Traffix Group

Traffic Engineering Assessment

Proposed Rezoning

Northeast Corner of Geelong-Ballan Road & Old Melbourne Road, Ballan

Prepared for
Wel.Co

February 2024

G31463R-01E

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1. Introduction

Traffix Group has been engaged by Wel.Co to undertake a Traffic Engineering Assessment for the Proposed Rezoning of land at Northeast Corner of Geelong-Ballan Road & Old Melbourne Road, Ballan.

This report provides a traffic engineering assessment of the site in regard to the future potential internal road layout and access arrangements and the likely impacts on the surrounding road network with regard to the Ballan Framework Plan area.

This report also provides a response to the relevant traffic engineering matters set out in Moorabool Shire Council's Request for Further Information letter dated 15 May 2023.

2. Existing Conditions

2.1. Subject Site

The subject site is located on the northeast corner of Geelong-Ballan Road and Old Melbourne Road in Ballan, as shown in the locality plan at Figure 1.

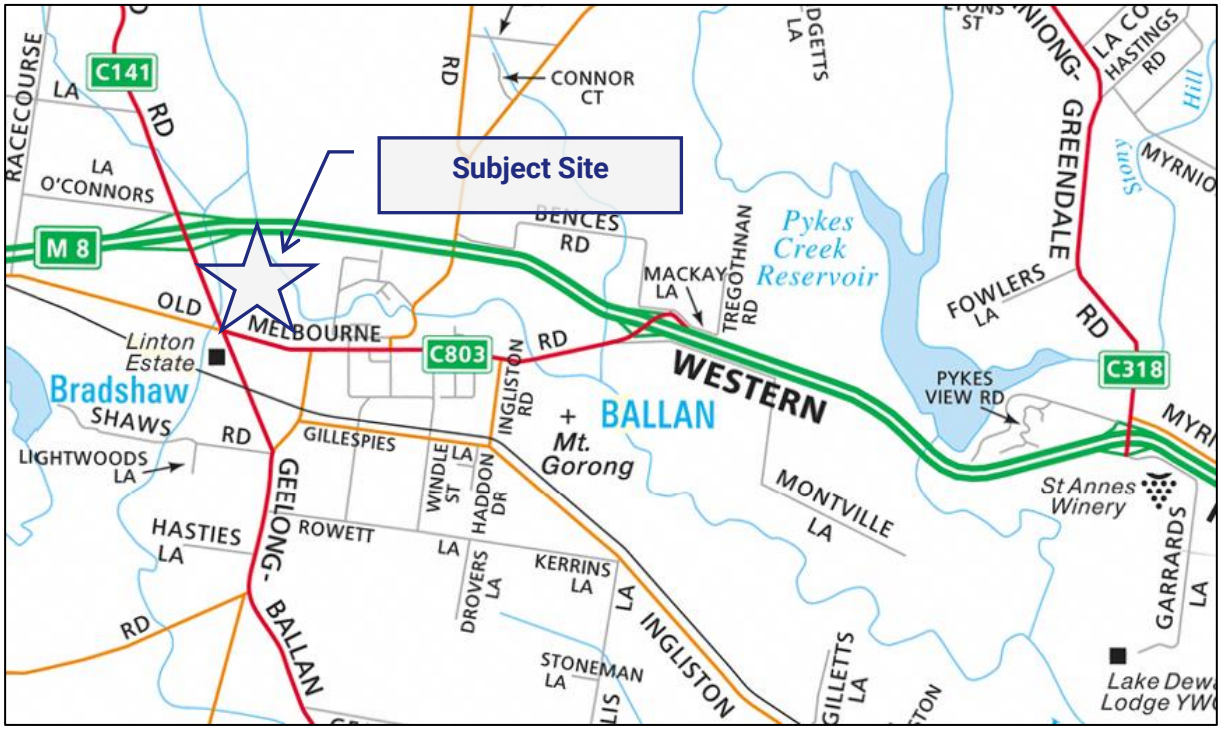


Figure 1: Locality Plan *Reproduced with Permission of Melway Publishing Pty Ltd*

The site consists of six parcels of land that are bound by Western Freeway, Old Melbourne Road, Geelong-Ballan Road and Werribee River to the north, south, west and east, respectively. The parcels of land currently accommodate residential dwellings and the Cedars Indulgence Retreat towards the southwest corner of the site, whilst the majority of remaining land is largely vacant.

An aerial photograph of the subject site and its surrounds is shown at Figure 2.

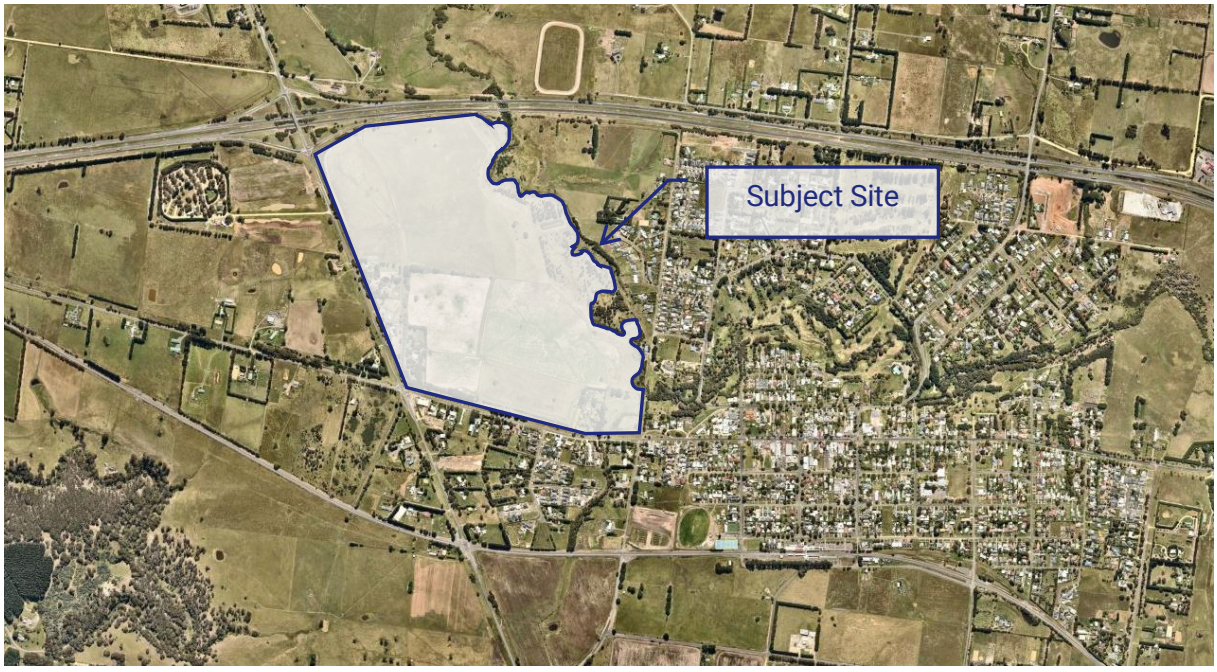


Figure 2: Aerial Photograph *Source: Nearmap*

The site is situated within a 'Rural Living Zone (RLZ)' under the Moorabool Planning Scheme, as shown in the land use zoning map at Figure 3.

Surrounding land is typically rural and low density residential, with the Ballan Township located further to the east of the site. Phoenix Park is located to the west of the site.

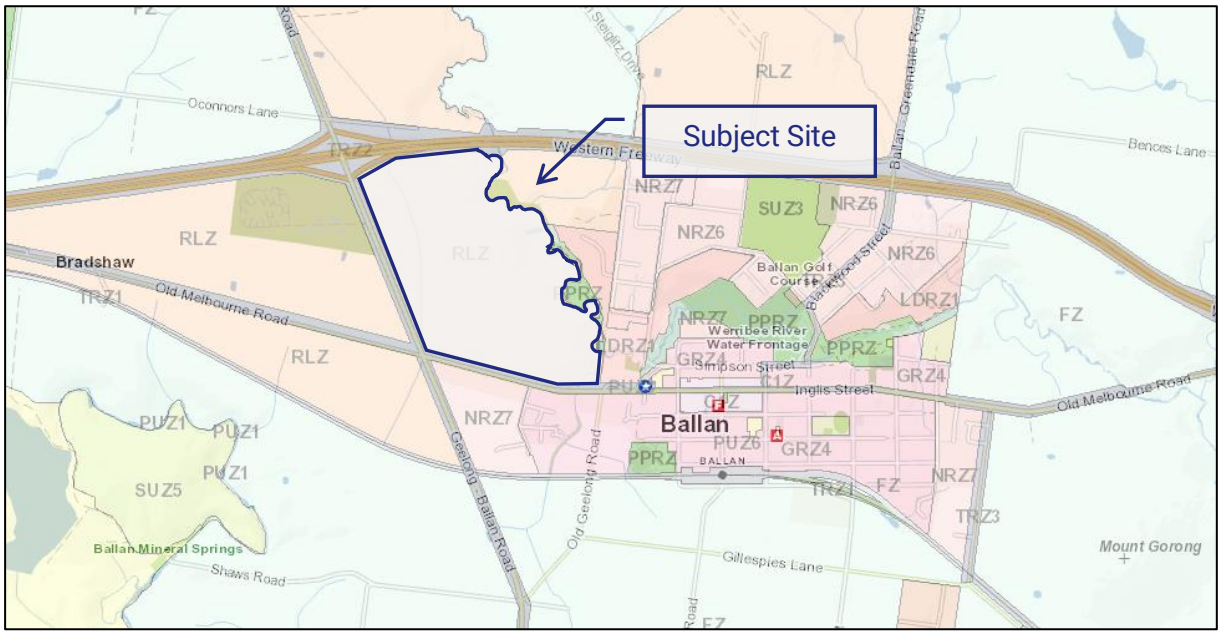


Figure 3: Land Use Zoning Map *Source: VicPlan, https://mapshare.vic.gov.au/vicplan/*

2.2. Road Network

Geelong-Ballan Road is a Department of Transport and Planning (DTP) declared arterial road and is zoned 'Transport Zone 2 (TRZ2)' under the Planning Scheme.

In the vicinity of the subject site, Geelong-Ballan Road is orientated in a northwest-southeast alignment and has an approximately 6.3m wide sealed carriageway which includes a single through traffic lane in each direction.

A posted speed limit of 80km/h applies to Geelong-Ballan Road past the site.

Geelong-Ballan Road, adjacent to the subject site, is shown at Figure 4 and Figure 5.

Figure 4: Geelong-Ballan Road - view northwest

Figure 5: Geelong-Ballan Road - view southeast

Old Melbourne Road is a DTP declared arterial road and is zoned 'Transport Zone 2 (TRZ2)' under the Planning Scheme.

In the vicinity of the subject site, Old Melbourne Road is orientated in a general east-west alignment which includes a single traffic lane and bicycle lane in each direction.

A posted speed limit of 60km/h applies to Old Melbourne Road past the site.

Old Melbourne Road, adjacent to the subject site, is shown at Figure 6 and Figure 7.

Figure 6: Old Melbourne Road - view east

Figure 7: Old Melbourne Road - view west

The Geelong-Ballan Road/Old Melbourne Road intersection is a four-leg staggered T-intersection located at the southwest corner of the site. The eastern and western legs of the intersection are staggered by approximately 30m, in the desirable right-left direction.

The south approach widens to provide an informal passing opportunity of motorists that may be propped to turn right into the eastern leg of Old Melbourne Road and/or an informal turn lane for motorists wanting to turn left into the western leg of Old Melbourne Road. The north approach provides a single lane to facilitate all through and left and right turning traffic.

The eastern and western legs of the intersection are provided with separate left and right turn lanes.

2.3. Existing Traffic Volumes

Traffix Group commissioned turning movement counts at the Geelong-Ballan Road/Old Melbourne Road intersection on Wednesday March 23rd, 2022, at the following times:

- 7:00am-9:00am, and
- 4:00pm-7:00pm.

The AM peak hour occurred from 7:30am to 8:30am and the PM peak hour occurred from 4:15pm to 5:15pm during the turning movement counts.

A summary of the existing traffic volumes during the AM and PM peak hours is presented at Figure 8 and Figure 9, respectively.

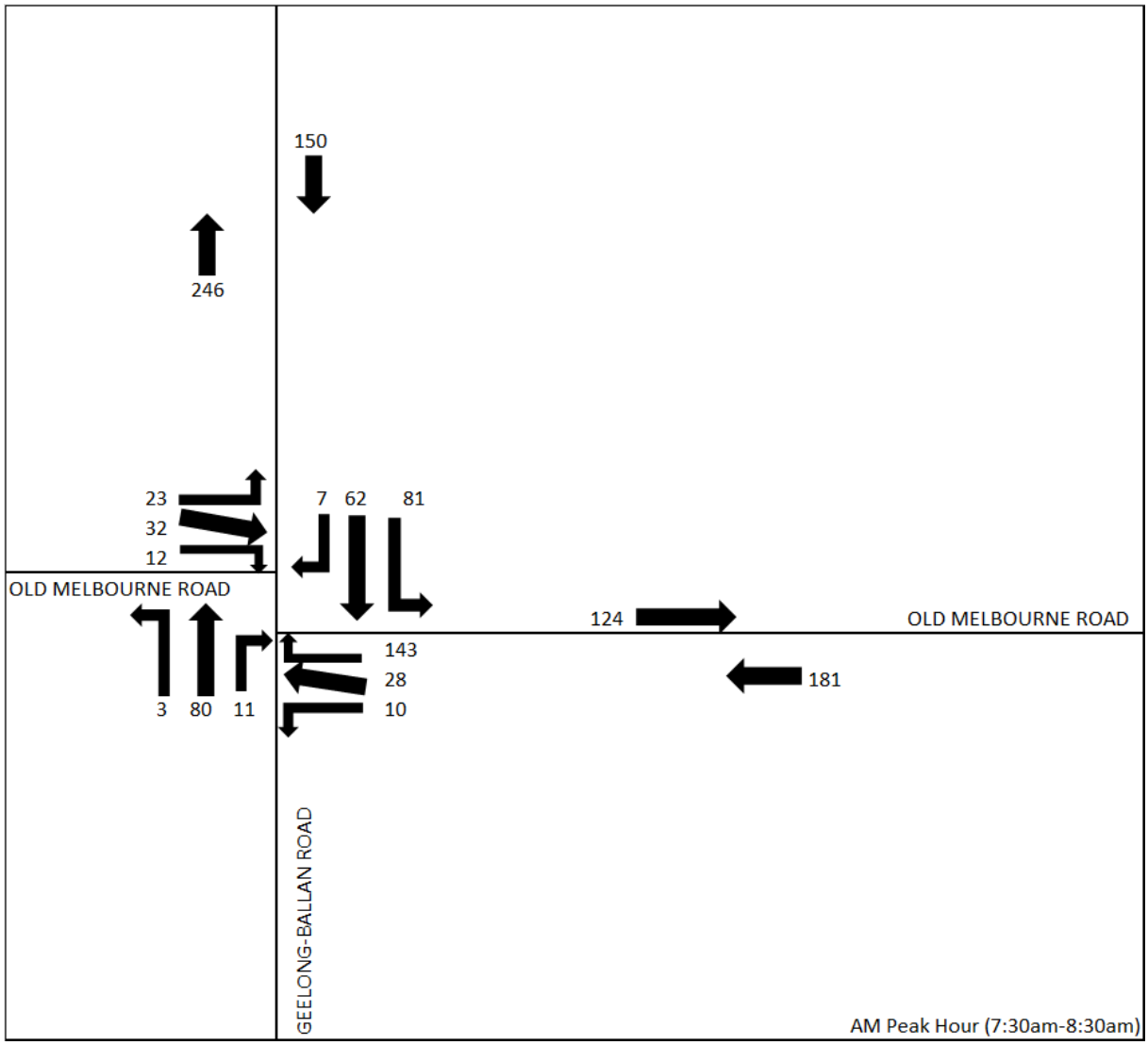


Figure 8: Turning Movement Count Summary - AM Peak Hour

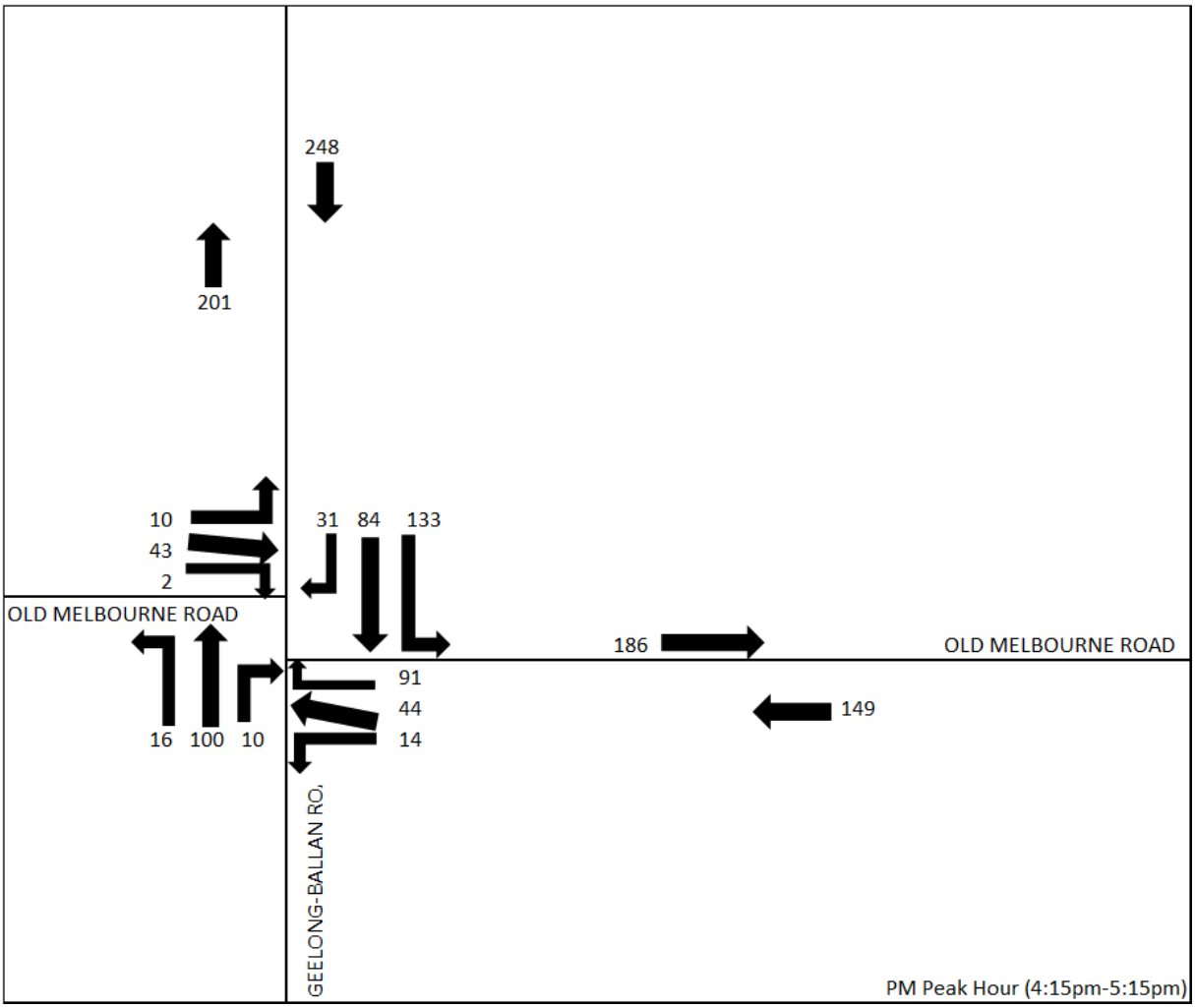


Figure 9: Turning Movement Count Summary – PM Peak Hour

3. Ballan Framework Plan

The Ballan Framework Plan identifies the following with regard to the subject site and abutting road network:

- A 'secondary gateway' site connection with Geelong-Ballan Road,
- A primary shared path network (hike and bike) that runs throughout the site and along Old Melbourne Road, and
- The Geelong-Ballan Road/Old Melbourne Road intersection will be a 'key primary gateway'.

Figure 10 shows the location of the subject site in context of the Ballan Framework Plan.

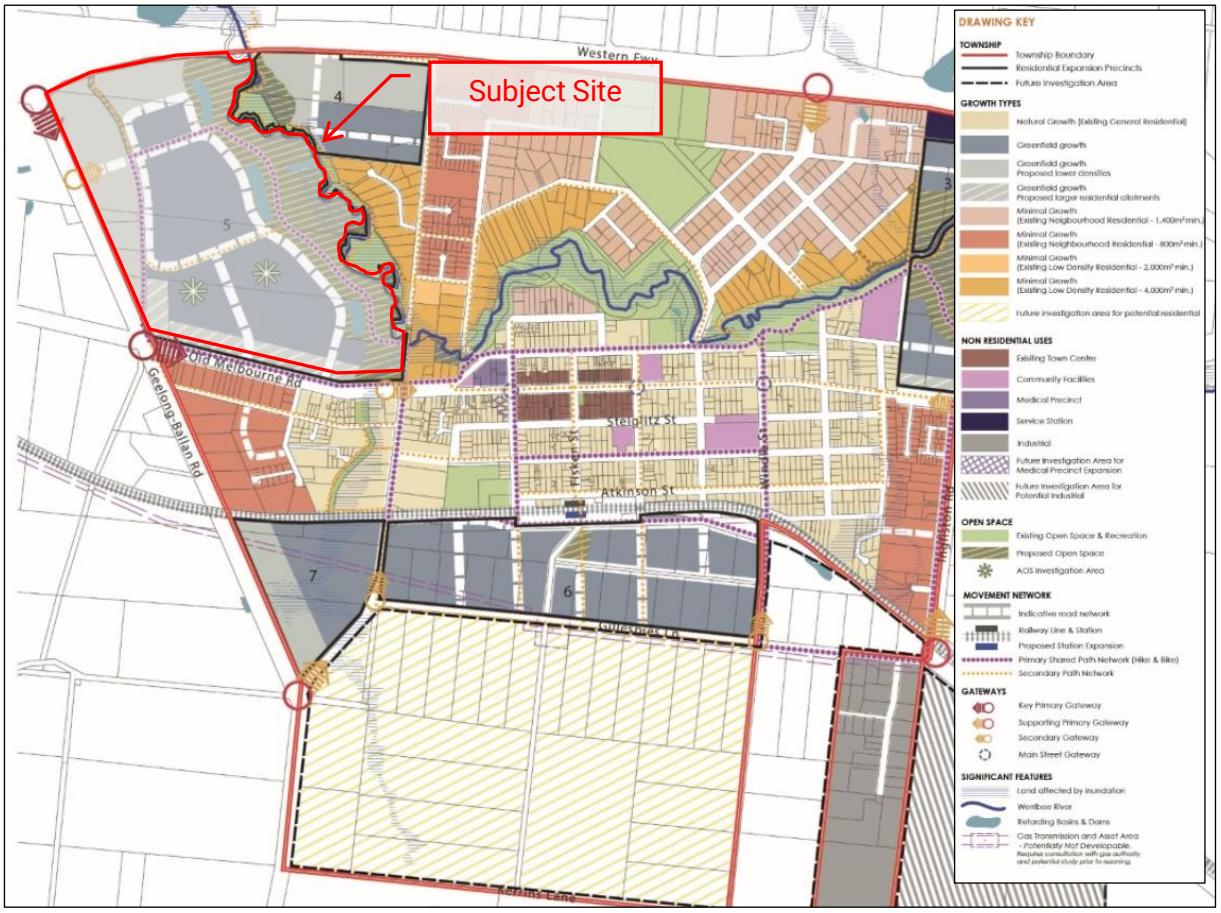


Figure 10: Ballan Framework Plan

4. Proposal

The proposal is to rezone the land to allow for a conventional residential subdivision to be developed. An active recreation reserve is also proposed within the site.

A concept layout plan showing how the site could potentially be developed, prepared by Patch, is attached at Appendix A, which identifies in the order of 1,000 future residential allotments.

Connections with the external road network are identified to the south and west of the site.

Any future subdivision would be subject to a future detailed report as part of a separate application once the land has been rezoned.

5. Traffic Engineering Considerations

5.1. Traffic Generation

For the purposes of this assessment, we have adopted an average residential generation rate of 8 vehicle trip ends (vte) per allotment per day which is consistent with typical rates adopted for growth areas.

We understand that Council has requested for adoption of 10 daily vte per dwelling. It is our experience that this rate is excessive for establishing a road hierarchy and undertaking intersection analysis with adoption of this trip generation rate relating to conservative assessments that are used for pavement design. Based on case studies completed by Traffix Group of residential growth areas, and typical rates adopted for modelling of Precinct Structure Plan and Development Plan areas, a more realistic upper limit for establishing a road's classification and undertaking intersection analysis is 8 daily vte per dwelling.

Based on this it is predicted that no more than in the order of 8,000 daily vehicle trip-ends (vte) would be generated by the entire site following full build out[1].

Of these, we will conservatively assume that in the order of 10% would be generated during each of the AM and PM peak hours[2], or in the order of 800 vte.

5.2. Road Cross Sections

The concept layout at Appendix A shows that the potential future subdivision could include a number of higher order roads connecting to the external road network.

When also having consideration for the identified potential external access connections and daily traffic generation conservatively predicted above, it is expected that the future internal roads that connect with the abutting roads would need to be nothing more than Connector Streets and a Local Access Street Level 2 for the eastern Old Melbourne Road connection based on the potential development scenario with two connections with Old Melbourne Road.

[1] This would be as high as 10,000 daily vte if a conservative average of 10vte per day per lot was instead adopted.

[2] Previous experience with residential subdivisions indicates that an upper limit of approximately 8% of daily trips would instead likely be generated in each commuter peak hour in areas such as this, noting that the same peak hour traffic would be predicted if we instead assumed 8% of a conservative daily generation of 10vte per lot was generated during each peak hour.

Local Access Street Level 1 and 2 roads will also be constructed within the subject site to complete the internal road network. There may also be laneways and/or extended/shared driveways.

Typical cross sections for a 'Connector Street', 'Access Street Level 2' and 'Access Street Level 1' based on current VPA requirements for Precinct Structure Plan areas are shown at Figure 11, Figure 12 and Figure 13, respectively.

It is noted that the connector street cross section will be sufficient to allow for a future bus route(s) in accordance with current 'best practice' requirements.

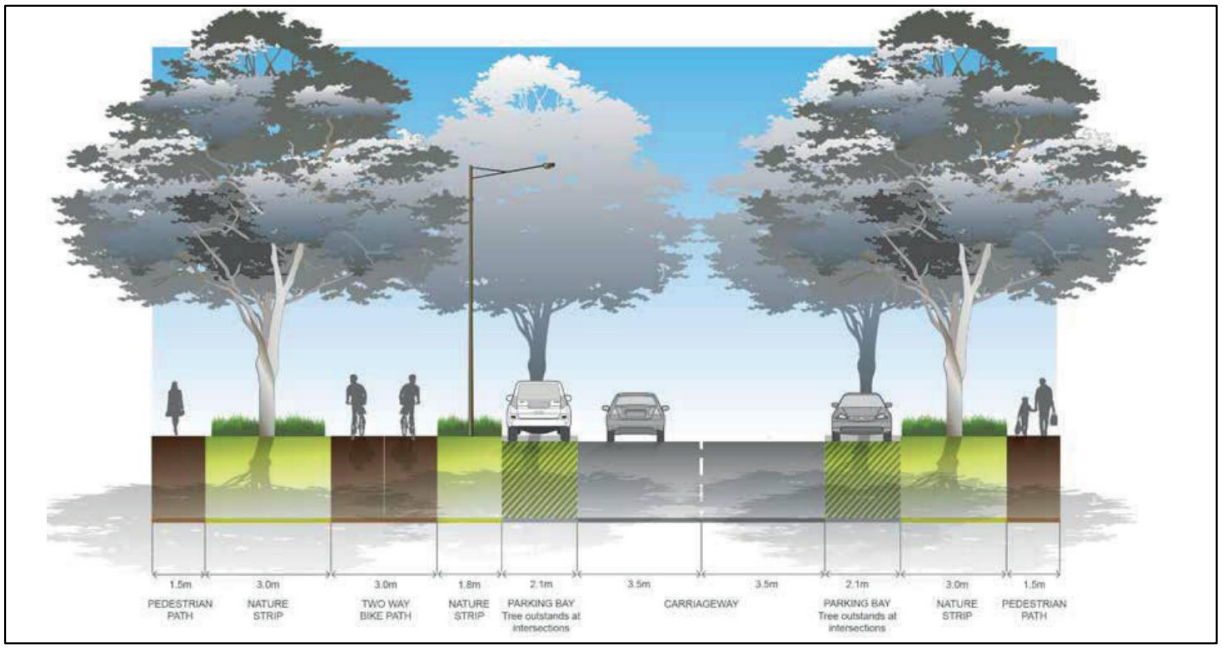


Figure 11: Typical Connector Street Cross Section

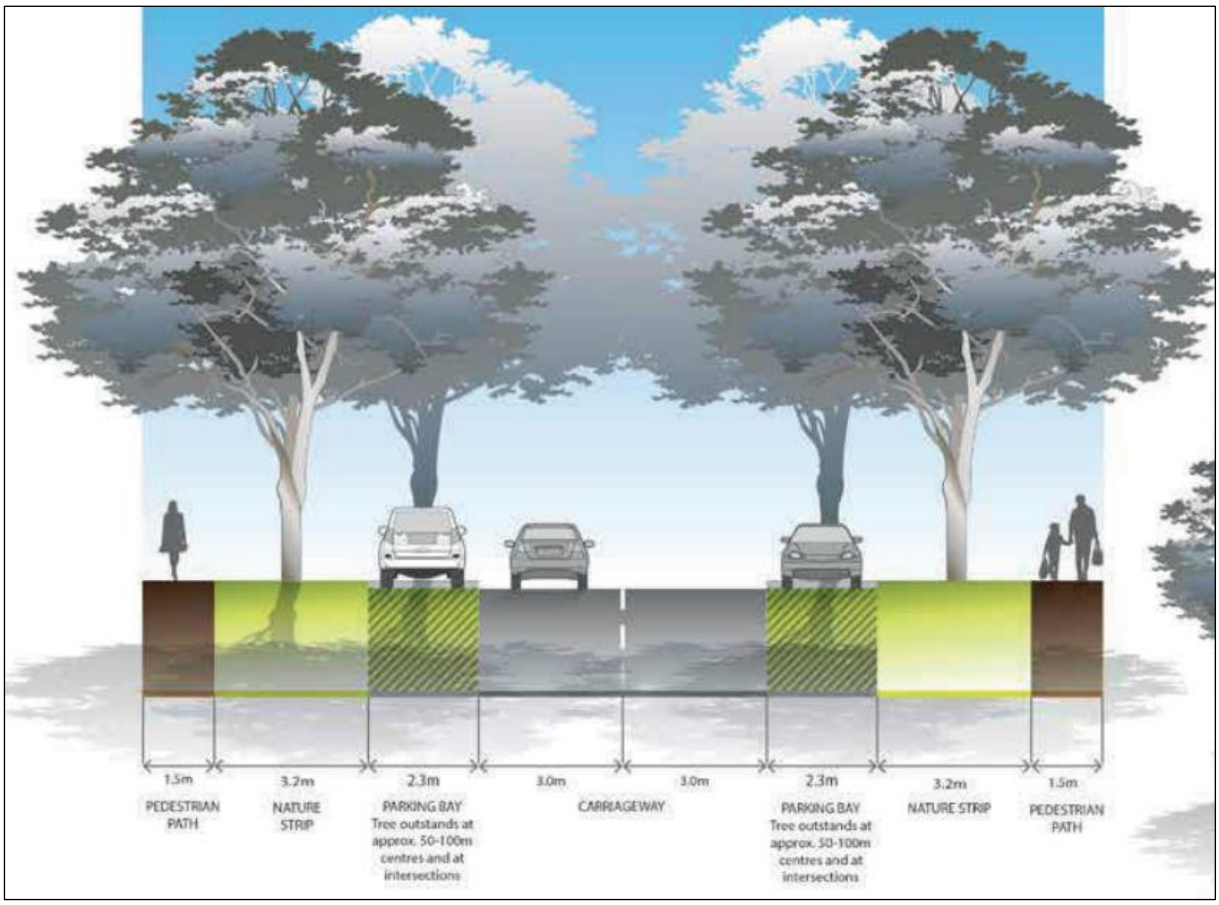


Figure 12: Typical Local Access Street Level 2 Cross Section

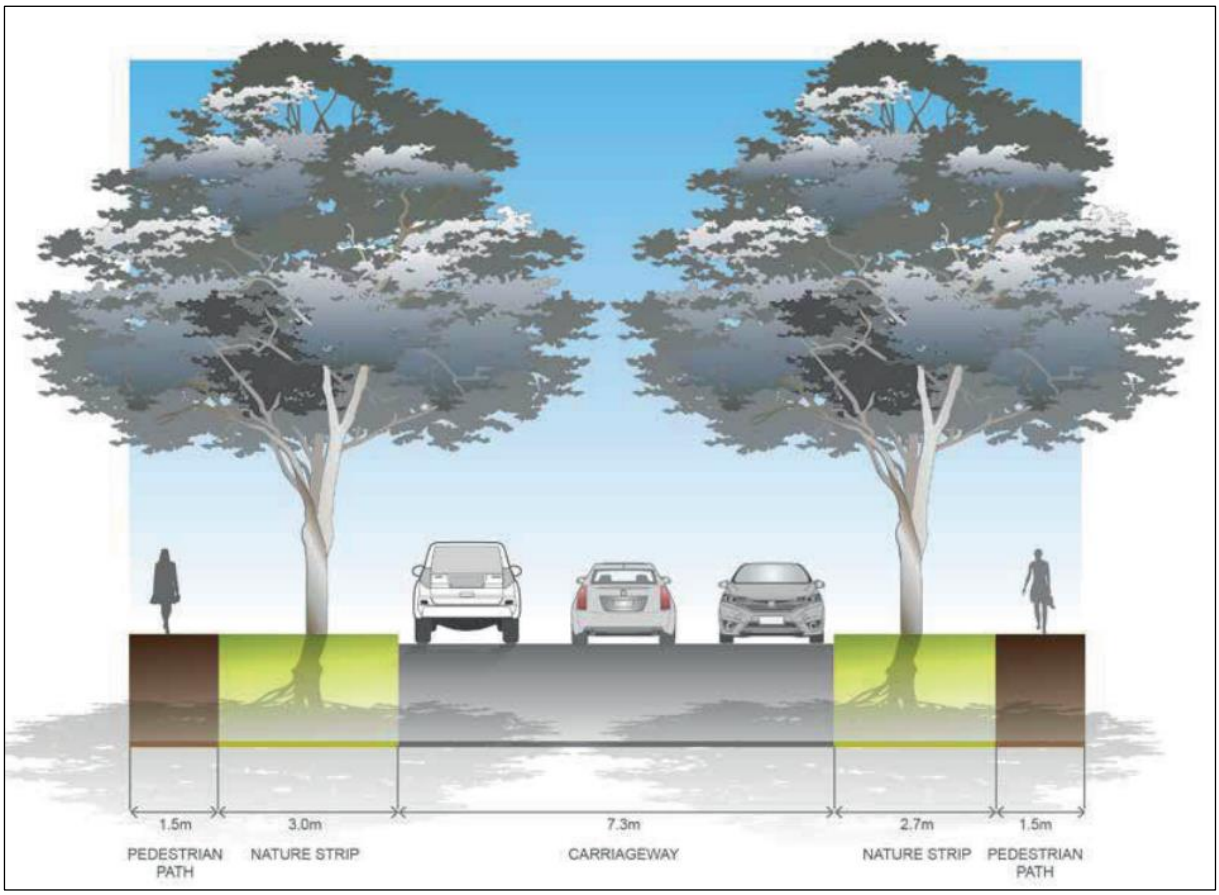


Figure 13: Typical Local Access Street Level 1 Cross Section

5.3. Parking Provision

As shown above in Figure 11 and Figure 12, formal on-street parking lanes are typically provided on both sides of connector streets and local access street level 2 roads.

Whilst the remaining road network has not been configured at this stage of the application, local access street level 1 roads will be sufficiently wide to allow informal parking on one side of the road whilst allowing for simultaneous two-way traffic. Alternatively, if parking occurs on both sides of these roads, a single traffic lane can be accommodated. This is typical of standard residential neighbourhoods.

Consideration would also need to be had to ensure sufficient nearby parking could be provided for visitors and service vehicles associated with any future allotment that may be accessed via a laneway or shared/extended driveway, including on abutting or nearby access roads.

Overall, we are satisfied that sufficient parking provision could be accommodated within a future subdivision on the land, both in a formal and informal arrangement that is consistent with good current practice.

5.4. Access for Service and Emergency Vehicles

The future carriageways of internal roads will need to adequately facilitate relevant service and emergency vehicles and be consistent with typical CFA requirements.

Any 'dead-end' roads that are proposed in a future subdivision layout proposal that are longer than 60m should be provided with adequate turning provisions in accordance with CFA requirements.

Furthermore, consideration would need to be had for future collection of waste for any allotments that are located within a dead-end, shared/extended driveway or laneway, noting that it is usually satisfactory for residents living in such allotments to walk and place bins in an adjacent access street for collection as long as there is sufficient space to accommodate all necessary bins and subject to a necessary walk being no longer than 50-60m.

5.5. Pedestrian and Cyclist Access

Footpaths should be provided on both sides of internal roads where there is residential abuttal on both sides. Pedestrians will suitably share the carriageway with motor vehicles along any shared/extended driveway or laneway.

Cyclists can utilise the proposed local access street carriageways in a shared fashion on the internal road network.

Furthermore, the Ballan Framework Plan identifies a perimeter bicycle and pedestrian path to run through the site and provide a connection between Old Melbourne Road and Werribee River. Typical connector street cross sections also include footpaths on both sides of the road and a two-way bike path on one side, allowing for pedestrian and cyclist movements into and out of the subject site.

The master plan attached at Appendix A also identifies shared paths along the site's Geelong-Ballan Road and Old Melbourne Road abuttals, which will assist in connecting the site to the Ballan township. We also understand that the developer of the site will provide a connection between the site's Old Melbourne Road frontage to connect to the existing path network within the Ballan Town Centre, immediately east of Bradshaw Street.

A diagram demonstrating the shared path network within and immediately abutting the site is presented at Figure 14. This shared path provision is in excess of what is set out in the Ballan Framework Plan and more than sufficient to service the site.

The paths discussed above will provide connections with adjacent land and the wider road network at a level that is consistent with the objectives of the Ballan Strategic Directions and good current practice and will be appropriate to serve the proposed development.

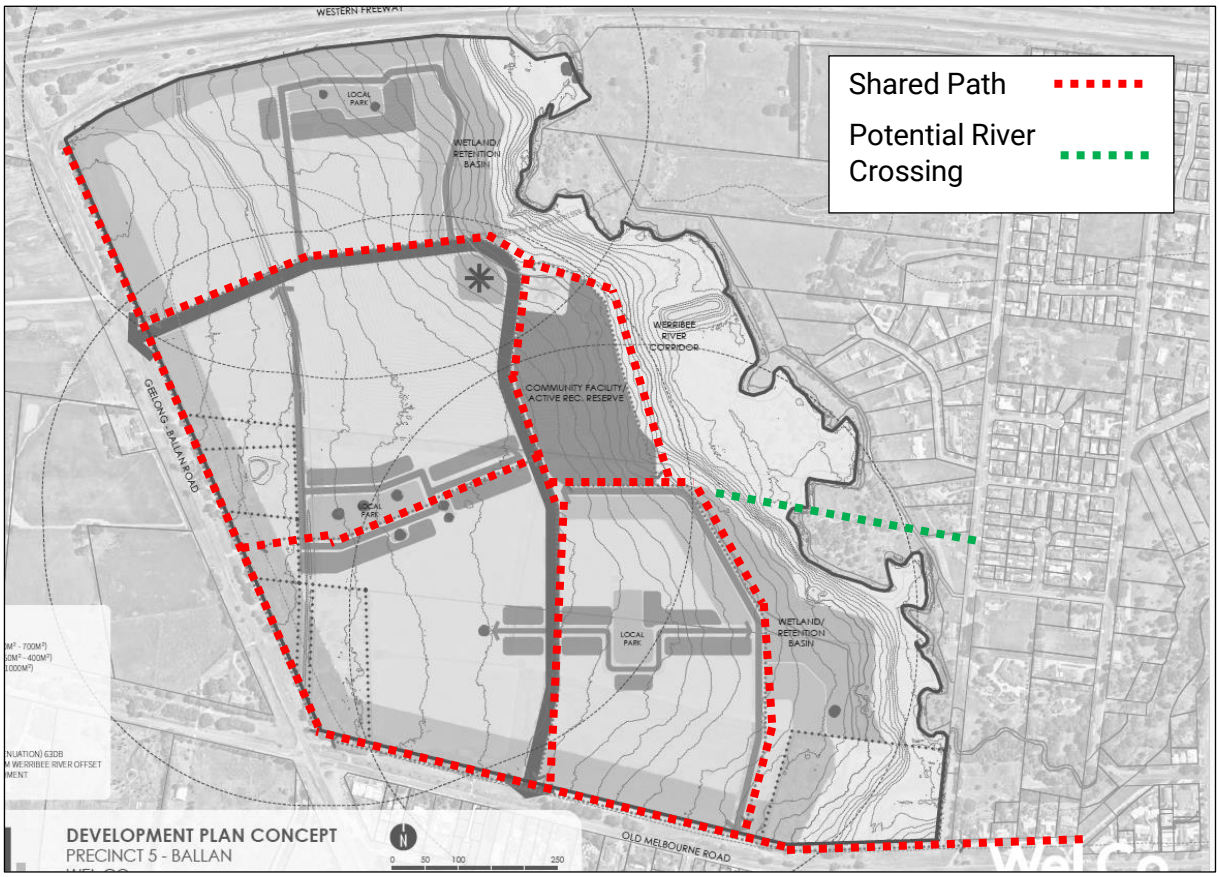


Figure 14: Shared Path Network

5.6. Public Transport Considerations

The subject site currently has limited access to public transport, with V/Line services operating from Ballan Railway Station which is located approximately 1.5km to the southeast of the subject site. The V/Line railway services provide services to Ararat, Ballarat, Maryborough and Southern Cross Railway Stations.

As the area continues to develop, additional public transport infrastructure may be provided, noting that the identified connector streets within the site are to be 'bus capable' in the event that operators decide to ultimately provide a route(s) through the site.

5.7. Traffic Control

All T-intersections identified within a future subdivision proposal should be appropriately staggered in accordance with good current practice, i.e. a typical minimum of 20m (centre to centre). Consideration may need to be had to providing a roundabout at any future cross-intersections.

It is also noted that some of the internal street blocks within a future subdivision may exceed 240m in length and that traffic control devices may need to be installed where necessary in order to control traffic speeds in accordance with Clause 56 of the Planning Scheme. Having

said that, it is typical that the distance between potential speed control devices is increased to 400-500m on any road (connector streets) that might form part of a future bus route.

6. Intersection Analysis

6.1. Traffic Generation and Distribution

As outlined in Section 5.1, a conservative traffic generation rate of 8 vehicle trips per day has been adopted for each dwelling, with 10% of these conservatively assumed to occur within each peak hour. For the purposes of our analysis, we have adopted a lot yield of 1,000 lots, noting that this is conservative when having regard to the latest master plan which identifies 928 lots.

A growth rate of 2% per annum for 10 years (i.e. a total growth of 20%) has been adopted for existing traffic volumes recorded on Old Melbourne Road and Geelong-Ballan Road in order to reflect future growth and development of the surrounding areas.

Traffic was assumed to be distributed to and from the external road network with consideration of the existing directional split obtained from the turning movement counts as follows:

- North – 40% of trips
- South – 10% of trips
- East – 40% of trips
- West – 10% of trips

It is noted that a higher proportion of traffic has been distributed to the east rather than the south to account for the future growth of the Ballan Town Centre and anticipated associated increase in trip proportions to and from the same. We are satisfied that the above directional splits are logical and take into account the orientation of the surrounding road network. We expect that most trips will be generated to/from the north (where access is provided to/from Western Freeway), and east (where access is provided to/from the Ballan Town Centre).

Despite two access connections with Old Melbourne Road being identified under the concept layout attached at Appendix A, we have also conservatively assumed that all traffic entering/exiting the site via Old Melbourne Road will utilise only one connection.

An entry/exit split of 20%/80% and 70%/30% has been assumed for the AM and PM peak hours, respectively. This distribution is generally consistent with what is commonly adopted for residential subdivisions within growth areas throughout outer metropolitan Melbourne and rural Victoria.

Based on the above, the anticipated post development traffic volumes are presented at Figure 15 and Figure 16.

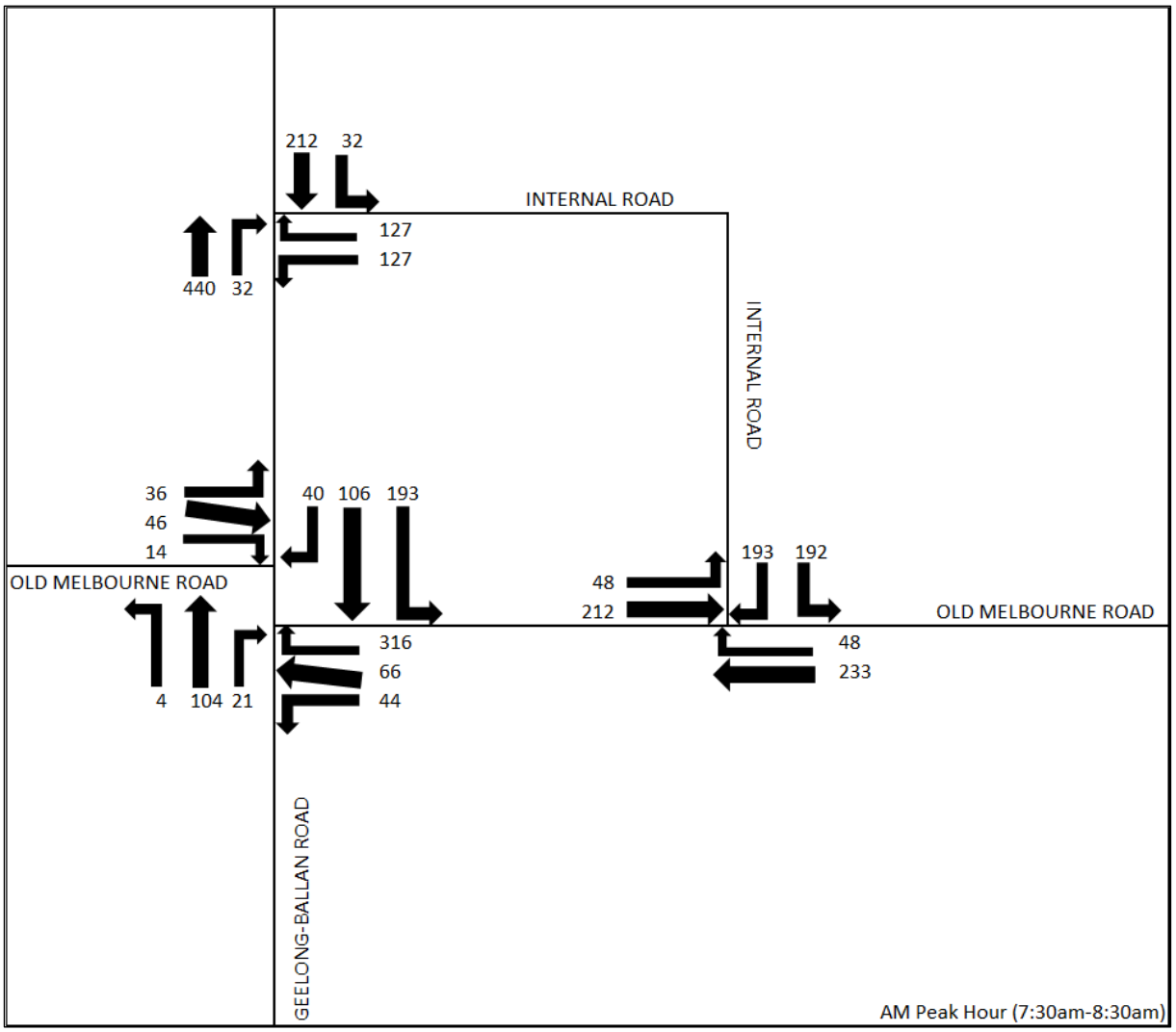


Figure 15: Post Development Traffic Volumes - AM Peak Hour

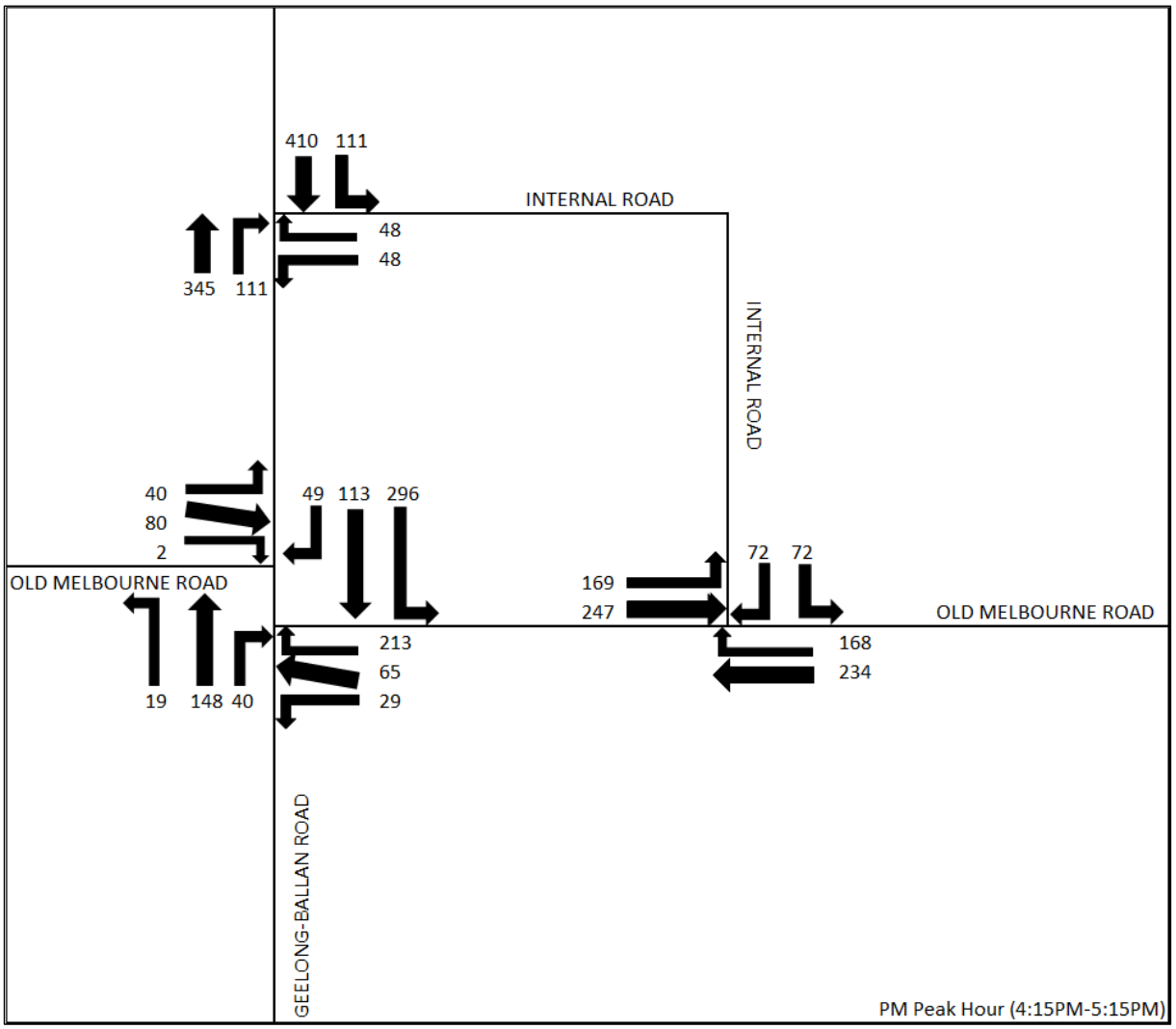


Figure 16: Post Development Traffic Volumes - PM Peak Hour

6.2. SIDRA Assessment

SIDRA Intersection 9 has been utilised to undertake an assessment of the performance of the Geelong-Ballan Road/Old Melbourne Road intersection in addition to the site access intersections with Geelong-Ballan Road and Old Melbourne Road, under both existing and post development conditions.

SIDRA is a computer simulation package which assesses the operating performance of intersections. A summary of the key outputs is as follows:

- **Degree of Saturation (DoS)** – The ratio of traffic volume to the practical absorption capacity for a particular turning movement.
- **Average Delay (Avg. Delay)** – The average delay in seconds for a vehicle making a particular turning movement.

- **95th Percentile Queue (95% Queue)** – The 95% percentile queue is the length in metres which 95 per cent of all observed cycle queues fall below (or 5% exceed) during the peak analysis period.

The Geelong-Ballan Road/Old Melbourne Road intersection has been modelled as a network to allow for the approximately 30m long existing stagger between the eastern and western legs of the intersection.

Heavy vehicles have been adopted as a nominal 5% on each external road and 2% on each internal road.

All remaining SIDRA values have been kept as default.

The analysis outputs demonstrate that each of the proposed ultimate intersection layouts as discussed in more detail later in this report will function well within acceptable operating conditions. Furthermore, the Geelong-Ballan Road/Old Melbourne Road intersection can continue to function within acceptable operating conditions under its existing layout without any modifications or provision of turn lanes on Geelong-Ballan Road.

Full output of the results of the SIDRA assessments are attached at Appendix B, which show that there will be acceptable operating conditions based on queues, delays and degree of saturation.

7. External Access Considerations

7.1. Site Access Connections

Site access will ultimately be available via Geelong-Ballan Road to the west of the site and Old Melbourne Road to the south of the site.

Guidelines for the selection of intersection treatments are provided in the AustRoads Guide to Road Design series. *Part 4A: Unsignalised and Signalised Intersections* gives an indication of intersection types and turn treatments for a number of road scenarios including urban and rural intersections and Greenfields developments.

An assessment of the turning lane warrants for the Geelong-Ballan Road and Old Melbourne Road site access connections following full development of the subject site[3] during the critical PM peak hour, i.e. when much more traffic will enter the site when compared with the AM peak hour, are presented at Figure 17 and Figure 18, respectively.

Traffix Group has prepared concept layout plans of potential site access arrangements with Geelong-Ballan Road and Old Melbourne Road which are attached at Appendix C, noting that they all include full length left and right turn lanes despite a warrants assessment suggesting that something lesser would be satisfactory in some cases. Importantly, these intersections will be sufficient to accommodate heavy vehicles and buses to allow for a potential future bus route(s) through the site.

[3] Assessments based on 1,000 standard residential allotments.

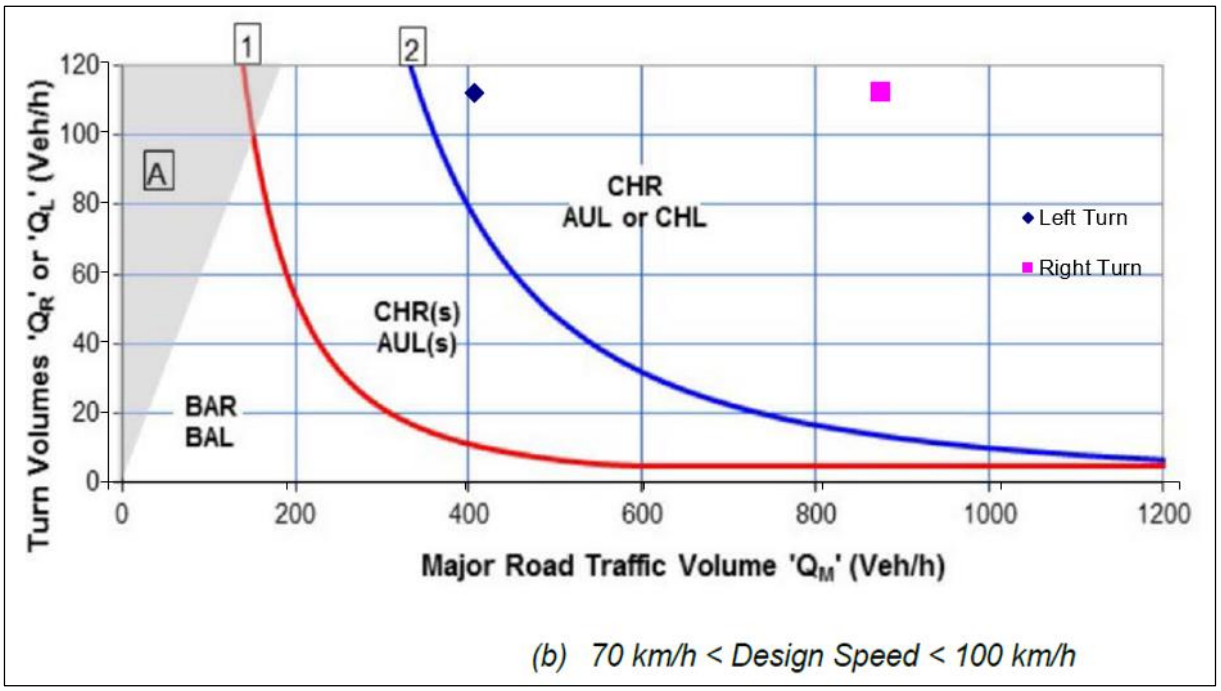


Figure 17: Geelong-Ballan Road Site Access Connection - Turning Lane Warrants (PM Peak Hour)

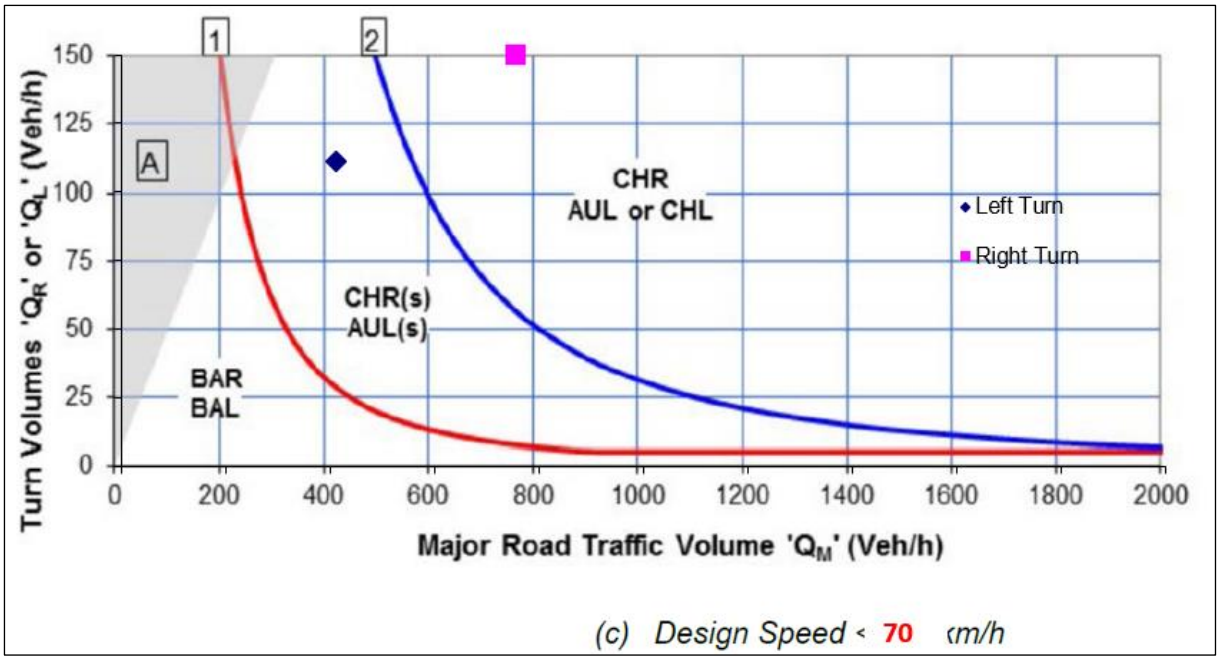


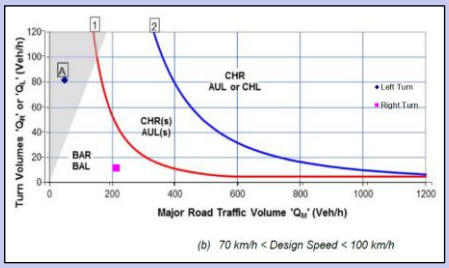
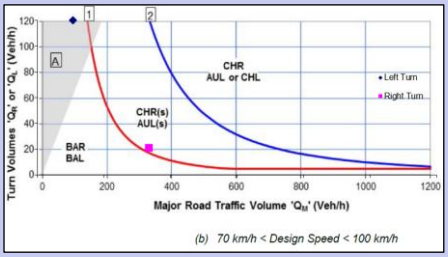
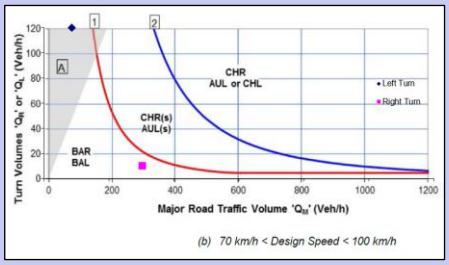
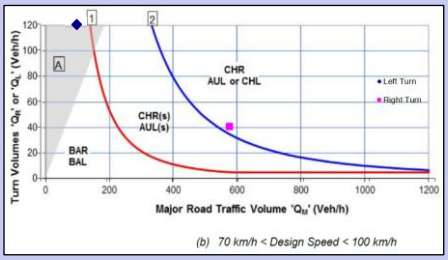
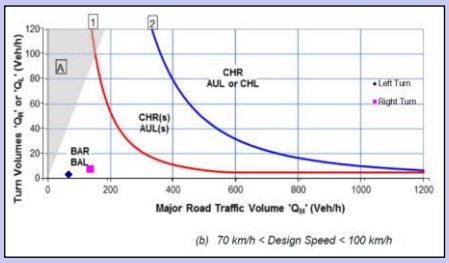
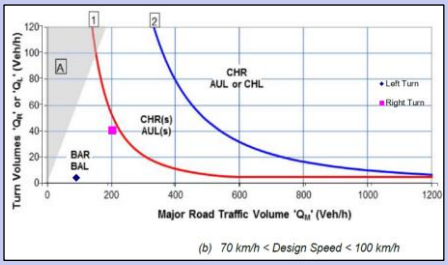
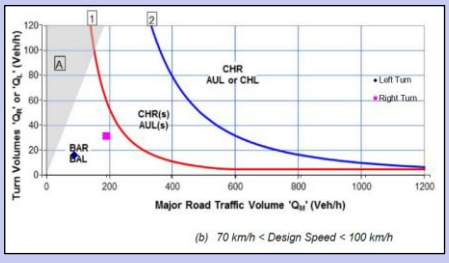
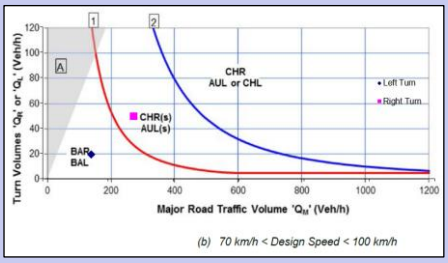
Figure 18: Old Melbourne Road Site Access Connection - Turning Lane Warrants (PM Peak Hour)

7.2. Geelong-Ballan Road/Old Melbourne Road Intersection

The turning lane warrants for the Geelong-Ballan Road/Old Melbourne Road have also been assessed, under existing conditions and following development of the subject site.

In particular, Table 1 provides a summary of the turning lane warrants for each Geelong-Ballan Road approach for motorists turning into the eastern and western legs of the intersections.

Table 1: Geelong-Ballan Road/Old Melbourne Road Turning Lane Warrants

Intersection Leg	Peak Hour	Existing Conditions	Post Development
Eastern Leg	AM		
	PM		
Western Leg	AM		
	PM		

Based on the above assessments, each of the existing Geelong-Ballan Road approaches to

the Old Melbourne Road intersection legs currently require Basic Left-Turn (BAL) and Basic Right-Turn (BAR) treatments.

Following full development of the subject site, each Geelong-Ballan Road approach continues to meet the warrants for a BAL treatment whilst the warrants for a Channelised Right Turn Lane (CHR) are met on the northern approach and a Short Channelised Right Turn Lane (CHR(s)) are met on the southern approach.

A concept layout plan of the proposed Geelong-Ballan Road/Old Melbourne Road intersection layout is attached at Appendix C, which includes an Auxiliary Left-turn Lane Treatment (AUL) and Channelised Right-turn Lane treatment (CHR) on each leg, thus exceeding or meeting what is required under both the warrants assessment and intersection analysis assessment as discussed in detail earlier.

8. RFI Response

8.1. May 2023 RFI

We have undertaken a review of the relevant traffic engineering items raised by Council in its RFI dated 15 May 2023 and provide the following responses in Table 2.

Table 2: May 2023 RFI Responses

RFI Item	Traffix Group Response
a) *Map in Figure 10: Needs to be updated to show the Ballan Framework Plan in accordance with Clause 11.01-1L-03.*	Figure 10 has been updated to show the Ballan Framework Plan.
b) *Map in Appendix A: The concept plan needs to include all properties within precinct 5 and needs to be consistent with the updated indicative concept plan.*	Refer to Appendix A.
c) *The traffic generation estimates need to be increased to 10 vehicle trip ends per allotment per day (i.e. rather than 8), consistent with the IDM.*	Refer to Section 5.1 for additional commentary. We are satisfied that adoption of 8 trips per allotment per day is representative of the likely trip generation for the site based on typical practice for PSP and DP areas and case study data obtained by Traffix Group.
d) *Section 6.1: Traffic movements observed at these intersections are drastically different to the traffic trip assumptions provided. Further information is therefore required on these assumptions, to ensure that the intersection upgrades are correct and realistic.*	Refer to Section 6.1 for additional commentary. We are satisfied that the estimated traffic distribution at the Geelong-Ballan Road / Old Melbourne Road intersection is appropriate when having regard to the surrounding road network and location of nearby uses.

e) *Section 6.2: Further information needs to be provided for the SIDRA assessment assumptions. Council needs be assured that appropriate traffic outcomes are achieved for the greater Ballan community.*	All SIDRA variables have been kept at default, with the exception of heavy vehicle percentage which has been increased to 5% for Geelong-Ballan Road and Old Melbourne Road, and 2% for internal roads.
f) *Section 7.1: The Department of Transport (DOT [now DTP]) has advised: "The identified intersections (consisting of new pavement and any road widening) for the access collector roads to the development are to be bus and freight capable for local shopping precinct deliveries."*	We agree that connector streets should be designed to allow for future potential bus routes, noting that the cross section included at Figure 11 is appropriate to accommodate the same consistent with typical practice and requirements of bus operators.
g) *Section 7.2: DOT has advised: "With the additional development demands identified in the TEA, the intersection of Old Melbourne Road and Geelong-Ballan Road will be in excess of current provisions. This intersection requires further investigation and design to ensure safe and efficient movement for all road users."* *Due consideration needs to be given to the long term growth of Ballan as a whole. Although this ultimate outcome is not the sole responsibility of this development, it may need to contribute. (N.B. Council is currently undertaking a Transport Analysis Investigation for Ballan and the key intersections and therefore further advice can be provided in the near future.)*	As per the analysis completed at Section 6.2, the Geelong-Ballan Road / Old Melbourne Road can continue to operate within acceptable conditions, with minimal queuing and delays, following full development of the subject site in addition to 20% growth with no modifications to its current configuration. Notwithstanding, the turn lane warrants assessment provided at Section 7.2 indicates that the eastern and western Old Melbourne Road legs require a channelised right turn treatment (CHR) and short channelised right turn treatment (CHR(s)), respectively. Clearly, it is not solely the development of the subject site that triggers upgrade works to the intersection, rather a combination of existing traffic, surrounding growth and the site itself.
h) *Appendix C: The concept plans for the access intersections are not consistent with the vegetation assessment. Further consideration needs to be given to existing vegetation that may need to be removed to allow for construction and maintenance of intersections.*	We have been advised by the project team that they are not aware of any native vegetation that may affect the proposed site access intersections or future entry road alignments.
i) *The TEA needs to provide greater emphasis on integrated transport, including a high level assessment of:* *i. Sustainable transport (i.e. pedestrian and cycling): Consideration should be given to off-road shared path networks (both onsite and offsite), linking key destinations and including*	Refer to Section 5.5 for commentary regarding pedestrian and cyclist provisions. Shared paths are identified along connector streets and adjacent to the local park within the site. Additional shared paths are identified along Old

	the Werribee River corridor. Such networks should also provide linkages between the subject site and existing paths to the east and/or across the Werribee River (N.B. Council's expectation is that the developer should construct the external links to the existing network). The following comments from DOT should also be noted: *(1) "DOT encourage clear north-south and east-west corridors for access and movement.* *(2) DoT note and support shared pathway linkages are shown on Figure 11 of the Open Space Needs Assessment as they align with natural corridors of residential development and desire lines to the shopping precinct, open space and existing town centre. Subject to environmental impact assessment, bridged access across Werribee River to connect to existing township is encouraged.* *(3) Access to the Western Highway and limits of interchange reserve is not allowed and measures to ensure this is required.* *(4) DoT support the indicative layout plan detailing the introduction of a shared path along Geelong-Ballan Rd and Old Melbourne Road. This infrastructure will provide additional access to the community and provide access to the bus service on Old Melbourne Road."*	Melbourne Road and Geelong-Ballan Road on the site's abuttal. We also understand that a low order informal trail may be provided across the Werribee River, subject to approval from Melbourne Water. It is also noted that access to allotments is to be provided internally within the subject site in order to ensure that no direct allotment access is provided via Western Freeway, Geelong-Ballan Road or Old Melbourne Road.
i.	*ii) Potential public transport (i.e. bus) networks: The following comments from DOT should be noted:* *(1) "The Ballan-Hepburn route service operates along Geelong-Ballan Road and Old Melbourne Road which is at the periphery of the development.* *(2) The development is of considerable size where the general community will expect a bus service and most of the development is not within patron walking distance catchment of the current route.* *(3) Internal connector roads shall be built to satisfy bus route and stop infrastructure is required. We have identified stops on both sides of connector roads adjacent to the retail precinct, the community park, and just north of the entrance on Old Melbourne Road as suitable locations. This may be subject to*	As discussed previously, connector streets identified within the site will be capable of accommodating future potential bus routes in accordance with relevant requirements. It is generally desirable for bus routes to be capable of being provided within 400m walking distance for residents. The specific location of bus stops would be typically completed during the future detailed design stage of the project.

change depending on development final plans and bus stop spacing requirements."	

8.2. December 2023 RFI

Further to our previous RFI responses, Moorabool Shire Council issued an additional request for further information dated 21 December 2023 with responses provided to relevant traffic engineering matters in Table 3.

Table 3: December 2023 RFI Responses

RFI Item	Traffix Group Response
a) *The TEA needs to provide further details regarding shared path networks (both onsite and offsite), linking to key destinations beyond the site (such as the Ballan town centre) and including the Werribee River corridor. Such networks should also provide options for linkages across the Werribee River, subject to approval from Melbourne Water (N.B. Council's expectation is that the developer should construct the external links to the existing network). The importance of the shared path network has been flagged by Councillors on several occasions.*	Further details have been provided within Section 5.5 and in our previous RFI response at Table 2. As discussed previously, the site will provide a shared path network that is in excess of what is set out in the Ballan Framework Plan. A shared path connection will also be funded by the developer of the site on Old Melbourne Road between the boundary of the site and the Ballan Town Centre.
b) *Map in Figure 10: Needs to be updated to show the Ballan Framework Plan in accordance with Clause 11.01-1L-03 of the Moorabool Planning Scheme.*	Figure 10 has been updated to show the Ballan Framework Plan.
c) *The traffic generation estimates need to be increased to 10 vehicle trip ends per allotment per day (i.e. rather than 8), consistent with the IDM (which is referenced in Clause 19.03-2L of the planning scheme). Satisfactory evidence would need to be provided to justify less than 10 vehicle trip ends per allotment per day. E.g. Are the PSPs referred to located in a similar context to Ballan precinct 5, or are they located within walking distance of schools, shopping centres, childcare, etc?*	Our vast experience suggests that an average of 10 vte/lot/day as set out in the IDM should be used for pavement design whereas something considerably less should be adopted for the purposes of determining road hierarchy and undertaking intersection analysis. In particular, it is not representative of the actual level of traffic that is generated by residential estates. Traffix Group has completed numerous case studies of residential subdivisions to determine suitable residential traffic generation rates. This includes a case study in South Morang with a summary of the methodology and results provided at Appendix D. It is important to note that the case study site is considered to be located in a similar environment to Precinct

	5 given that it is not located in close proximity to an activity centre and likely to require a private motor vehicle to undertake most trips. Key findings of this case study identified a daily traffic generation rate of **7.91 trips per dwelling**, and peak hour traffic generation rates of 0.66 trips per dwelling and 0.72 trips per dwelling identified in the AM and PM peak hours, respectively. Accordingly, we are satisfied that a traffic generation rate of 8 trips per dwelling is appropriate, noting that modelling undertaken for the Victorian Planning Authority and various Councils for Precinct Structure Plan areas adopt even lower daily and peak hourly traffic volumes than what we have adopted.
d) Section 6.1: The post development traffic turning volumes appear to be different to the SIDRA outputs data (appendix B). Further clarification is required for this data. Additional tables could be provided, to show existing, post development and 10 years after development.	SIDRA applies a peak flow factor to convert input volumes to arrival flows. The SIDRA default value of 95% peak flow factor (i.e. a 5% increase in input volumes) has been adopted for this analysis, noting that this is common practice when undertaking intersection analysis.

9. Conclusions

Having visited the site, perused relevant background documents and plans, provided advice to the project team in relation to potential future site access arrangements and undertaken other investigations and assessments, we are of the opinion that:

a) There is no reason to suggest that future internal road reservations could not be provided in accordance with what is required to accommodate appropriate carriageways, paths, services, etc., in accordance with relevant standards and good current practice,

b) Public transport, on-street parking, pedestrian and cycle provisions can be provided consistent with the relevant standards and current practice,

c) Any dead-end roads that are longer than 60m in length should be provided with an appropriate turning area to adequately accommodate service and emergency vehicles,

d) Consideration should be had in the detailed functional layout design process for the future internal site layout to provide traffic control devices as required,

e) The level of traffic likely to be generated by a future residential subdivision on the site will be readily accommodated by the surrounding road network without any adverse impacts,

f) All proposed site access intersections and the Geelong-Ballan Road/Old Melbourne Road intersection will function well within acceptable operating conditions, and are in some cases proposed in excess of what is required based on both a warrants and an analysis assessment, following development of the site,

g) The proposed upgrade of the Geelong-Ballan Road/Old Melbourne Road intersection is identified at a level that is greater than required based on both a warrants and an analysis assessment when having consideration for full development of the subject site and other growth on existing traffic volumes. Accordingly, we believe that it would be appropriate to allow some future development on the subject site prior to some or all of the identified intersection upgrades as a result,

h) All relevant traffic engineering items in Council's RFIs have been addressed, and

i) There are no traffic engineering reasons why the subject land should not rezoned to allow future development of a residential subdivision.

Appendix A

Future Subdivision Concept Plans

WESTERN FREEWAY

GEELONG - BALLAN ROAD

OLD MELBOURNE ROAD

LOCAL PARK

WETLAND/ RETENTION BASIN

WERRIBEE RIVER CORRIDOR

COMMUNITY FACILITY/ ACTIVE REC. RESERVE

LOCAL PARK

LOCAL PARK

WETLAND/ RETENTION BASIN

LEGEND

- PRECINCT 5 BOUNDARY
- PROPERTY BOUNDARY
- CONVENTIONAL RESIDENTIAL (300M^2 - 700M^2)
- MEDIUM DENSITY RESIDENTIAL (150M^2 - 400M^2)
- INTERFACE RESIDENTIAL (800M^2 - 1000M^2)
- COMMERCIAL
- ACTIVE RECREATION
- COMMUNITY HUB
- LOCAL PARK
- WETLAND / RETENTION BASIN
- WERRIBEE RIVER CORRIDOR
- ACTIVE TRANSPORT PATH
- FREEWAY NOISE EXTENT (NO ATTENUATION) 63DB
- COMBINED 75M Q100 OFFSET/100M WERRIBEE RIVER OFFSET
- 400M PASSIVE OPEN SPACE CATCHMENT
- EXISTING TREE (TO BE RETAINED)

PATCH. DESIGN+PLAN

DEVELOPMENT PLAN CONCEPT

PRECINCT 5 - BALLAN

WEL.CO

N

0 50 100 250

SCALE: 1:5,000 @ A3

26.06.23 V13

Wel.Co

Appendix B

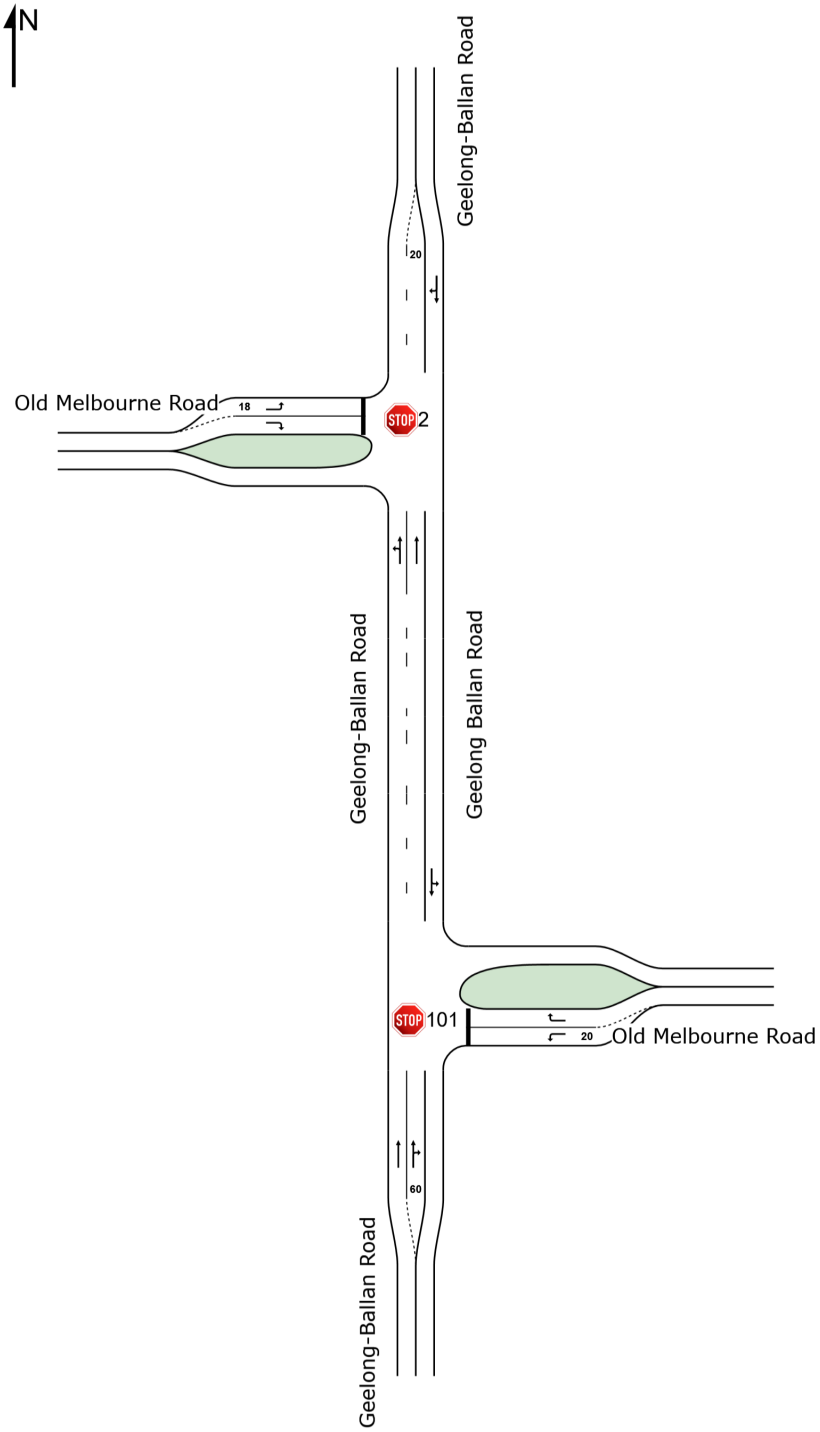
SIDRA Outputs

NETWORK LAYOUT

Network: N101 [AM Peak Hour Post Development (Network Folder: General)]

New Network
Network Category: (None)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



SITES IN NETWORK		
Site ID	**CCG ID**	**Site Name**
101	NA	East Approach
2	NA	West Approach

MOVEMENT SUMMARY

Site: 101 [East Approach (Site Folder: AM Peak Period)]

Network: N101 [AM Peak Hour Post Development (Network Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Geelong-Ballan Road														
2	T1	114	4.6	114	4.6	0.039	0.3	LOS A	0.2	1.2	0.11	0.08	0.11	57.8
3	R2	22	4.8	22	4.8	0.039	7.0	LOS A	0.2	1.2	0.33	0.22	0.33	54.9
Approach		136	4.7	136	4.7	0.039	1.4	NA	0.2	1.2	0.15	0.10	0.15	57.0
East: Old Melbourne Road														
4	L2	46	2.3	46	2.3	0.037	8.6	LOS A	0.1	1.0	0.23	0.88	0.23	51.7
6	R2	402	1.6	402	1.6	0.622	15.4	LOS C	5.5	39.1	0.71	1.18	1.22	41.1
Approach		448	1.6	448	1.6	0.622	14.7	LOS B	5.5	39.1	0.66	1.15	1.12	42.7
North: Geelong Ballan Road														
7	L2	252	4.6	252	4.6	0.207	3.1	LOS A	0.0	0.0	0.00	0.36	0.00	53.4
8	T1	126	5.0	126	5.0	0.207	0.0	LOS A	0.0	0.0	0.00	0.36	0.00	56.3
Approach		378	4.7	378	4.7	0.207	2.1	NA	0.0	0.0	0.00	0.36	0.00	54.3
All Vehicles		962	3.3	962	3.3	0.622	7.9	NA	5.5	39.1	0.33	0.69	0.54	48.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [West Approach (Site Folder: AM Peak Period)]

Network: N101 [AM Peak Hour Post Development (Network Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Geelong-Ballan Road														
1	L2	74	1.4	74	1.4	0.227	3.1	LOS A	0.0	0.0	0.00	0.10	0.00	55.9
2	T1	442	4.5	442	4.5	0.227	0.2	LOS A	0.0	0.0	0.00	0.08	0.00	59.2
Approach		516	4.1	516	4.1	0.227	0.6	NA	0.0	0.0	0.00	0.08	0.00	58.7
North: Geelong-Ballan Road														
8	T1	315	5.0	315	5.0	0.221	0.8	LOS A	0.6	4.7	0.19	0.08	0.19	56.7
9	R2	42	5.0	42	5.0	0.221	9.2	LOS A	0.6	4.7	0.19	0.08	0.19	56.5
Approach		357	5.0	357	5.0	0.221	1.8	NA	0.6	4.7	0.19	0.08	0.19	56.6
West: Old Melbourne Road														
10	L2	38	2.8	38	2.8	0.039	9.8	LOS A	0.1	1.1	0.42	0.87	0.42	51.1
12	R2	63	1.7	63	1.7	0.198	18.6	LOS C	0.7	5.1	0.75	1.01	0.77	38.6
Approach		101	2.1	101	2.1	0.198	15.3	LOS C	0.7	5.1	0.63	0.96	0.64	44.5
All Vehicles		974	4.2	974	4.2	0.227	2.6	NA	0.7	5.1	0.14	0.17	0.14	55.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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.
Delay Model: SIDRA Standard (Geometric Delay is included).
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 [East Approach (Site Folder: PM Peak Period)]

Network: N101 [PM Peak Hour Post Development (Network Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Geelong-Ballan Road														
2	T1	176	4.8	176	4.8	0.067	0.5	LOS A	0.3	2.4	0.13	0.09	0.13	57.6
3	R2	42	5.0	42	5.0	0.067	7.8	LOS A	0.3	2.4	0.46	0.32	0.46	53.9
Approach		218	4.8	218	4.8	0.067	1.9	NA	0.3	2.4	0.19	0.13	0.19	56.3
East: Old Melbourne Road														
4	L2	31	3.4	31	3.4	0.024	8.6	LOS A	0.1	0.7	0.23	0.88	0.23	51.6
6	R2	293	1.8	293	1.8	0.565	17.2	LOS C	3.9	27.5	0.72	1.16	1.21	39.5
Approach		323	2.0	323	2.0	0.565	16.4	LOS C	3.9	27.5	0.67	1.13	1.12	41.2
North: Geelong Ballan Road														
7	L2	396	4.3	396	4.3	0.283	3.1	LOS A	0.0	0.0	0.00	0.41	0.00	52.9
8	T1	119	5.3	119	5.3	0.283	0.0	LOS A	0.0	0.0	0.00	0.41	0.00	55.8
Approach		515	4.5	515	4.5	0.283	2.4	NA	0.0	0.0	0.00	0.41	0.00	53.5
All Vehicles		1056	3.8	1056	3.8	0.565	6.6	NA	3.9	27.5	0.25	0.58	0.38	49.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network 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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [West Approach (Site Folder: PM Peak Period)]

Network: N101 [PM Peak Hour Post Development (Network Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Geelong-Ballan Road														
1	L2	88	1.2	88	1.2	0.206	3.1	LOS A	0.0	0.0	0.00	0.13	0.00	55.7
2	T1	380	4.7	380	4.7	0.206	0.1	LOS A	0.0	0.0	0.00	0.10	0.00	58.9
Approach		468	4.0	468	4.0	0.206	0.7	NA	0.0	0.0	0.00	0.11	0.00	58.3
North: Geelong-Ballan Road														
8	T1	431	4.4	431	4.4	0.291	0.7	LOS A	0.9	6.2	0.18	0.07	0.19	57.0
9	R2	52	6.1	52	6.1	0.291	9.1	LOS A	0.9	6.2	0.18	0.07	0.19	56.6
Approach		482	4.6	482	4.6	0.291	1.6	NA	0.9	6.2	0.18	0.07	0.19	56.9
West: Old Melbourne Road														
10	L2	42	2.5	42	2.5	0.041	9.4	LOS A	0.2	1.1	0.38	0.87	0.38	51.3
12	R2	86	1.2	86	1.2	0.312	22.6	LOS C	1.2	8.7	0.81	1.04	0.97	35.7
Approach		128	1.6	128	1.6	0.312	18.3	LOS C	1.2	8.7	0.67	0.99	0.78	42.0
All Vehicles		1079	4.0	1079	4.0	0.312	3.2	NA	1.2	8.7	0.16	0.19	0.18	54.7

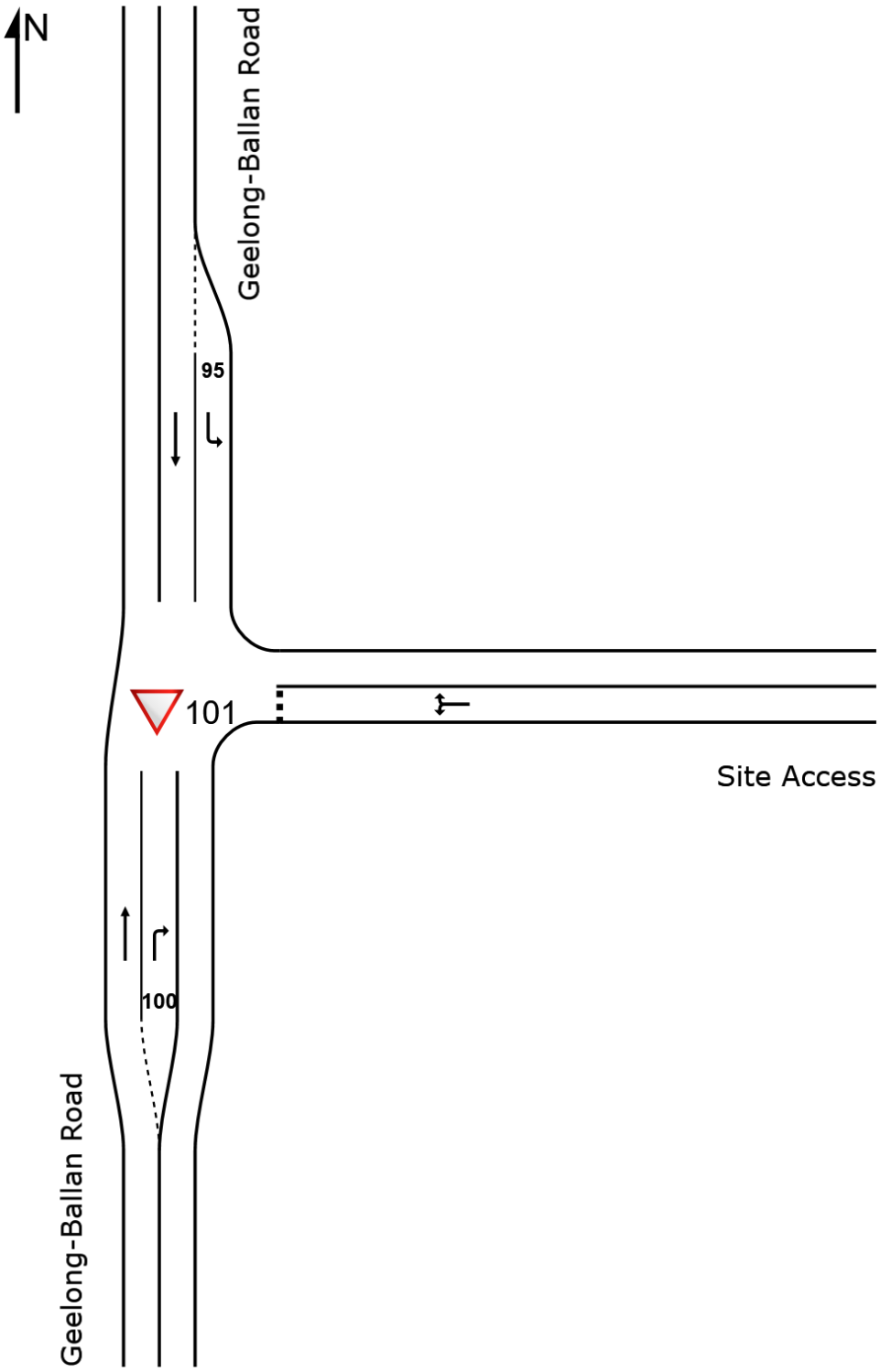
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and 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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Northern Site Access (Site Folder: AM Peak Period)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 101 [Northern Site Access (Site Folder: AM Peak Period)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Geelong-Ballan Road														
2	T1	440	5.0	463	5.0	0.247	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	32	2.0	34	2.0	0.031	6.5	LOS A	0.1	0.8	0.35	0.60	0.35	52.1
Approach		472	4.8	497	4.8	0.247	0.5	NA	0.1	0.8	0.02	0.04	0.02	59.3
East: Site Access														
4	L2	127	2.0	134	2.0	0.496	9.1	LOS A	3.1	21.8	0.58	0.87	0.90	47.5
6	R2	127	2.0	134	2.0	0.496	19.2	LOS C	3.1	21.8	0.58	0.87	0.90	47.3
Approach		254	2.0	267	2.0	0.496	14.2	LOS B	3.1	21.8	0.58	0.87	0.90	47.4
North: Geelong-Ballan Road														
7	L2	32	2.0	34	2.0	0.018	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.5
8	T1	212	5.0	223	5.0	0.118	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		244	4.6	257	4.6	0.118	0.8	NA	0.0	0.0	0.00	0.08	0.00	59.0
All Vehicles		970	4.0	1021	4.0	0.496	4.1	NA	3.1	21.8	0.16	0.27	0.25	55.6

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Eastern Site Access (Site Folder: PM Peak Period)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Old Melbourne Road														
5	T1	234	5.0	246	5.0	0.131	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	168	2.0	177	2.0	0.197	7.9	LOS A	0.8	5.8	0.50	0.73	0.50	51.3
Approach		402	3.7	423	3.7	0.197	3.3	NA	0.8	5.8	0.21	0.31	0.21	56.0
North: Site Access														
7	L2	72	2.0	76	2.0	0.282	7.2	LOS A	1.2	8.4	0.55	0.77	0.61	49.3
9	R2	72	2.0	76	2.0	0.282	15.7	LOS C	1.2	8.4	0.55	0.77	0.61	49.1
Approach		144	2.0	152	2.0	0.282	11.4	LOS B	1.2	8.4	0.55	0.77	0.61	49.2
West: Old Melbourne Road														
10	L2	169	2.0	178	2.0	0.097	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.5
11	T1	247	5.0	260	5.0	0.138	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		416	3.8	438	3.8	0.138	2.3	NA	0.0	0.0	0.00	0.23	0.00	57.1
All Vehicles		962	3.5	1013	3.5	0.282	4.1	NA	1.2	8.4	0.17	0.34	0.18	55.3

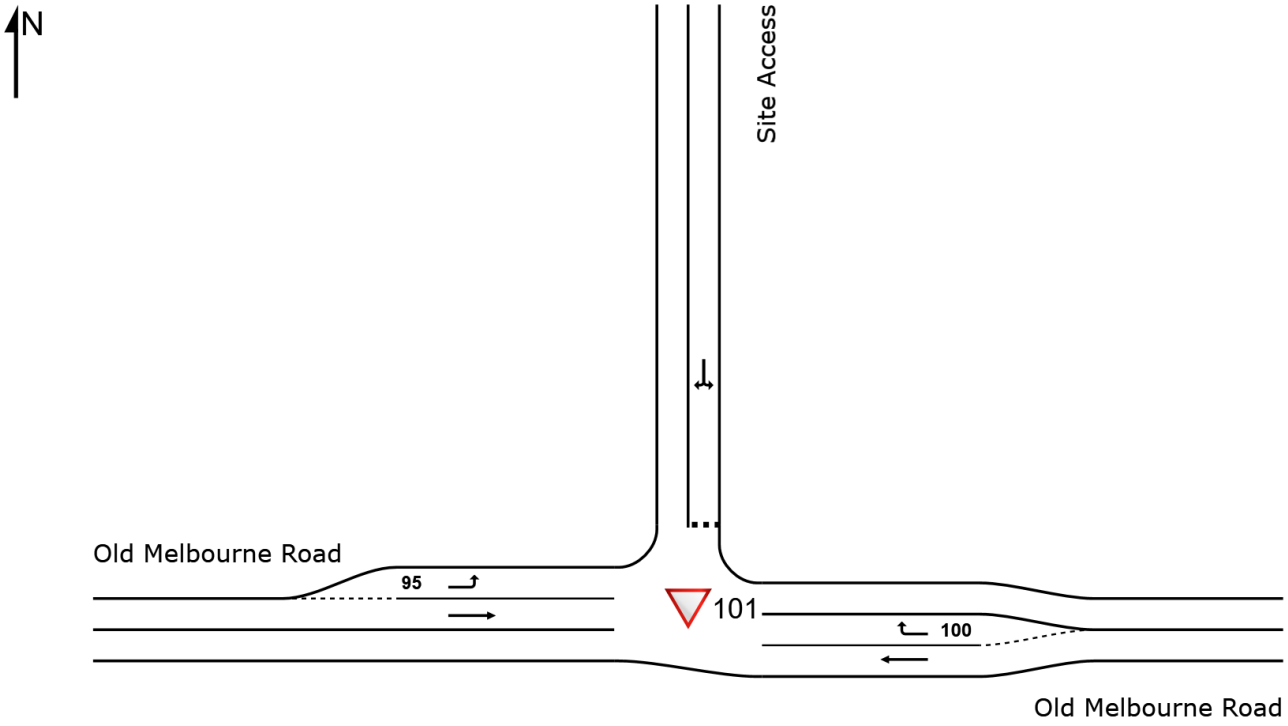
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and 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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Eastern Site Access (Site Folder: AM Peak Period)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 101 [Eastern Site Access (Site Folder: AM Peak Period)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Old Melbourne Road														
5	T1	233	5.0	245	5.0	0.131	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	48	2.0	51	2.0	0.047	6.6	LOS A	0.2	1.3	0.36	0.61	0.36	52.1
Approach		281	4.5	296	4.5	0.131	1.2	NA	0.2	1.3	0.06	0.10	0.06	58.4
North: Site Access														
7	L2	192	2.0	202	2.0	0.586	9.5	LOS A	4.8	34.5	0.60	0.91	1.00	48.5
9	R2	193	2.0	203	2.0	0.586	15.8	LOS C	4.8	34.5	0.60	0.91	1.00	48.3
Approach		385	2.0	405	2.0	0.586	12.6	LOS B	4.8	34.5	0.60	0.91	1.00	48.4
West: Old Melbourne Road														
10	L2	48	2.0	51	2.0	0.028	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.5
11	T1	212	5.0	223	5.0	0.118	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		260	4.4	274	4.4	0.118	1.1	NA	0.0	0.0	0.00	0.11	0.00	58.6
All Vehicles		926	3.4	975	3.4	0.586	5.9	NA	4.8	34.5	0.27	0.44	0.44	53.8

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Northern Site Access (Site Folder: PM Peak Period)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Geelong-Ballan Road														
2	T1	345	5.0	363	5.0	0.193	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	111	2.0	117	2.0	0.152	8.7	LOS A	0.6	4.2	0.55	0.78	0.55	50.7
Approach		456	4.3	480	4.3	0.193	2.1	NA	0.6	4.2	0.13	0.19	0.13	57.4
East: Site Access														
4	L2	48	2.0	51	2.0	0.265	8.6	LOS A	1.0	7.2	0.68	0.87	0.76	47.1
6	R2	48	2.0	51	2.0	0.265	21.2	LOS C	1.0	7.2	0.68	0.87	0.76	46.9
Approach		96	2.0	101	2.0	0.265	14.9	LOS B	1.0	7.2	0.68	0.87	0.76	47.0
North: Geelong-Ballan Road														
7	L2	111	2.0	117	2.0	0.064	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.5
8	T1	410	5.0	432	5.0	0.229	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		521	4.4	548	4.4	0.229	1.2	NA	0.0	0.0	0.00	0.12	0.00	58.4
All Vehicles		1073	4.1	1129	4.1	0.265	2.8	NA	1.0	7.2	0.12	0.22	0.12	56.7

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix C

Concept Layout Plans

ISSUE	ISSUE DESCRIPTION	ISSUE DATE

GENERAL NOTES
1 BASE INFORMATION FROM SUPPLIED FILES AND AERIAL PHOTOGRAPH (SOURCE NEARMAP SAT 12 FEB 2022)
2 ALL DIMENSIONS ARE TO FACE OF KERB & CHANNEL
3 MAIN ROAD - GEELONG - BALLAN ROAD (SPEED ZONE 80km/h)
LOCAL ROAD - PROPOSED SITE ACCESS No 1 (SPEED ZONE 50km/h)
4 EXISTING/PROPOSED SIGNAGE TO BE SHOWN AT FUNCTIONAL LAYOUT STAGE
5 SERVICE RELOCATION AND/OR PROTECTION AND TREE REMOVAL AND/OR PROTECTION TO BE SHOWN AT FUNCTIONAL LAYOUT STAGE

DESIGNED
G RAKITA 05 MAY 2022

CHECKED/APPROVED
N WOOLCOCK 05 MAY 2022

FILE NAME
G31463-01-00 dgn

Traffix Group
Level 28, 459 Collins Street
Melbourne, Victoria 3000
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www.traffixgroup.com.au

GEELONG - BALLAN ROAD / PROPOSED SITE ACCESS No. 1

MOORABOOL SHIRE

CONCEPT PLAN

SCALE 1:1000 (A3) 0 10 20

SHEET No.

DWG No. G31463-01-01

ISSUE	ISSUE DESCRIPTION	ISSUE DATE
A	FEATURE SURVEY SUPPLIED AND PLAN UPDATED TO SUIT	23 JAN 2024

GENERAL NOTES
1 BASE INFORMATION FROM SUPPLIED FILES AND AERIAL PHOTOGRAPH (SOURCE NEARMAP SAT 12 FEB 2022)
2 ALL DIMENSIONS ARE TO FACE OF KERB & CHANNEL
3 MAIN ROAD - OLD MELBOURNE ROAD (INGLIS STREET) (SPEED ZONE 60km/h)
LOCAL ROAD - PROPOSED SITE ACCESS No 2 (SPEED ZONE 50km/h)
4 EXISTING/PROPOSED SIGNAGE TO BE SHOWN AT FUNCTIONAL LAYOUT STAGE
5 SERVICE RELOCATION AND/OR PROTECTION AND TREE REMOVAL AND/OR PROTECTION TO BE SHOWN AT FUNCTIONAL LAYOUT STAGE

DESIGNED
G RAKITA 05 MAY 2022

CHECKED/APPROVED
N WOOLCOCK (RPE6892) 05 MAY 2022

FILE NAME
G31463-01-00.dgn

Traffix Group
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Melbourne, Victoria 3000
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www.traffixgroup.com.au

OLD MELBOURNE ROAD (INGLIS STREET) / PROPOSED OPTION 1 SITE ACCESS No. 2

MOORABOOL SHIRE

CONCEPT PLAN

SCALE 1:1000 (A3) 0 10 20
SHEET No.
DWG No. G31463-01-02

ISSUE	ISSUE DESCRIPTION	ISSUE DATE

GENERAL NOTES
1 BASE INFORMATION FROM SUPPLIED FILES AND AERIAL PHOTOGRAPH (SOURCE NEARMAP SAT 12 FEB 2022)
2 ALL DIMENSIONS ARE TO FACE OF KERB & CHANNEL
3 MAIN ROAD - OLD MELBOURNE ROAD (INGLIS STREET) (SPEED ZONE 60km/h)
LOCAL ROAD - PROPOSED SITE ACCESS No 3 (SPEED ZONE 50km/h)
4 EXISTING/PROPOSED SIGNAGE TO BE SHOWN AT FUNCTIONAL LAYOUT STAGE
5 SERVICE RELOCATION AND/OR PROTECTION AND TREE REMOVAL AND/OR PROTECTION TO BE SHOWN AT FUNCTIONAL LAYOUT STAGE

DESIGNED
G RAKITA 05 MAY 2022

CHECKED/APPROVED
N WOOLCOCK 05 MAY 2022

FILE NAME
G31463-01-00 dgn

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OLD MELBOURNE ROAD (INGLIS STREET) / PROPOSED OPTION 1 SITE ACCESS No. 3

MOORABOOL SHIRE

CONCEPT PLAN

SCALE 1:1000 (A3) 0 10 20
SHEET No.
DWG No. G31463-01-03

ISSUE	ISSUE DESCRIPTION	ISSUE DATE

GENERAL NOTES
1 BASE INFORMATION FROM SUPPLIED FILES AND AERIAL PHOTOGRAPH (SOURCE NEARMAP SAT 12 FEB 2022)
2 ALL DIMENSIONS ARE TO FACE OF KERB & CHANNEL
3 MAIN ROAD - GEELONG - BALLAN ROAD (SPEED ZONE 80km/h)
LOCAL ROAD - PROPOSED SITE ACCESS No 1 (SPEED ZONE 50km/h)
4 EXISTING/PROPOSED SIGNAGE TO BE SHOWN AT FUNCTIONAL LAYOUT STAGE
5 SERVICE RELOCATION AND/OR PROTECTION AND TREE REMOVAL AND/OR PROTECTION TO BE SHOWN AT FUNCTIONAL LAYOUT STAGE

DESIGNED
G RAKITA 05 MAY 2022

CHECKED/APPROVED
N WOOLCOCK 05 MAY 2022

FILE NAME
G31463-01-00.dgn

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GEELONG - BALLAN ROAD / OLD MELBOURNE ROAD (INGLIS STREET)

MOORABOOL SHIRE

CONCEPT PLAN

SCALE 1:1000 (A3) 0 10 20
SHEET No.
DWG No. G31463-04-01

Appendix D

Traffic Generation Case Study

Case Study

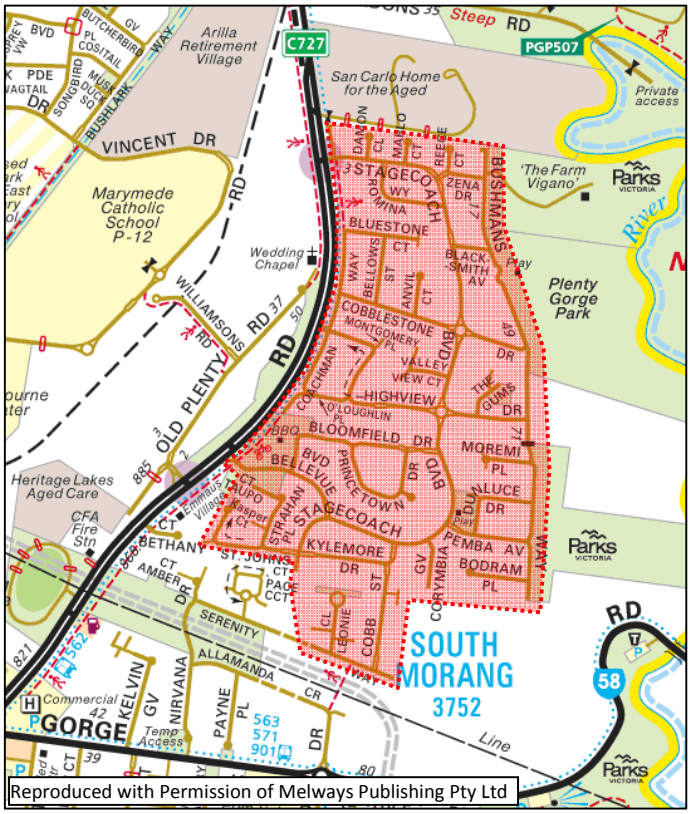
TraffixGroup
Traffic Engineers and Transport Planners

Traffic Generation - Residential Estate in South Morang

Introduction

The purpose of this Case Study is to calculate the traffic generation for a typical residential estate within metropolitan Melbourne. The results of this Case Study can be used as empirical evidence when undertaking traffic generation assessments for future residential estates and subdivisions.

Case Study Area



Location: The case study area is located on the east side of Plenty Road in South Morang.

South Morang is a suburb of Melbourne, Victoria, located approximately 23km north-east of the CBD.

Access: Access to the estate is only available via Plenty Road at Stagecoach Boulevard, Highview Drive & Bellevue Boulevard.

Area Characteristics: The case study area is entirely residential with the exception of 'The Farm Vigano' located at the north-east corner of the area. This facility contains a restaurant/bar which can hold functions, and also a relatively small Health Centre.

Dwellings within the estate are primarily single houses on each allotment, although there are a small number of units/townhouses located throughout the estate.

Local Government Area: City of Whittlesea

Data Collection

Traffix Group conducted traffic counts (tube counts) at each of main access points between the estate and the external road network. These counts were undertaken simultaneously for a 24 hour period between 12noon on Wednesday 4th September and 12noon on Thursday 5th September, 2013.

Traffix Group also visited the site during the counts to undertake a count of the number of dwellings within the catchment area. Dwellings with direct access to Plenty Road or with an access location which was outside the area bounded by the tube counters were excluded. Furthermore, a number of allotments were found to be vacant or have dwellings under construction and these were also excluded.

A total of 614 dwellings were located within the case study area at the time of our site inspection.

Results

A total of 4859 movements were recorded during the 24 hour period, including 2408 entry movements and 2451 exit movements.

This calculates to a traffic generation rate of **7.91 daily vehicle trips per dwelling**.

A **heavy vehicle percentage of 2.5%** was calculated for the 24 hour period.

The AM peak hour occurred between 8:05-9:05am and the PM peak hour occurred between 5:15-6:15pm.

Table 1 shows the recorded peak hour volumes and splits of vehicles entering and exiting the case study area.

Table 1: Peak Hour Entry/Exit Splits

	AM Peak Hour		PM Peak Hour	
	Trips	%	Trips	%
Entry Movements	123	**30.1%**	285	**64.3%**
Exit Movements	285	**69.9%**	158	**35.7%**
Total	**408**	**100%**	**443**	**100%**

Based on the above, the following weekday peak hour traffic generation rates (and heavy vehicle percentages) are calculated:

- **AM peak hour** traffic generation of **0.66 vehicle trips per dwelling (1.7% heavy vehicles)**
- **PM peak hour** traffic generation of **0.72 vehicle trips per dwelling (1.1% heavy vehicles)**