Traffic Impact Assessment Report

Proposed Residential Development

66 & 90 Bena Road
Korumburra

Bena Rd Development Pty Ltd
April 2016
## Document Issue Record

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<tr>
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1 INTRODUCTION

1.1 Background

Transport & Traffic Solutions (T&TS) has been engaged by Bena Rd Development Pty Ltd to prepare a Traffic Impact Assessment Report (TIAR) for the proposed development of 66 & 90 Bena Road, Korumburra into a residential development.

1.2 Aim of this Report

The aim of this report is to assess the traffic impacts on the external and internal road network as a result of the proposed development. This will include an assessment of the:

- Existing conditions adjacent to the site,
- Proposed development,
- Traffic impacts associated with the development, and
- Proposed internal road network and site access.

1.3 References

The following references were used to assist in the preparation of this report:

- Department of Transport, Planning and Local Infrastructure 2016, Planning Maps Online; and Planning Schemes Online;
- VicRoads Guidelines for Transport Impact Assessment Reports For major land use and development proposals;
- The Infrastructure Design Manual v4.4.2, Local Government Infrastructure Design Association, 14 October 2015;
- South Gippsland Shire Council, Korumburra Structure Plan, June 2014 and Road Management Plan 2013; and
2 EXISTING CONDITIONS ASSESSMENT

2.1 Site Location and Land Use

The subject site is located on the north side of Bena Road in Korumburra, approximately 650m west of its intersection with George Street / Radovick Street. The site is bounded by Bena Road to the south, an unmade road to the west, existing residential development located to the east, and industrial land located to the north. The north-east corner of Bena Road and the unmade road comprises existing farm land.

The total site area is approximately 15.6 hectares with a frontage to Bena Road of approximately 170 metres. The site is located approximately 1.4km west of the Korumburra town centre. Refer Figure 2.1 below for the site location.

![Figure 2.1: Locality Plan](http://www.melway.com.au/online-maps/), March 2016

The subject site is currently vacant rural property and is located within a General Residential Zone 1 - GRZ1. A Development Plan Overlay (DPO6) applies to the site. Refer Figure 2.2 below.

![Figure 2.2: Land Use Plan](http://www.melway.com.au/online-maps/)

2.2 Existing Road Network Characteristics

An inspection of Bena Road and its intersection with George Street / Radovick Street and Korumburra-Whitelaw Road was undertaken on Friday 1 April 2016, between the hours of 12pm and 1pm. Conditions were dry and sunny. Details of the site inspection are as follows.

2.2.1 Bena Road

Bena Road is a sealed two-way local road with no through access at its western end. It runs in a mainly east-west direction from George Street in the east and provides direct access to residential dwellings and rural properties as well as a wastewater treatment plant located at its western end. Referring to South Gippsland Shire Council’s Road Management Plan 2013, Road Register, Bena Road is classified as an Access Street.

Adjacent to the site, the road reservation is approximately 20 metres wide with a 6.0 metre wide sealed carriageway. A 9.5 metre wide and 4.5 metre wide grass verge is located on the north side and south side of the carriageway respectively. Vegetation is present within the verge on both sides of the carriageway. Refer Figure 2.3 and Figure 2.4 below.

The road alignment immediately adjacent to the site is generally straight with a gradual fall to the west. A crest is located at the eastern boundary of the site on Bena Road. The posted speed limit increases from 80km/h to 100km/h westbound adjacent to the site.

![Figure 2.3: Bena Road, looking east towards the site](image)

![Figure 2.4: Bena Road, looking west towards the site](image)

2.2.2 Bena Road / George Street / Radovick Street Intersection

The Bena Road / George Street / Radovick Street intersection comprises two closely spaced T-intersections whereby Bena Road intersects George Street with a Stop sign on the Bena Road approach and George Street intersects Radovick Street with a Give Way sign on the George Street approach. A channelised right-turn short lane (CHR(S)) treatment is provided on Radovick Street. Refer Figure 2.5 below.

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2.2.3  Bena Road / Korumburra-Whitelaw Road Intersection

The Bena Road Korumburra-Whitelaw Road intersection is a priority controlled cross intersection. Bena Road forms the major road leg where-as Korumburra-Whitelaw Road (north) and Bena-Jumbunna Road (south) forms the minor road legs and are controlled by a Stop sign. Refer Figure 2.5 below.

Figure 2.5: Bena Rd / George St intersection looking east from Bena Rd

2.3  Existing Road Network Traffic Volumes

2.3.1  Bena Road / George Street / Radovick Street Intersection

A manual intersection turning movement count was undertaken by BVY Traffic Survey at the Bena Road / George Street / Radovick Street intersection on Tuesday 22 March 2016. Figure 2.7 below provides a summary of the AM and PM peak traffic volumes for all vehicles.

Figure 2.6: Bena Rd / Korumburra-Whitelaw Rd intersection looking north
The Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis, provides guidance to capacity analysis at un-signalised intersections. Austroads states that “At un-signalised intersections with minor roads where there are relatively low volumes of cross and turning traffic, capacity considerations are usually not significant, and capacity analysis is unnecessary. Table 6.1 sets out details of intersection volumes below which capacity analysis is unnecessary. While flaring for capacity is not required at intersections with traffic volumes below those shown in Table 6.1, separate lanes for left or right-turning vehicles may be provided on the major road for improved safety.”

Table 2.1: Intersection volumes below which capacity analysis is unnecessary (Extract from Austroads)

As can be seen from Table 2.1 a capacity analysis check of the existing intersection is unnecessary. However to understand what impact the proposed development traffic will have on the existing Bena Road / George Street / Radovick Street intersection, a check of the operational performance of the existing intersection was undertaken using SIDRA Intersection 6.1. It is noted that the intersection has been assessed as a network of two closely spaced intersections to account for the effects of the upstream intersection on the downstream intersection.

Degree of Saturation, Average Delay, Level of Service, and 95% Back of Queue Distance results of the analysis for the “total approach” are provided in Table 2.2 and Table 2.3 below. Full results can be found in Appendix A.
Table 2.2: SIDRA Summary Results – Existing Bena Road / George Street intersection with current traffic volumes

<table>
<thead>
<tr>
<th>Period</th>
<th>AM Peak</th>
<th>PM Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach Leg</td>
<td>George St (East)</td>
<td>Bena Road (North)</td>
</tr>
<tr>
<td>Degree of Saturation</td>
<td>0.030</td>
<td>0.018</td>
</tr>
<tr>
<td>Average Delay (sec)</td>
<td>0.2</td>
<td>8.0</td>
</tr>
<tr>
<td>Level of Service</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>95% Queue Distance (m)</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

As illustrated in Table 2.2 the Bena Road approach has a Level of Service A, Degree of Saturation below 0.02, Average Delay less than 10 seconds, and Queues less than 1m during the AM and PM Peak periods. Where-as the George Street approach legs have a Degree of Saturation below 0.05, Average Delay less than 1 second, and no queuing during the AM and PM Peak periods.

Similarly, Table 2.3 shows that the George Street approach has a Level of Service A, Degree of Saturation below 0.07, Average Delay less than 5 seconds, and Queues less than 2m during the AM and PM Peak periods. Where-as the Radovick Street approach legs have a Degree of Saturation below 0.15, Average Delay less than 2 seconds, and Queues less than 1m during the AM and PM Peak periods.

These results indicate that the intersection is operating well below capacity, with free flowing traffic conditions and minimal delay. Therefore it can be concluded that the CHR(S) treatment provided on the Radovick Street approach has been provided for safety reasons.

2.3.2  Bena Road / Whitelaw Road Intersection

A manual intersection turning movement count was also undertaken by BVY Traffic Survey at the Bena Road / Whitelaw Road intersection on Tuesday 22 March 2016. Figure 2.8 below provides a summary of the AM and PM peak traffic volumes for all vehicles.
2.3.3 Bena Road

South Gippsland Shire Council provided historical traffic volume data for Bena Road, 50m west of its intersection with George Street. The traffic volume data was collected in July 2008 and May 2013. The weekday average daily traffic volume recorded at this location was 304 and 382 vehicles per day respectively. Based on this historical traffic volume data it can be concluded that the traffic volumes on Bena Road grew at a rate equivalent to 4.67% per annum over the 5 year period.

Referring to the May 2013 traffic volume data, the weekday average AM and PM Peak hour traffic volume recorded on Bena Road was 28 and 38 vehicles per hour respectively. This equates to a peak hour to daily traffic volume ratio equivalent to 7.3% and 10% respectively.

Council also provided traffic volume data for Bena Road directly adjacent to the site. The traffic volume data was collected in February 2011. The weekday average traffic volume recorded at this location was 112 vehicles per day. Applying the above traffic growth rate to the 2011 traffic volume it is estimated that the 2016 weekday average daily traffic volume on Bena Road adjacent to the site is 140 vehicles per day.

2.4 Casualty Accident Statistics

The casualty accident history adjacent to the site was sourced from the VicRoads’ Crashstats database. The database indicates that one casualty accident (other injury) was recorded at the intersection of Radovick Street and George Street to the east of the site at 6.45pm on 25 December 2013. Due to VicRoads updating the CrashStats website details of the type of accident are unknown. Considering that only one accident occurred in this location over the last six years it can be concluded that there are no serious safety concerns with the road network adjacent to the site.

2.5 Public Transport & Path Network

Korumburra is serviced by a regional V/Line train / coach service connecting residents to Melbourne and Yarram via Leongatha, Koo Wee Rup and Dandenong. The railway station and coach stop are both located in the Korumburra town centre, approximately 1.5km east of the site.

Footpaths are provided on both sides of Bena Road to the east of the site where adjacent to existing residential dwellings. No footpaths are provided adjacent to the site.
3 PROPOSED DEVELOPMENT

3.1 Development Plan

The proposed development consists of subdividing approximately 15.6 hectares of land into 81 residential lots. Primary access to the site is provided from Bena Road for all vehicles via the construction of a new unsignalised T-intersection.

A second access point for Emergency Access only is provided from the unmade road located along the sites western boundary.

Refer Figure 3.1 below for the “Proposed Plan of Subdivision”. See Appendix B for a detailed copy.

Figure 3.1: Proposed Plan of Subdivision
4 TRAFFIC IMPACT ASSESSMENT

This section of the report will review what impact traffic generated from the proposed development will have on the existing road network adjacent to the site. In particular an assessment of the existing Bena Road / George Street / Radovick Street intersection will be undertaken to determine if the intersection will operate satisfactorily under future traffic conditions.

4.1 Traffic Generation

Section 12.3.1 of the Infrastructure Design Manual v4.4.2 (IDM), states that traffic volumes for undeveloped residential allotments should normally be based upon a daily traffic generation rate equivalent to at least 10 vehicle movements per day per lot.

Based on the Bena Road AM and PM peak hour to daily traffic volume ratio of 7.3% and 10% respectively\(^3\), it is estimated that during the AM and PM peak periods a residential allotment will generate approximately 0.7 and 1 vehicle movement per hour per lot respectively.

Therefore for modelling purposes a traffic generation rate equivalent to 10 vehicle movements per day per lot and 1 vehicle movement per hour per lot will be used.

Applying this rate to the 81 residential dwellings within the site, it is expected that the proposed development will generate approximately 810 daily vehicle trips and 81 peak hour vehicle trips.

4.2 Traffic Distribution

It is expected that the majority of vehicle trips generated by the residential development will travel east along Bena Road and use the existing George Street / Radovick Street intersection. Therefore, the peak hour traffic volumes generated from the proposed development site will be distributed to Bena Road as follows; 95% to the east, and 5% to the west.

Based on the existing intersection turning movement count data, the proposed development traffic entering / exiting Bena Road at its intersection with George Street and Radovick Street will be distributed from / to the surrounding road network as detailed in Table 4.1 below.

<table>
<thead>
<tr>
<th>Table 4.1: Distribution of traffic to/ from Bena Road</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Period</strong></td>
</tr>
<tr>
<td>Direction</td>
</tr>
<tr>
<td>From Bena Road</td>
</tr>
<tr>
<td>To Bena Road</td>
</tr>
</tbody>
</table>

The following peak hour directional split of traffic has been adopted for modelling purposes. It is noted that these values are based on the existing intersection turning movement count volumes, for the existing traffic entering / exiting Bena Road at its intersection with George Street and Radovick Street.

- AM Peak Hour - 30% inbound and 70% outbound; and
- PM Peak Hour - 55% inbound and 45% outbound.

4.3 External Traffic Growth

South Gippsland population forecasts\(^4\) for the Korumburra area states that for the period 2016 to 2036, the average annual percentage change in population is expected to be 1.8% per annum.

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\(^3\) Refer Section 2.3.3 of this report.

Therefore for modelling purposes an average annual percentage change of 1.8% will be added to the existing through traffic volumes over a 10 year period.

4.4 Intersection Turning Movement Volumes

In order to determine the proposed intersection turning movement volumes at the proposed site access point and at the existing Bena Road / George Street / Radovick Street intersection, a spreadsheet Transport Model was created to assign traffic generated from the subject site to the proposed and existing intersections. The Transport Model was developed using the traffic generation, traffic distribution and peak hour directional split assumptions, as outlined in Sections 4.1 and 4.2 above. An external traffic growth rate of 1.8% per annum was also applied to the existing through traffic volumes over a 10 year period (traffic impact forecast time period).

Refer Figure 4.1 and Figure 4.2 below for the expected future year intersection turning movement volumes at the proposed site access point and the existing Bena Road / George Street / Radovick Street intersection over a 10 year forecast period. It is noted that these peak hour traffic volumes are a conservative estimate as it assumes that the land to the south of the subject site has commenced development and that an additional 125 residential dwellings would have been developed within the same 10 year forecast period.

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5 It has been assumed that 80% of the additional 125 dwellings to the south of Bena Road will gain access to Bena Road west of the proposed site access point and the remaining 20% will gain access east of the proposed site access point.
4.5 Performance Assessment

SIDRA Intersection 6.1 was used to analyse the operational performance of the existing Bena Road / George Street / Radovick Street intersection, with the future year traffic volumes indicated in Figure 4.2 above. Degree of Saturation, Average Delay, Level of Service, and 95% Back of Queue Distance results of the analysis for the “total approach” are provided in Table 4.2 and Table 4.3 below. Full results can be found in Appendix C. It is noted that the intersection has been assessed as a network of two closely spaced intersections.

Due to the expected low turning movement volumes at the proposed site access point, a performance assessment of this intersection is not warranted.

Table 4.2: SIDRA Summary Results – Existing Bena Road/ George Street intersection with the future year traffic volumes

<table>
<thead>
<tr>
<th>Period</th>
<th>AM Peak</th>
<th></th>
<th></th>
<th>PM Peak</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>George St (East)</td>
<td>Bena Road (North)</td>
<td>George St (West)</td>
<td>George St (East)</td>
<td>Bena Road (North)</td>
</tr>
<tr>
<td>Degree of Saturation</td>
<td>0.043</td>
<td>0.129</td>
<td>0.072</td>
<td>0.062</td>
<td>0.092</td>
</tr>
<tr>
<td>Average Delay (sec)</td>
<td>1.2</td>
<td>8.2</td>
<td>1.1</td>
<td>1.7</td>
<td>8.3</td>
</tr>
<tr>
<td>Level of Service</td>
<td>-</td>
<td>A</td>
<td>-</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>95% Queue Distance (m)</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

As illustrated in Table 4.2 above, the Bena Road approach has a Level of Service A, Degree of Saturation below 0.13, Average Delay less than 10 seconds, and Queues less than 5m during the AM and PM Peak periods. Where-as the George Street approach legs have a Degree of Saturation below 0.10, Average Delay less than 2 seconds, and Queues less than 1m during the AM and PM Peak periods.

Similarly, Table 4.3 shows that the George Street approach has a Level of Service A, Degree of Saturation below 0.15, Average Delay less than 4 seconds, and Queues less than 5m during the AM and PM Peak periods. Where-as the Radovick Street approach legs have a Degree of Saturation below 0.17, Average Delay less than 3 seconds, and Queues less than 2m during the AM and PM Peak periods.

These results are very similar to the existing intersection performance results as illustrated in Table 2.2 and Table 2.3 and indicate that both intersections in the future year will operate well below capacity, with free flowing traffic conditions and minimal delay.
5 INTERNAL ROAD NETWORK REVIEW & SITE ACCESS

Clause 56.06-7 of the South Gippsland Planning Scheme states that street blocks should generally be “between 120 metres and 240 metres in length and generally between 60 metres to 120 metres in width to facilitate pedestrian movement and control traffic speeds”.

Referring to the proposed development plan it is noted that the length of Road 3 is greater than 240 metres. Therefore in order to control traffic speeds it is recommended that the proposed Intersection of Road 3 and Road 1 be modified to change priority as shown in Figure 5.1 below.

It is also noted that the length of Road 3 east of Road 1 is greater than 120 metres long. Therefore in order to minimise pedestrian walk times it is recommended that a reserve for pedestrian and bicycle access only be provided on the north-west boundary of Lot 56 connecting Road 3 to Road 1 as shown in Figure 5.1 below.

![Figure 5.1: Proposed Modified T-intersections](image)

Based on a daily traffic generation rate equivalent to at least 10 vehicle movements per day per lot, it is estimated that Road 1 south of Road 2 will carry a maximum of 770 vehicles per day, whereas Road 1 north of Road 2 will carry a maximum of 610 vehicles per day. It is also estimated that Road 3 (between Lot 38 and Lot 73) will carry a maximum of 380 vehicles per day.

In accordance with Table 2: Urban Road / Street Characteristics of the IDM, Road 1 and Road 3 (between Lot 38 and Lot 73) are to be designed and constructed as an Access Street.

It is estimated that all other roads will carry less than 300 vehicles per day and therefore can be designed and constructed as an Access Place.

Bena Road directly adjacent to the site is to be upgraded to provide a concrete footpath, a grass verge, and kerb and channel north side only as per the Access Street requirements of the IDM. The existing Bena Road carriageway is also to be widened to achieve a 7.3 metre wide carriageway to allow for on-street parking. Widening of the carriageway is to occur on the north side due to the provision of a wider verge.
It is noted that Bena Road in the future year is expected to carry less than 2,600 vpd\(^6\). Therefore it will still function as an Access Street.

5.1 Proposed Intersection Road 1 / Bena Rd - Site Access Point

The Safe Intersection Sight Distance (SISD) is the minimum distance, which should be provided on the major road at any intersection\(^7\). Section 3.2.2 of the Austroads Guide sets out the SISD requirements of the major road. The Austroads Guide also notes that wherever it is physically and economically practicable, consideration should be given to providing a more generous sight distance than the values tabulated in the guide.

The posted speed limit on Bena Road adjacent to the proposed site access point is 100 km/h. Due to the future development of the subject site and land to the south of the subject site into residential dwellings, it is recommended that the speed limit on Bena Road within the General Residential Zone 1 limits be reduced to 60km/h. This recommended speed limit is similar to the existing section of Bena Road east of the site, adjacent to the existing residential dwellings.

Based on a posted speed limit of 60km/h and a downgrade equivalent to 6% on the eastern approach to the intersection and an upgrade equivalent to 1% on the western approach to the intersection the SISD required to the east and west of the proposed intersection is 135 metres and 125 metres respectively.

At a distance of 7.0 metres set back from the centre of the through lane, the proposed intersection has an available sight distance of approximately 138 metres to the east just beyond the crest and approximately 140 metres to the west also just beyond the crest. Refer Figure 5.2 and Figure 5.3 below. It is noted that the SISD check takes into account that the existing vegetation is to be cut down and maintained on a regular basis and that the existing trees are to be removed both sides of the intersection.

Therefore the SISD of the proposed intersection / site access point in both directions complies with the Austroads requirements.

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\(^{6}\) Includes the additional 125 dwellings to the south of Bena Road.

Taking into account the expected low future year traffic volumes at the proposed intersection of Road 1 and Bena Road, that the available sight distance complies with the Austroads Guidelines for a 60km/h speed limit, and that the posted speed limit will be reduced from a 100km/h to 60km/h after development, the construction of this intersection as a standard T-intersection with Bena Road forming the major road leg is a more than acceptable intersection arrangement to provide safe and efficient access to the proposed development site.

5.2 Proposed Bena Road Lot Access

Referring to the proposed plan of subdivision it is noted that lots 8 to 12 front Bena Road. Due to the presence of a crest on Bena Road east of Lot 12 it is recommended that the available sight distance to the proposed access driveway locations for these lots comply with “Figure 3.2 Sight Distance Requirements at Access Driveways” of the Australian / New Zealand Standard AS/NZ 2890.1:2004 Parking Facilities Part1: Off-street car parking.

For the proposed posted speed limit of 60km/h, the access driveways are to achieve a minimum sight distance requirement equivalent to 55 metres along the frontage road.

It is recommended that Lot 8 obtain access via Road 1.
6 FINDINGS & CONCLUSION

The key findings of this Traffic Impact Assessment review are detailed below:

Existing Conditions

- In accordance with South Gippsland Shire Council’s Road Management Plan 2013, Road Register, Bena Road is classified as an Access Street.
- The existing Bena Road / George Street / Radovick Street intersection is operating well below capacity, with free flowing traffic conditions and minimal delay. Therefore it can be concluded that the CHR(S) treatment provided on the Radovick Street approach has been provided for safety reasons.
- It is estimated that the 2016 weekday average daily traffic volume on Bena Road adjacent to the site is 140 vehicles per day.
- One casualty accident was recorded at the intersection of Radovick Street and George Street to the east of the site on 25 December 2013. Based on the one recorded accident over the last six year period it can be concluded that there are no serious safety concerns with the road network adjacent to the site.

Proposed Development, Traffic Generation & Intersection Assessment

- The proposed development will consist of 81 residential lots.
- The proposed residential development will generate 810 daily vehicle trips and 81 peak hour vehicle trips.
- Primary access to the site is provided from Bena Road via the construction of a new unsignalised T-intersection.
- A second access point for Emergency Access only is provided from the unmade road located along the sites western boundary.
- A Performance Assessment of the existing Bena Road / George Street / Radovick Street intersection layout with the future year traffic volumes from the development site and 125 residential dwellings form the future development of the land south of Bena Road, shows that the intersection will operate well below capacity, with free flowing traffic conditions and minimal delay.
- Due to the expected low turning movement volume at the proposed site access point, a performance assessment of this intersection is not warranted as it is expected that the proposed intersection will operate well below capacity, with free flowing traffic conditions and minimal delay.

Internal Road Network & Site Access

- To control traffic speeds, it is recommended that the proposed Intersection of Road 3 and Road 1 be modified to change priority as shown in Figure 5.1.
- To minimise pedestrian walk times it is recommended that a reserve for pedestrian and bicycle access only be provided on the north-west boundary of Lot 56 connecting Road 3 to Road 1.
- In accordance with Table 2: Urban Road / Street Characteristics of the IDM, Road 1 and Road 3 (between Lot 38 and Lot 73) are to be designed and constructed as an Access Street. All other roads can be designed and constructed as an Access Place.
- Bena Road directly adjacent to the site is to be upgraded to provide a concrete footpath, a grass verge, and kerb and channel north side only as per the Access Street requirements of the IDM.
- The existing Bena Road carriageway is to be widened to achieve a 7.3 metre wide carriageway to allow for on-street parking. Widening of the carriageway is to occur on the north side due to the provision of a wider verge.
- Bena Road in the future year is expected to carry less than 2,600 vpd and therefore will still function as an Access Street.
• It is recommended that the existing speed limit on Bena Road within the General Residential Zone 1, be lowered to 60 km/h to take into account the proposed change in land use.

• The process to lower the speed limit should be commenced once the planning permit is issued for the development and be implemented prior to occupation of the first allotment.

• The available SISD at the proposed intersection / site access point in both directions complies with the Austroads requirements provided that the existing vegetation is cut down and maintained on a regular basis and that the existing trees are removed both sides of the intersection.

• The construction of the proposed intersection of Bena Road with / Road 1 as a standard T-intersection is a more than acceptable intersection arrangement to provide safe and efficient access to the proposed development site.

• For the proposed posted speed limit of 60km/h, the access driveways to Lots 9 to 12 are to achieve a minimum sight distance requirement equivalent to 55 metres along the frontage road.

• Lot 8 is to obtain access via Road 1.

Based on the key findings of this report it can be concluded that the following transport infrastructure projects will be required to support the proposed development of the site into 81 residential dwellings:

• The intersection of Road 3 and Road 1 be modified to change priority as shown in Figure 5.1.

• A narrow reserve for pedestrian and bicycle access only be provided on the north-west boundary of Lot 56.

• Road 1 and Road 3 (between Lot 38 and Lot 73) are to be designed and constructed as an Access Street. All other roads are to be designed and constructed as an Access Place.

• A concrete footpath, a grass verge, and kerb and channel be constructed on Bena Road north side only as per the Access Street requirements of the IDM.

• The existing Bena Road carriageway be widened to achieve a 7.3 metre wide carriageway to allow for on-street parking. Widening of the carriageway is to occur on the north side due to the provision of a wider verge.

• The existing speed limit on Bena Road within the General Residential Zone 1, be lowered to 60 km/h.

• The construction of the proposed intersection of Bena Road with / Road 1 as a standard T-intersection to provide access into the proposed development site.

Further to the above:

• The proposed driveways to Lots 9 to 12 are to achieve a minimum sight distance requirement equivalent to 55 metres along the frontage road.

• Lot 8 is to obtain access via Road 1.

Therefore if the above transport infrastructure projects are implemented into the Proposed Development, then there are no traffic engineering reasons as to why the subject site should not be granted a permit for the development of the site into 81 residential lots.
APPENDIX A – EXISTING SIDRA ASSESSMENT RESULTS
NETWORK LAYOUT

Network: Korumburra - AM peak
Bena Rd / George St / Radovick St Ex. Intersection

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Site Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>Radovick St/ George St - AM peak</td>
</tr>
<tr>
<td>101</td>
<td>George St/ Bena Rd - AM peak</td>
</tr>
</tbody>
</table>

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com
Organisation: TRANSPORT & TRAFFIC SOLUTIONS PTY LTD | Created: Monday, 25 April 2016 7:09:22 PM
Project: C:\Users\Michael\Sync folder\Company-T&TS\Projects\16008_Bena Rd, Korumburra\Modelling\SIDRA\Bena Road.sip6
## Lane Use and Performance

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<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
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<td>0.0</td>
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<td>56 5.0</td>
<td>1321 5.0</td>
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<td>100 8.0</td>
<td>0.018</td>
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<td>0.018</td>
<td>LOS A 0.0</td>
<td>0.4 Full</td>
<td>500 0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td>Approach</td>
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<td>24 5.0</td>
<td>1321 5.0</td>
<td>0.018</td>
<td>100 8.0</td>
<td>0.018</td>
<td>LOS A 0.0</td>
<td>0.4 Full</td>
<td>500 0.0</td>
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<td>72 5.0</td>
<td>1876 5.0</td>
<td>0.038</td>
<td>100 0.3</td>
<td>0.038</td>
<td>LOS A 0.0</td>
<td>0.0 Full</td>
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<td>0.0</td>
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</table>

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
## Lane Use and Performance

<table>
<thead>
<tr>
<th>Site: Radovick St/ George St - AM peak</th>
<th>Network: Korumburra - AM peak</th>
</tr>
</thead>
</table>

**Existing**

**Giveaway / Yield (Two-Way)**

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<tr>
<td></td>
<td>Total HV %</td>
<td>Total HV %</td>
<td>Total HV %</td>
<td>Lane %</td>
<td>sec</td>
<td>LOS Veh Dist</td>
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</table>

**Level of Service (LOS) Method: Delay (HCM 2000).**

Lane LOS values are based on average delay per lane. Minor Road Approach LOS values are based on average delay for all lanes.

**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 lanes.

**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.
### LANE SUMMARY

**Site:** George St/ Bena Rd - PM peak  
**Network:** Korumburra - PM peak

**Existing Stop (Two-Way)**

<table>
<thead>
<tr>
<th>Lane Use and Performance</th>
<th>Demand Flows</th>
<th>Arrival Flows</th>
<th>Cap. v/c</th>
<th>Lane Util. %</th>
<th>Average Delay sec</th>
<th>Level of Service</th>
<th>95% Back of Queue Veh</th>
<th>Lane Config</th>
<th>Lane Length m</th>
<th>Cap. Adj. %</th>
<th>Prob. Block. %</th>
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</thead>
<tbody>
<tr>
<td><strong>East: George Street - east</strong></td>
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<td></td>
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</tr>
<tr>
<td>Lane 1</td>
<td>73 5.0</td>
<td>73 5.0 1862</td>
<td>0.039</td>
<td>100 0.4</td>
<td>LOS A 0.0</td>
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<td>Full</td>
<td>500 0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
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<td>Approach</td>
<td>73 5.0</td>
<td>73 5.0</td>
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<td>NA</td>
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<td>0.2</td>
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<tr>
<td><strong>North: Bena Rd</strong></td>
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<td>25 5.0 1320</td>
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<tr>
<td>Approach</td>
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<td><strong>West: George Street - west</strong></td>
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</tbody>
</table>

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
| Site: Radovick St/ George St - PM peak | Network: Korumburra - PM peak |

Existing Giveaway / Yield (Two-Way)

### Lane Use and Performance

<table>
<thead>
<tr>
<th>Lane</th>
<th>Demand Flows</th>
<th>Arrival Flows</th>
<th>Cap. Veh</th>
<th>Lane Util.</th>
<th>Average Delay</th>
<th>Level of Service</th>
<th>95% Back of Queue</th>
<th>Lane Config</th>
<th>Lane Length</th>
<th>Cap. Adj.</th>
<th>Prob. Block.</th>
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<tbody>
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<td>LOS A</td>
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<td>1.8</td>
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<td><strong>North: Radovick Street - north</strong></td>
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Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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 lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
APPENDIX C – FUTURE SIDRA ASSESSMENT RESULTS
## LANE SUMMARY

**Site:** George St/ Bena Rd - Future AM peak

**Network:** Korumburra - Future AM peak

**Future Stop (Two-Way)**

### Lane Use and Performance Table

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<thead>
<tr>
<th>Lane Use and Performance</th>
<th>Demand Flows</th>
<th>Arrival Flows</th>
<th>Cap. v/c</th>
<th>Lane Util.</th>
<th>Average Delay</th>
<th>Level of Service</th>
<th>95% Back of Queue Veh</th>
<th>Lane Config</th>
<th>Lane Length</th>
<th>Cap. Adj.</th>
<th>Prob. Block.</th>
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<td>Total HV %</td>
<td>Total v/h</td>
<td>Total %</td>
<td>Lane</td>
<td>Util.</td>
<td>Delay</td>
<td>LOS</td>
<td>Dist m</td>
<td>Lane</td>
<td>m</td>
<td>%</td>
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**Level of Service (LOS) Method:** Delay (HCM 2000).

Lane LOS values are based on average delay per lane.

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

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 lanes.

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


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

**Site:** Radovick St/ George St - Future AM peak  

**Network:** Korumburra - Future AM peak

**Future Giveway / Yield (Two-Way)**

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<tr>
<th>Lane Use and Performance</th>
<th>Demand Flows</th>
<th>Arrival Flows</th>
<th>Cap. Veh/h</th>
<th>Lane Util. (%)</th>
<th>Average Delay (sec)</th>
<th>Lane LOS</th>
<th>95% Back of Queue Veh</th>
<th>Lane Config</th>
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**Level of Service (LOS) Method:** Delay (HCM 2000).

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


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

**Site:** George St/ Bena Rd - Future PM peak  
**Network:** Korumburra - Future PM peak

**Future Stop (Two-Way)**

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Level of Service (LOS) Method: Delay (HCM 2000).  
Lane LOS values are based on average delay per lane.  
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## Lane Use and Performance

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