the car park, golf course, trail head buildings and mini-bus area;

5.2 MT DONNA BUANG

- Confirm suitability of existing angled car parking bays to accommodate mini-buses and modify if necessary.

5.3 MT TUGWELL

- The car parking spaces and aisles shall be designed in accordance with either Clause 52.06 of the Yarra Ranges Planning Scheme or AS/NZS 2890.1:2004 for 'User Class 2' car parking;
- Ensure adequate turning space and parking areas for shuttle buses; and
- Install appropriate warning signage along Mt Bride Road to alert drivers to the presence of shuttle buses and other oncoming vehicles.

6 EXTERNAL ACCESSIBILITY AT GOLF CLUB

The golf club trail head can currently be accessed from the Warburton township by foot via Yarra River Walk. However, there is no connection to the Warburton Rail Trail.

Separate to the trail head project, it is recommended that Council investigate upgrades to the external road and cycling network to facilitate safer pedestrian and cyclist travel to/from the proposed trail head.

Options to improve access to the Warburton Rail Trail include:

- Provision of an at-grade pedestrian/cyclist crossing point on Warburton Highway near Mayer Bridge and a shared path connection to the Warburton Rail Trail; OR
- An elevated shared pathway across Warburton Highway and the Yarra River connecting at-grade with the existing trail overpass at Scotchmans Creek Road and ramping down to the golf club.

The second option is a far costlier endeavor but provides an improved safety outcome by separating cyclists and cars altogether. Before deciding whether to undertake one of these upgrades, it is recommended that surveys be undertaken once the trail head is established to determine the volume of cyclists travelling directly between the trail head and rail trail. This will inform the level of benefit to be gained by providing an improved connection.

In addition, it is recommended that Dammans Road be upgraded to a cycling route. However, the limited width of Dammans Road makes provision of bicycle lanes impractical, and therefore it is recommended that “sharrow” line marking be installed – refer example Figure 16. Sharrows assist by alerting other road users of the presence of cyclists and assisting cyclists to navigate routes. Speed control devices can also be considered to further improve cyclist safety e.g. speed humps or one-lane slow points with bicycle cut-throughs.



Figure 16 Typical sharrow treatment (source: dpti.sa.gov.au)



7 TRAFFIC GENERATION, DISTRIBUTION AND IMPACT

7.1 WARBURTON GOLF CLUB

7.1.1 TRAFFIC GENERATION

The daily volume of traffic generated by the trail head can be calculated in the most conservative scenario by adopting the full potential scenario (Years 13 – 20) with 845 riders on a Saturday or Sunday (85% at the golf club), the parking generation rate of 0.35 vehicles per user and multiplying by 2 trips per vehicle (i.e. one trip to the trail head and one trip from the trail head).

This equates to a total of $845 \times 0.85 \times 0.35 \times 2 = 503$ daily vehicle trips (two-way).

During the peak hour, it is conservatively assumed that 25% of parking spaces will turn over including shuttle bus movements. Based on the very conservative estimate of a peak parking demand equal to 251 car parking spaces at full potential (refer **Section 4**), this equates to 63 inbound vehicle movements and 63 outbound vehicle movements (adopting a 50/50 split during the critical Saturday afternoon peak hour).

7.1.2 TRAFFIC DISTRIBUTION

The following assumptions have been made:

- 70% of traffic would enter/exit from the existing access to the car park;
- 30% of traffic would enter/exit from the new access point;
- 90% of traffic would arrive/depart from Warburton Highway, across Mayer Bridge;
- 10% of traffic would arrive/depart from the east along Dammans Road;
- 67% of traffic from Warburton Highway would arrive/depart from the west; and
- 33% of traffic from Warburton Highway would arrive/depart from the east.

Figure 17 below shows the traffic generated by the trail head and **Figure 18** shows the trail head volumes combined with the existing peak hour volumes at the intersection of Warburton Highway / Dammans Bridge. This is based on the critical Saturday peak hour (noting existing traffic volumes are higher on the Saturday than they are on a weekday).

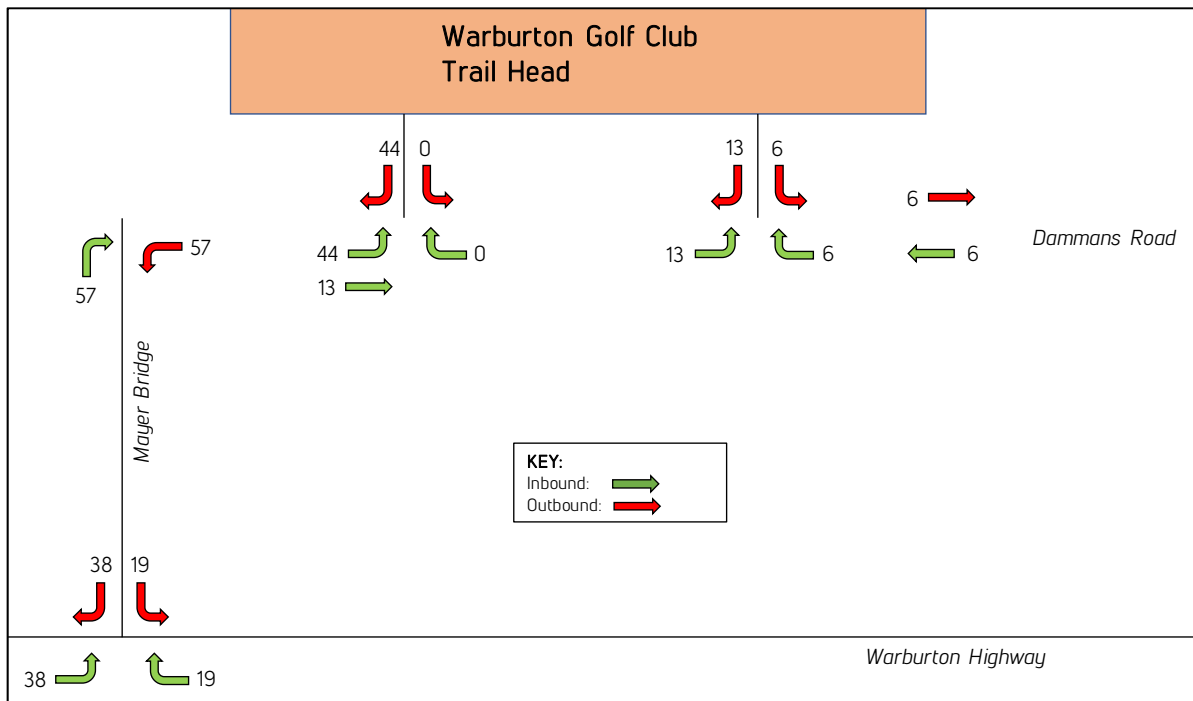


Figure 17 Peak hour traffic distribution

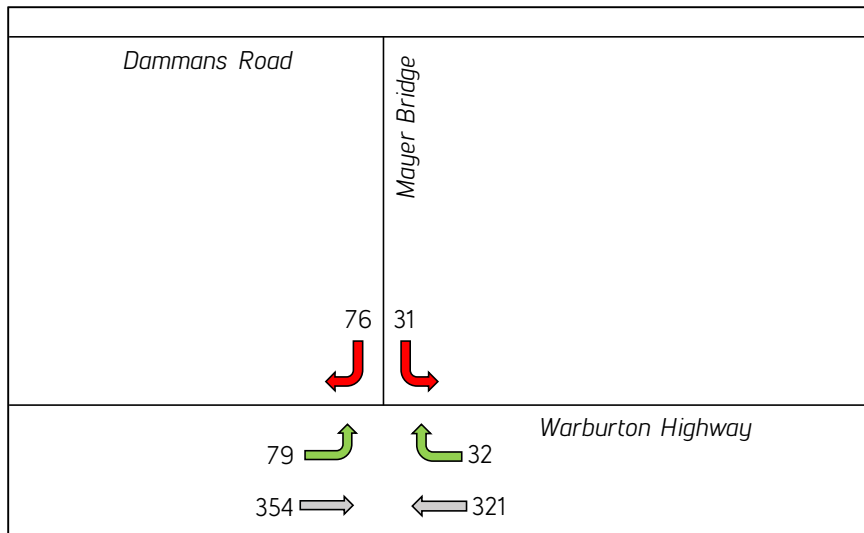


Figure 18 Future traffic volumes at Warburton Highway / Mayer Bridge (Saturday, 2pm – 3pm)

7.1.3 TRAFFIC IMPACT

DAMMANS ROAD / MAYER BRIDGE

Dammans Road is classified as a Collector Road and has a target maximum volume of 3,000 vehicles per day based on the guidelines set out in Clause 56.06 of the Yarra Ranges Planning Scheme.

Mayer Bridge, which feeds into Dammans Road, currently carries a maximum of 1,092 vehicles per day (two-way). Given some traffic will turn left into Dammans Road and some will turn right, it can be inferred that the maximum volume of traffic at any one point on Dammans Road is significantly less than 1,092vpd.

The addition of up to 503 daily vehicle trips includes 453 trips over Mayer Bridge into Dammans Road and 50 trips to/from the east along Dammans Road. It can hence be seen that the ultimate traffic volume will fall well short of the target volume of 3,000 vehicles per day.

Dammans Road and Mayer Bridge will hence continue to operate well below capacity.

INTERSECTION OF WARBURTON HIGHWAY / MAYER BRIDGE

To quantify the level of traffic impact during the critical Saturday PM peak hour, the intersection between Mayer Bridge and Warburton Highway has been modelled using SIDRA Intersection v8. SIDRA is an advanced micro-analytical traffic evaluation tool that provides estimates of capacity and performance statistics (delay, queue lengths etc) on a lane by lane basis.

Key performance criteria include:

Degree of Saturation (DOS): This represents the ratio of traffic volume to capacity. Generally speaking, a DOS of below 0.9 indicates acceptable performance. A DOS of over 1.0 indicates that capacity has been exceeded.

Level of Service (LOS): An index of the operational performance of traffic based on service measures such as delay, degree of saturation, density and speed during a given flow period. A guide to LOS ratings is provided in **Table 2**.

Average Delay: The average delay time that can be expected for a given movement.

95th Percentile Queue: The maximum queue length that can be expected in 95% of all observed queue lengths during the hour.



Table 4 Level of Service Ratings

Level of Service	
A	Excellent
B	Very Good
C	Good
D	Acceptable
E	Poor
F	Very Poor

The detailed SIDRA outputs are provided in **Appendix 1**.

The key performance factors are summarised in **Tables 5 & 6**.

Table 5 SIDRA Outputs – Existing Conditions

Approach	Movement	Degree of Saturation (DOS)	Average Delay (S)	Level of Service (LOS)	95% Back of Queue (No. Vehicles)
Warburton Highway (east)	T	0.172	0.0	LOS A	0.0
	R	0.011	6.9	LOS A	0.0
Mayer Bridge (north)	L	0.097	5.8	LOS A	0.4
	R	0.097	10.8	LOS B	0.4
Warburton Highway (west)	L	0.209	5.6	LOS A	0.0
	T	0.209	0.0	LOS A	0.0

Table 6 SIDRA Outputs – Future Conditions

Approach	Movement	Degree of Saturation (DOS)	Average Delay (S)	Level of Service (LOS)	95% Back of Queue (No. Vehicles)
Warburton Highway (east)	T	0.172	0.0	LOS A	0.0
	R	0.030	7.1	LOS A	0.1
Mayer Bridge (north)	L	0.212	5.9	LOS A	0.8
	R	0.212	11.9	LOS B	0.8
Warburton Highway (west)	L	0.230	5.6	LOS A	0.0
	T	0.230	0.0	LOS A	0.0

The results of the SIDRA assessment indicate:

- The intersection has an “excellent” level of service for all movements except for right turns out of Mayer Bridge that have a “very good” level of service under both existing and future conditions.
- The maximum Degree of Saturation for the future conditions is 0.230, which indicates that there is more than adequate spare capacity. Further, this is only a minor increase above the existing DOS of 0.209;
- The longest delay is for vehicles turning right from Mayer Bridge into Warburton Highway; however, this is only a short delay of 11.9 seconds which is only 1 second greater than existing conditions.

- Further, the 95th percentile back of queue is only 0.8 vehicles which can be comfortably accommodated on the bridge; and
- The right-turn queue from Warburton Highway into Mayer Bridge is only 0.1 vehicles and can therefore be comfortably accommodated within the existing right-turn lane that can store 4 – 5 cars.

It is therefore concluded that the intersection would operate more than satisfactorily, and the trail head would not cause an unreasonable impact on traffic flow along Mayer Bridge and Warburton Highway.

7.2 MT DONNA BUANG

The Mt Donna Buang trail head is expected to attract:

- 12 – 15 shuttle bus trips per day on weekends, equating to a peak of 30 trips (two-way); and
- Up to 63 riders driving themselves to the trail head, equating to 23 cars (at 2.8 riders per vehicle) and 46 trips (two-way).

Therefore, in total up to 56 daily vehicle trips (two-way) would be generated on a Saturday or Sunday.

In traffic engineering terms, this is a negligible volume of traffic and will be comfortably accommodated.

7.3 MT TUGWELL

The Mt Donna Buang trail head is expected to attract:

- 12 – 15 shuttle bus trips per day on weekends, equating to a peak of 30 trips (two-way); and
- Up to 63 riders driving themselves to the trail head, equating to 23 cars (at 2.8 riders per vehicle) and 46 trips (two-way).

Therefore, in total up to 56 daily vehicle trips (two-way) would be generated on a Saturday or Sunday.

In traffic engineering terms, this is a negligible volume of traffic and will be comfortably accommodated along Mt Bride Road, Old Warburton Highway and Park Road.

Nonetheless, given the relative narrow carriageway width of Mt Bride Road, it is recommended that warning signage be installed to alert drivers to the presence of shuttle buses and other oncoming vehicles.



8 CONCLUSION

Based on the assessments undertaken, it is concluded that:

- On the most conservative estimate, up to 201 car parking spaces are required to service the golf club trail head under the 'mature operation' scenario (6 – 12 years from now);
- Realistically the parking demands are likely to be lower than this figure. It is recommended that in the order of 150 – 200 spaces be provided initially, together with spatial provision to expand the car park to 250 spaces in future should the need ever eventuate;
- No additional parking is required at the Mt Donna Buang trail head;
- Approx. 20 (or more) parking spaces should be provided at the Mt Tugwell trail head;
- A Car Parking & Traffic Management Plan should be developed to manage the parking and traffic demands and impacts of large events (2,000+ riders) that are to occur infrequently;
- The design of the trail head car parks should achieve the design objectives set out in **Section 5** to accommodate both cars and shuttle buses;
- Council should separately investigate upgrades to the external road network to improve pedestrian and cyclist connectivity and safety to the golf club trail head, including:
 - Providing a shared path connection between the Warburton Rail Trail and the trail head;
 - Upgrading Dammans Road to a bicycle route;
- The additional traffic generated by the golf club trail head can be comfortably accommodated within Dammans Road and Mayer Bridge, and will have negligible adverse impact on the safety and operation of the intersection between Warburton Highway / Mayer Bridge during peak periods; and
- The additional traffic generated by the two secondary trail heads is very low in traffic engineering terms and can be comfortably accommodated by the existing road network.

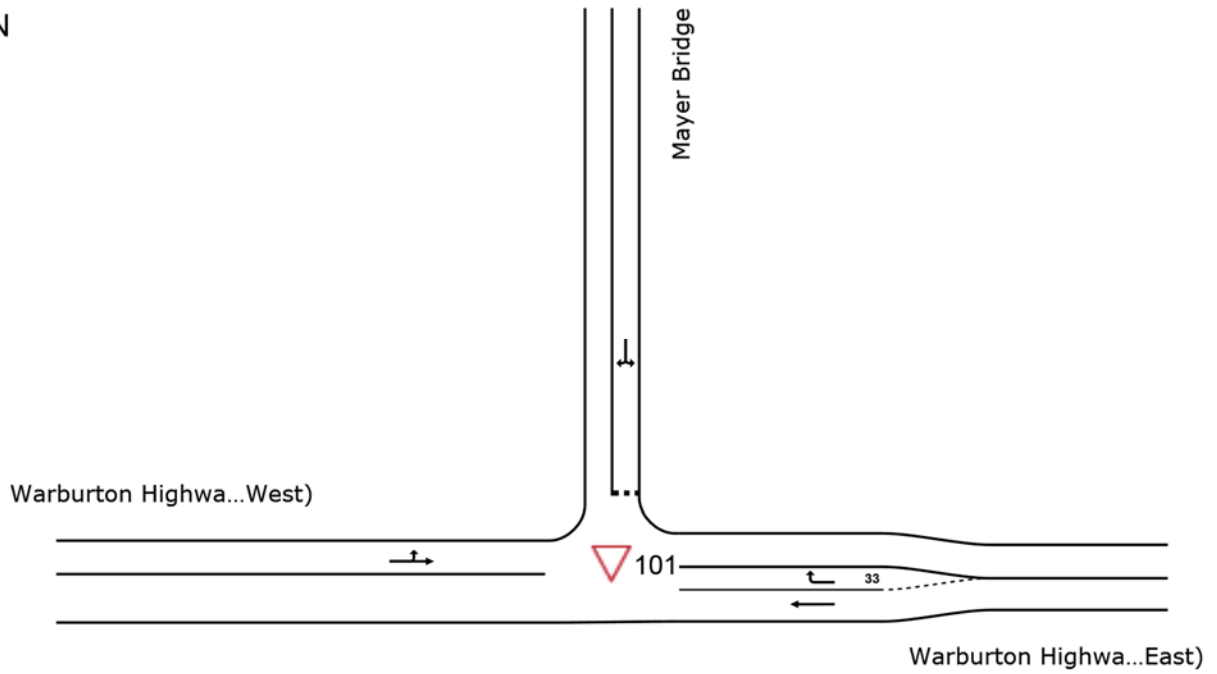
We hence find the proposed trail heads to be appropriate from a traffic engineering perspective, subject to the above recommendations.

APPENDIX 1 SIDRA OUTPUTS

SITE LAYOUT

▽ Site: 101 [Warburton Highway / Mayer Bridge (Existing)]

New Site
Site Category: (None)
Giveaway / Yield (Two-Way)



MOVEMENT SUMMARY

▽ Site: 101 [Warburton Highway / Mayer Bridge (Existing)]

New Site
 Site Category: (None)
 Giveaway / Yield (Two-Way)

Movement Performance - Vehicles													
Mov ID	Turn	Demand Total	Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed	
		veh/h	%	v/c	sec		veh	m				km/h	
East: Warburton Highway (East)													
5	T1	338	0.0	0.172	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0	
6	R2	14	0.0	0.011	6.9	LOS A	0.0	0.3	0.45	0.60	0.45	46.6	
Approach		352	0.0	0.172	0.3	NA	0.0	0.3	0.02	0.02	0.02	59.6	
North: Mayer Bridge													
7	L2	13	0.0	0.097	5.8	LOS A	0.4	2.5	0.58	0.78	0.58	45.2	
9	R2	40	0.0	0.097	10.8	LOS B	0.4	2.5	0.58	0.78	0.58	44.8	
Approach		53	0.0	0.097	9.6	LOS A	0.4	2.5	0.58	0.78	0.58	44.9	
West: Warburton Highway (West)													
10	L2	43	0.0	0.209	5.6	LOS A	0.0	0.0	0.00	0.06	0.00	30.6	
11	T1	373	0.0	0.209	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	59.4	
Approach		416	0.0	0.209	0.6	NA	0.0	0.0	0.00	0.06	0.00	56.1	
All Vehicles		820	0.0	0.209	1.0	NA	0.4	2.5	0.04	0.09	0.04	57.1	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



MOVEMENT SUMMARY

▽ Site: 101 [Warburton Highway / Mayer Bridge (Future)]

New Site
 Site Category: (None)
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	of Queue Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total	HV %									
East: Warburton Highway (East)												
5	T1	338	0.0	0.172	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	34	0.0	0.030	7.1	LOS A	0.1	0.9	0.47	0.64	0.47	46.5
Approach		372	0.0	0.172	0.7	NA	0.1	0.9	0.04	0.06	0.04	59.0
North: Mayer Bridge												
7	L2	33	0.0	0.212	5.9	LOS A	0.8	5.6	0.60	0.79	0.60	44.7
9	R2	80	0.0	0.212	11.9	LOS B	0.8	5.6	0.60	0.79	0.60	44.3
Approach		113	0.0	0.212	10.2	LOS B	0.8	5.6	0.60	0.79	0.60	44.4
West: Warburton Highway (West)												
10	L2	83	0.0	0.230	5.6	LOS A	0.0	0.0	0.00	0.11	0.00	30.4
11	T1	373	0.0	0.230	0.0	LOS A	0.0	0.0	0.00	0.11	0.00	59.0
Approach		456	0.0	0.230	1.0	NA	0.0	0.0	0.00	0.11	0.00	53.3
All Vehicles		940	0.0	0.230	2.0	NA	0.8	5.6	0.09	0.17	0.09	54.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



This page is intentionally left blank





Service. Approachability. Loyalty. Transparency.



MELBOURNE Level 3/51 Queen Street, Melbourne VIC 3000
+61 3 9020 4225

SYDNEY Level 17/40 Mount Street, North Sydney NSW 2060
+61 2 8415 9781

www.salt3.com.au

TRAFFIC ENGINEERS / WASTE ENGINEERS / TRANSPORT PLANNERS / ROAD SAFETY AUDITORS

2016 EAST GIPPSLAND BUSINESS AWARDS FINALIST
Professional Services, Innovation, Child & Family Friendly