Transport and Traffic Impact Assessment Report

South Leongatha

For: South Gippsland Shire Council

11 JANUARY, 2011

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1 INTRODUCTION

1.1 Background

SMEC Australia Pty Ltd has been engaged by South Gippsland Shire Council to prepare a Transport and Traffic Impact Assessment Report for the area south of South Leongatha based on the Southern Leongatha Outline Development Plan (ODP).

1.2 Aim of this Report

The aim of this report is to assess the implications of the area south of Leongatha including consequences beyond the ODP area. The report will evaluate what impact the traffic generated from the overall development will have on the existing road network. A performance assessment of the key intersections identified in the ODP Infrastructure Plan will also be undertaken. In particular the report will assess the traffic implications if Simons Lane remains open or is truncated at the Bass Highway intersection.

1.3 Report Structure

The transport and traffic impact assessment for this proposal covers 5 areas as follows:

- Existing Conditions Assessment
- Transport Model
- Traffic Impact Assessment
- Internal Road Network Review
- Integrated Transport Review

1.4 References

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

- Austroads Guide to Traffic Management, Part 12: Traffic Impacts of Development
- Austroads Guide to Traffic Management, Part 3: Guide to Traffic Studies and Analysis
- Austroads Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections
- Austroads Guide to Road Design, Part 6A: Pedestrian and Cyclists Paths
- RTA Guide to Traffic Generating Developments, Version 2.2, October 2002
- Leongatha Structure Plan, June 2008
- Southern Leongatha Outline Development Plan – Discussion Paper, July 2010
- Korumburra & Leongatha Traffic Study, O'Brien Traffic, March 2008
- Department of Planning and Community Development, Planning Maps Online
- Department of Transport Guidelines for Land Use and Development: Public Transport, 2008

2 PROPOSED DEVELOPMENT

2.1 Site Location

The ODP area is located in south Leongatha, Victoria to the south-east of the Leongatha town centre.

The ODP area is bounded by Parr Street and existing residential developments to the north, the Great Southern Rail Trail and Greenwood Parade to the west, Simons Lane / Boags Road to the south and Coalition Creek to the east. Refer to Figure 1 below for the site location.

The site is located approximately 1.8km south of the Leongatha town centre.

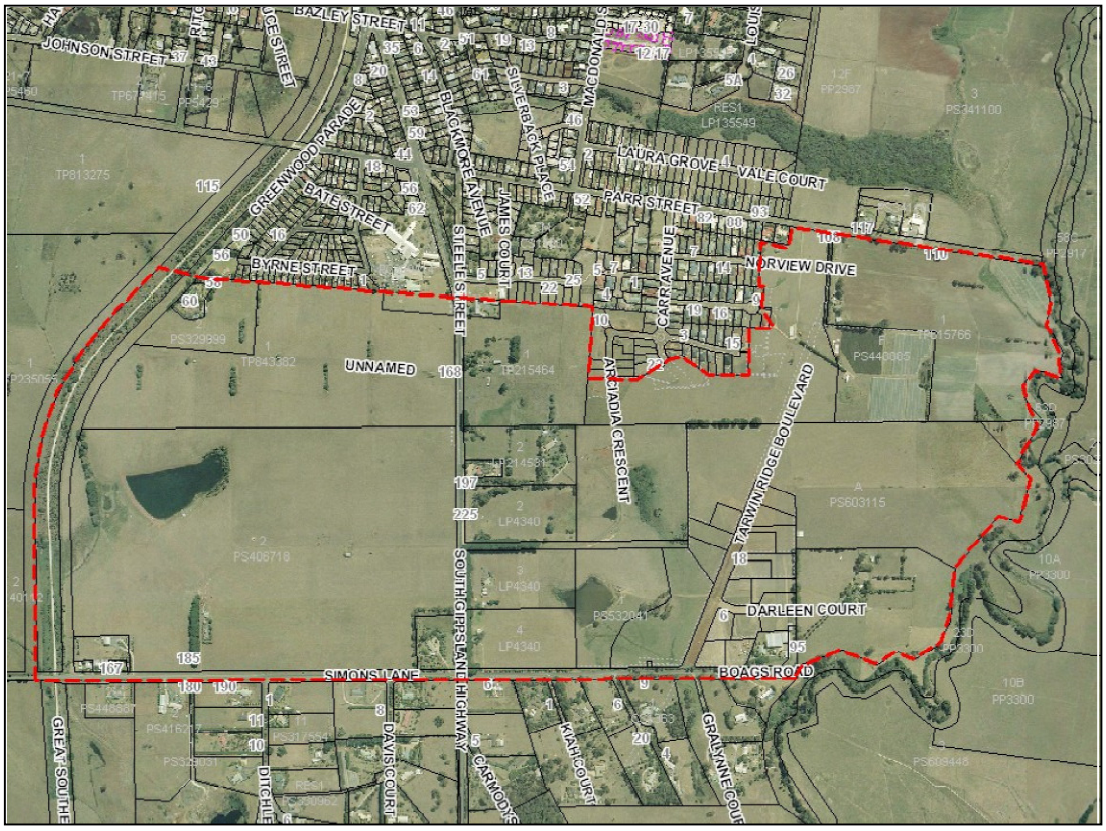


Figure 1: Locality Plan (Source: Southern Leongatha Outline Development Plan – Discussion paper)

Although the current land zoned Farm Zone (FZ) to the west of the Great Southern Rail Trail is not included in the ODP study area, the issues surrounding the full length of Simons Lane will be assessed as the development poses potential consequences to the operation and performance of this road.

2.2 Outline Development Plan (ODP)

The Outline Development Plan (ODP) provides a strategic framework to help manage the use and development of a particular site or area over an extended period of time.

The ODP study area outlined in Figure 1 consists of a total land area of 208ha, of which 84ha is on the western side of the South Gippsland Highway and 124ha is on the eastern side of the South Gippsland Highway. The rezoning of land across the ODP is to support the Leongatha Structure Plan and would result in the following land use types:

- 14ha commercial land
- 194ha urban residential zoning of which 41ha is already zoned as low density residential

The land use type proposed for the ODP area is outlined in the ODP Land Use Plan. Refer Figure 2 below. The land use plan is based on the Leongatha Framework Plan clause 21.04.4 of the Planning Scheme. This plan details Council's preferred use for the area within the ODP.

Figure 2 below shows the proposed development areas outlined in the ODP.

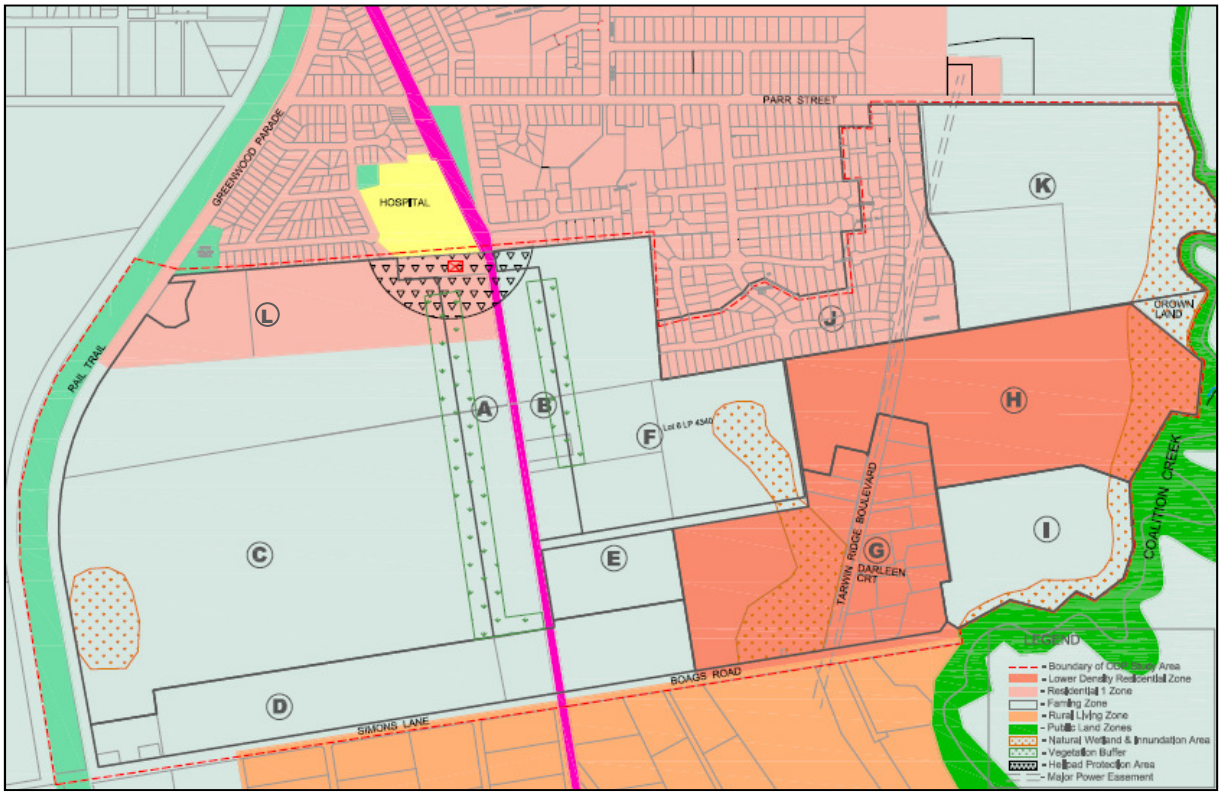


Figure 2: Proposed ODP land use map

Table 1 below shows a breakdown of the proposed land use development areas outlined in the Southern Leongatha Outline Development Plan – Discussion Paper.

Table 1 : Proposed land use developments

Area*	Current Zone	Proposed Zone	Land Use	Approximate Size (ha)
A	FZ	Commercial	Bulky Goods Retail Area	8
B	FZ	Retail / Commercial	Retail / Commercial Area	5
C	FZ	R1Z	Residential Zone 1	55
D**	FZ	LDRZ	Low Density Residential Zone	12
E**	FZ	LDRZ	Low Density Residential Zone	9
F	FZ	R1Z	Residential 1 Zone	21
G	LDRZ	-	Low Density Residential Zone	17
H	LDRZ	R1Z	Low Density Residential Zone	22
I	FZ	LDRZ	Low Density Residential Zone	10
J	R1Z	-	Residential Zone 1	14
K	FZ	R1Z	Residential Zone 1	24
L	R1Z	-	Residential Zone 1	11

* Refer to Figure 2 for the location of ODP areas
** For the purpose of the traffic report we have amended the areas stipulated in the ODP for catchments D and E. Catchment D now represents the LDRZ land to the west of South Gippsland Highway where-as catchment E represents the land to the east. Refer Figure 16 and Figure 17 for these new areas.

3 EXISTING CONDITIONS ASSESSMENT

3.1 Leongatha Structure Plan

The Leongatha Structure Plan defines the urban growth areas and transport access and mobility features within Leongatha. It provides a strategic framework for the future land use developments of Leongatha over the next 20 years. Refer to Appendix A for a copy of the Leongatha Local Level Structure Plan.

The Leongatha Structure Plan identifies the following items relevant to the ODP study area:

- Provision of a future connector road that runs from Simons Lane to Greenwood Parade and South Gippsland Highway;
- Provision of a pedestrian and cycle access to the Great Southern Rail Trail adjoining new residential developments;
- All new subdivisions to be connected to a pedestrian and cycle network;
- The possible reinstatement of the passenger rail service between Cranbourne to Leongatha;
- Provision for a future central north-south pedestrian and cycle route through Leongatha via the Great Southern Rail Trail;
- Residential subdivisions have clear linkages to existing residential areas, road infrastructure and pedestrian / cycle ways; and
- Strong linkages to Melbourne and Gippsland.

3.2 Land Use

The ODP study area consists of a total land area of 208ha, of which 84ha is on the western side of the South Gippsland Highway and 124ha is on the eastern side of the South Gippsland Highway.

The ODP area is predominately undeveloped farm land, apart from seven dwellings bunched in the south-west corner and ten dwelling located east of the South Gippsland Highway. A plant nursery and motel are also located east of the South Gippsland Highway with frontage access.

Key land uses surrounding the subject site include:

- 29.5ha Residential 1 Zone (R1Z)
- 41ha in the Low Density Residential Zone (LDRZ)
- 137.5 ha Farming Zone (FZ)

Refer to the land use plan, Figure 3 below.

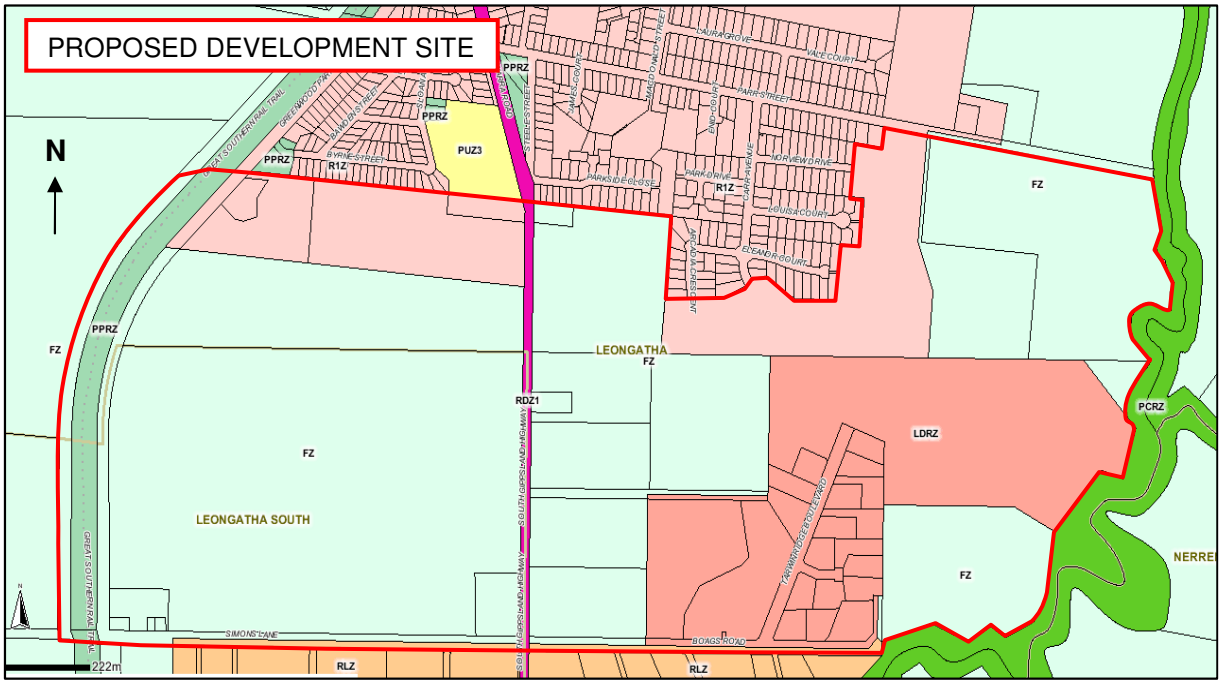


Figure 3: Land Use Plan (source: http://services.land.vic.gov.au/maps/pmo)

3.3 Existing Road Network

An inspection of the proposed development site, South Gippsland Highway, Simons Lane, Boags Road, Tarwin Ridge Boulevard and Parr Street was undertaken on Friday 20 September 2010, between the hours of 11am and 1pm.

3.3.1 South Gippsland Highway

South Gippsland Highway is a sealed two-lane, two-way arterial road. It is a declared major arterial road pursuant to the Victoria Road Management Act 2004.

North of Parr Street, the South Gippsland Highway consists of a 30.5m road reserve made up of two 3.3m traffic lanes. A narrow median is present to provide protection and channelization for vehicles turning right into Parr Street. Kerb and channel is provided along the edge of the carriageway.

Footpaths are present at South Gippsland Highway / Parr Street and continue north along both edges of the carriageway adjacent to the residential properties.

The road alignment is generally straight and undulating. Refer Photo 1. A posted speed limit of 60km/h applies to this section of the South Gippsland Highway.

Between Parr Street and Simons Lane, the South Gippsland Highway consists of a 19.7m road reserve made up of two 3.5m traffic lanes. There is no kerb and channel provided along the edge of the carriageway. Open drains are present along both edges of the carriageway. Centreline line-marking is present. Footpaths are not present.

The road alignment is generally straight and undulating with a gentle incline to a crest to the south of Parr Street. Refer Photo 2. A posted speed limit of 70km/h applies to this section of the South Gippsland Highway.

Photo 1: South Gippsland Highway / Parr Street intersection, looking south

Photo 2: South Gippsland Highway, between Parr Street and Simons Lane, looking south

3.3.2 Simons Lane

Simons Lane is an un-sealed two-lane, two-way undivided rural type road.

It consists of a 19.9m road reserve made up of two 3.5m traffic lanes. Open drains are present along both edges of the carriageway. Centreline line-marking is not present. Footpaths are not present.

The road alignment is straight and undulating. Refer Photo 3.

The posted speed limit on Simons Lane is 100km/h.

Photo 3: Simons Lane, looking east

3.3.3 Boags Road

Boags Road is an unsealed two-lane, two-way undivided rural type road.

It consists of a 7.0m carriageway. Open drains are present on both sides of the carriageway. Centreline line-marking is not present. Footpaths are not present.

The road alignment is generally straight and undulating. Refer Photo 4.

The posted speed limit on Boags Road is 100km/h.

Photo 4: Boags Road, looking east

3.3.4 Tarwin Ridge Road

Tarwin Ridge Road is a sealed two-lane, two-way undivided rural type road. It provides connectivity to Boags Road to the south and is truncated to the north.

It consists of a 7.0m carriageway. Kerb and channel is present along both edges of the carriageway. Footpaths are present on the western side of the carriageway.

The road alignment is winding and undulating. Refer Photo 5.

There is no posted speed limit on Tarwin Ridge Road.

Photo 5: Tarwin Ridge Road, looking north

3.4 Region Context

The South Gippsland Highway provides a north–south transport corridor, linking Leongatha to Korumburra / Melbourne to the north and Foster / Wilsons Promontory to the south-east.

The Bass Highway provides a north–south transport corridor, linking Leongatha to Inverloch to the south.

Outside of the ODP study area, the Strzelecki Highway to the north of the Leongatha town centre provides an east-west transport corridor, linking Leongatha to Morwell and Traralgon and neighbouring townships.

South Gippsland Highway, Bass Highway and Strzelecki Highway are all approved B-double and Higher Mass Limit Truck routes on the VicRoads approved Heavy Vehicle Access Maps.

3.5 Existing Railway Line

The existing Cranbourne to Leongatha railway line was part of the South Gippsland regional rail network, operating both passenger and freight services. In 1993, the State Government withdrew the passenger train services and replaced them with road coaches. The existing railway line, railway reservation and supporting infrastructure have remained untouched since its decommissioning. The rail reserve now forms the basis of the Great Southern Rail Trail. The State Government has withdrawn its commitment to reinstate the passenger services in the short term, however the reinstatement of a passenger and/or freight railway connection may be provided in the future.

3.6 Great Southern Rail Trail

The Great Southern Rail Trail is a 49km pedestrian and cycle track which meanders through the lush dairy cattle farmland and remnant bush of the Gippsland hills.

The Great Southern Rail Trail runs between Leongatha and Foster and provides a safe and even track to walk, run or cycle. Since the decommissioning of the South Gippsland regional rail network, the existing railway line south of Leongatha has since been removed and replaced by The Great Southern Rail Trail. Throughout its length, the Great Southern Rail Trail is generally undulating and well maintained with a surface of compacted gravel.

3.7 Existing Road Network Traffic Volumes

3.7.1 Traffic Volumes

South Gippsland Shire Council provided traffic volumes at the following locations.

- Simons Lane, 100m off Bass Highway, dated September 2010
- Boags Road, 100m off South Gippsland Highway, dated February 2010
- Greenwood Parade, 100m from South Gippsland Highway, dated December 2008
- Parr Street, 400m off Greenwood parade, dated August 2005

A summary of the traffic volumes for all vehicles is provided in Table 2.

South Gippsland Shire Council has identified high traffic movements occurring during the PM peak period, and as such, only the PM peak period will be analysed for the overall development of the ODP area.

Table 2 : Traffic volume counts

	Total	% Heavy Vehicles
Simons Lane		
24 hour weekday average (veh/day)	128	7.2
AM peak hour (veh/hour)	13	-
PM peak hour (veh/hour)	17	-

	Total	% Heavy Vehicles
Boags Road		
24 hour weekday average (veh/day)	194	9.7
AM peak hour veh/hour)	17	-
PM peak hour (veh/hour)	20	-
	Total	**% Heavy Vehicles**
Greenwood Parade		
24 hour weekday average (veh/day)	693	1.4
AM peak hour veh/hour)	53	-
PM peak hour (veh/hour)	57	-
	Total	**% Heavy Vehicles**
Parr Street		
24 hour weekday average (veh/day)	1093	4.0
AM peak hour veh/hour)	82	-
PM peak hour (veh/hour)	116	-

3.7.2 Intersection Turning Movement Counts

Intersection turning movement surveys were conducted by Sky High Pty Ltd on Wednesday 15th September 2010 between 3pm and 6pm. The turning movement counts were undertaken at the following intersections:

- South Gippsland Highway / Simons Lane / Boags Road
- Bass Highway / Simons Lane
- South Gippsland Highway / Parr Street
- Parr Street / South Gippsland Highway Service Road
- South Gippsland Highway / Greenwood Parade

The results of the turning movement counts are as follows:

- **South Gippsland Highway / Simons Lane / Boags Road Intersection**
  - PM peak period occurred between 3:30pm and 4:30pm
  - 450 vehicles were recorded in the PM peak period
  - 32 commercial vehicle were recorded in the PM peak period

- **Bass Highway / Simons Lane Intersection**

- PM peak period occurred between 4:45pm and 5:45pm
- 376 vehicles were recorded in the PM peak period
- 7 commercial vehicle were recorded in the PM peak period

- **South Gippsland Highway / Parr Street Intersection**
  - PM peak period occurred between 3:30pm and 4:30pm
  - 677 private vehicles were recorded in the PM peak period
  - 41 commercial vehicle were recorded in the PM peak period
  - 17 u-turning vehicles were recorded

- **Parr Street / South Gippsland Highway Service Road Intersection**
  - PM peak period occurred between 3:00pm and 4:00pm
  - 160 private vehicles were recorded in the PM peak period
  - 1 commercial vehicle were recorded in the PM peak period

- **South Gippsland Highway / Greenwood Parade Intersection**
  - PM peak period occurred between 3:15pm and 4:15pm
  - 755 vehicles were recorded in the PM peak period
  - 37 commercial vehicle were recorded in the PM peak period

Figure 4, Figure 5, Figure 6, Figure 7 and Figure 8 show the traffic volumes on each approach to the intersections during the PM peak.

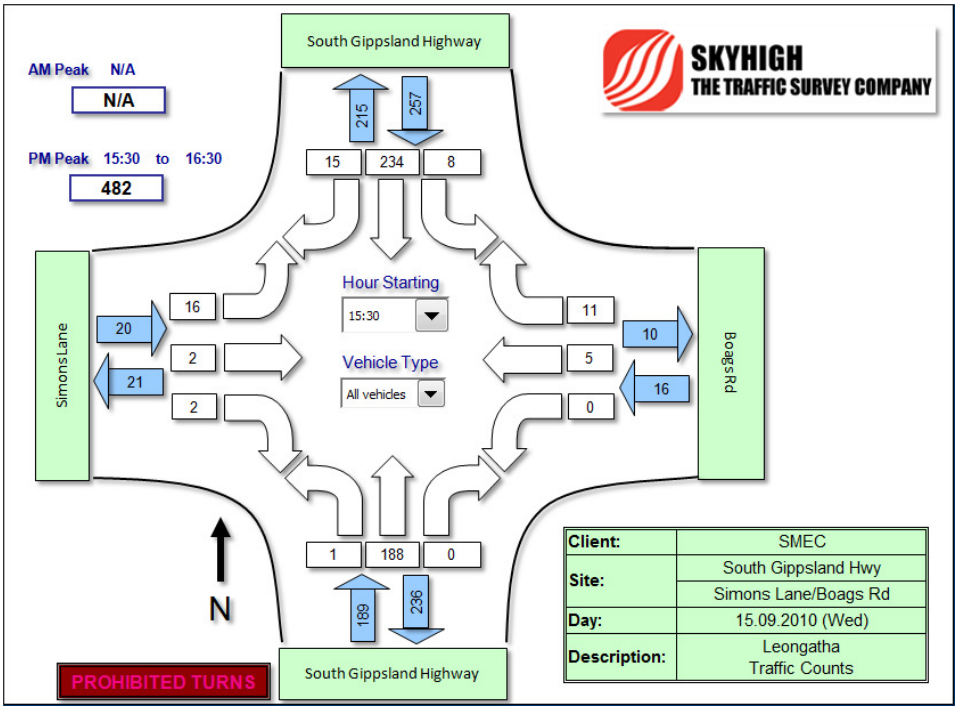


Figure 4 : Traffic volumes at South Gippsland Highway / Simons Lane / Boags Road

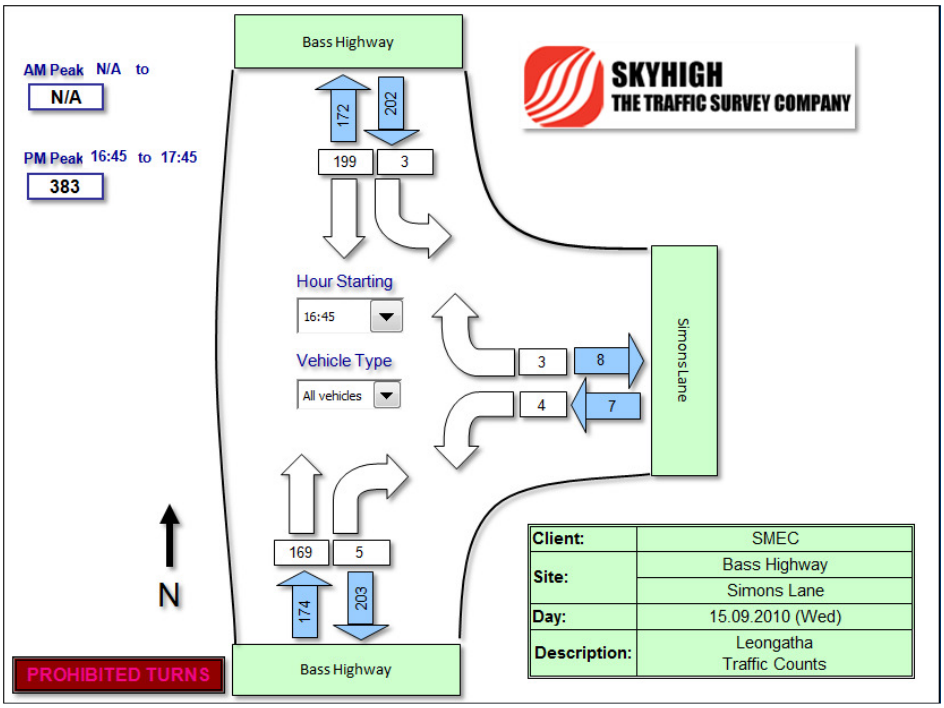


Figure 5 : Traffic volumes are Bass Highway / Simons Lane

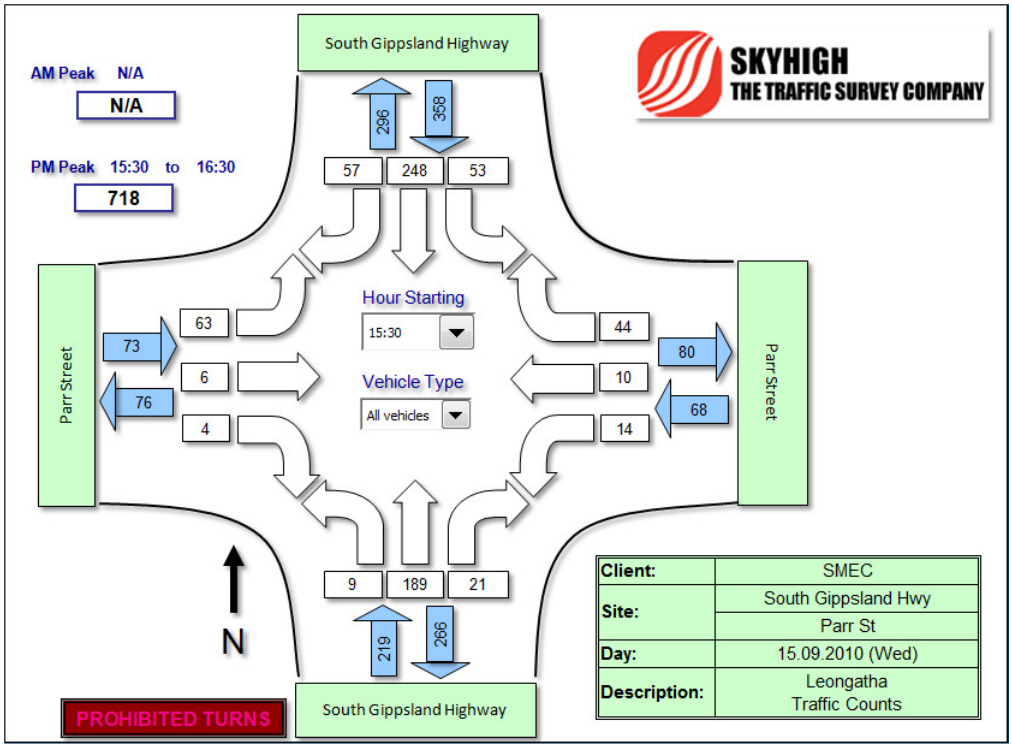


Figure 6 : Traffic volumes at South Gippsland Highway / Parr Street

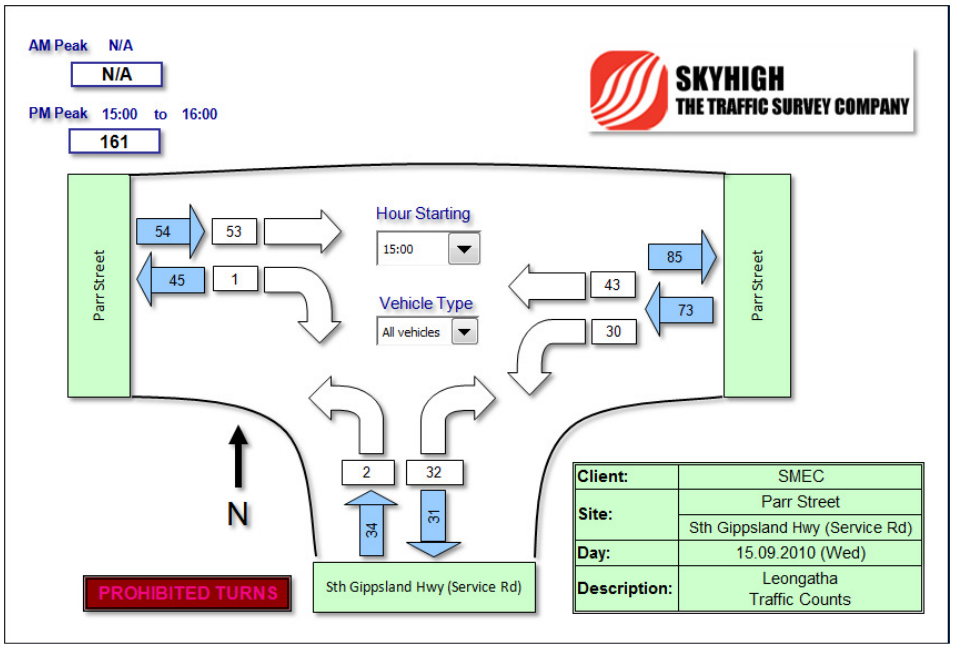


Figure 7 : Traffic volumes Parr Street / South Gippsland Highway (Service Road)

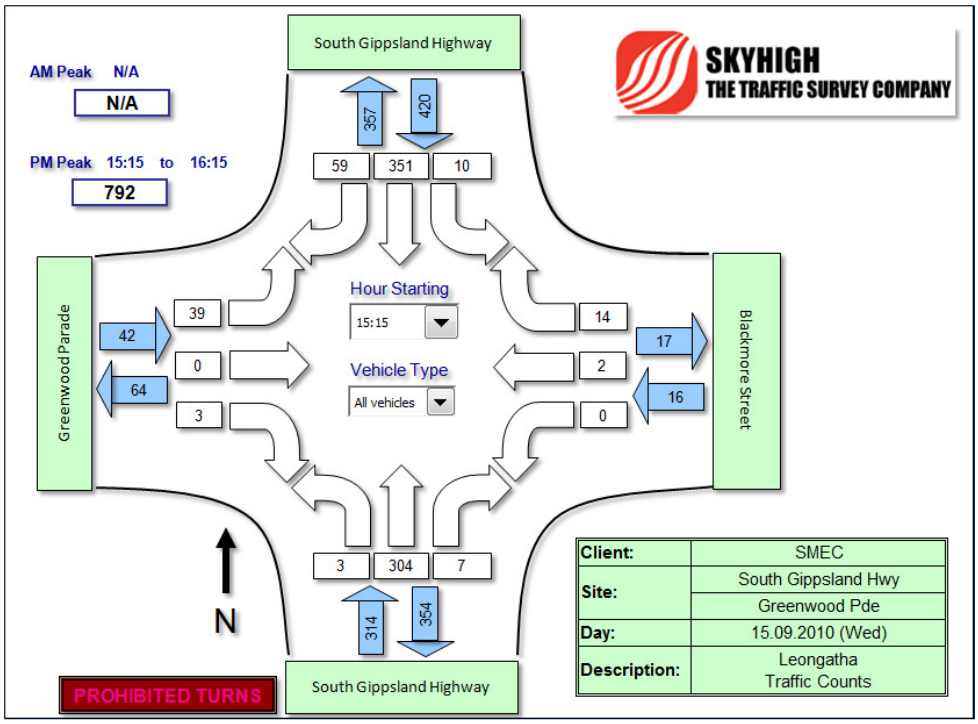


Figure 8 : Traffic volumes South Gippsland Highway / Greenwood Parade

3.8 Public Transport

3.8.1 Train

Leongatha railway station is located on Long Street approximately 1.8km north of the ODP study area. Passenger train services were ceased in 1993. The tracks south of Leongatha have since been dismantled and now forms part of the Great Southern Rail Trail. The existing railway station is currently used as the V/Line Bus terminus.

Leongatha forms part of the South Gippsland Tourist Railway services which operate for visitors on the following days:

- Every Sunday
- Public holiday (except Christmas and Good Friday)
- Every Wednesday during the Victorian school holiday period

3.8.2 Bus

There are numerous bus services which operate throughout Leongatha, including providing connectivity to Melbourne and neighbouring townships. Refer Table 3 for a breakdown of the bus services operating throughout Leongatha.

Table 3 : Bus services in Leongatha

Operator	Route Name	Frequency	Operating Days
Gippsland Bus Services	Traralgon to Wonthaggi	2-3 per day	Every Day
Moons Bus Lines	Foster to Leongatha	1 per week	Thursday Only
South Gippsland Transport Connections	Venus bay	6 per week	Sunday, Monday and Friday
V/Line	Yarram & Leongatha to Melbourne	4-8 per day	Every Day
Dysons	Leongatha to Wonthaggi	1 per day	School days

3.9 Pedestrians and Cyclists

3.9.1 Pedestrians

The Great Southern Rail Trail provides connectivity between the Leongatha town centre and Simons Lane.

There are no formal footpaths present along South Gippsland Highway, Simons Lane, Boags Road and Parr Street within the ODP study area.

Footpaths are only provided at the following locations:

- East side of Tarwin Ridge Road

3.9.2 Cyclists

The Great Southern Rail Trail provides a formal off road cycle path within the ODP study area. The Great Southern Rail Trail forms the western boundary of the ODP study area. There are no formal on road cycle lanes within close proximity of the ODP study area.

3.10 Casualty Accident Statistics

VicRoads' Crashstats database indicates that one casualty crash has been recorded within the study area in the 5-year period between January 2005 and December 2009.

The crash occurred at the intersection of South Gippsland Highway and Boags Road. The intersection type crash involved a car failing to stop along Boags Road colliding with a motorist on South Gippsland Highway. The accident resulted in a serious injury to the 3 occupants.

4 TRANSPORT MODEL

The transport model will assess the traffic volumes generated from the land use precincts outlined in the ODP study area for the following two road network options:

- Option 1 – Simons Lane open at Bass Highway
- Option 2 – Simons Lane closed at Bass Highway

4.1 Road Network Options

4.1.1 Option 1 – Simons Lane Open

The existing intersection of Bass Highway / Simons Lane will remain open to service the ODP area from the west. The intersection would retain its current configuration of a T-intersection with 'give-way' control on the minor approach. Refer to Figure 9 for the road network with Simons Lane open.

The current intersection configuration of Bass Highway / Simons Lane is currently unsatisfactory as it is located near a crest and has restricted sight distances. If the traffic assessment supports the retention of Simons Lane, it is strongly recommended that the current intersection arrangement be redesigned to improve the safe intersection sight distance and achieve compliance with Austroads guidelines.

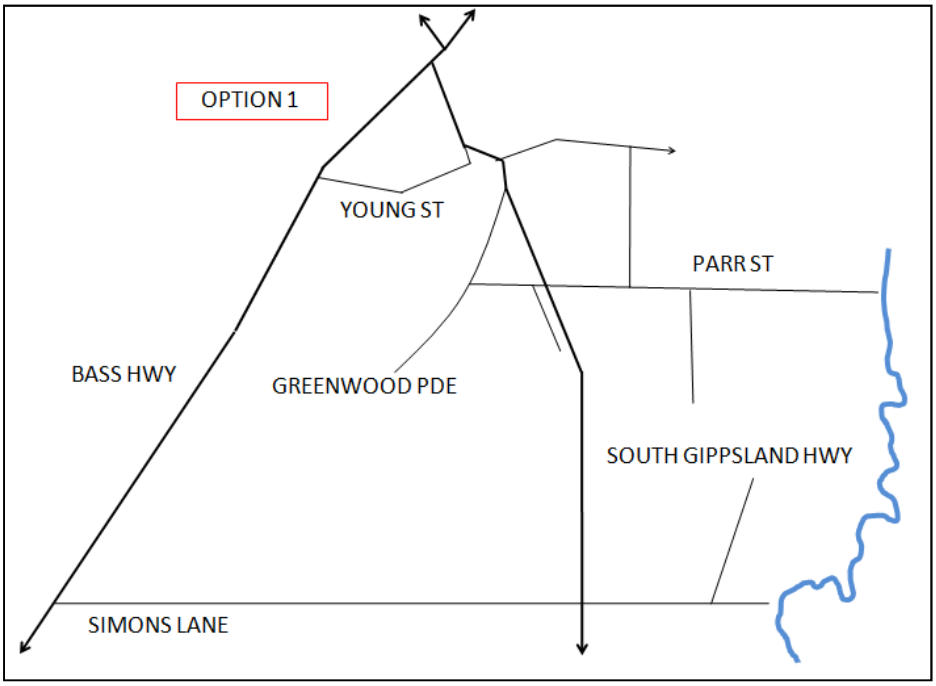


Figure 9: Option 1 - Simons Lane open

4.1.2 Option 2 – Simons Lane Closed

Under Option 2, the existing intersection of Bass Highway / Simons Lane is to be truncated at the western end. To compensate for this closure, it is recommended that a new east-west road connection (extension of Parr Street to Bass Highway) be constructed to allow the easy and quick distribution of traffic around the ODP area. Without this extension, people wanting to access the development area would be required to travel the extra distance to Young Street.

The Parr Street extension has been selected as a suitable road extension for the following reasons:

- there is currently an existing road reserve on the land west of the Great Southern Rail Trail,
- its intersection with Bass Highway provides adequate safe intersection sight distances on both approaches,
- it will reduce the travel time for people wanting to travel from Bass Highway south to access the development area, and
- the extension would be required to service the future development of land to the west of the Great Southern Rail Trail.

It is noted that at full development of the South Leongatha ODP, this new road connection may not be required until Young Street and it's intersections with South Gippsland Highway and the Bass Highway reach capacity. Therefore careful monitoring of Young Street is required to determine when this extension is to be constructed.

However for the purpose of this report the Parr Street extension has been assessed as follows. The future intersection would form a T-intersection with 'give-way' control on the minor approach. Refer to Figure 10 for the indicative road network with Simons Lane closed.

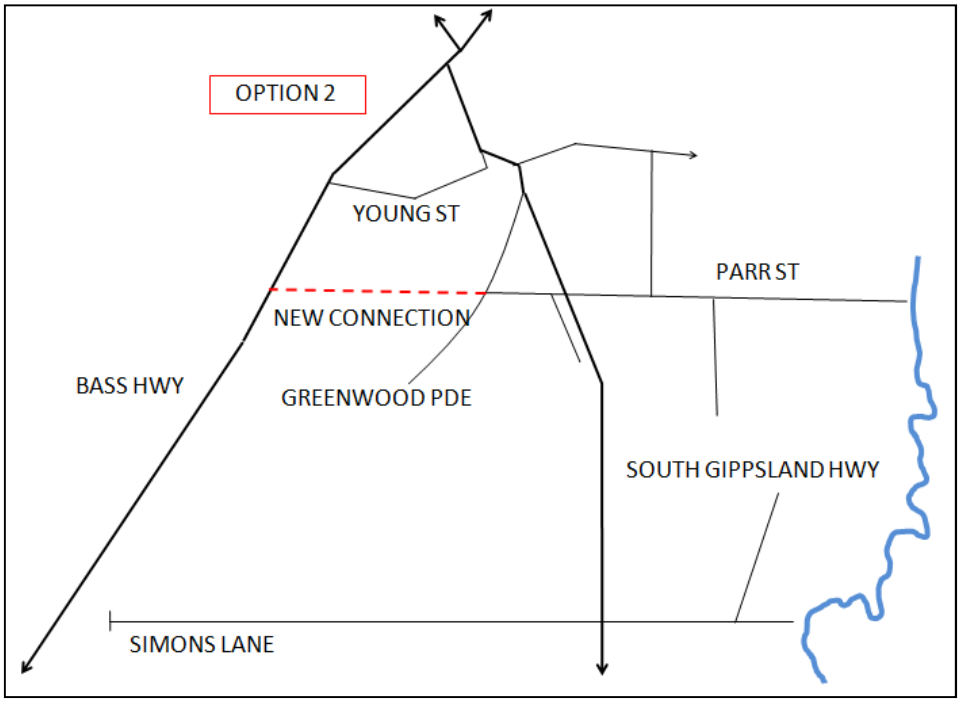


Figure 10: Option 2 – Simons Lane closed

4.2 Traffic Generation Rates

Given that the proposed residential development areas are zoned as either Low Density Residential Zone (LDRZ) or Residential 1 Zone (R1Z), it is anticipated that the traffic generation rates will be slightly different. Therefore the trip generations for each of these zones have been determined based on traffic counts conducted around the ODP study area.

The following two roads were selected and traffic count surveys were carried out over a two week period by the South Gippsland Shire Council.

- Blair Crescent - lies within a R1Z north of the study area
- Boags Road - lies within a LDRZ located along the southern border of the study area

Both roads are 'no through roads', therefore a large majority of the private vehicle trips on these roads can be assumed to originate from the residential dwellings. Heavy vehicle trips have been excluded in determining the daily trip generation rates and peak hour factors

calculations. A full summary of the generation rate and peak hour factor calculations are provided in Appendix B.

Peak hour trip generation rates for the bulky goods and commercial retail land uses were sourced from the RTA Guide to Traffic Generating Developments, Version 2.2, October, 2002.

The traffic generation rates applicable for each land use within this development are shown in Table 4 below.

It should be noted that the proposed traffic generation rates quoted in Table 4 for Bulky Goods and Commercial Retail development are quite high for a town like Leongatha and generation rates of this type may never be realised. However without reliable traffic survey data within the industry, we have taken a conservative approach and adopted the RTA Guide's rates to calculate the traffic generated from these types of developments.

Table 4 : Land use traffic generation rates

Land Use	Traffic Generation Rates		
	Daily Vehicle Trips	Peak Hour Vehicle Trips	Peak Generation Rate
Residential (R1Z)	7	10%	0.7 trips/lot
Low Density Residential (LDRZ)	10	11%	1.1 trips/lot
Bulky Goods	-	-	2.5 trips/100m^2
Commercial Retail	-	-	2.0 trips/100m^2

4.3 Traffic Generation

The proposed developments within the ODP study area will generate approximately 2,162 peak hour vehicle trips. Table 5 shows a summary of both the daily and peak hour trips generated in each of the areas in the ODP (refer to Figure 2 for the ODP areas).

The number of lots per hectare for the R1Z and LDRZ areas have been determined by dividing the total number of lots over the total areas for that zone, the rates come to 10 lots/ha and 1.4 lots/ha respectively. This lower than average LDRZ lot yield accounts for a range of site specific matters including the fragmented ownership pattern, established dwelling developments, proximity to waterways and the existing drainage reserves. These factors are likely to reduce potential lot yields per ha.

Table 5 : Traffic generation

ODP Area*	Type of Development	Area Size (ha)	No. Lots	Floor Space (m^2)	Proposed Daily Vehicle Trips	Proposed Peak Hour Vehicle Trips
A	Bulky Goods	8	-	32,000	-	800
B	Retail / Commercial	5	-	13,000	-	260
C	Residential	55	550	-	3850	385
D**	Low Density Residential	12	17	-	170	19

ODP Area*	Type of Development	Area Size (ha)	No. Lots	Floor Space (m^2)	Proposed Daily Vehicle Trips	Proposed Peak Hour Vehicle Trips
E**	Low Density Residential	9	12	-	120	13
F	Residential	21	210	-	1470	147
G	Low Density Residential	17	24	-	240	26
H	Residential	22	220	-	1540	154
I	Low Density Residential	10	14	-	140	15
J	Residential	14	140	-	980	98
K	Residential	24	240	-	1680	168
L	Residential	11	110	-	770	77

* Refer to Figure 2 for the location of ODP areas
** For the purpose of the traffic report we have amended the areas stipulated in the ODP for catchments D and E. Catchment D now represents the LDRZ land to the west of South Gippsland Highway where-as catchment E represents the land to the east. Refer Figure 16 and Figure 17 for these new areas.

4.4 External Traffic Growth Rate

It is estimated that the average annual percent change in population for Leongatha is 2% per annum. In order to estimate the future 2026 year external traffic volumes, a 2% compounded growth per year has been added to the existing traffic volumes.

4.5 Traffic Distribution

Given the absence of Origin / Destination (OD) surveys and a traffic model covering the ODP study area, a high level analysis of the existing intersection turning movement counts has been undertaken. This analysis will assist in determining the existing traffic distribution pattern which can then be applied to the proposed development area. The analysis was undertaken as follows.

A large portion of the current area is undeveloped with most of the existing developments situated near or north of Parr Street towards the town centre. Therefore travel patterns in that area are assumed to vary compared to areas around Simons Lane or Boags Road. In addition, travel patterns around Boags Road are expected to differ compared to Simons Lane primarily due to the fact that Simons Lane can be used for through trips between Bass Highway and South Gippsland Highway. Further trips generated from Simons Lane heading northbound towards the north-west regions of Leongatha have the option of using Bass Highway whereas the same type of trip generated from Boags Road would use South Gippsland Highway.

To account for the potential differences in travel patterns, the region bounded by the traffic count locations mentioned above have been disaggregated into three main sub-areas, Precincts 1, 2, and 3, refer Figure 11 below. Therefore the distribution of residential trips generated from the ODP Areas will adopt the same travel patterns assigned to the Precinct that they belong to. There is a fourth subarea (Precinct 4) which represents the distribution of trips to/from the retail and bulky goods area. The traffic distribution for this precinct has been assumed as the average of Precincts 1 to 3.

Trips outside of the traffic count locations have been treated as external trips represented by the four main travel movements:

- Northern direction/Town Centre via South Gippsland Highway (South Gippsland Hwy North)
- Northern direction via Bass Highway from Simons Lane (Bass Hwy North)
- Southern direction via South Gippsland Highway (South Gippsland Hwy South)
- Southern direction via Bass Highway from Simons Lane (Bass Hwy South)

Allowances have been made in the calculations for trips between precincts but it is expected that most trips would travel to and from the external zones with a majority heading in northern direction towards the town centre using South Gippsland Highway. Internal precinct trips have been ignored with the exception of Precinct 3 where it covers a much larger area. These trips have been assumed as eastbound and westbound through traffic crossing South Gippsland Highway at Greenwood Parade and Parr Street.

Figure 11 below shows the location of the precincts and the external zones.

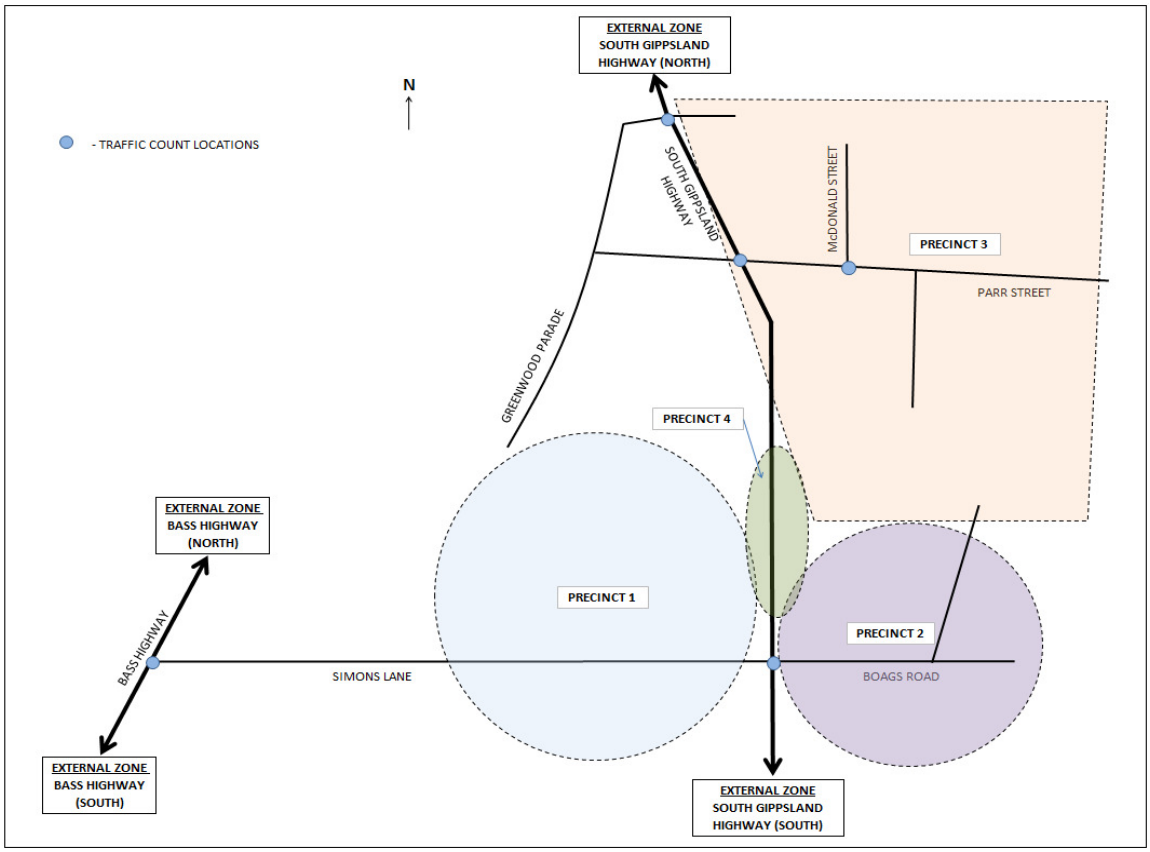


Figure 11: Location of Precincts and External Zones

The following assumptions have been made when calculating the traffic distribution percentages:

- 25% of traffic from Bass Highway are through traffic to South Gippsland Highway
- 25% of traffic from South Gippsland Highway are through traffic to Bass Highway
- All traffic between Parr Street and Simons Lane along South Gippsland Highway are through traffic
- Traffic count volumes at intersection between Parr Street and South Gippsland Highway Service Road have been ignored as inclusion of these volumes would distort

the travel patterns for Precinct 3. This is due to the presence of the hospital which would attract trips from other external locations outside of the study area

- 40% of traffic to and from Precinct 3 travelling to the north uses McDonald Street. This has been based on traffic turning count information conducted at Parr Street / McDonald Street by SMEC staff members.

Calculation of distribution percentages for trips into and out of the Precincts 1, 2 and 3 have been carried out using existing turning movement percentages from the traffic count surveys. For example, trips into Precinct 2 comprised of:

- through volumes from Simons Lane
- left turning volumes from South Gippsland Highway southbound, and
- right turning volumes from South Gippsland Highway northbound

Each of these turning movements is then traced back to their respective upstream intersections and the volumes further broken down based on the turning movement percentages at that upstream intersection. The process continues until the trips get traced back to the external zone or the other Precincts. Similarly trips out of Precinct 2 have been applied using the same approach, but adopting the existing turning movement percentages for the opposite direction.

At Precinct 1, distributions of IN and OUT trips have been based on turning movement percentages at Simons Lane / Bass Highway intersection and Simons Lane / Boags Rd / South Gippsland Highway intersection, taking into account the assumptions made on the percentage of through traffic between these intersections. At Precinct 3, distributions of IN and OUT trips have been based on the average turning movement percentages at South Gippsland Highway / Greenwood Parade intersection and South Gippsland Highway / Parr Street intersection.

Each of the ODP area assumes a set of IN and OUT trip distribution percentages depending on the Precinct they belong to, this relationship is shown in Table 6. Figure 12 to Figure 15 show the distribution percentages of IN and OUT trips to the different Precincts.

Table 6 : Relationship between ODP area and Precinct

Precinct	ODP Area
Precinct 1	C, D, L
Precinct 2	E, G, I
Precinct 3	F, H, J, K
Precinct 4	A, B

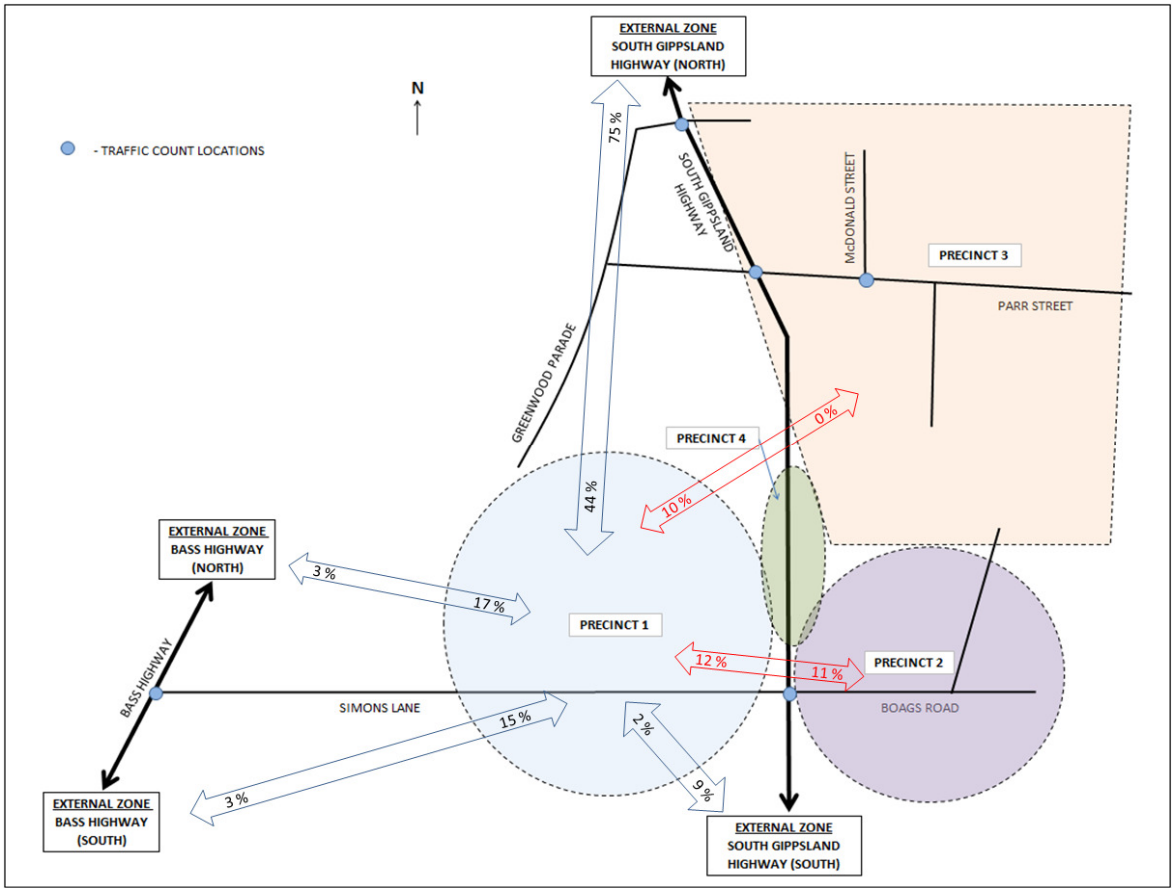


Figure 12: IN and OUT Trip Distribution Percentages from Precinct 1

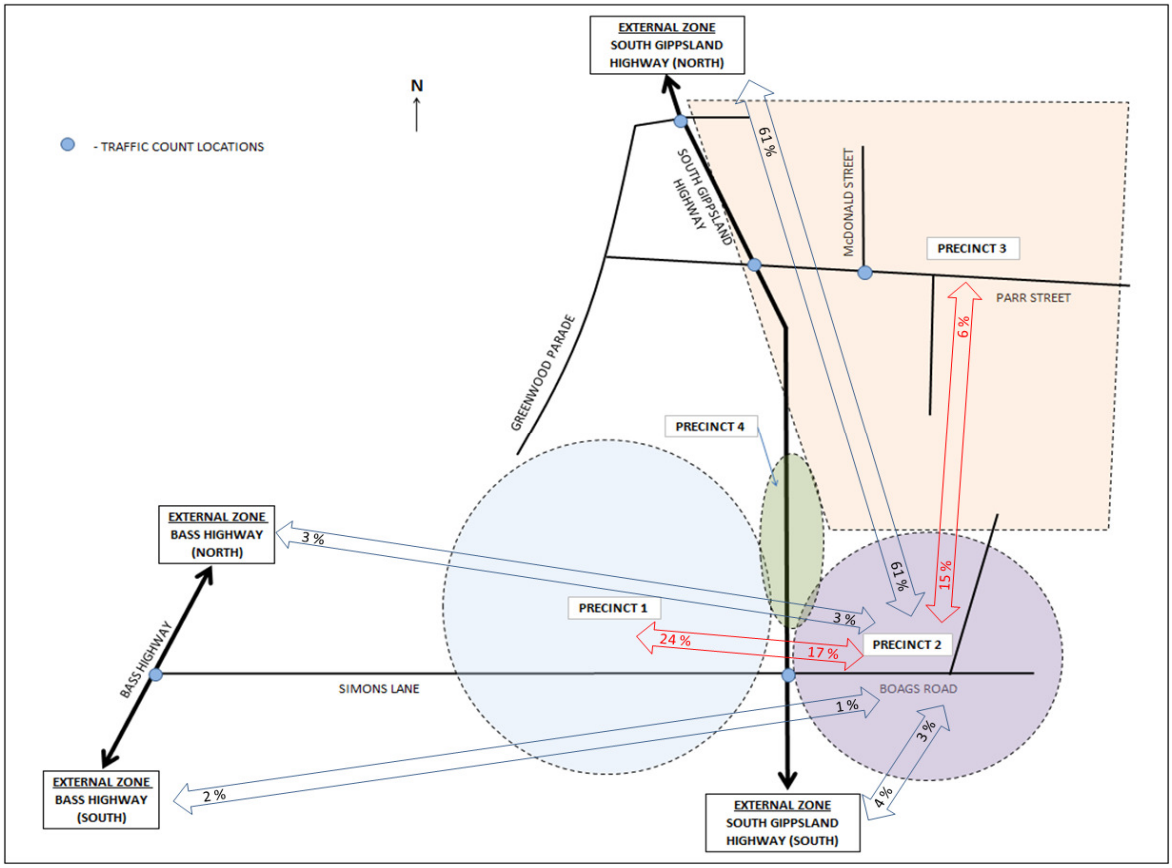


Figure 13: IN and OUT Trip Distribution Percentages from Precinct 2

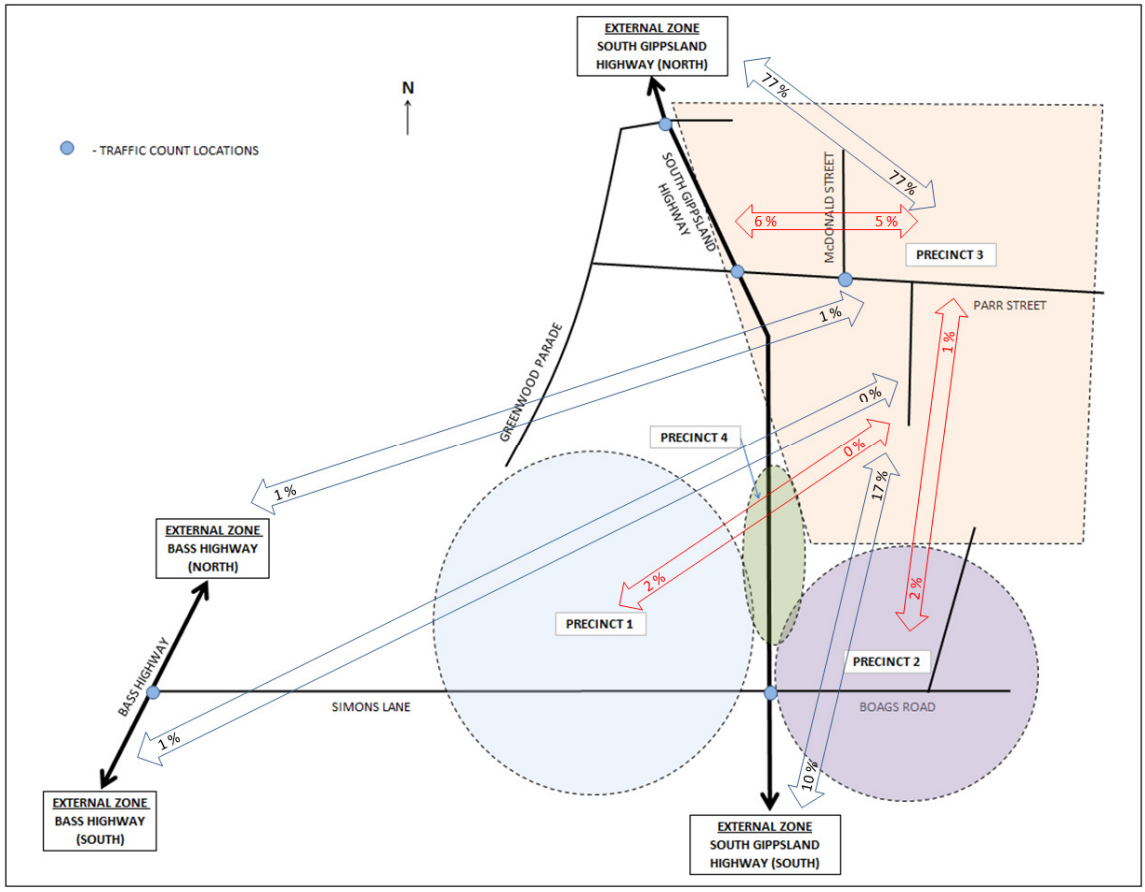


Figure 14: IN and OUT Trip Distribution Percentages from Precinct 3

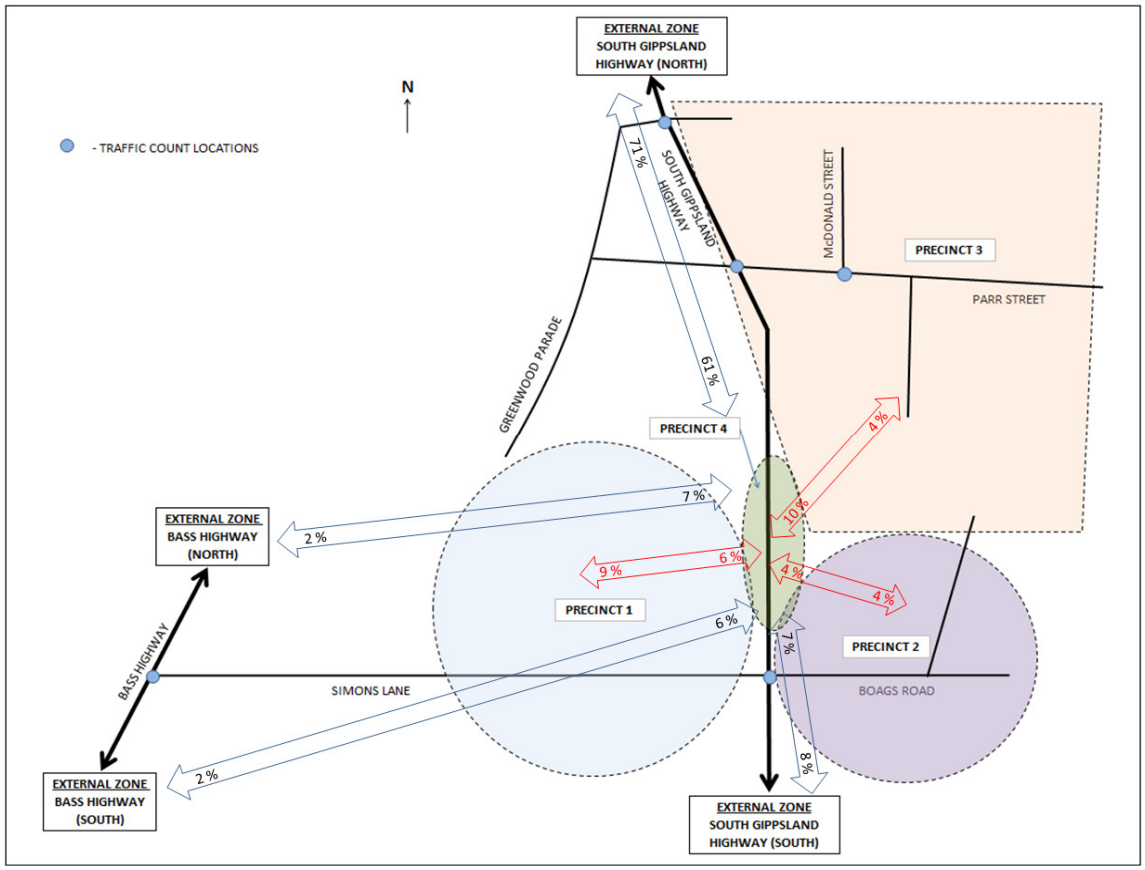


Figure 15: IN and OUT Trip Distribution Percentages from Precinct 4

For the assessment of Option 2, the closure of Simons Lane and the extension of Parr Street to the Bass Highway, the traffic that is distributed through Simon's Lane from the four precincts have been diverted to Parr Street.

4.6 Traffic Assignment

Table 7 below summarises the predicted total peak hour trips from each ODP area that is assigned onto the road network, based on the traffic generation and distribution assumptions described in the previous section.

Table 7 : Peak hour private vehicle movements accessing the ODP area

ODP Area	Precinct No.	Land Use	PM Peak		
			Total Peak Hour Vehicle Trips	In	Out
A	Precinct 4	Bulky Goods	800	400	400
B	Precinct 4	Retail / Commercial	260	130	130
C	Precinct 1	Residential	385	223	162
D	Precinct 1	Low Density Residential	19	10	9
E	Precinct 2	Low Density Residential	13	7	6
F	Precinct 3	Residential	147	85	62
G	Precinct 2	Low Density Residential	26	13	13
H	Precinct 3	Residential	154	89	65
I	Precinct 2	Low Density Residential	15	8	8
J	Precinct 3	Residential	98	57	41
K	Precinct 3	Residential	168	97	71
L	Precinct 1	Residential	77	45	32
Total			**2162**	**1164**	**999**

The above traffic assignment is based on the following directional split of traffic entering and exiting the ODP area:

- Bulky Goods – 50% In / 50% Out
- Retail / Commercial – 50% In / 50% Out
- Low Density Residential – 51% In /49% Out
- Residential – 58% In/42% Out

Applying the distribution percentages for each of the four Precincts shown in Figure 12 to Figure 15 with the IN and OUT trips in each ODP area, we arrived at the following trips to be assigned to the four external zones and three Precincts as shown in Table 8.

Table 8 : ODP area IN and OUT trips assigned to external zones and precincts

ODP Area	Split	PM Peak Hour Trips						
		Bass Hwy (Nth)	Bass Hwy (Sth)	Sth Gippsland Hwy (Nth)	Sth Gippsland Hwy (Sth)	Precinct 1	Precinct 2	Precinct 3
A	IN	27	22	242	29	23	17	39
	OUT	8	8	284	31	35	17	17
B	IN	9	7	79	10	7	6	13
	OUT	3	3	92	10	11	6	6
C	IN	37	34	99	4	0	28	22
	OUT	5	5	120	14	0	17	0
D	IN	2	1	4	0	0	1	1
	OUT	0	0	7	1	0	1	0
E	IN	0	0	4	0	1	0	1
	OUT	0	0	4	0	2	0	0
F	IN	1	0	65	15	0	1	4
	OUT	1	0	48	6	1	1	4
G	IN	0	0	8	0	2	0	2
	OUT	0	0	8	0	3	0	1
H	IN	1	0	68	15	0	1	4
	OUT	1	0	50	7	2	1	4
I	IN	0	0	5	0	1	0	1
	OUT	0	0	5	0	2	0	0
J	IN	0	0	43	10	0	0	3
	OUT	0	0	32	4	1	1	3
K	IN	1	0	75	17	0	1	5
	OUT	1	0	55	7	2	2	4
L	IN	7	7	20	1	0	6	4
	OUT	1	1	24	3	0	3	0
Sub total	**IN**	**85**	**71**	**712**	**101**	**34**	**61**	**99**
	OUT	**20**	**17**	**729**	**83**	**59**	**49**	**39**
Total*	**IN**	**1163**						
	OUT	**996**						

* Differences in trip totals between Table 7 and Table 8 are due to rounding errors

The resultant peak hourly flows for each of the two network options have been derived by combining the above peak hour trips for each ODP area with the uplifted peak hour external traffic volumes adopting a 2 per cent annual compound growth to the 2026 ultimate year.

Figure 16 and Figure 17 show the new traffic assigned to the two network options. Appendix C shows the breakdown of the trips assigned to the network for these options.

SOUTH LEONGATHA PM PEAK HOUR TRAFFIC VOLUME - OPTION 1 (EXISTING ROAD NETWORK)

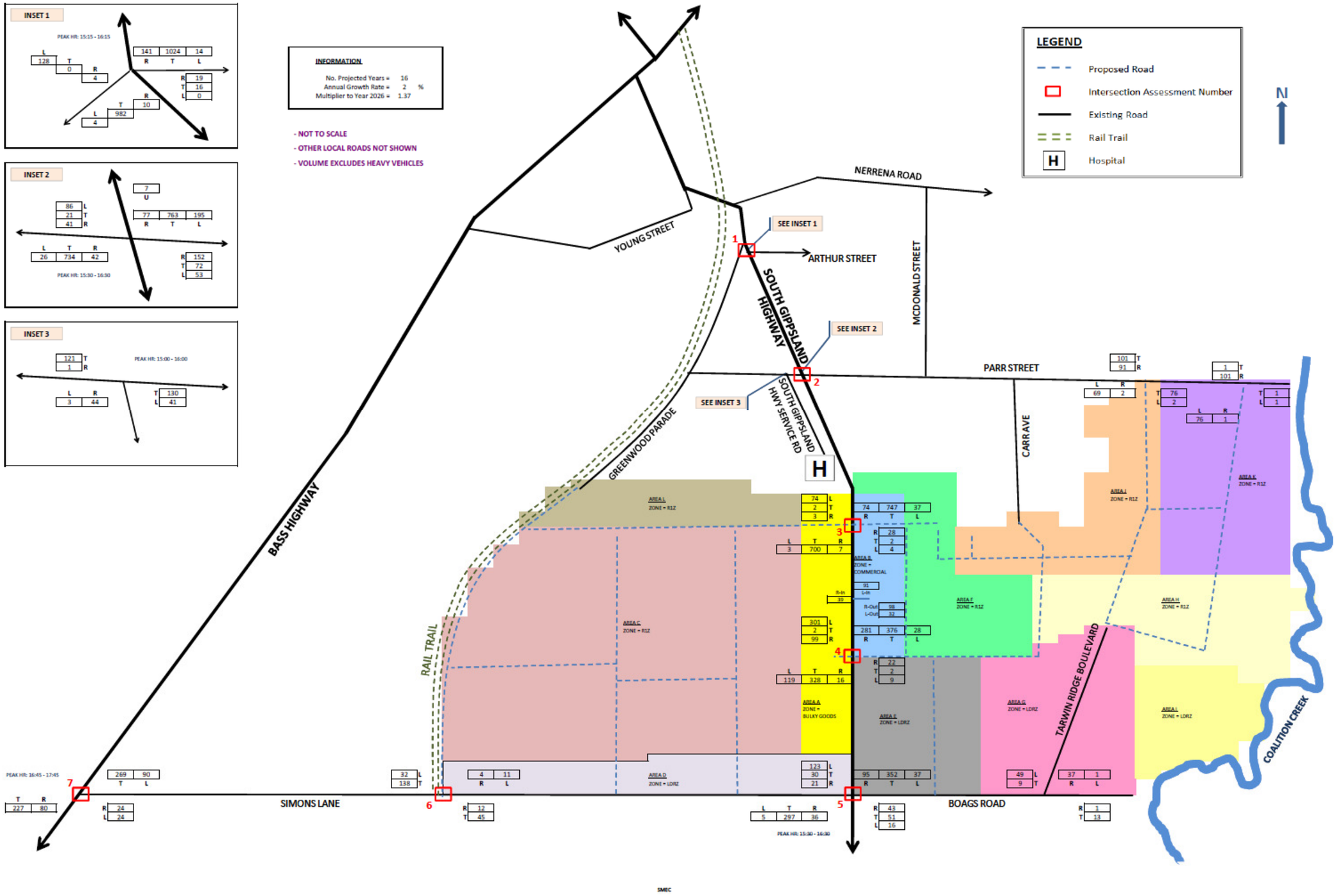


Figure 16 : Option 1 peak hour traffic volumes

SOUTH LEONGATHA PM PEAK HOUR TRAFFIC VOLUME - OPTION 2 (PARR STREET EXTENSION & CLOSURE OF SIMONS LANE ACCESS TO/FROM BASS HIGHWAY)

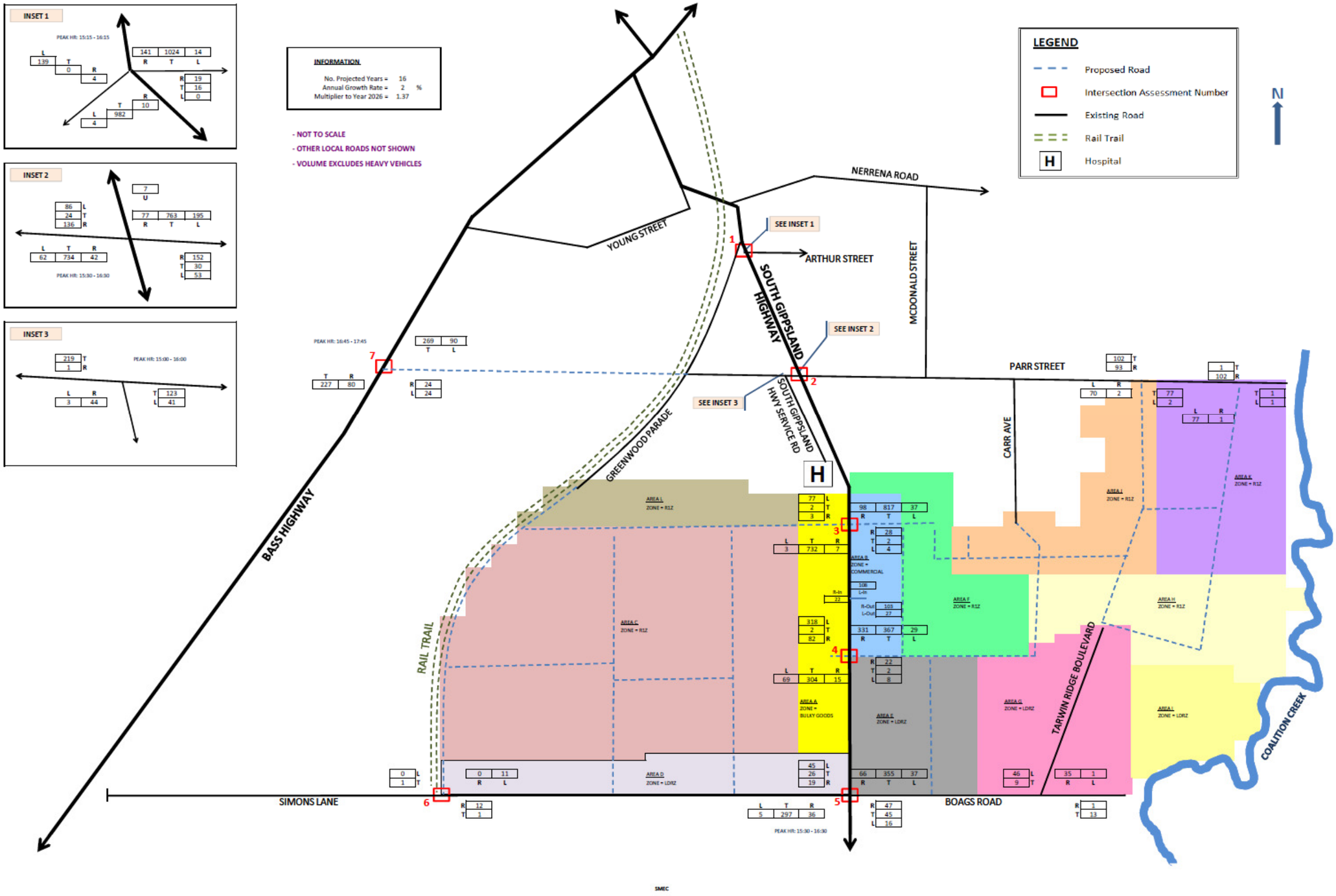


Figure 17 : Option 2 peak hour traffic volumes

4.7 Intersection Performance Assessment

SIDRA Intersection 5.0 was used to assess the performance of the key intersections pre and post development. SIDRA is a key tool used for this type of assessment as it helps identify the "Level of Service" and "Degree of Saturation" of the intersection.

Level of Service is defined as a qualitative measure for ranking *"operating conditions"*, based on factors such as speed, travel time, freedom to manoeuvre, interruptions, comfort and convenience[1]. There are six levels of service, from A to F, with level of service A representing the best operating condition and level of service F the worst, *ibid*.

The Degree of Saturation is defined as the ratio of the arrival flow (demand) to the capacity of the approach during the same period[1]. The degree of saturation of an intersection approach ranges from close to zero for very low traffic flows and up to one for saturated flow or capacity, *ibid*.

For unsignalised intersections and roundabouts, the "practical" Degree of Saturation is in the range of 0.80 to 0.85. Table 9 below sets out the degree of saturation ranges that SIDRA uses when assessing the level of service. As can be seen the lower the degree of saturation the better the level of service.

Table 9 : Level of service

Level of Service	Unsignalised Intersection	Roundabout
	Degree of Saturation	Degree of Saturation
A	< = 0.60	< = 0.60
B	0.60 – 0.70	0.60 – 0.70
C	0.70 – 0.80	0.70 – 0.85
D	0.80 – 0.90	0.85 – 0.95
E	0.90 – 1.00	0.95 – 1.00
F	>= 1.00	>= 1.00

4.8 Intersection Turn Warrants

Warrants for turn treatments are set out in section 4.8 of the Austroads Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections. These warrants apply to major road turn treatments for the basic, auxiliary lane and channelised layouts. Figure 4.9(b) of the Austroads guide has been used to assess if a turn treatment is required at each existing intersection.

An intersection performance assessment of all key junctions for the PM peak period has been undertaken for the two road network options highlighted in section 4.1. Refer to Figure 18 below for the key junction numbering configuration adopted for the assessment.

[1] Guide to Traffic Management, Part 3: Traffic Studies and Analysis, Austroads, 2009

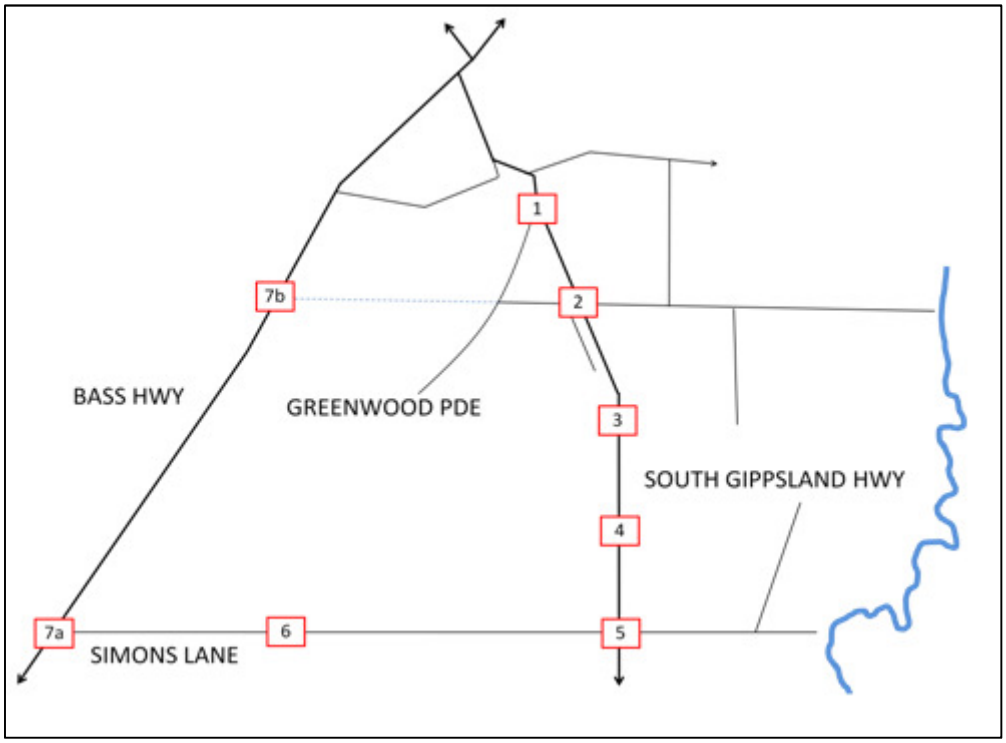


Figure 18: Key Junction numbering configuration

Refer Appendix E for this assessment and Table 10, Table 11, Table 12 and Table 13 for a tabulated breakdown of the PM peak turn movements at the following key junctions within the ODP study area.

Table 10: Turn Warrant Assessment at Junction 1

Major Road	Approach	Existing Intersection Make-up	Through Movement (Q_M)	Turn Movement (Q_L or Q_R)	Treatment Required (Yes/No)	Turn Treatment
Option 1 and Option 2						
Junction 1	South	Basic Left	1008	Q_L=4	No	Basic left
		Basic Right	1008	Q_R=10	Yes	Channelised Right (Short)
	North	Basic Left	1049	Q_L=14	Yes	Auxiliary left
		Basic Right	1049	Q_R=141	Yes	Channelised Right

As can be seen, a channelised right turn short treatment is required on the north and south approaches of South Gippsland Highway. An auxiliary left turn treatment is required on the north approach.

Table 11: Turn Warrant Assessment at Junction 2

Major Road	Approach	Existing Intersection Make-up	Through Movement (Q_M)	Turn Movement (Q_L or Q_R)	Treatment Required (Yes/No)	Turn Treatment
Option 1 and Option 2						
Junction 2	South	Basic Left	761	Q_L=26	Yes	Auxiliary left
		Basic Right	761	Q_R=42	Yes	Channelised Right
	North	Basic Left	787	Q_L=196	Yes	Auxiliary left
		Basic Right	787	Q_R=78	Yes	Channelised Right

As can be seen, a channelised right turn short treatment and an auxiliary left turn treatment is required on both the north and south approaches of South Gippsland Highway.

Based on the traffic demand anticipated in the full development scenario, and the safety implication of four legged intersections, it is recommended that Junctions 3, 4 and 5 be built as a roundabout. Therefore a turn warrant assessment was not undertaken for these intersections.

Table 12: Turn Warrant Assessment at Junction 6

Major Road	Existing Intersection Make-up	Through Movement (Q_M)	Turn Movement (Q_L or Q_R)	Treatment Required (Yes/No)	Turn Treatment
Option 1					
Junction 6	-	138	Q_L=32	No	Basic left
	-	45	Q_R=12	No	Basic right
Option 2					
Junction 6	-	1	Q_L=0	No	Basic left
	-	1	Q_R=12	No	Basic right

As can be seen, a basic left and basic right treatment is adequate for both approaches to Simons Lane.

Table 13: Turn Warrant Assessment at Junction 7

Major Road	Existing Intersection Make-up	Through Movement (Q_M)	Turn Movement (Q_L or Q_R)	Treatment Required (Yes/No)	Turn Treatment
Option 1					
Junction 7a	Basic Left	273	Q_L=90	Yes	Auxiliary left
	Basic Right	232	Q_R=80	Yes	Channelised Right (Short)
Option 2					
Junction 7b	Basic Left	273	Q_L=90	Yes	Auxiliary left
	Basic Right	232	Q_R=80	Yes	Channelised Right (Short)

As can be seen, a channelised right turn short treatment and an auxiliary left turn treatment is required on both the north and south approaches of Bass Highway.

4.8.1 Junction 1

Based on the intersection turn warrants, Junction 1 was modelled as an unsignalised intersection as follows for option 1 and 2:

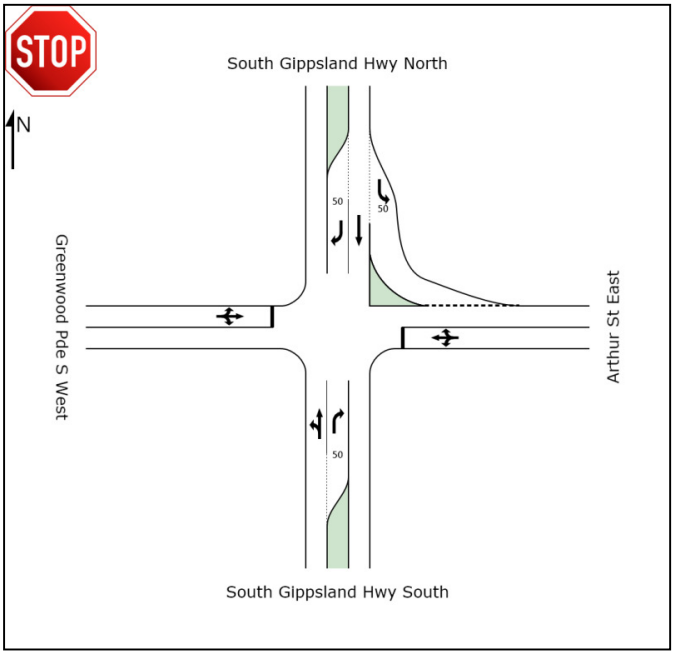


Figure 19: Proposed intersection at Junction 1 – Option 1

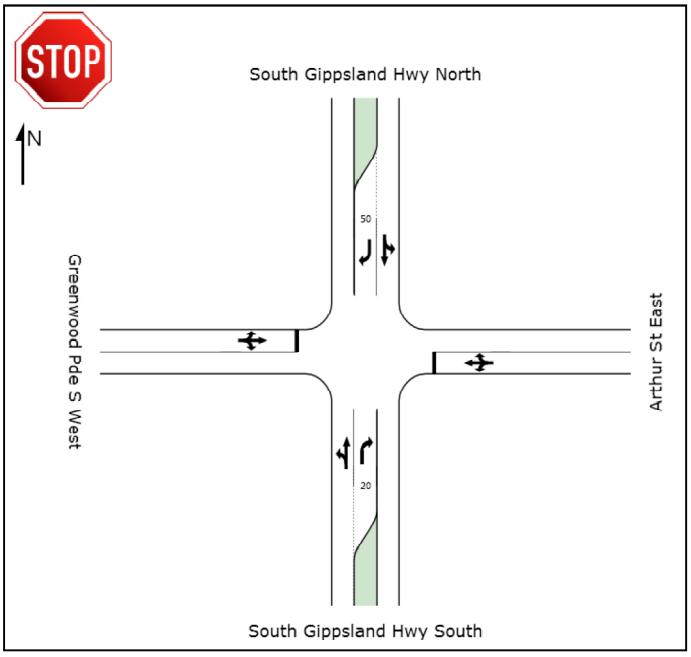


Figure 20: Proposed intersection at Junction 1 – Option 2

A comparison of the queue length, average delay, degree of saturation and level of service of each approach of Junction 1 for Option 1 and Option 2 is shown in Table 14 below.

Table 14: Comparison of results at Junction 1 Unsignalised intersection

Approach	North		East		South		West	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
PM Peak								
Queue Length (m)	24.1	24.1	92	92.5	1.7	1.7	383.3	420.4
Average Delay (sec)	6.3	6.3	1453.8	1486.5	2.9	0.3	970.4	1026.4
Degree of Saturation	0.614	0.614	1.000	1.000	0.576	0.576	1.965	2.033
Level of Service	B	B	F	F	B	B	F	F

The results show that the traffic volume at Junction 1 will not be acceptable for Option 1 and Option 2 in terms of queue lengths, average delays, Degree of Saturation and Level of Service for both the eastern and western approach to the intersection during the PM peak hour for an unsignalised intersection. Therefore we recommend that the intersection be upgraded to a roundabout.

The junction was then modelled as a roundabout as follows:

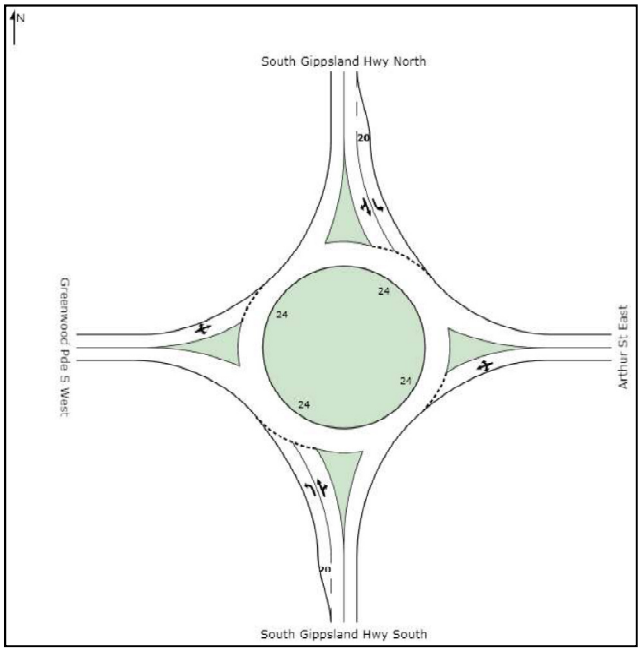


Figure 21: Proposed roundabout at Junction 1 – Option 1

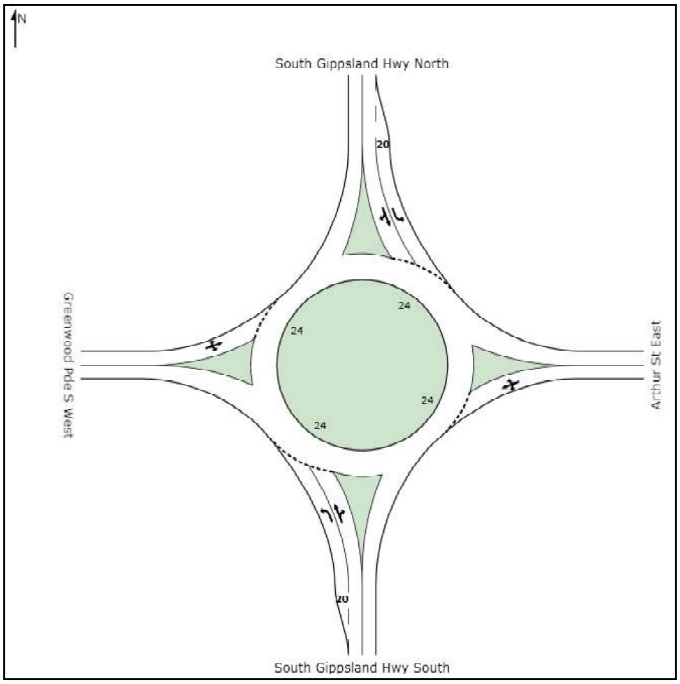


Figure 22: Proposed roundabout at Junction 1 – Option 2

A comparison of the queue length, average delay, degree of saturation and level of service of each approach of Junction 1 for Option 1 and Option 2 is shown in Table 15 below.

Table 15: Comparison of results at Junction 1 with Roundabout

Approach	North		East		South		West	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
PM Peak								
Queue Length (m)	94.8	89.3	7.0	6.7	75.4	69.8	28.4	28.2
Average Delay (sec)	8.3	8.3	26.2	25.6	8.4	8.3	20.8	19.6
Degree of Saturation	0.712	0.699	0.107	0.100	0.746	0.719	0.393	0.386
Level of Service	C	B	A	A	C	C	A	A

The results show that the traffic volume at Junction 1 will be acceptable for Option 1 and Option 2 in terms of queue lengths, average delays, Degree of Saturation and Level of Service for each approach to the intersection during the PM peak hour when upgraded to a roundabout.

Refer Appendix D for the full results of SIDRA analysis.

4.8.2 Junction 2

Based on the intersection turn warrants, Junction 2 was modelled as an unsignalised intersection as follows for option 1 and 2:

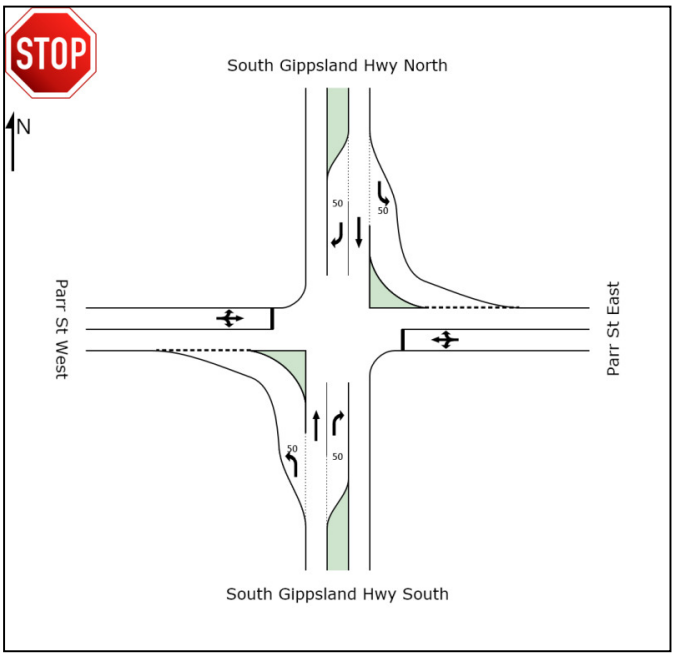


Figure 23: Proposed intersection at Junction 2 – Option 1

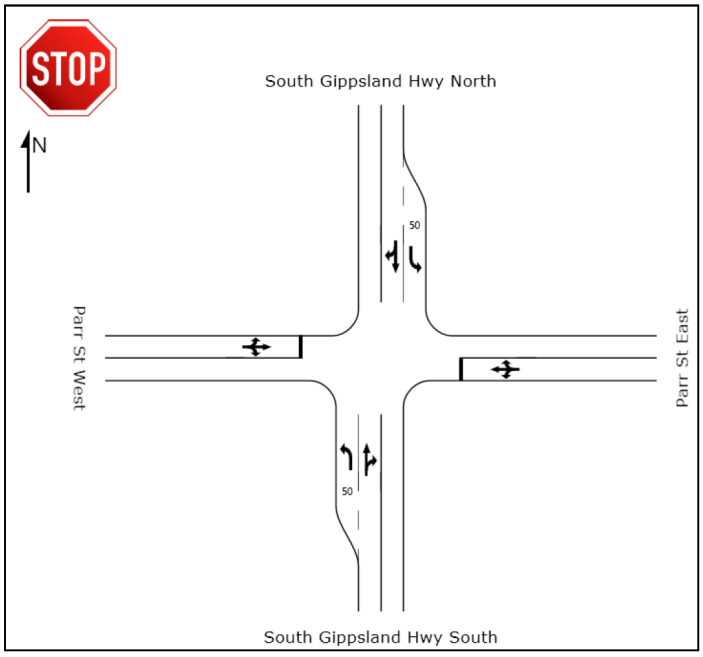


Figure 24: Proposed intersection at Junction 2 – Option 2

A comparison of the queue length, average delay, degree of saturation and level of service of each approach of Junction 2 for Option 1 and Option 2 is shown in Table 16 below.

Table 16: Comparison of results at Junction 2 with Unsignalised intersection

Approach	North		East		South		West	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
PM Peak								
Queue Length (m)	5.9	111.4	1081.3	909.8	3.0	109.8	386.6	917.7
Average Delay (sec)	5.0	16.4	3075.4	2842.7	3.6	20.3	941.2	2564.5
Degree of Saturation	0.446	0.601	4.141	3.860	0.429	0.540	1.854	3.620
Level of Service	A	B	F	F	A	A	F	F

The results show that the traffic volume at Junction 2 will not be acceptable for Option 1 and Option 2 in terms of queue lengths, average delays, Degree of Saturation and Level of Service for both the eastern and western approach to the intersection during the PM peak hour for an unsignalised intersection. Therefore we recommend that the intersection be upgraded to a roundabout.

The junction was then modelled as a roundabout as follows for option 1 and 2:

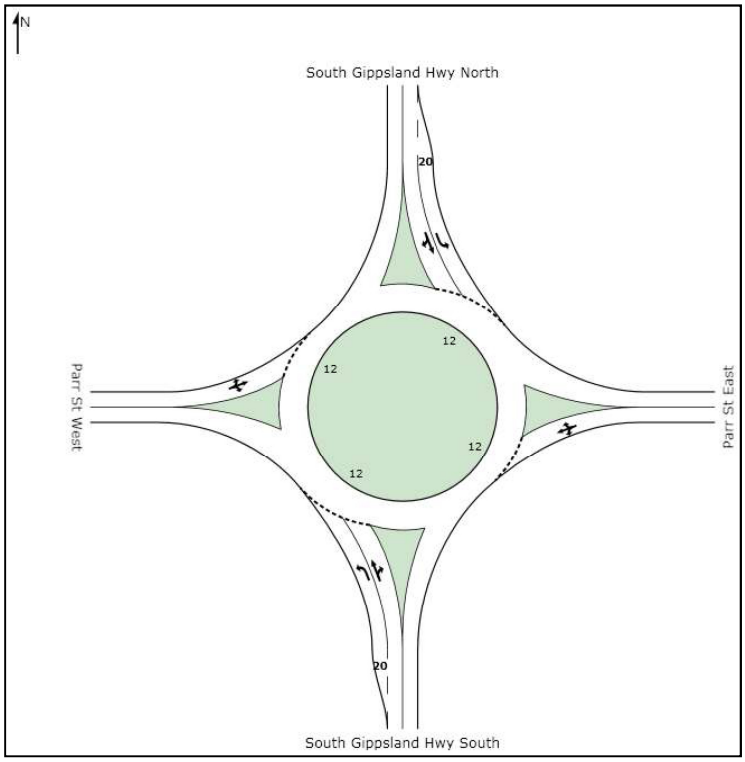


Figure 25: Proposed roundabout at Junction 2 – Option 1

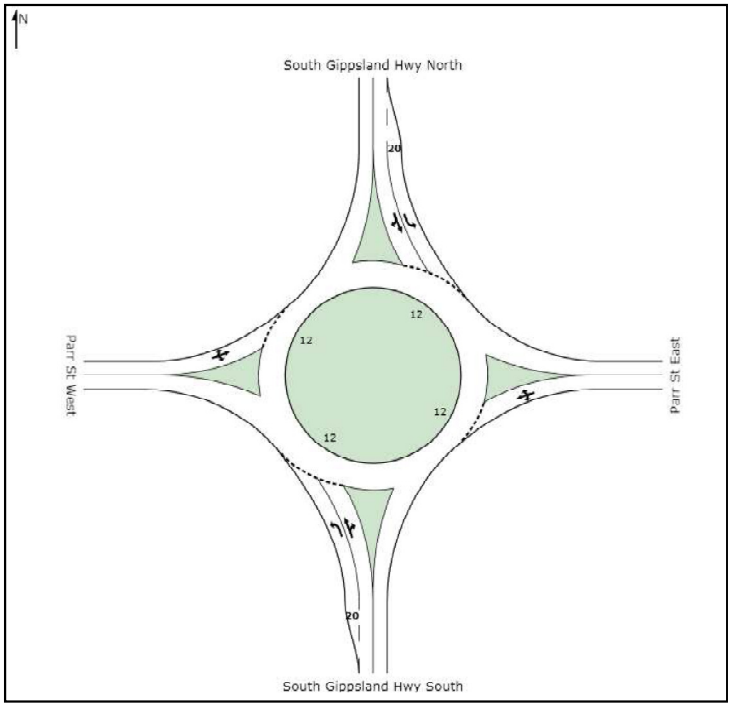


Figure 26: Proposed roundabout at Junction 2 – Option 2

A comparison of the queue length, average delay, degree of saturation and level of service of each approach of Junction 2 for Option 1 and Option 2 is shown in Table 17 below.

Table 17: Comparison of results at Junction 2 with Roundabout

Approach	North		East		South		West	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
PM Peak								
Queue Length (m)	56.0	65.9	48.5	53.5	74.2	63.7	25.1	50.9
Average Delay (sec)	7.7	8.6	24.6	31.0	10.1	8.8	18.0	27.5
Degree of Saturation	0.597	0.673	0.574	0.609	0.691	0.660	0.370	0.593
Level of Service	A	B	A	B	B	B	A	A

The results show that the traffic volume at Junction 2 will be acceptable for Option 1 and Option 2 in terms of queue lengths, average delays, Degree of Saturation and Level of Service for each approach to the intersection during the PM peak hour when upgraded to a roundabout.

Refer Appendix D for the full results of SIDRA analysis.

4.8.3 Junction 3

Based on the traffic demand anticipated in the full development scenario, and the safety implication of four legged intersections, it is recommended that Junction 3 be built as a roundabout. This junction was modelled as a roundabout as follows:

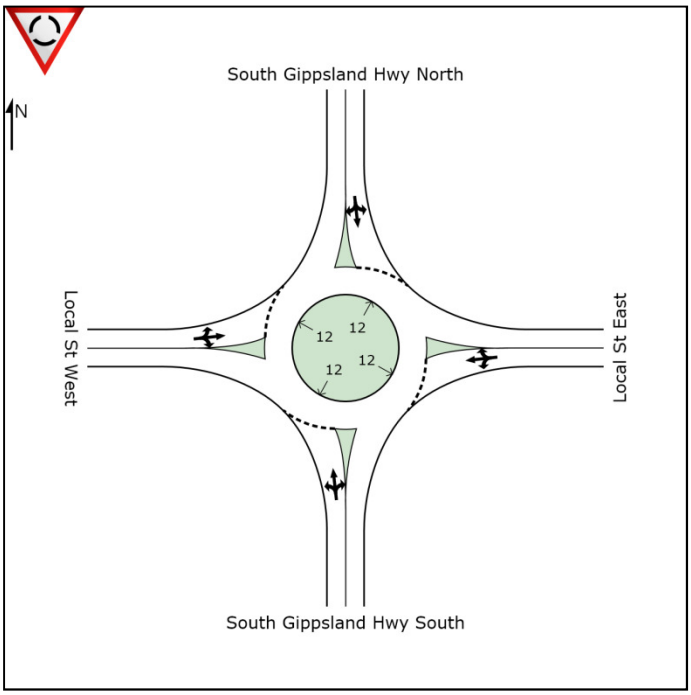


Figure 27: Proposed roundabout at Junction 3

A comparison of the queue length, average delay, degree of saturation and level of service of each approach of Junction 3 for Option 1 and Option 2 is shown in Table 18 below.

Table 18: Comparison of results at Junction 3

Approach	North		East		South		West	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
PM Peak								
Queue Length (m)	56.3	70.2	3.4	3.9	53.8	61.0	8.7	10
Average Delay (sec)	7.1	7.1	17.9	19.8	7.8	8.2	14.1	14.6
Degree of Saturation	0.584	0.646	0.065	0.073	0.610	0.661	0.154	0.172
Level of Service	A	B	A	A	B	B	A	A

The results show that the traffic volume at Junction 3 will be acceptable for Option 1 and Option 2 in terms of queue lengths, average delays, Degree of Saturation and Level of Service for each approach to the intersection during the PM peak hour.

Refer Appendix D for the full results of SIDRA analysis.

4.8.4 Junction 4

Based on the traffic demand anticipated in the full development scenario, and the safety implication of four legged intersections, it is recommended that Junction 4 also be built as a roundabout. This junction was modelled as a roundabout as follows:

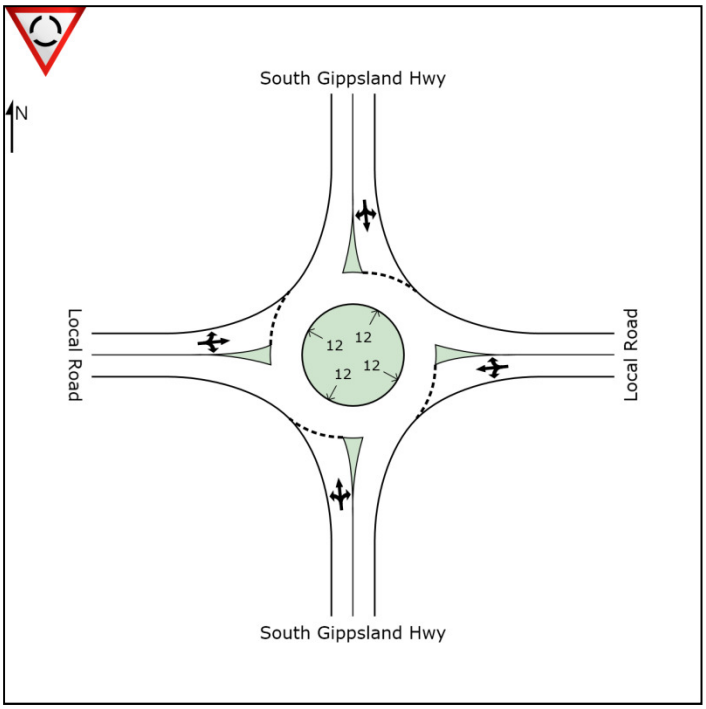


Figure 28: Proposed roundabout at Junction 4

A comparison of the queue length, average delay, degree of saturation and level of service of each approach of Junction 4 for Option 1 and Option 2 is shown in Table 19 below.

Table 19: Comparison of results at Junction 4

Approach	North		East		South		West	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
PM Peak								
Queue Length (m)	46.4	49.1	3.0	3.0	32.7	27.5	29.2	28.3
Average Delay (sec)	9.3	9.4	14.9	15.3	9.2	9.4	11.0	10.6
Degree of Saturation	0.571	0.586	0.056	0.056	0.499	0.445	0.465	0.454
Level of Service	A	A	A	A	A	A	A	A

The results show that the traffic volume at Junction 4 will be acceptable for Option 1 and Option 2 in terms of queue lengths, average delays, Degree of Saturation and Level of Service for each approach to the intersection during the PM peak hour.

Refer Appendix D for the full results of SIDRA analysis.

4.8.5 Junction 5

Based on the traffic demand anticipated in the full development scenario, and the safety implication of four legged intersections, it is recommended that Junction 5 be built as a roundabout. This junction was modelled as a roundabout as follows:

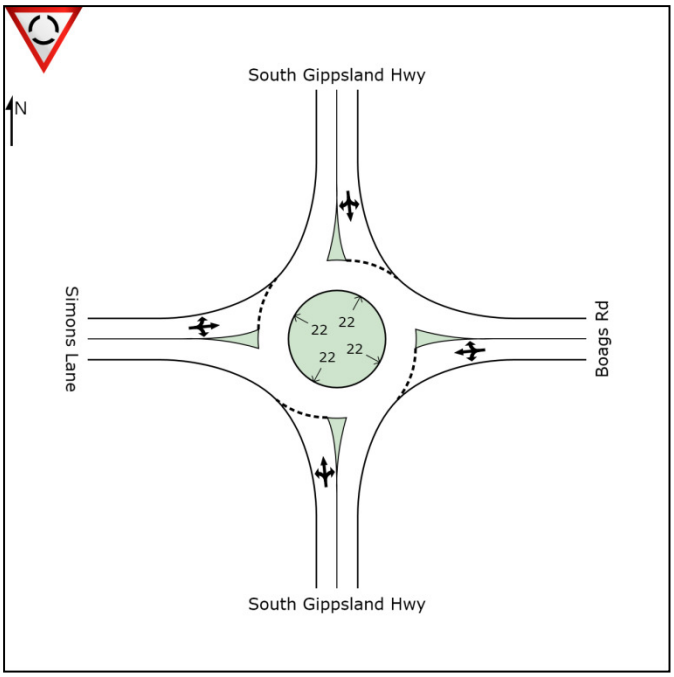


Figure 29: Proposed roundabout at Junction 5

A comparison of the queue length, average delay, degree of saturation and level of service of each approach of Junction 5 for Option 1 and Option 2 is shown in Table 20 below.

Table 20: Comparison of results at Junction 5

Approach	North		East		South		West	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
PM Peak								
Queue Length (m)	23.6	21.6	6.3	6.0	17.4	16.9	9.6	4.7
Average Delay (sec)	8.4	8.0	13.3	13.3	9.5	9.3	11.4	11.9
Degree of Saturation	0.380	0.358	0.128	0.122	0.311	0.300	0.188	0.097
Level of Service	A	A	A	A	A	A	A	A

The results show that the traffic volume at Junction 5 will be acceptable for Option 1 and Option 2 in terms of queue lengths, average delays, Degree of Saturation and Level of Service for each approach to the intersection during the PM peak hour.

Refer Appendix D for the full results of SIDRA analysis.

4.8.6 Junction 6

Based on the intersection turn warrants, Junction 6 was modelled as an unsignalised intersection as follows:

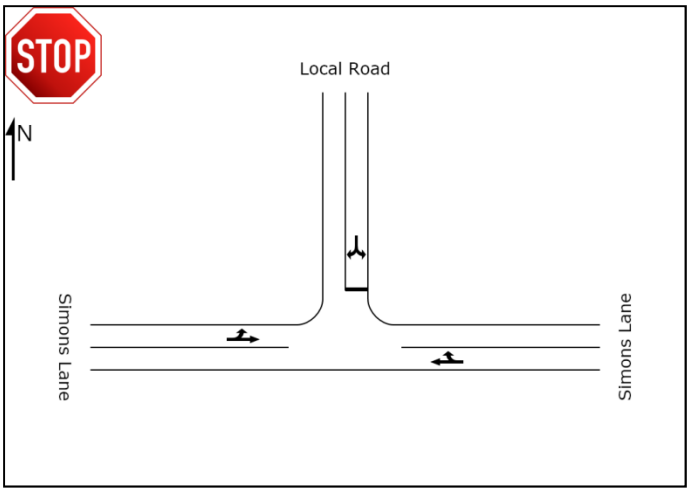


Figure 30: Proposed intersection at Junction 6

A comparison of the queue length, average delay, degree of saturation and level of service of each approach of Junction 6 for Option 1 and Option 2 is shown in Table 21 below.

Table 21: Comparison of results at Junction 6

Approach	North		East		West	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
PM Peak						
Queue Length (m)	0.6	0.3	1.9	0.3	0.0	0.0
Average Delay (sec)	12.8	11.7	2.8	9.4	1.8	0.8
Degree of Saturation	0.019	0.010	0.037	0.010	0.099	0.001
Level of Service	A	A	A	A	A	A

The results show that the traffic volume at Junction 6 will be acceptable for Option 1 and Option 2 in terms of queue lengths, average delays, Degree of Saturation and Level of Service for each approach to the intersection during the PM peak hour.

Refer Appendix D for the full results of SIDRA analysis.

4.8.7 Junction 7

Based on the intersection turn warrants, Junction 7 was modelled as an unsignalised intersection as follows:

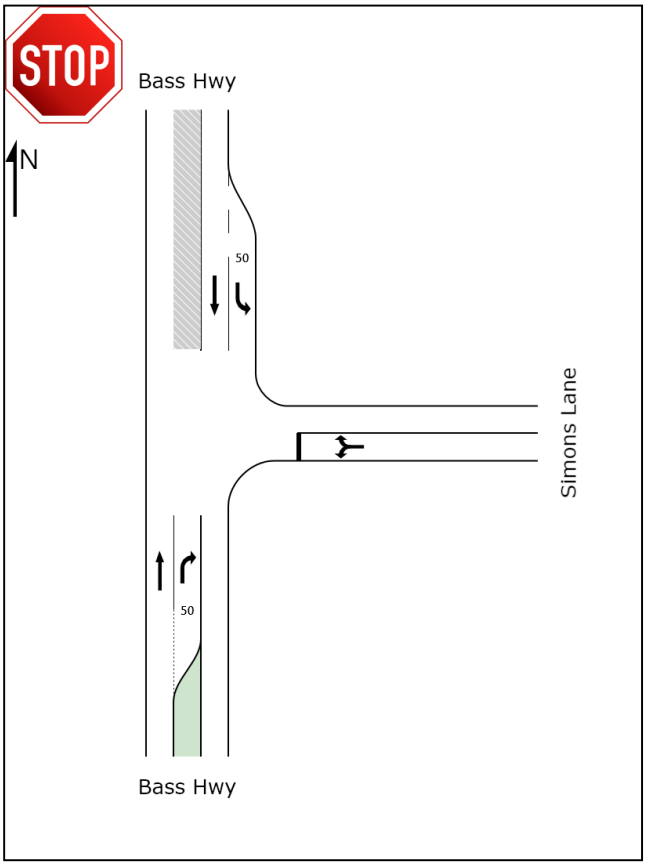


Figure 31: Proposed intersection at Junction 7

A comparison of the queue length, average delay, degree of saturation and level of service of each approach of Junction 7 for Option 1 and Option 2 is shown in Table 22 below.

Table 22: Comparison of results at Junction 7

Approach	North		East		South	
	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
PM Peak						
Queue Length (m)	0	0	3.7	3.7	3.1	3.1
Average Delay (sec)	2.5	2.5	17.9	17.9	3.0	3.0
Degree of Saturation	0.157	0.157	0.116	0.116	0.133	0.133
Level of Service	A	A	A	A	A	A

The results show that the traffic volume at Junction 7 will be acceptable for Option 1 and Option 2 in terms of queue lengths, average delays, Degree of Saturation and Level of Service for each approach to the intersection during the PM peak hour.

Refer Appendix D for the full results of SIDRA analysis.

5 INTERNAL ROAD NETWORK REVIEW

5.1 Road Hierarchy

From the generated traffic volumes for the ODP study area, we propose the following indicative road network for the ODP area, refer Figure 32: Indicative road network.

A detailed road hierarchy should be designed at a later stage once the land is rezoned.

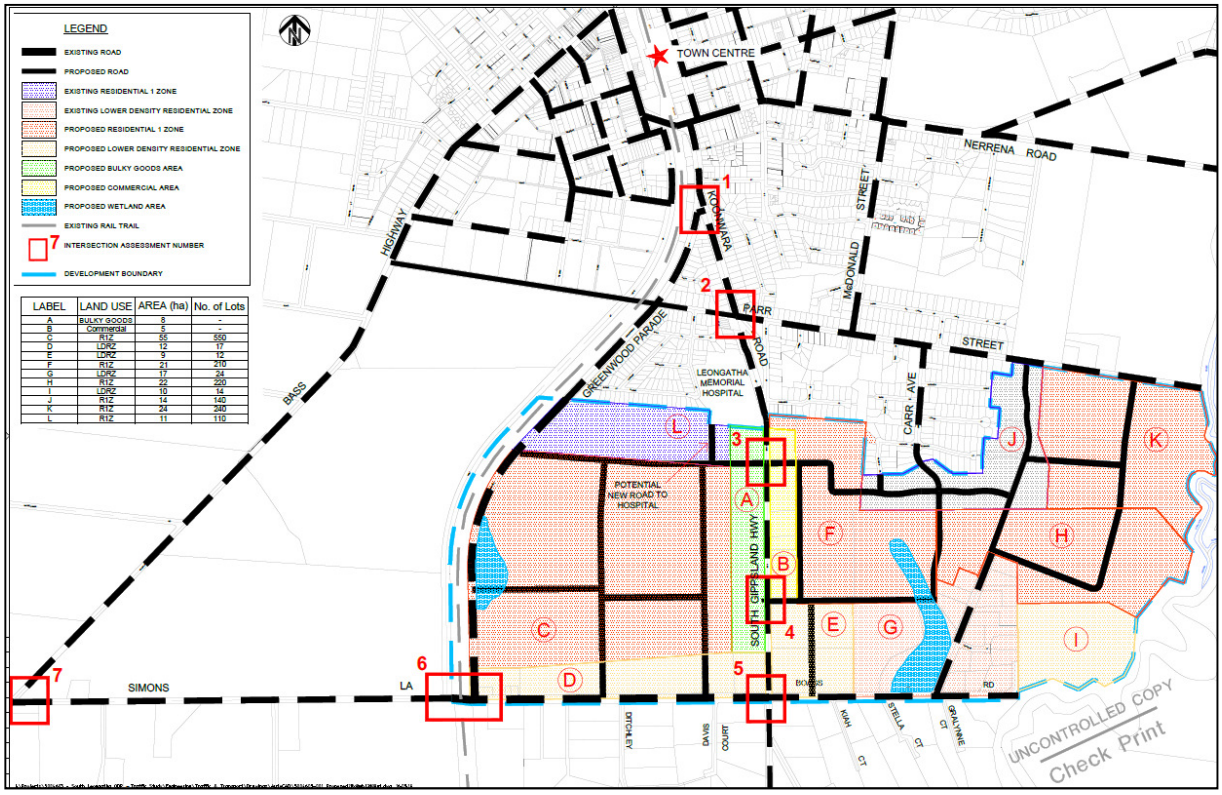


Figure 32: Indicative road network

5.2 Road Cross Sections

All road cross sections are to be in accordance with the Infrastructure Design Manual. Refer to this manual Table 2, page 36 for urban street characteristics and Table 6, page 45 for rural road characteristics.

6 INTEGRATED TRANSPORT REVIEW

6.1 Public Transport

6.1.1 Bus

Additional public bus services should be provided within the internal road network to connect the future residents and commercial / retail developments within the ODP study area to the Leongatha town centre and surroundings. Since the ODP study area is large, the bus services should be provided in two stages as follows:

- Stage 1 – Provide a bus route that services the ODP area east of the South Gippsland Highway. This should include bus stops along Parr Street and Boags Road.

- Stage 2 - Provide a bus route that services the ODP area west of the South Gippsland Highway. This should include bus stops along Greenwood Parade and Simons Lane. This service can also focus on providing connectivity to the Leongatha Hospital

These services would likely be in the form of a new route as the existing bus services do not operate within the ODP area.

6.2 Pedestrian and Bicycle Connectivity

6.2.1 Pedestrians

The Leongatha Local Structure Plan proposes the construction of a pedestrian link connecting Parr Street to South Gippsland Highway and the Great Southern Rail Trail. This connection will also service the commercial / retail developments on South Gippsland Highway.

Any new footpaths and pedestrian facilities should comply with the Disability Discrimination Act.

6.2.2 Bicycles

The Leongatha Local Structure Plan identifies the provision of a cycle link connecting Parr Street to South Gippsland Highway and the Great Southern Rail Trail. This connection will also service the commercial / retail developments on South Gippsland Highway.

These cycle paths should be provided to connect residents with the open space and natural features along the northern boundary of the development.

The existing crossing of the Great Southern Rail Trail adjacent to Junction 6 will need to be upgraded. The entry and exit terminals will need to be designed in accordance with Austroads Guidelines. Refer to Appendix F for Austroads entry and exit terminal requirements.

Further, if Council adopts Option 2 and proceeds with the extension of Parr Street, it is recommended that where the new road crosses the Great Southern Rail Trail, the same entry and exit details as per the Austroads Guidelines be implemented.

7 SUMMARY

Based on the site visit and this Transport and Traffic Impact Assessment, we have determined that the development of the ODP study area in South Leongatha will not have an adverse impact on the operation of the existing road network adjacent to the site.

In summary this Transport and Traffic Impact Assessment has identified the following outcomes:

- The residential development within the ODP study area will generate approximately 1,100 peak hour vehicle trips.
- The bulky goods and commercial developments within the ODP study area will generate approximately 1,060 peak hour vehicle trips.
- In order to estimate the future year external traffic volumes, a 2% annual growth rate compounded has been added to the existing traffic volumes.
- The directional split of traffic entering and exiting the development area is as follows:
    - Bulky Goods – 50% In / 50% Out
    - Retail / Commercial – 50% In / 50% Out
    - Low Density Residential – 51% In / 49% Out
    - Residential – 58% In / 42% Out
- An assumption has been made that the development will generate heavy vehicle movements equivalent to 5% of the proposed total daily vehicle trip on the Highway and 1% for local roads. This assumption was added to the SIDRA assessment.
- Turn warrant assessments for Junction 1 indicates that a channelised right turn short treatment is required on both approaches of South Gippsland Highway and an auxiliary left turn treatment is required on the north approach.
- Turn warrant assessments for Junction 2 indicates that a channelised right turn short treatment and an auxiliary left turn treatment is required on both approaches of South Gippsland Highway.
- Based on the traffic demand anticipated in the full development scenario, and the safety implication of four legged intersections, it is recommended that Junctions 3, 4 and 5 be built as a roundabout. Therefore a turn warrant assessment was not undertaken for these intersections.
- Turn warrant assessments for Junction 6 indicates that a basic left and basic right turn is adequate on both approaches to Simons Lane.
- Turn warrant assessments for Junction 7 indicates that an auxiliary left and channelised right turn short treatments are required on both approaches to Bass Highway.
- SIDRA assessment of Junction 1 as an unsignalised intersection shows unacceptable level of service. When upgraded to a roundabout, Junction 1 shows that the traffic volumes generated from the future development of the ODP area will not have an adverse impact on the current operating conditions
- SIDRA assessment of Junction 2 as an unsignalised intersection shows unacceptable level of service. When upgraded to a roundabout, Junction 2 shows that the traffic volumes generated from the future development of the ODP area will not have an adverse impact on the current operating conditions.

- SIDRA assessment of Junction 3, Junction 4 and Junction 5 as a roundabout shows that the traffic volumes generated from the future development of the ODP area will not have an adverse impact on the operating conditions of these roundabouts.

- SIDRA assessment of Junction 6 as an unsignalised intersection shows acceptable level of service.

- SIDRA assessment of Junction 7 as an unsignalised intersection shows acceptable level of service.

- All junctions should be designed in accordance with the Austroads Guide to Road Design 2009 – Part 4: Intersections and Crossings, and Part 4B: Roundabouts.

- Additional public bus services should be provided to connect the eastern and western future residential developments within the ODP area to the Leongatha town centre.

- A future pedestrian link connecting Parr Street to South Gippsland Highway and the Great Southern Rail Trail should be constructed. This connection will also service the commercial / retail developments on South Gippsland Highway.

- A future cycle link connecting Parr Street to South Gippsland Highway and the Great Southern Rail Trail should be constructed. This connection will also service the commercial / retail developments on South Gippsland Highway.

- The bicycle network should be upgraded by Council in the near future in accordance with the Leongatha Local Level Structure Plan recommendations.

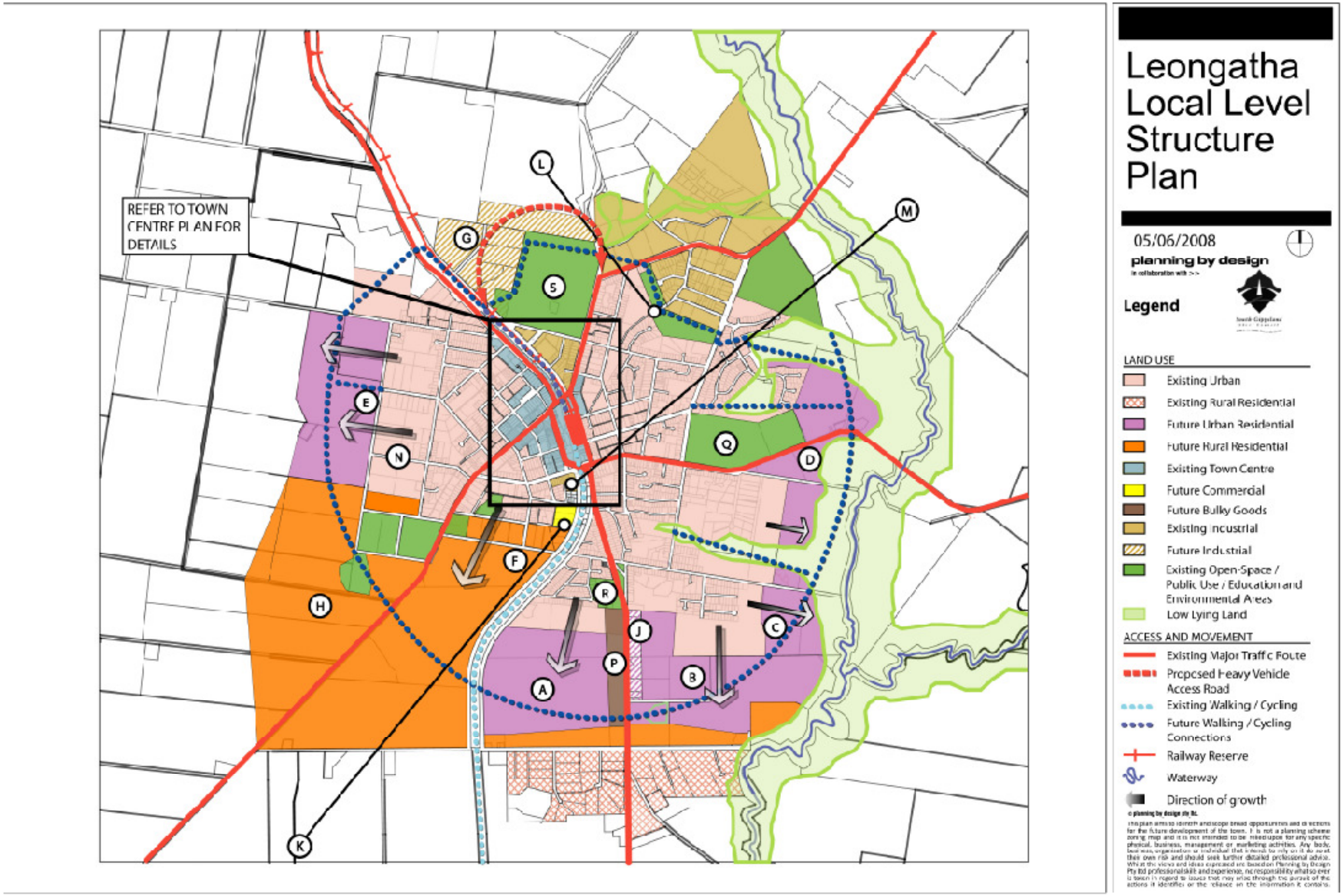
8 RECOMMENDATIONS

The following recommendations are made based on an assessment of the key intersections identified within the ODP study area. Our transport and traffic engineering recommendations to support the proposed development are as follows:

- The assessment shows that existing Junctions 1, 2 and 3 require upgrading to a roundabout treatment for both options 1 and 2.
- The assessment shows that the proposed Junctions 3 and 4 operate adequately as roundabouts for both options 1 and 2.
- The assessment shows that existing Junctions 5 operates adequately when upgraded to a roundabout for both options 1 and 2.
- The assessment shows that Junction 6 operates adequately as a unsignalised T-intersection for both options 1 and 2.
- The assessment shows that Junction 7 operates adequately as a unsignalised T-intersection for both options 1 and 2.
- The traffic assessment supports the retention of Simons Lane if upgraded to include an auxiliary left turn and channelised right turn lane treatment. It is also strongly recommended that the new intersection arrangement be redesigned to improve the safe intersection sight distance to achieve compliance with Austroads guidelines.
- If the current intersection configuration at Bass Highway / Simons Lane cannot be modified, then it is recommended that Simons Lane be truncated at Bass Highway as it poses a safety risk due to restricted sight distances.
- If Simons Lane is truncated then it is recommended that the Parr Street extension be constructed when Young Street and it's intersections with South Gippsland Highway and Bass Highway reach capacity and/or when the future development to the west of the Great Southern Rail Trail commences.
- The existing cycle crossing and entry and exit terminals at the Great Southern Rail Trail adjacent to Junction 6 should be upgraded to comply with Austroads guidelines.
- If Council adopts Option 2 and proceeds with the extension of Parr Street, it is recommended that where the new road crosses the Great Southern Rail Trail, the same entry and exit details as per the Austroads Guidelines be implemented.
- Future pedestrian and cycle links connecting Parr Street to South Gippsland Highway and the Great Southern Rail Trail should be constructed.
- All new footpaths and pedestrian facilities should comply with the Disability Discrimination Act.

Therefore, there are no transport and traffic reasons as to why the overall development of the ODP area cannot proceed, subject to the appropriate conditions.

APPENDIX A – LEONGATHA LOCAL LEVEL STRUCTURE PLAN



APPENDIX B – TRIP GENERATION RATE CALCULATIONS

SOUTH LEONGATHA TRAFFIC STUDY

R1Z and LDRZ Trip Generation Rate and Peak Hour Factor Calcs **(Average Weekday)**

Location

A) **BLAIR CRESCENT** **(11/02/10 - 25/02/10)**

No. Lots = 26 **% HV =** 1.4%

Day of Week	Daily	No. TRIPS AM	PM
Fri	195	16	19
Mon	203	18	22
Tue	169	17	18
Wed	170	13	8
Thu	210	20	21
Fri	182	19	18
Mon	214	16	23
Tue	180	19	19
Wed	226	19	25
Ave	194	17	19
Ave Excl. HVs	**192**	**17**	**19**

Daily Trip/Lot = **7**
AM PHF = 9%
PM PHF = **10%**

ZONE : R1Z

B) **BOAGS RD / TARWIN RIDGE BLVD** **(07/10/10 - 21/10/10)**

No. Lots = 17 **% HV =** 8.6%

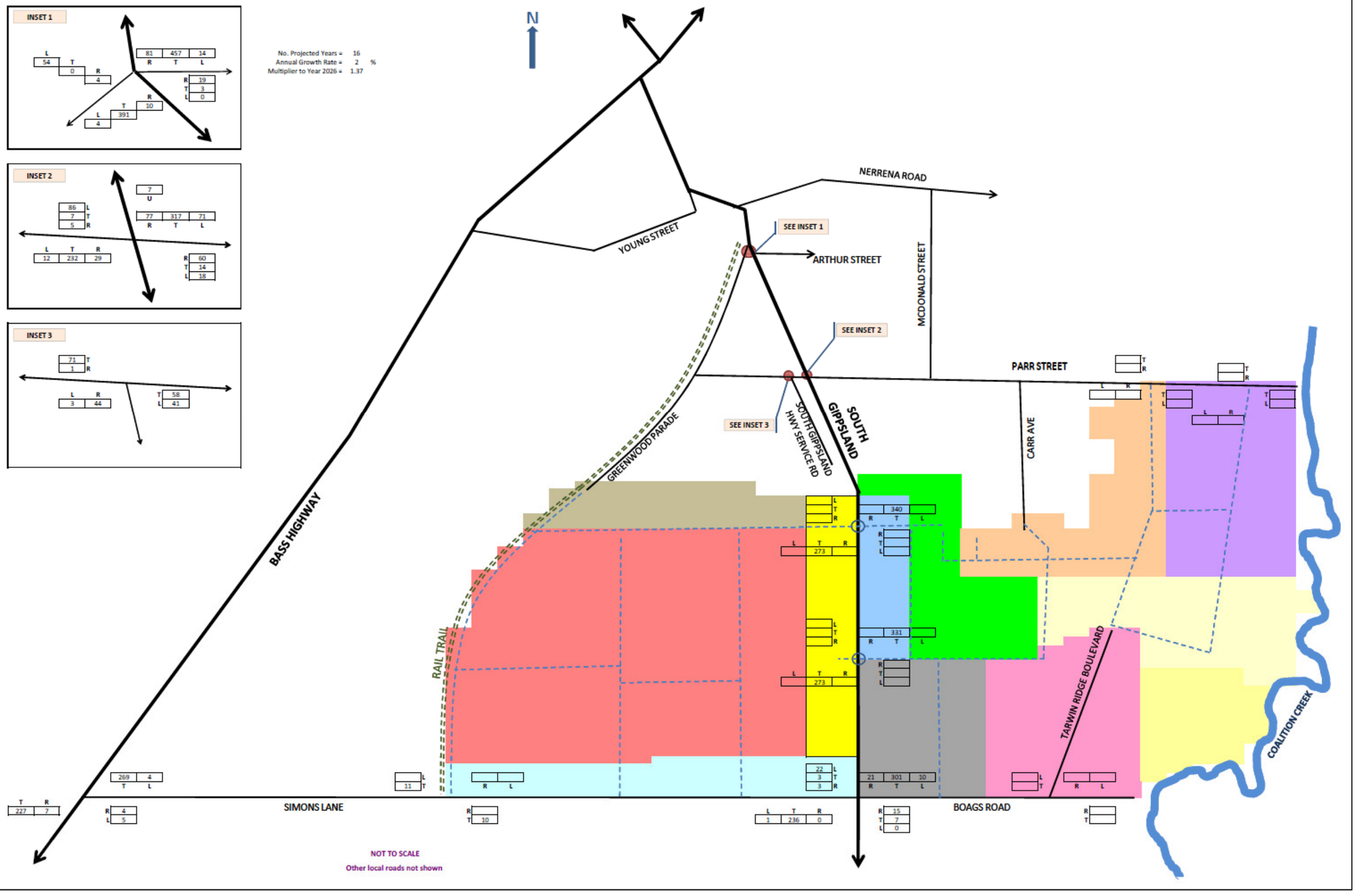
Day of Week	Daily	No. TRIPS AM	PM
Fri	182	15	21
Mon	174	13	19
Tue	205	13	22
Wed	226	22	32
Thu	183	19	18
Fri	182	19	21
Mon	168	15	16
Tue	208	16	20
Wed	194	17	19
Average	191	17	21
Ave Excl. HVs	**175**	**15**	**19**

Daily Trip/Lot = **10**
AM PHF = 9%
PM PHF = **11%**

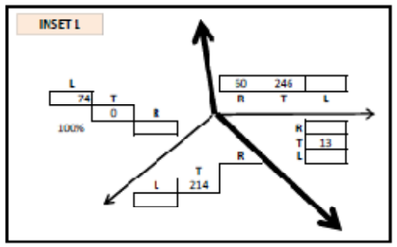
ZONE : LDRZ

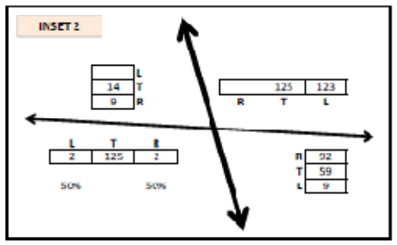
APPENDIX C – ASSIGNMENT TRIPS BREAKDOWN

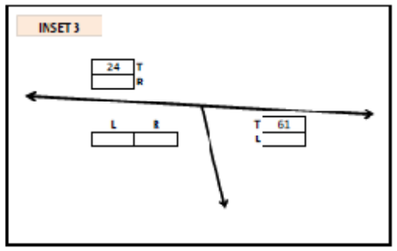
SOUTH LEONGATHA PM PEAK HOUR TRAFFIC DISTRIBUTION - OPTION 1 (EXISTING ROAD NETWORK) - UPLIFTED BACKGROUND TRAFFIC



SOUTH LEONGATHA PM PEAK HOUR TRAFFIC DISTRIBUTION - OPTION 1 (EXISTING ROAD NETWORK) - DEVELOPMENT TRAFFIC ONLY (EXCLUDES AREA A & B)







123 - Dummy volume

N

YOUNG STREET

NERRENA ROAD

SEE INSET 1

ARTHUR STREET

MCDONALD STREET

SEE INSET 2

PARR STREET

SEE INSET 3

GREENWOOD PARADE

SOUTH GIPPSLAND HWY SERVICE RD

SOUTH GIPPSLAND

CARR AVE

BASS HIGHWAY

RAIL TRAIL

TARWIN RIDGE BOULEVARD

COALITION CREEK

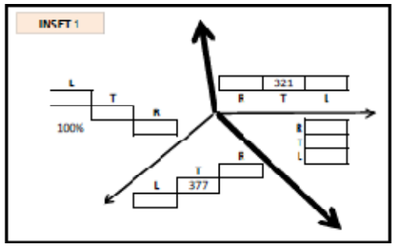
SIMONS LANE

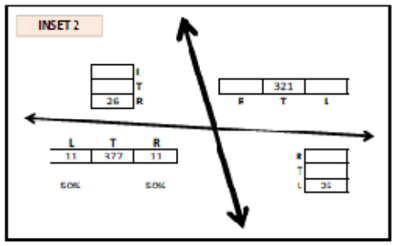
BOAGS ROAD

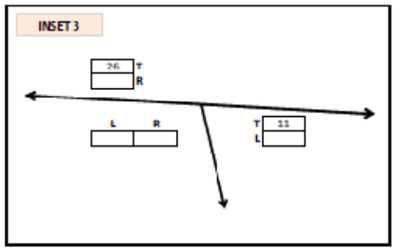
NOT TO SCALE

Other local roads not shows

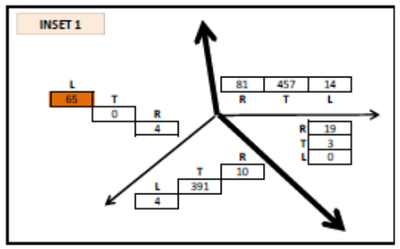
SOUTH LEONGATHA PM PEAK HOUR TRAFFIC DISTRIBUTION - OPTION 1 (EXISTING ROAD NETWORK) - DEVELOPMENT TRAFFIC ONLY (AREA A & B)

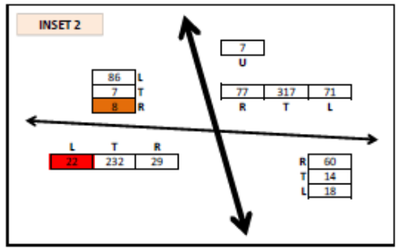


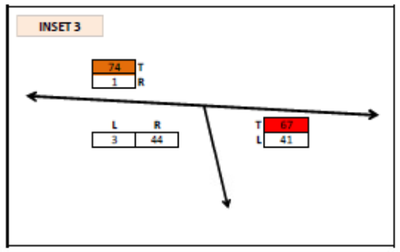


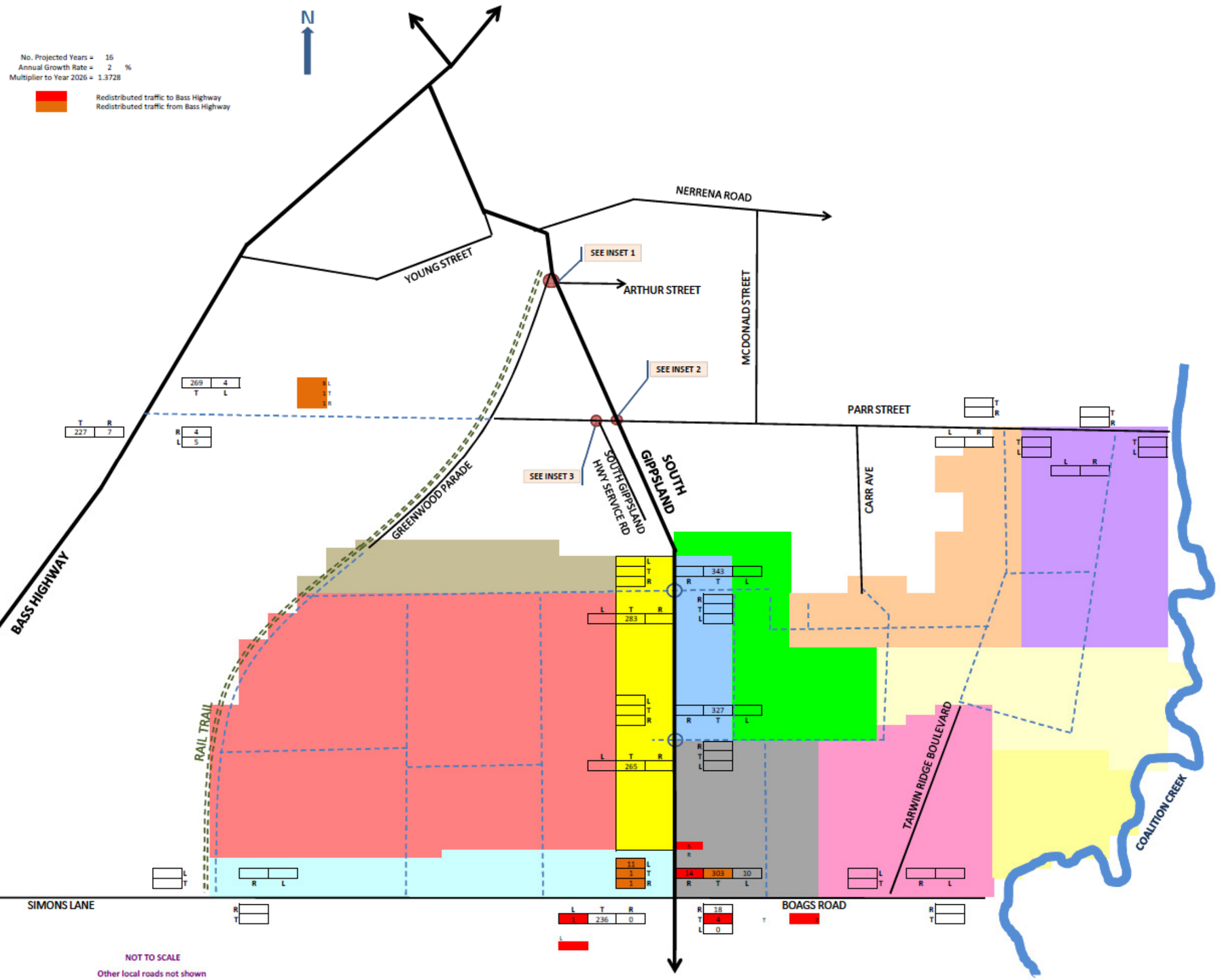


SOUTH LEONGATHA PM PEAK HOUR TRAFFIC DISTRIBUTION - OPTION 2 (CLOSURE OF SIMONS LN TO/FROM BASS HWY) - UPLIFTED BACKGROUND TRAFFIC

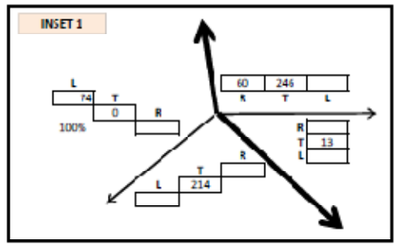


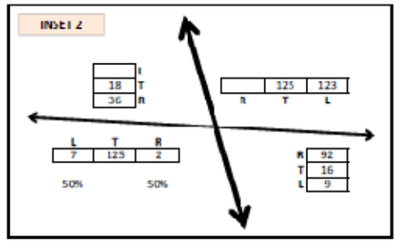


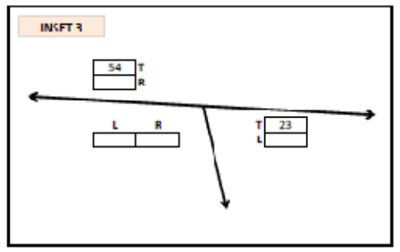




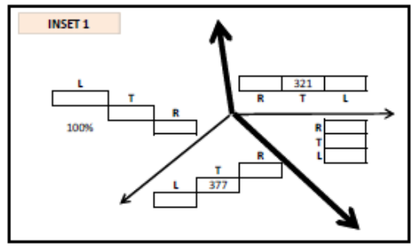
SOUTH LEONGATHA PM PEAK HOUR TRAFFIC DISTRIBUTION - OPTION 2 (CLOSURE OF SIMONS LN TO/FROM BASS HWY) - DEVELOPMENT TRAFFIC ONLY (EXCL AREA A & B)

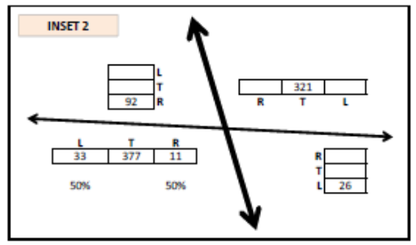


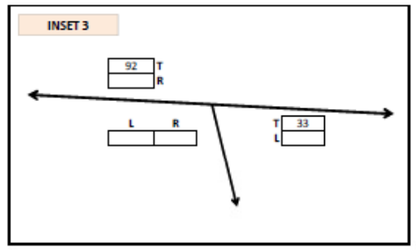




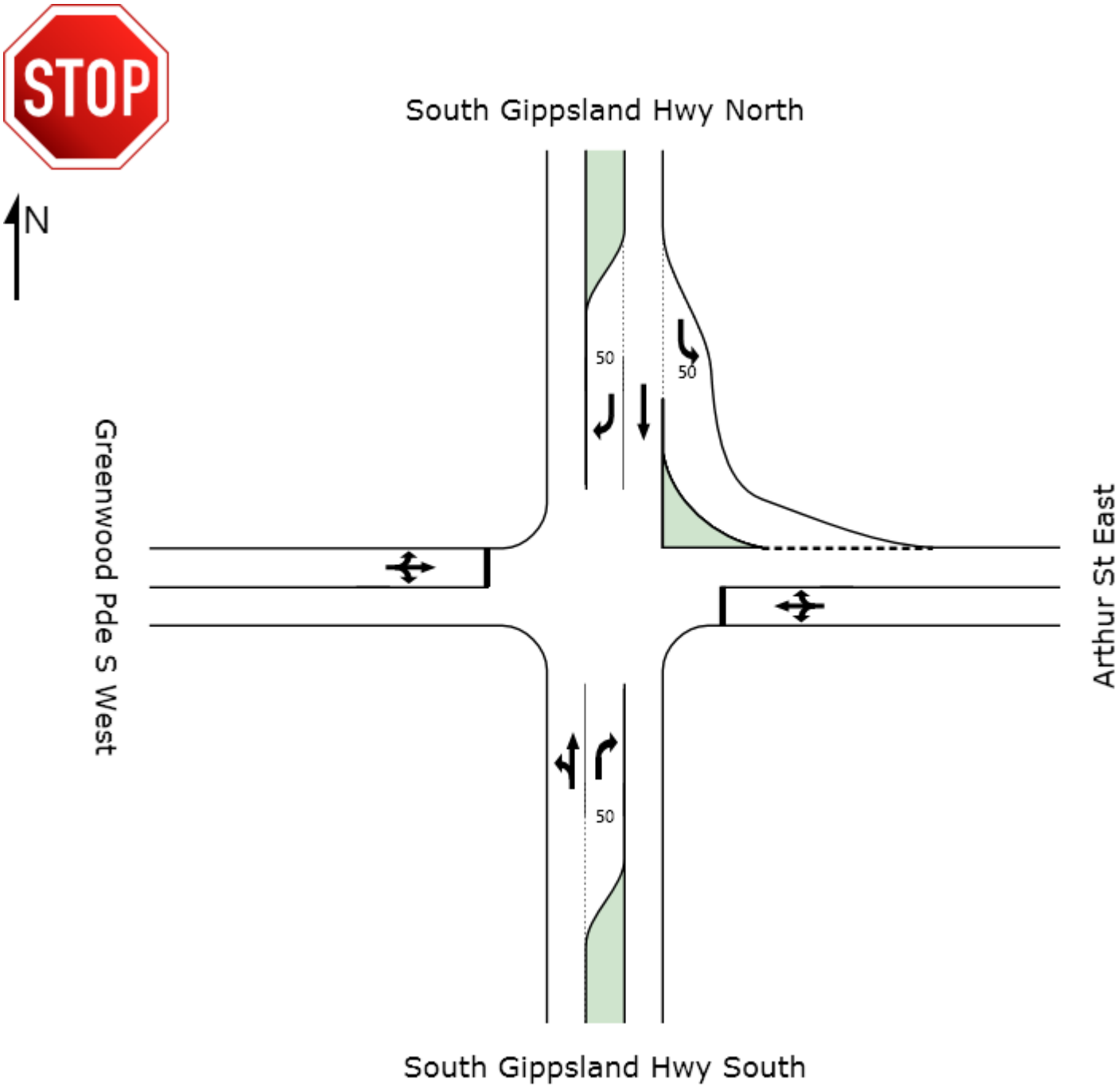
SOUTH LEONGATHA PM PEAK HOUR TRAFFIC DISTRIBUTION - OPTION 2 (CLOSURE OF SIMONS LN TO/FROM BASS HWY) - AREA A & B DEVELOPMENT TRAFFIC ONLY







APPENDIX D – SIDRA OUTPUTS


STOP
N
South Gippsland Hwy North
Greenwood Pde S West
Arthur St East
50
50
50
South Gippsland Hwy South

MOVEMENT SUMMARY

Site: J1 Option 1 Stop

Sth Leongatha, Option 1, Junction 1 PM Peak
Stop (Two-Way)

Movement Performance - Vehicles

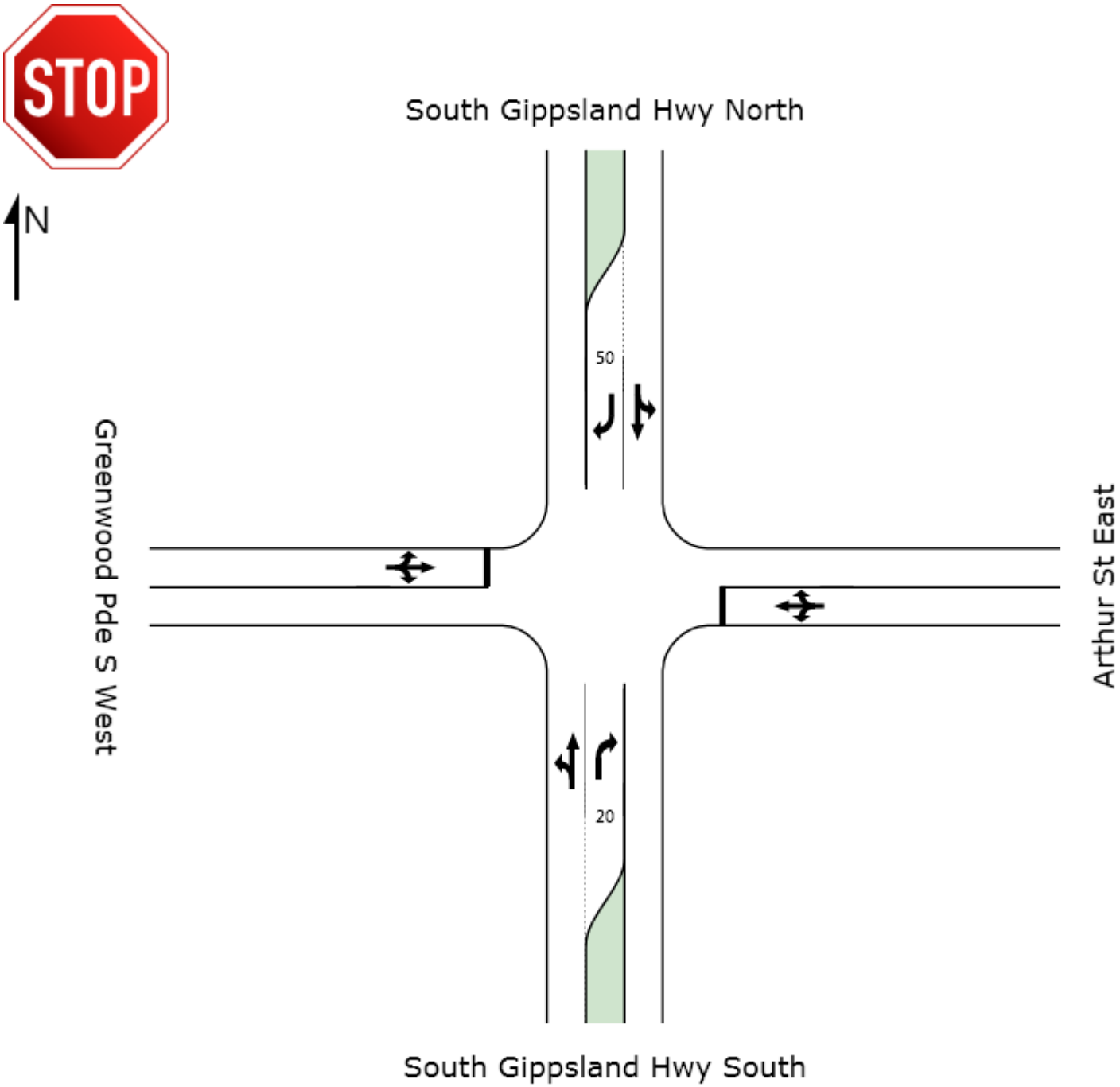
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Gippsland Hwy South											
1	L	4	0.0	0.602	10.1	LOS B	0.0	0.0	0.00	1.74	57.1
2	T	1085	4.8	0.576	2.6	LOS A	0.0	0.0	0.00	0.23	71.0
3	R	12	9.1	0.058	27.5	LOS A	0.2	1.7	0.86	0.96	39.4
Approach		1101	4.8	0.576	2.9	LOS B	0.2	1.7	0.01	0.24	70.3
East: Arthur St East											
4	L	1	0.0	1.053	1453.8	LOS F	12.6	92.0	1.00	1.60	1.6
5	T	18	5.9	0.994	1453.3	LOS E	12.6	92.0	1.00	1.48	1.5
6	R	21	5.0	1.003	1454.2	LOS F	12.6	92.0	1.00	1.47	1.6
Approach		40	5.3	1.000	1453.8	LOS F	12.6	92.0	1.00	1.48	1.6
North: South Gippsland Hwy North											
7	L	16	6.7	0.014	10.0	LOS A	0.1	0.4	0.06	0.63	57.1
8	T	1132	4.7	0.598	2.6	LOS A	0.0	0.0	0.00	0.23	71.0
9	R	156	4.7	0.613	33.1	LOS B	3.3	24.1	0.92	1.09	35.6
Approach		1303	4.8	0.614	6.3	LOS B	3.3	24.1	0.11	0.33	63.3
West: Greenwood Pde S West											
10	L	142	5.2	1.974	970.4	LOS F	52.5	383.3	1.00	3.52	2.4
11	T	1	0.0	1.053	969.4	LOS F	52.5	383.3	1.00	3.19	2.2
12	R	4	0.0	2.105	970.0	LOS F	52.5	383.3	1.00	3.14	2.4
Approach		147	5.0	1.965	970.4	LOS F	52.5	383.3	1.00	3.51	2.4
All Vehicles		2592	4.8	1.965	82.0	NA	52.5	383.3	0.13	0.49	19.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Degree of Saturation.

Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.

SIDRA INTERSECTION


STOP
N
South Gippsland Hwy North
50
Greenwood Pde S West
Arthur St East
20
South Gippsland Hwy South

MOVEMENT SUMMARY

Site: J1 Option 2 Stop

Sth Leongatha, Option 2, Junction 1 PM Peak
Stop (Two-Way)

Movement Performance - Vehicles

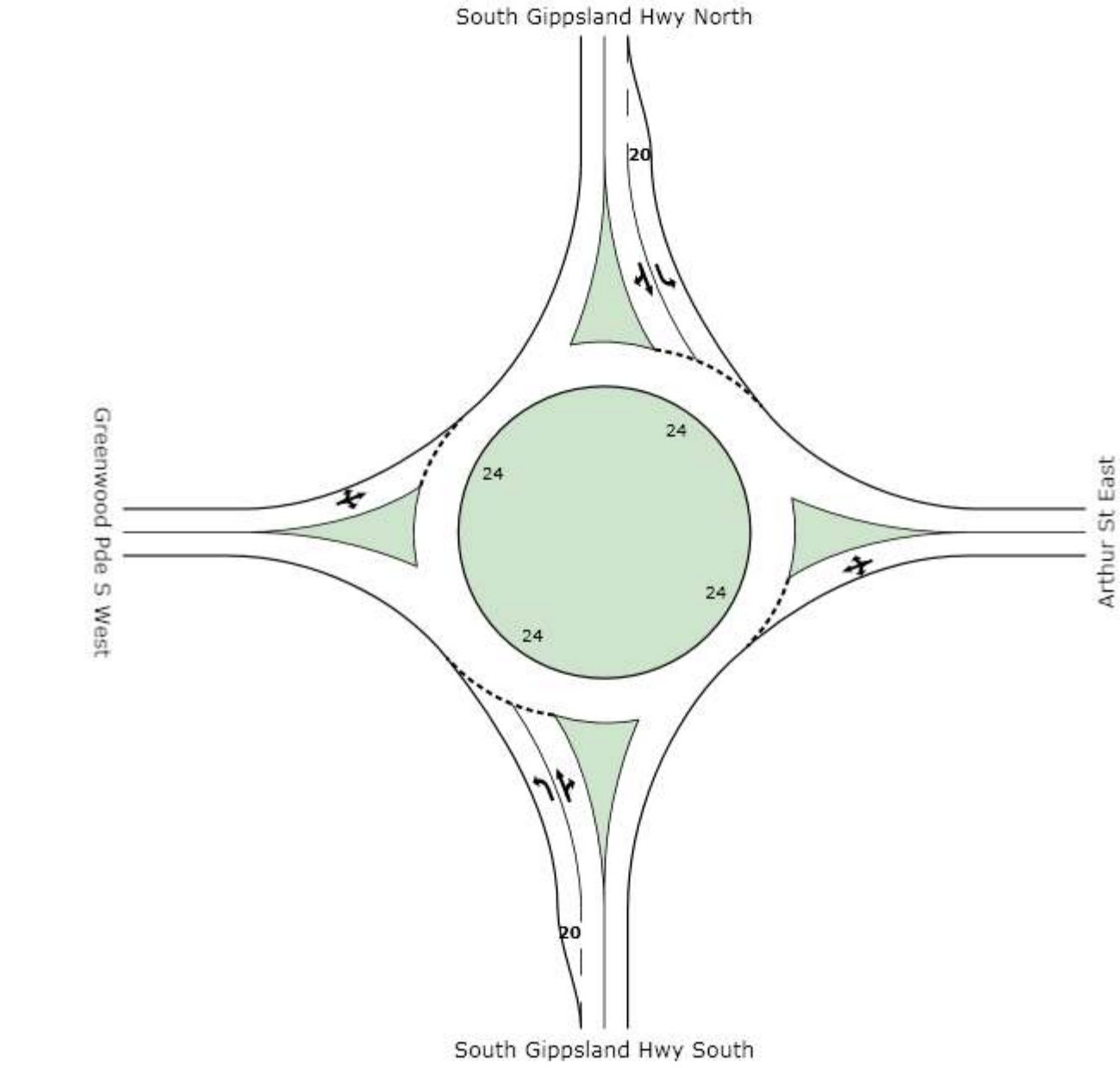
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Gippsland Hwy South											
1	L	4	0.0	0.602	8.2	LOS B	0.0	0.0	0.00	1.09	49.0
2	T	1085	4.8	0.576	0.0	LOS A	0.0	0.0	0.00	0.00	63.5
3	R	12	9.1	0.062	26.6	LOS A	0.2	1.7	0.87	0.96	34.7
Approach		1101	4.8	0.576	0.3	LOS B	0.2	1.7	0.01	0.01	63.0
East: Arthur St East											
4	L	1	0.0	1.053	1485.9	LOS F	12.6	92.5	1.00	1.56	1.4
5	T	18	5.9	0.994	1486.0	LOS E	12.6	92.5	1.00	1.49	1.4
6	R	21	5.0	1.003	1487.0	LOS F	12.6	92.5	1.00	1.47	1.6
Approach		40	5.3	1.000	1486.5	LOS F	12.6	92.5	1.00	1.48	1.5
North: South Gippsland Hwy North											
7	L	16	6.7	0.607	10.3	LOS B	0.0	0.0	0.00	1.76	57.1
8	T	1132	4.7	0.607	2.6	LOS B	0.0	0.0	0.00	0.22	71.0
9	R	156	4.7	0.613	33.1	LOS B	3.3	24.1	0.92	1.09	35.6
Approach		1303	4.8	0.614	6.3	LOS B	3.3	24.1	0.11	0.35	63.3
West: Greenwood Pde S West											
10	L	154	4.8	2.022	1026.5	LOS F	57.8	420.4	1.00	3.69	2.3
11	T	1	0.0	1.053	1025.0	LOS F	57.8	420.4	1.00	3.33	2.0
12	R	4	0.0	2.105	1025.1	LOS F	57.8	420.4	1.00	3.28	2.1
Approach		159	4.6	2.033	1026.4	LOS F	57.8	420.4	1.00	3.68	2.3
All Vehicles		2603	4.8	2.033	88.8	NA	57.8	420.4	0.14	0.43	19.0

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Degree of Saturation.

Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.

SIDRA INTERSECTION


N
South Gippsland Hwy North
20
24
24
24
24
Greenwood Pde S West
Arthur St East
20
South Gippsland Hwy South

MOVEMENT SUMMARY

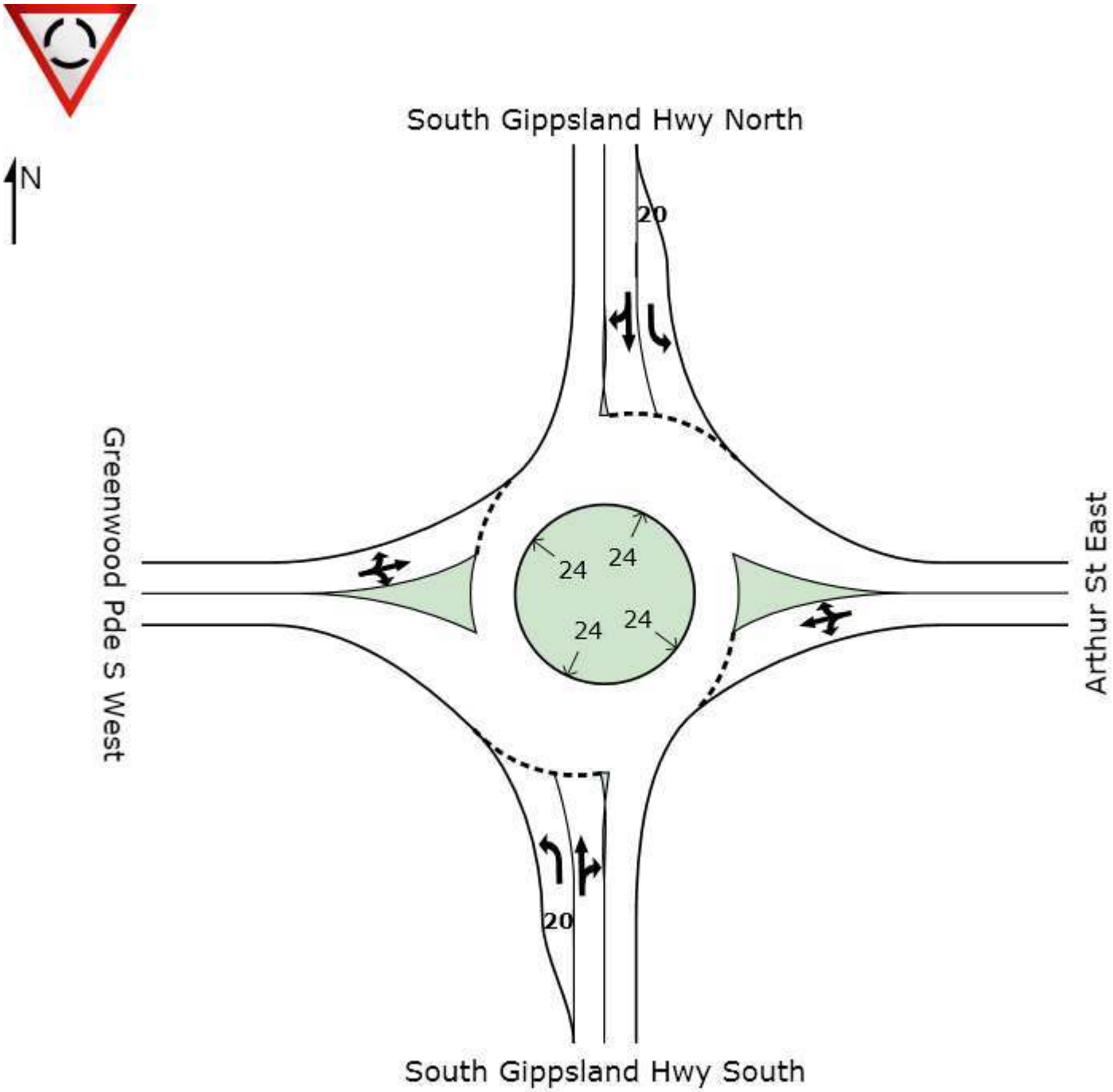
Site: J1 Option 1c Roundabout

Sth Leongatha, Option 1, Junction 1 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Gippsland Hwy South											
1	L	4	0.0	0.007	7.5	LOS A	0.0	0.2	0.39	0.50	48.9
2	T	1085	4.8	0.746	8.3	LOS C	10.3	75.4	0.71	0.60	49.6
3	R	12	9.1	0.724	13.3	LOS C	10.3	75.4	0.71	0.75	46.2
Approach		1101	4.8	0.746	8.4	LOS C	10.3	75.4	0.71	0.61	49.5
East: Arthur St East											
4	L	1	0.0	0.105	22.9	LOS A	1.0	7.0	0.97	0.87	36.7
5	T	18	5.9	0.107	22.0	LOS A	1.0	7.0	0.97	0.87	36.8
6	R	21	5.0	0.107	30.0	LOS A	1.0	7.0	0.97	0.89	37.1
Approach		40	5.3	0.107	26.2	LOS A	1.0	7.0	0.97	0.88	37.0
North: South Gippsland Hwy North											
7	L	16	6.7	0.025	8.8	LOS A	0.1	0.7	0.11	0.56	58.6
8	T	1132	4.7	0.712	7.6	LOS C	13.0	94.8	0.22	0.47	59.2
9	R	156	4.7	0.711	13.5	LOS C	13.0	94.8	0.22	0.80	53.0
Approach		1303	4.8	0.712	8.3	LOS C	13.0	94.8	0.22	0.51	58.3
West: Greenwood Pde S West											
10	L	142	5.2	0.393	20.7	LOS A	3.9	28.4	1.00	1.02	41.2
11	T	1	0.0	0.351	18.2	LOS A	3.9	28.4	1.00	1.02	39.3
12	R	4	0.0	0.383	24.5	LOS A	3.9	28.4	1.00	1.02	37.4
Approach		147	5.0	0.393	20.8	LOS A	3.9	28.4	1.00	1.02	41.1
All Vehicles		2592	4.8	0.746	9.3	LOS A	13.0	94.8	0.48	0.58	52.4

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Degree of Saturation.
Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.


South Gippsland Hwy North
N
20
Greenwood Pde S West
Arthur St East
24
24
24
24
20
South Gippsland Hwy South

MOVEMENT SUMMARY

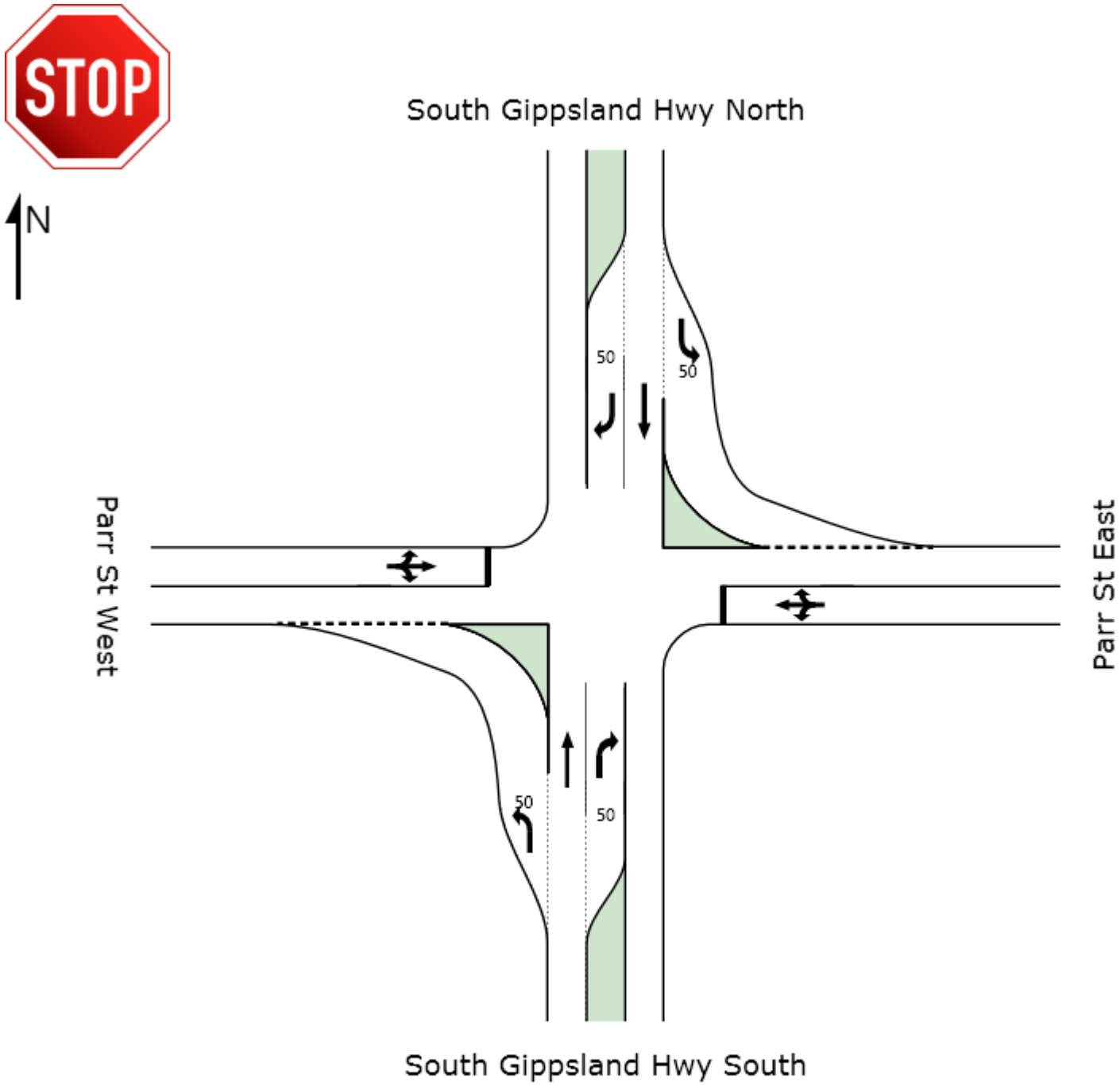
Site: J1 Option 2c Roundabout

Sth Leongatha, Option 2, Junction 1 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Gippsland Hwy South											
1	L	4	0.0	0.006	7.1	LOS A	0.0	0.2	0.38	0.49	49.1
2	T	1085	4.8	0.719	8.2	LOS C	9.6	69.8	0.67	0.59	49.8
3	R	12	9.1	0.724	13.1	LOS C	9.6	69.8	0.67	0.75	46.3
Approach		1101	4.8	0.719	8.3	LOS C	9.6	69.8	0.67	0.59	49.8
East: Arthur St East											
4	L	1	0.0	0.096	21.9	LOS A	0.9	6.7	0.97	0.86	37.2
5	T	18	5.9	0.100	21.3	LOS A	0.9	6.7	0.97	0.86	37.3
6	R	21	5.0	0.100	29.4	LOS A	0.9	6.7	0.97	0.87	37.5
Approach		40	5.3	0.100	25.6	LOS A	0.9	6.7	0.97	0.86	37.4
North: South Gippsland Hwy North											
7	L	16	6.7	0.024	8.6	LOS A	0.1	0.7	0.11	0.55	58.9
8	T	1132	4.7	0.699	7.6	LOS B	12.3	89.3	0.21	0.47	59.2
9	R	156	4.7	0.699	13.5	LOS B	12.3	89.3	0.21	0.80	52.9
Approach		1303	4.8	0.699	8.3	LOS B	12.3	89.3	0.21	0.51	58.4
West: Greenwood Pde S West											
10	L	154	4.8	0.386	19.5	LOS A	3.9	28.2	1.00	0.99	42.1
11	T	1	0.0	0.351	17.2	LOS A	3.9	28.2	1.00	0.99	40.2
12	R	4	0.0	0.383	23.4	LOS A	3.9	28.2	1.00	0.99	38.2
Approach		159	4.6	0.386	19.6	LOS A	3.9	28.2	1.00	0.99	42.0
All Vehicles		2603	4.8	0.719	9.3	LOS A	12.3	89.3	0.46	0.58	52.5

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Degree of Saturation.
Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.


STOP
N
South Gippsland Hwy North
Parr St West
Parr St East
South Gippsland Hwy South
50
50
50
50

MOVEMENT SUMMARY

Site: J2 Option 1 Stop

Sth Leongatha, Option 1, Junction 2 PM Peak
Stop (Two-Way)

Movement Performance - Vehicles

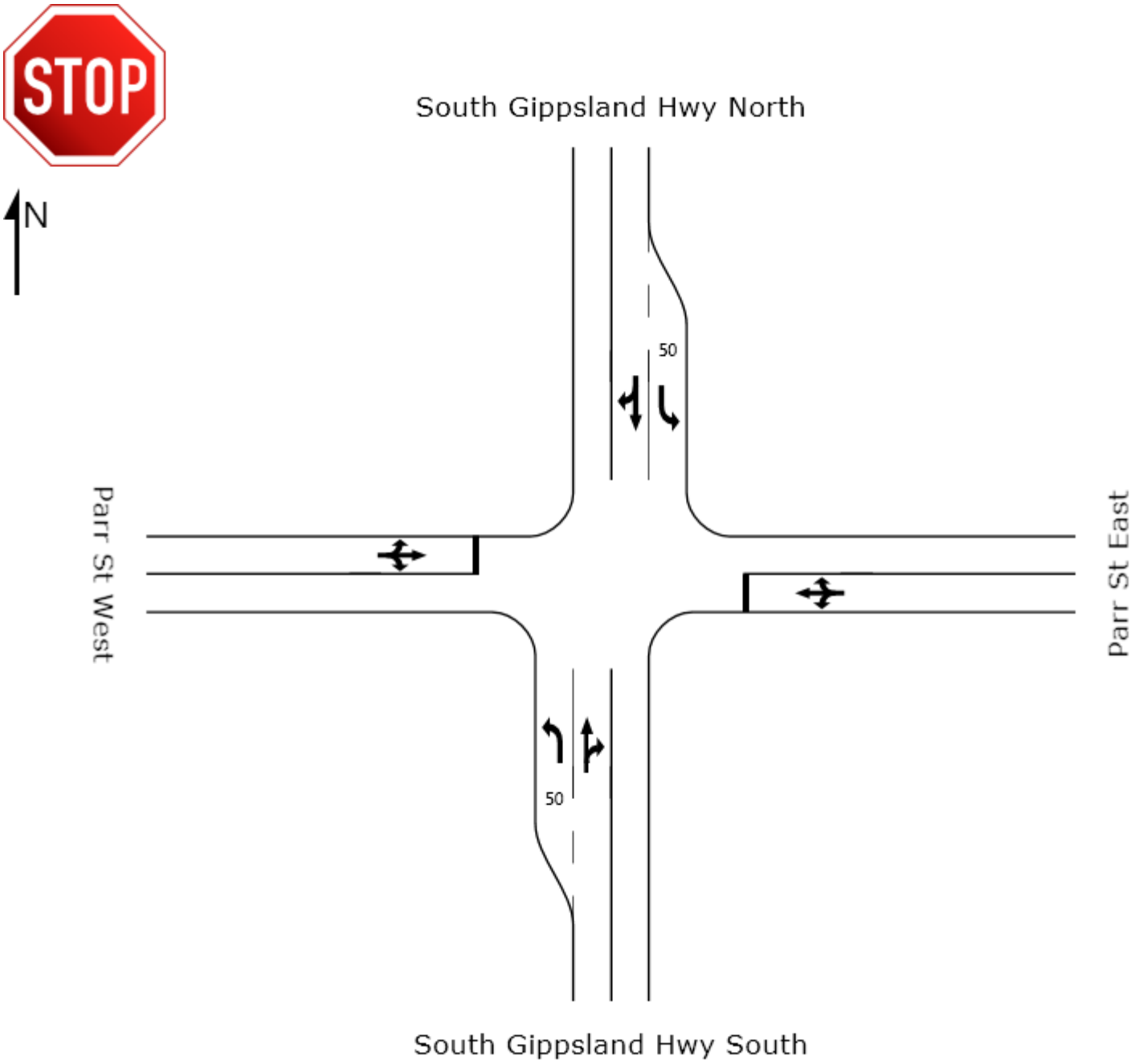
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Gippsland Hwy South											
1	L	28	3.7	0.025	10.1	LOS A	0.1	0.8	0.18	0.61	56.3
2	T	812	4.8	0.429	2.6	LOS A	0.0	0.0	0.00	0.23	71.0
3	R	45	2.3	0.098	16.9	LOS A	0.4	3.0	0.70	0.92	48.4
Approach		885	4.6	0.429	3.6	LOS A	0.4	3.0	0.04	0.27	68.8
East: Parr St East											
4	L	57	1.9	4.060	3075.5	LOS F	152.6	1081.3	1.00	5.30	0.8
5	T	77	1.4	4.044	3074.7	LOS F	152.6	1081.3	1.00	4.45	0.7
6	R	162	1.3	4.157	3075.6	LOS F	152.6	1081.3	1.00	4.31	0.8
Approach		296	1.4	4.141	3075.4	LOS F	152.6	1081.3	1.00	4.54	0.8
North: South Gippsland Hwy North											
7	L	207	1.0	0.176	10.0	LOS A	0.8	5.9	0.14	0.62	56.5
8	T	843	4.7	0.446	2.6	LOS A	0.0	0.0	0.00	0.23	71.0
9	R	82	1.3	0.168	16.6	LOS A	0.7	5.2	0.70	0.92	48.7
Approach		1133	3.8	0.446	5.0	LOS A	0.8	5.9	0.08	0.35	65.7
West: Parr St West											
10	L	92	1.1	1.869	941.2	LOS F	54.3	386.6	1.00	4.12	2.5
11	T	23	4.5	1.930	940.6	LOS F	54.3	386.6	1.00	3.41	2.2
12	R	44	2.4	1.842	941.4	LOS F	54.3	386.6	1.00	3.31	2.5
Approach		159	2.0	1.854	941.2	LOS F	54.3	386.6	1.00	3.79	2.5
All Vehicles		2473	3.7	4.141	432.0	NA	152.6	1081.3	0.23	1.04	4.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Degree of Saturation.

Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.

SIDRA INTERSECTION


STOP
South Gippsland Hwy North
N
50
Parr St West
Parr St East
50
South Gippsland Hwy South

MOVEMENT SUMMARY

Site: J2 Option 2 Stop

Sth Leongatha, Option 2, Junction 2 PM Peak
Stop (Two-Way)

Movement Performance - Vehicles

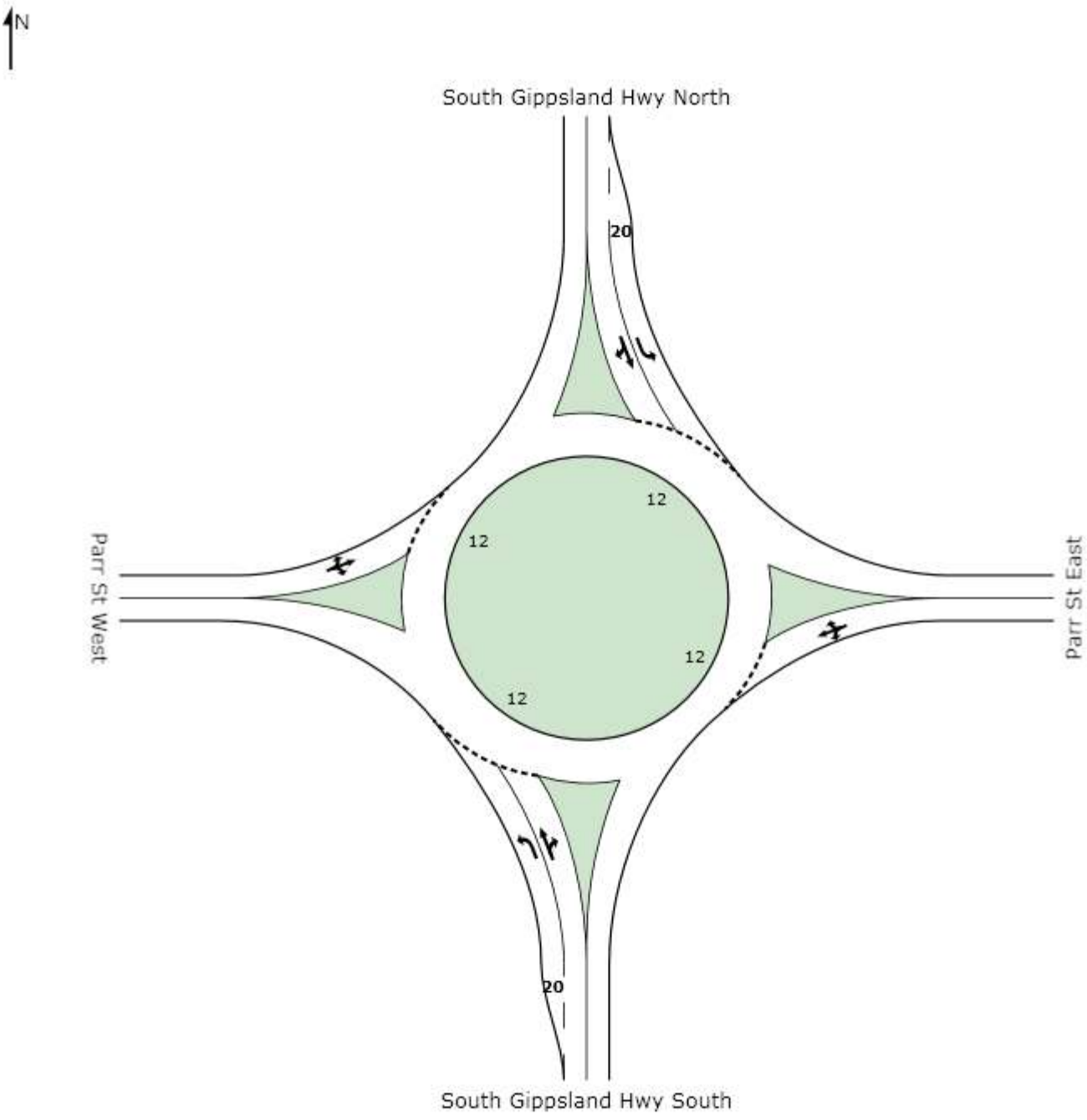
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Gippsland Hwy South											
1	L	66	1.6	0.036	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
2	T	812	4.8	0.540	20.8	LOS A	15.1	109.8	1.00	0.00	35.8
3	R	45	2.3	0.539	29.3	LOS A	15.1	109.8	1.00	1.25	35.6
Approach		923	4.4	0.540	20.3	LOS A	15.1	109.8	0.93	0.11	36.5
East: Parr St East											
4	L	57	1.9	3.789	2842.8	LOS F	128.1	909.8	1.00	4.88	0.8
5	T	33	3.2	4.079	2842.7	LOS F	128.1	909.8	1.00	4.09	0.8
6	R	162	1.3	3.860	2842.7	LOS F	128.1	909.8	1.00	3.99	0.8
Approach		252	1.7	3.860	2842.7	LOS F	128.1	909.8	1.00	4.21	0.8
North: South Gippsland Hwy North											
7	L	207	1.0	0.112	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
8	T	843	4.7	0.601	17.4	LOS B	15.3	111.4	1.00	0.00	37.7
9	R	82	1.3	0.599	25.9	LOS A	15.3	111.4	1.00	1.29	37.6
Approach		1133	3.8	0.601	16.4	LOS B	15.3	111.4	0.82	0.22	39.4
West: Parr St West											
10	L	92	1.1	3.663	2564.6	LOS F	129.8	917.7	1.00	5.20	0.8
11	T	26	4.0	3.759	2564.6	LOS F	129.8	917.7	1.00	4.18	0.8
12	R	144	0.7	3.605	2564.5	LOS F	129.8	917.7	1.00	4.15	0.8
Approach		262	1.2	3.620	2564.5	LOS F	129.8	917.7	1.00	4.52	0.8
All Vehicles		2569	3.6	3.860	554.4	NA	129.8	917.7	0.89	1.01	3.7

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Degree of Saturation.

Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.

SIDRA INTERSECTION


N
South Gippsland Hwy North
20
7
12
12
12
12
4
4
Parr St West
Parr St East
7
20
South Gippsland Hwy South

MOVEMENT SUMMARY

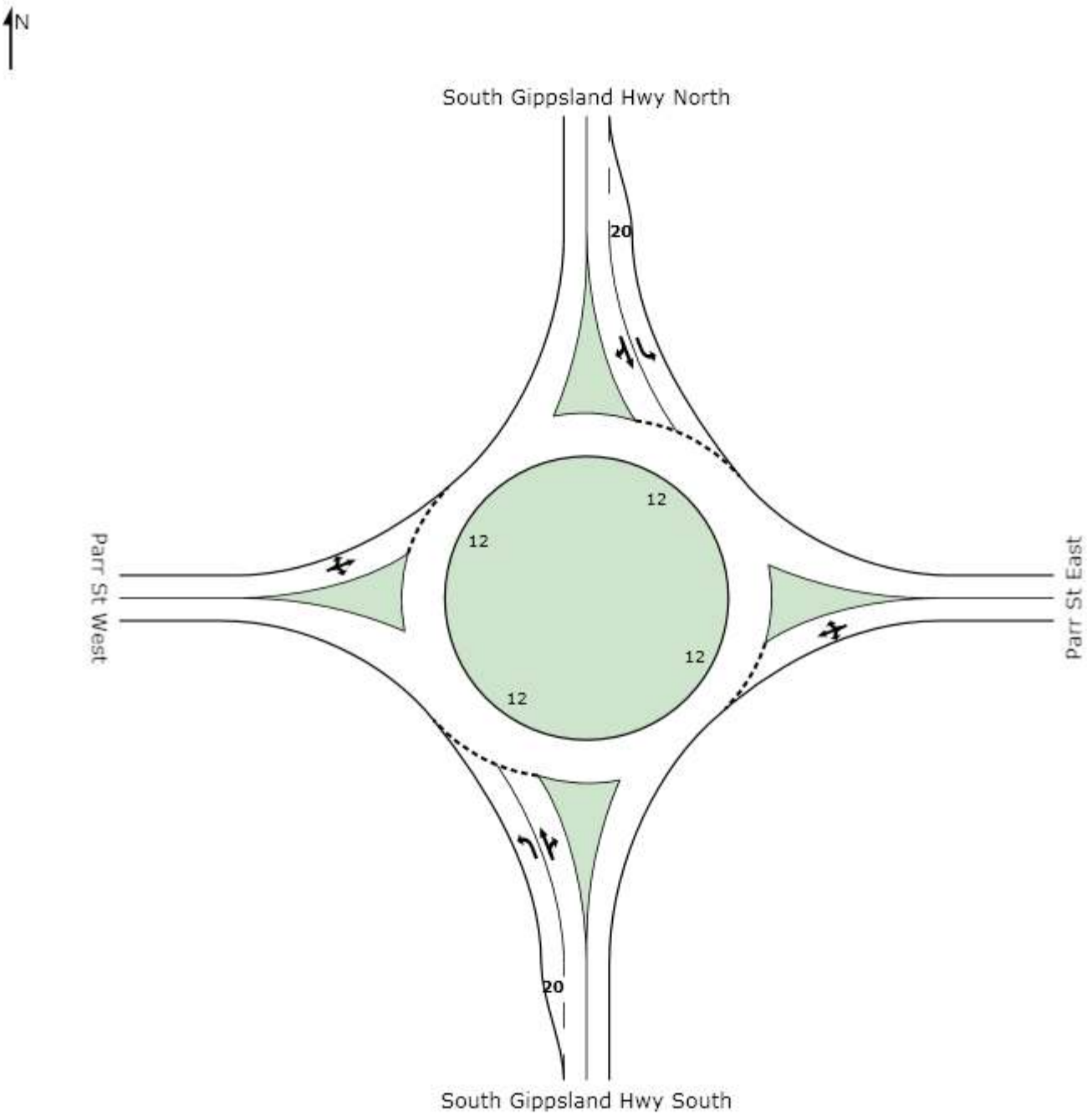
Site: J2 Option 1b Roundabout

Sth Leongatha, Option 1, Junction 2 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Gippsland Hwy South											
1	L	28	3.7	0.052	9.6	LOS A	0.3	1.8	0.55	0.63	47.3
2	T	812	4.8	0.691	9.9	LOS B	10.2	74.2	0.84	0.76	46.2
3	R	45	2.3	0.686	14.7	LOS B	10.2	74.2	0.84	0.83	44.3
Approach		885	4.6	0.691	10.1	LOS B	10.2	74.2	0.83	0.76	46.1
East: Parr St East											
4	L	57	1.9	0.574	22.5	LOS A	6.8	48.5	1.00	1.14	36.9
5	T	77	1.4	0.573	21.9	LOS A	6.8	48.5	1.00	1.14	36.9
6	R	162	1.3	0.573	26.7	LOS A	6.8	48.5	1.00	1.14	35.5
Approach		296	1.4	0.574	24.6	LOS A	6.8	48.5	1.00	1.14	36.1
North: South Gippsland Hwy North											
7	L	207	1.0	0.331	8.2	LOS A	1.7	11.7	0.38	0.59	48.1
8	T	843	4.7	0.598	7.1	LOS A	7.7	56.0	0.50	0.52	48.2
9	R	82	1.3	0.599	11.9	LOS A	7.7	56.0	0.50	0.71	45.9
Approach		1133	3.8	0.597	7.7	LOS A	7.7	56.0	0.48	0.55	48.0
West: Parr St West											
10	L	92	1.1	0.371	16.9	LOS A	3.5	25.1	1.00	0.98	40.8
11	T	23	4.5	0.368	16.4	LOS A	3.5	25.1	1.00	0.98	40.8
12	R	44	2.4	0.372	21.2	LOS A	3.5	25.1	1.00	0.98	39.0
Approach		159	2.0	0.370	18.0	LOS A	3.5	25.1	1.00	0.98	40.3
All Vehicles		2473	3.7	0.691	11.3	LOS B	10.2	74.2	0.70	0.72	45.0

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Degree of Saturation.
Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.


N
South Gippsland Hwy North
20
7
12
12
12
12
4
4
Parr St West
Parr St East
7
20
South Gippsland Hwy South

MOVEMENT SUMMARY

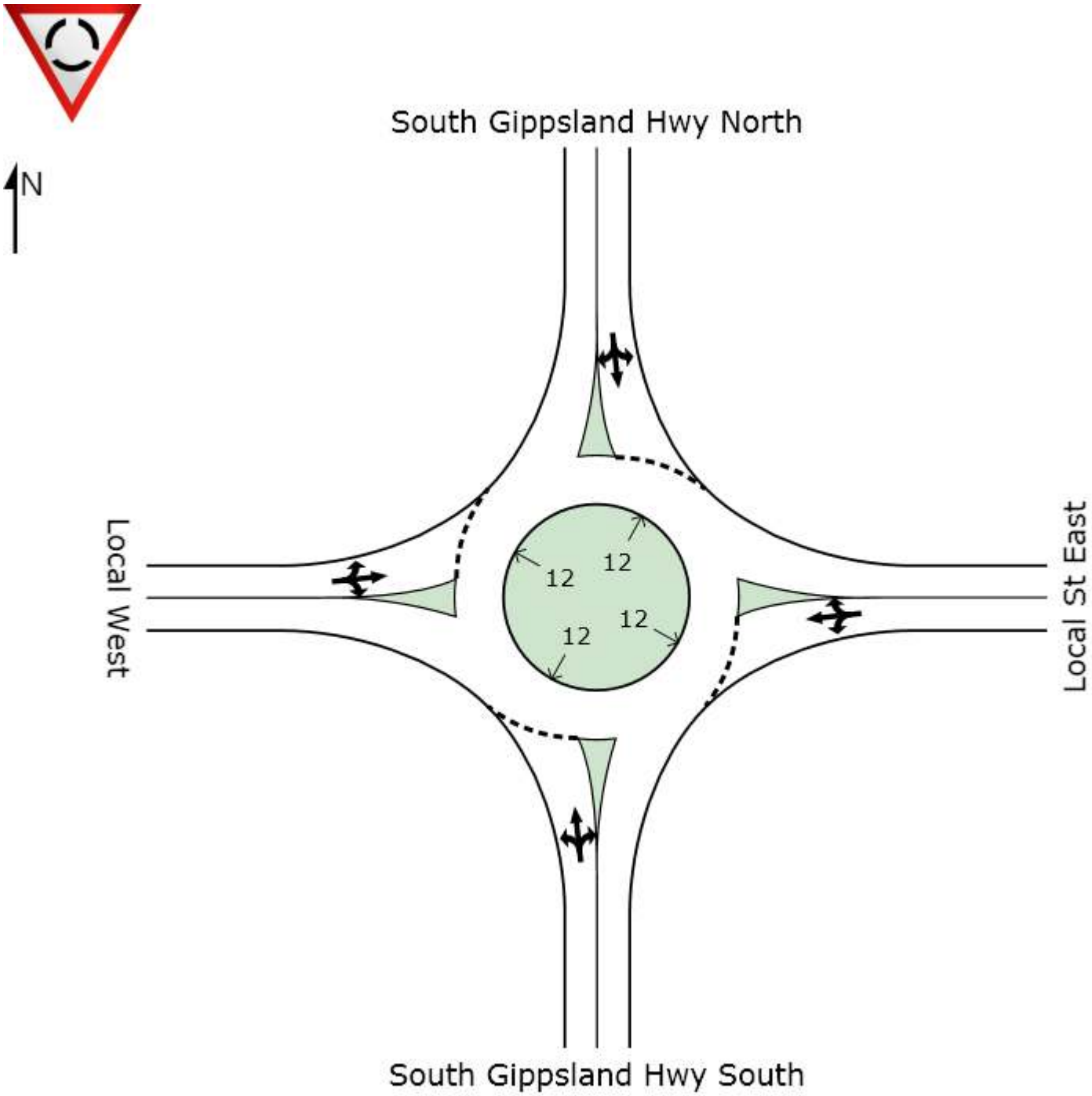
Site: J2 Option 2b Roundabout

Sth Leongatha, Option 2, Junction 2 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Gippsland Hwy South											
1	L	66	1.6	0.117	9.3	LOS A	0.6	4.1	0.52	0.64	47.4
2	T	812	4.8	0.660	8.8	LOS B	8.8	63.7	0.78	0.69	46.6
3	R	45	2.3	0.656	13.6	LOS B	8.8	63.7	0.78	0.78	45.2
Approach		923	4.4	0.660	9.0	LOS B	8.8	63.7	0.76	0.69	46.6
East: Parr St East											
4	L	57	1.9	0.611	28.4	LOS B	7.5	53.5	1.00	1.17	33.5
5	T	33	3.2	0.604	27.7	LOS B	7.5	53.5	1.00	1.17	33.5
6	R	162	1.3	0.609	32.5	LOS B	7.5	53.5	1.00	1.17	32.4
Approach		252	1.7	0.609	31.0	LOS B	7.5	53.5	1.00	1.17	32.8
North: South Gippsland Hwy North											
7	L	207	1.0	0.356	9.2	LOS A	1.9	13.6	0.53	0.65	47.4
8	T	843	4.7	0.673	8.0	LOS B	9.1	65.9	0.74	0.63	46.7
9	R	82	1.3	0.673	12.8	LOS B	9.1	65.9	0.74	0.73	45.7
Approach		1133	3.8	0.673	8.6	LOS B	9.1	65.9	0.70	0.64	46.8
West: Parr St West											
10	L	92	1.1	0.595	25.2	LOS A	7.2	50.9	1.00	1.15	35.2
11	T	26	4.0	0.598	24.6	LOS A	7.2	50.9	1.00	1.15	35.2
12	R	144	0.7	0.593	29.4	LOS A	7.2	50.9	1.00	1.15	34.0
Approach		262	1.2	0.593	27.5	LOS A	7.2	50.9	1.00	1.15	34.5
All Vehicles		2569	3.6	0.673	12.9	LOS B	9.1	65.9	0.78	0.76	43.3

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Degree of Saturation.
Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.


South Gippsland Hwy North
N
Local West
Local St East
12
12
12
12
South Gippsland Hwy South

MOVEMENT SUMMARY

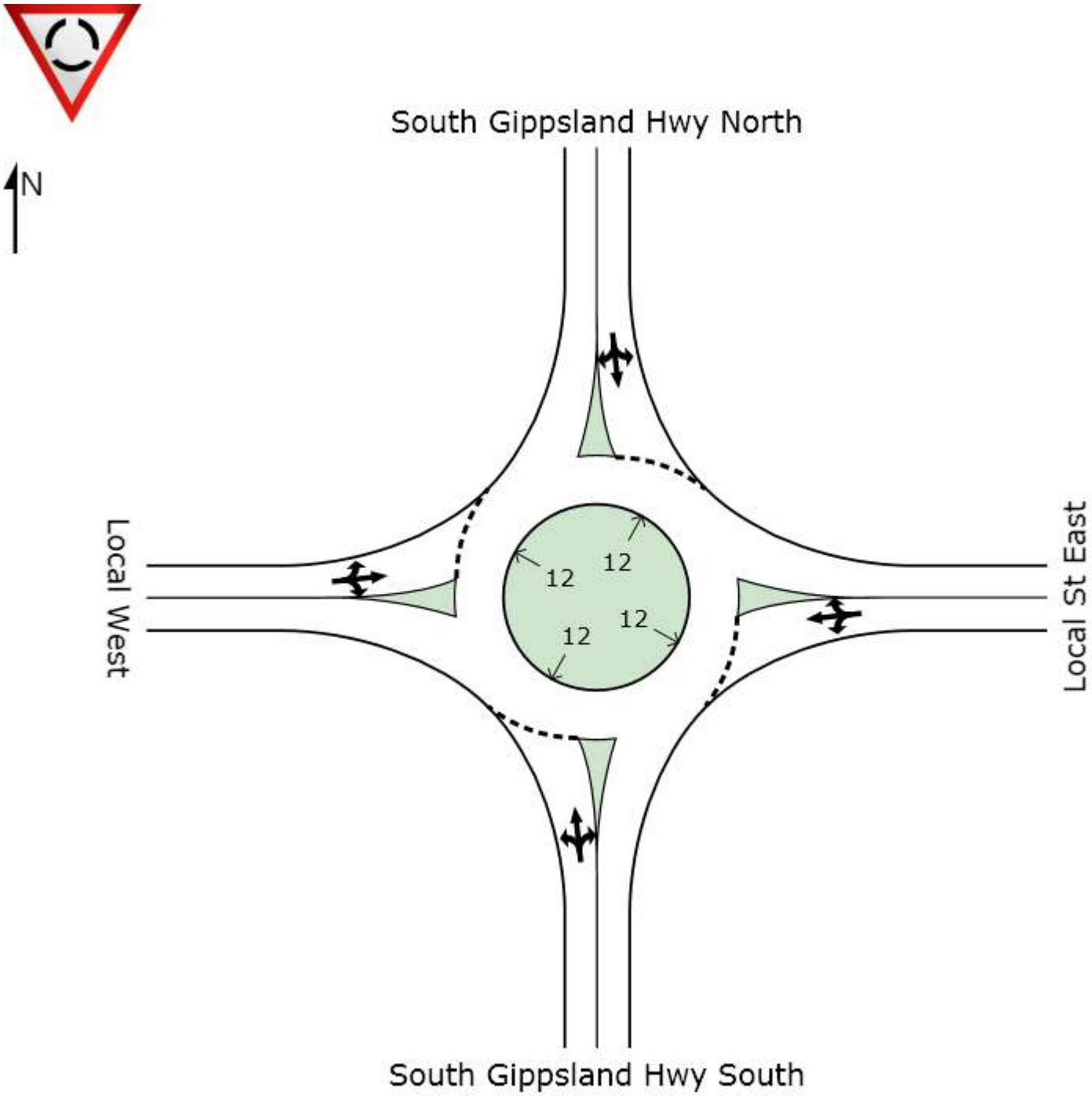
Site: J3 Option 1 Roundabout

Sth Leongatha, Option 1, Junction 3 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Gippsland Hwy South											
1	L	3	0.0	0.632	8.5	LOS B	7.4	53.8	0.52	0.61	47.8
2	T	774	4.8	0.610	7.8	LOS B	7.4	53.8	0.52	0.56	47.9
3	R	7	0.0	0.614	12.1	LOS B	7.4	53.8	0.52	0.73	46.0
Approach		784	4.7	0.610	7.8	LOS B	7.4	53.8	0.52	0.56	47.9
East: Local St East											
4	L	4	0.0	0.065	15.0	LOS A	0.5	3.4	0.78	0.78	42.1
5	T	2	0.0	0.064	14.1	LOS A	0.5	3.4	0.78	0.76	42.3
6	R	29	0.0	0.065	18.6	LOS A	0.5	3.4	0.78	0.82	40.1
Approach		36	0.0	0.065	17.9	LOS A	0.5	3.4	0.78	0.81	40.5
North: South Gippsland Hwy North											
7	L	40	2.6	0.580	7.4	LOS A	7.8	56.3	0.15	0.59	49.3
8	T	825	4.7	0.584	6.7	LOS A	7.8	56.3	0.15	0.50	50.0
9	R	79	1.3	0.585	11.0	LOS A	7.8	56.3	0.15	0.80	46.3
Approach		944	4.3	0.584	7.1	LOS A	7.8	56.3	0.15	0.53	49.6
West: Local West											
10	L	79	1.3	0.154	14.0	LOS A	1.2	8.7	0.82	0.84	43.3
11	T	2	0.0	0.150	13.1	LOS A	1.2	8.7	0.82	0.82	43.5
12	R	3	0.0	0.150	17.5	LOS A	1.2	8.7	0.82	0.88	41.2
Approach		84	1.3	0.154	14.1	LOS A	1.2	8.7	0.82	0.84	43.2
All Vehicles		1848	4.3	0.610	7.9	LOS A	7.8	56.3	0.35	0.56	48.4

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Degree of Saturation.
Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.


South Gippsland Hwy North
N
Local West
Local St East
12
12
12
12
South Gippsland Hwy South

MOVEMENT SUMMARY

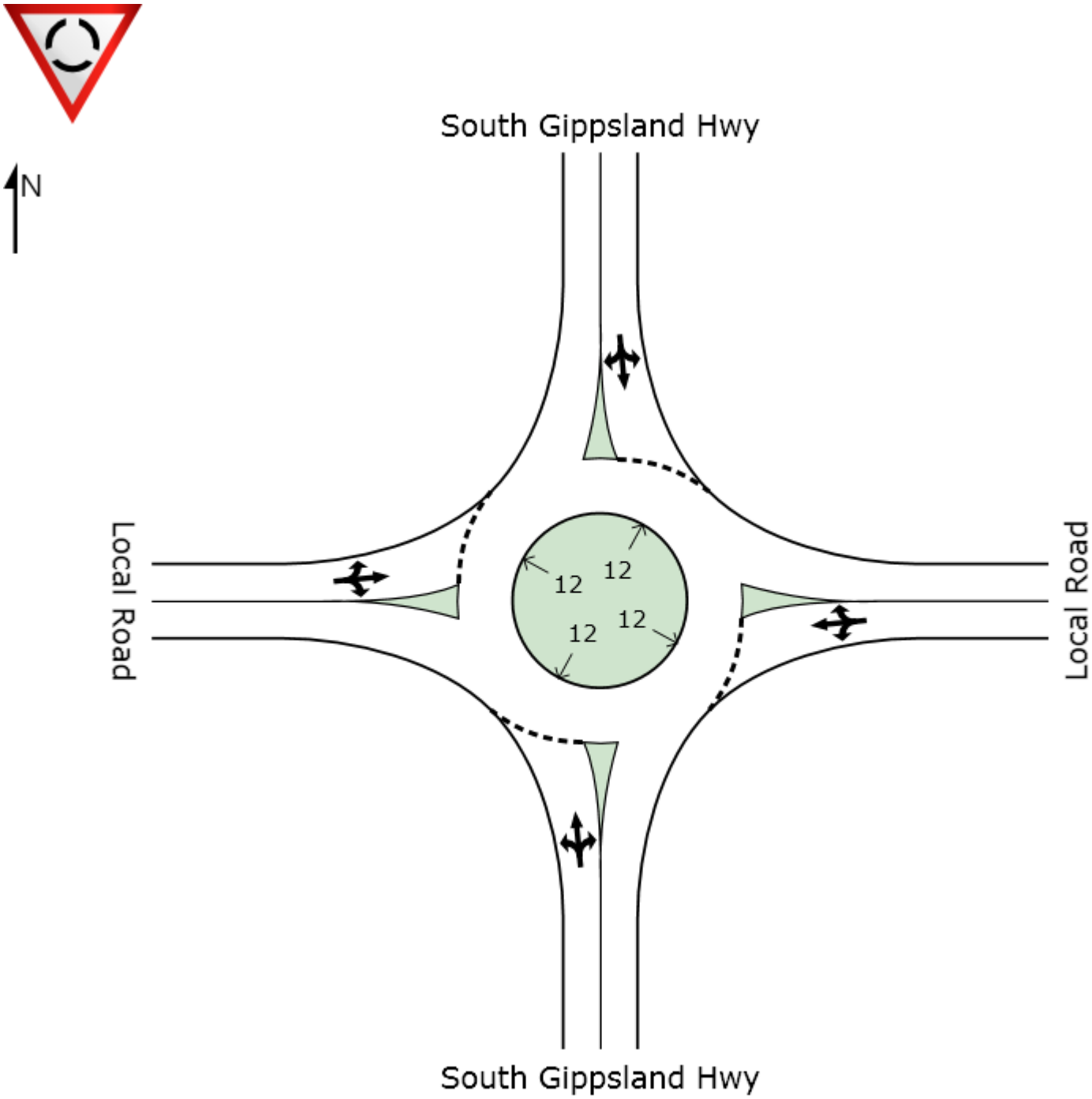
Site: J3 Option 2 Roundabout

Sth Leongatha, Option 2, Junction 3 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Gippsland Hwy South											
1	L	3	0.0	0.632	8.9	LOS B	8.4	61.0	0.61	0.63	47.5
2	T	809	4.8	0.661	8.2	LOS B	8.4	61.0	0.61	0.59	47.4
3	R	7	0.0	0.670	12.5	LOS B	8.4	61.0	0.61	0.73	45.8
Approach		820	4.7	0.661	8.2	LOS B	8.4	61.0	0.61	0.59	47.4
East: Local St East											
4	L	4	0.0	0.073	16.8	LOS A	0.6	3.9	0.83	0.81	40.6
5	T	2	0.0	0.073	16.0	LOS A	0.6	3.9	0.83	0.79	40.8
6	R	29	0.0	0.073	20.5	LOS A	0.6	3.9	0.83	0.84	38.8
Approach		36	0.0	0.073	19.8	LOS A	0.6	3.9	0.83	0.83	39.1
North: South Gippsland Hwy North											
7	L	40	2.6	0.645	7.5	LOS B	9.7	70.2	0.17	0.58	49.2
8	T	903	4.8	0.646	6.7	LOS B	9.7	70.2	0.17	0.49	49.9
9	R	104	1.0	0.647	11.0	LOS B	9.7	70.2	0.17	0.78	46.3
Approach		1047	4.3	0.646	7.1	LOS B	9.7	70.2	0.17	0.52	49.5
West: Local West											
10	L	82	1.3	0.172	14.5	LOS A	1.4	10.0	0.85	0.86	42.8
11	T	2	0.0	0.175	13.6	LOS A	1.4	10.0	0.85	0.85	43.0
12	R	3	0.0	0.175	18.1	LOS A	1.4	10.0	0.85	0.89	40.9
Approach		87	1.2	0.172	14.6	LOS A	1.4	10.0	0.85	0.86	42.8
All Vehicles		1991	4.3	0.661	8.1	LOS A	9.7	70.2	0.39	0.57	48.1

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Degree of Saturation.
Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.


South Gippsland Hwy
N
Local Road
Local Road
12
12
12
12
South Gippsland Hwy

MOVEMENT SUMMARY

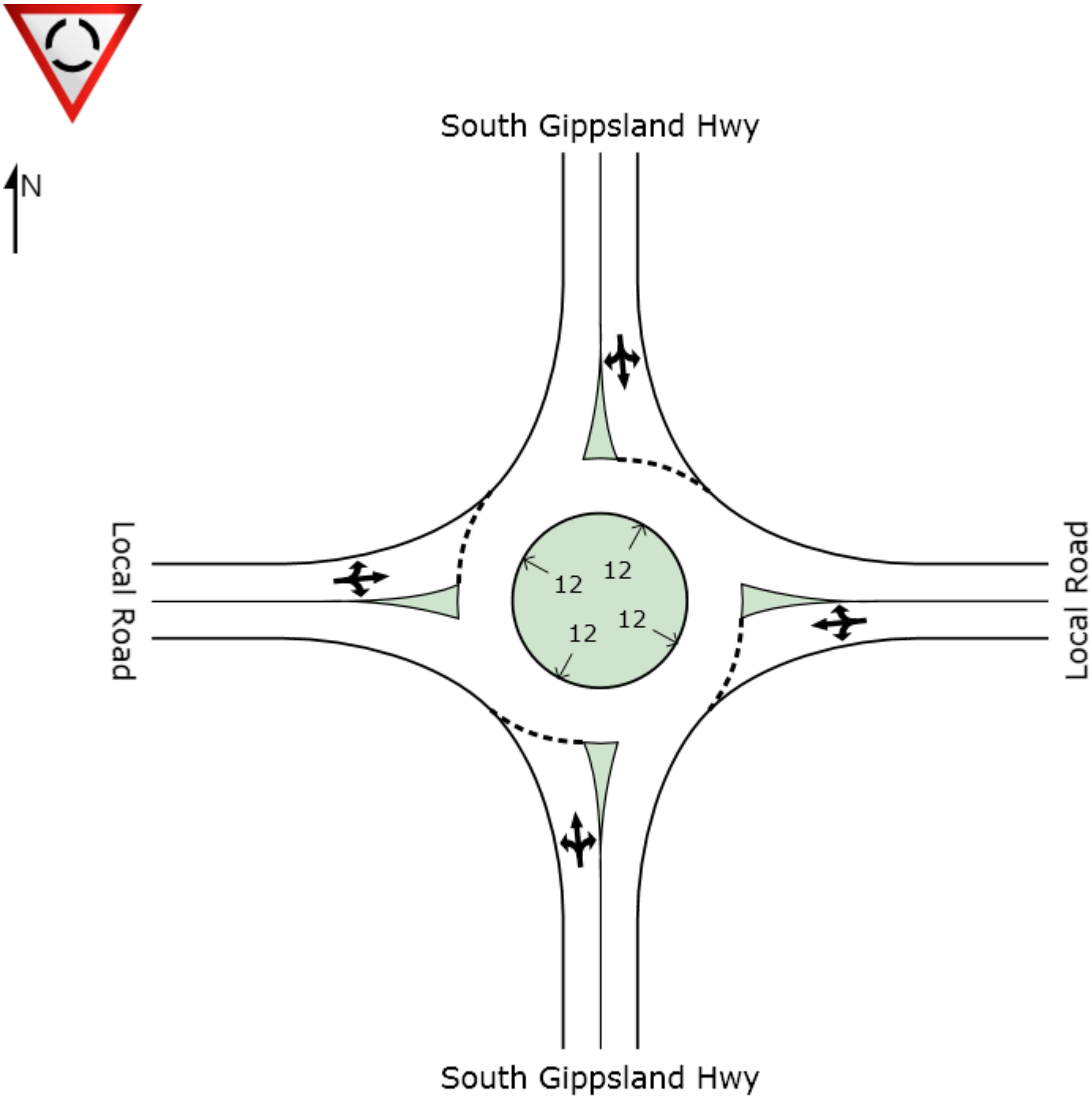
Site: J4 Option 1 Roundabout

Sth Leongatha, Option 1, Junction 4 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Gippsland Hwy											
1	L	127	1.0	0.498	9.6	LOS A	4.5	32.7	0.66	0.74	47.2
2	T	363	4.8	0.499	8.9	LOS A	4.5	32.7	0.66	0.70	47.0
3	R	17	1.2	0.502	13.4	LOS A	4.5	32.7	0.66	0.82	45.0
Approach		506	3.7	0.499	9.2	LOS A	4.5	32.7	0.66	0.72	47.0
East: Local Road											
4	L	10	1.1	0.056	12.3	LOS A	0.4	3.0	0.76	0.74	44.5
5	T	2	4.8	0.057	11.7	LOS A	0.4	3.0	0.76	0.72	44.7
6	R	23	1.3	0.056	16.2	LOS A	0.4	3.0	0.76	0.79	42.1
Approach		35	1.5	0.056	14.9	LOS A	0.4	3.0	0.76	0.77	42.8
North: South Gippsland Hwy											
7	L	30	1.1	0.573	8.1	LOS A	6.5	46.4	0.50	0.59	47.7
8	T	416	4.8	0.572	7.4	LOS A	6.5	46.4	0.50	0.54	47.7
9	R	299	1.0	0.571	12.0	LOS A	6.5	46.4	0.50	0.70	45.4
Approach		744	3.1	0.571	9.3	LOS A	6.5	46.4	0.50	0.61	46.8
West: Local Road											
10	L	320	1.0	0.465	10.0	LOS A	4.1	29.2	0.72	0.77	46.4
11	T	2	4.8	0.442	9.4	LOS A	4.1	29.2	0.72	0.74	46.2
12	R	105	1.0	0.466	13.9	LOS A	4.1	29.2	0.72	0.83	44.1
Approach		428	1.0	0.465	11.0	LOS A	4.1	29.2	0.72	0.78	45.8
All Vehicles		1713	2.7	0.571	9.8	LOS A	6.5	46.4	0.61	0.69	46.5

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Degree of Saturation.
Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.


South Gippsland Hwy
N
Local Road
Local Road
12
12
12
12
South Gippsland Hwy

MOVEMENT SUMMARY

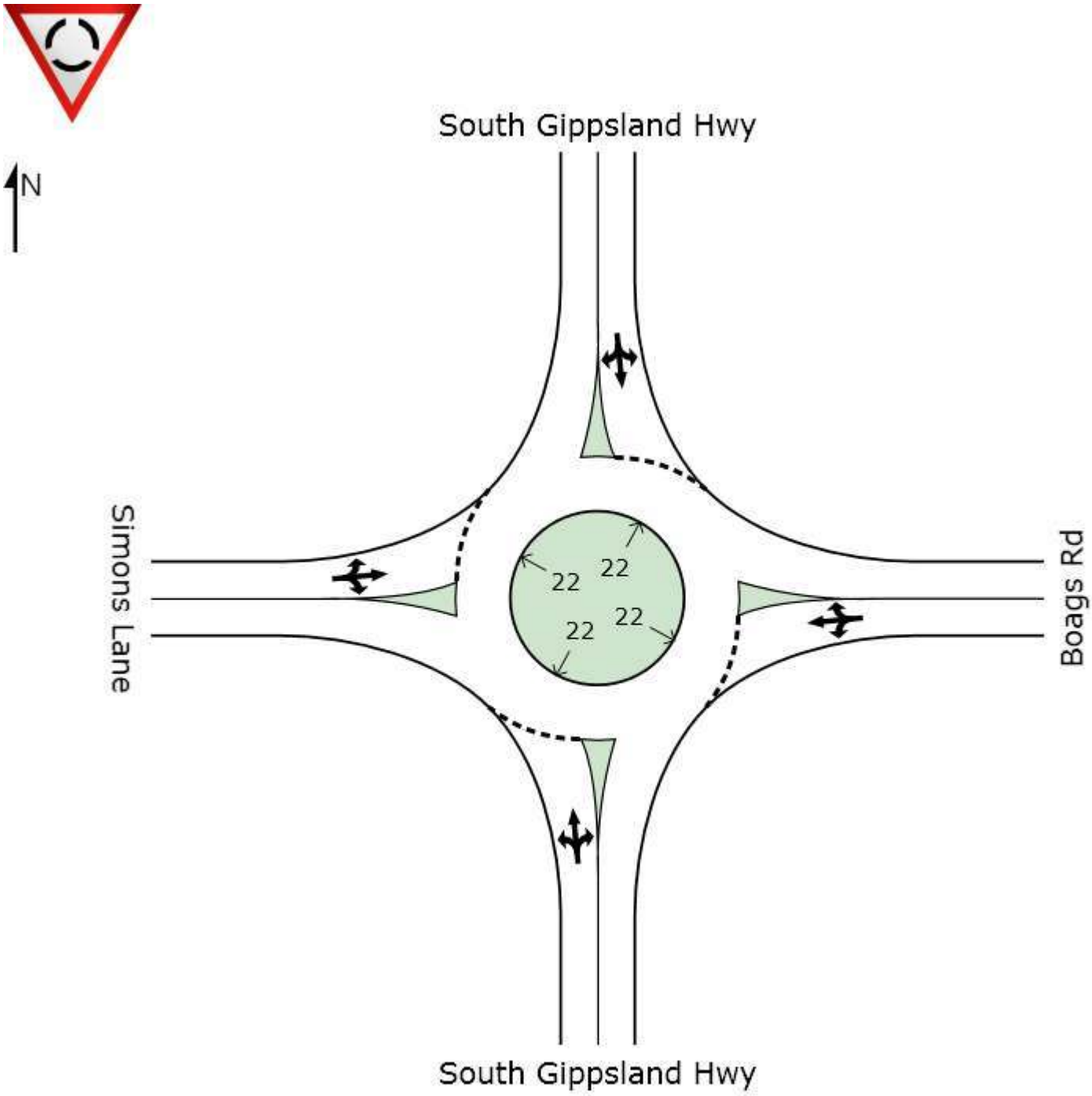
Site: J4 Option 2 Roundabout

Sth Leongatha, Option 2, Junction 4 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Gippsland Hwy											
1	L	73	1.0	0.445	9.8	LOS A	3.8	27.5	0.67	0.76	47.2
2	T	336	4.8	0.445	9.2	LOS A	3.8	27.5	0.67	0.72	47.0
3	R	16	1.3	0.444	13.7	LOS A	3.8	27.5	0.67	0.84	44.7
Approach		425	4.0	0.445	9.4	LOS A	3.8	27.5	0.67	0.73	47.0
East: Local Road											
4	L	9	1.2	0.056	12.6	LOS A	0.4	3.0	0.77	0.75	44.2
5	T	2	4.8	0.055	12.0	LOS A	0.4	3.0	0.77	0.73	44.4
6	R	23	1.3	0.056	16.5	LOS A	0.4	3.0	0.77	0.79	41.9
Approach		34	1.5	0.056	15.3	LOS A	0.4	3.0	0.77	0.77	42.6
North: South Gippsland Hwy											
7	L	31	1.0	0.582	8.0	LOS A	6.8	49.1	0.47	0.57	47.8
8	T	406	4.8	0.586	7.3	LOS A	6.8	49.1	0.47	0.52	47.9
9	R	352	1.0	0.586	11.9	LOS A	6.8	49.1	0.47	0.69	45.5
Approach		789	3.0	0.586	9.4	LOS A	6.8	49.1	0.47	0.60	46.7
West: Local Road											
10	L	338	1.0	0.453	9.8	LOS A	4.0	28.3	0.69	0.75	46.6
11	T	2	4.8	0.442	9.1	LOS A	4.0	28.3	0.69	0.72	46.4
12	R	87	1.1	0.454	13.7	LOS A	4.0	28.3	0.69	0.81	44.3
Approach		428	1.0	0.454	10.6	LOS A	4.0	28.3	0.69	0.76	46.1
All Vehicles		1676	2.7	0.586	9.8	LOS A	6.8	49.1	0.58	0.68	46.5

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Degree of Saturation.
Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.


South Gippsland Hwy
N
Simons Lane
Boags Rd
22
22
22
22
South Gippsland Hwy

MOVEMENT SUMMARY

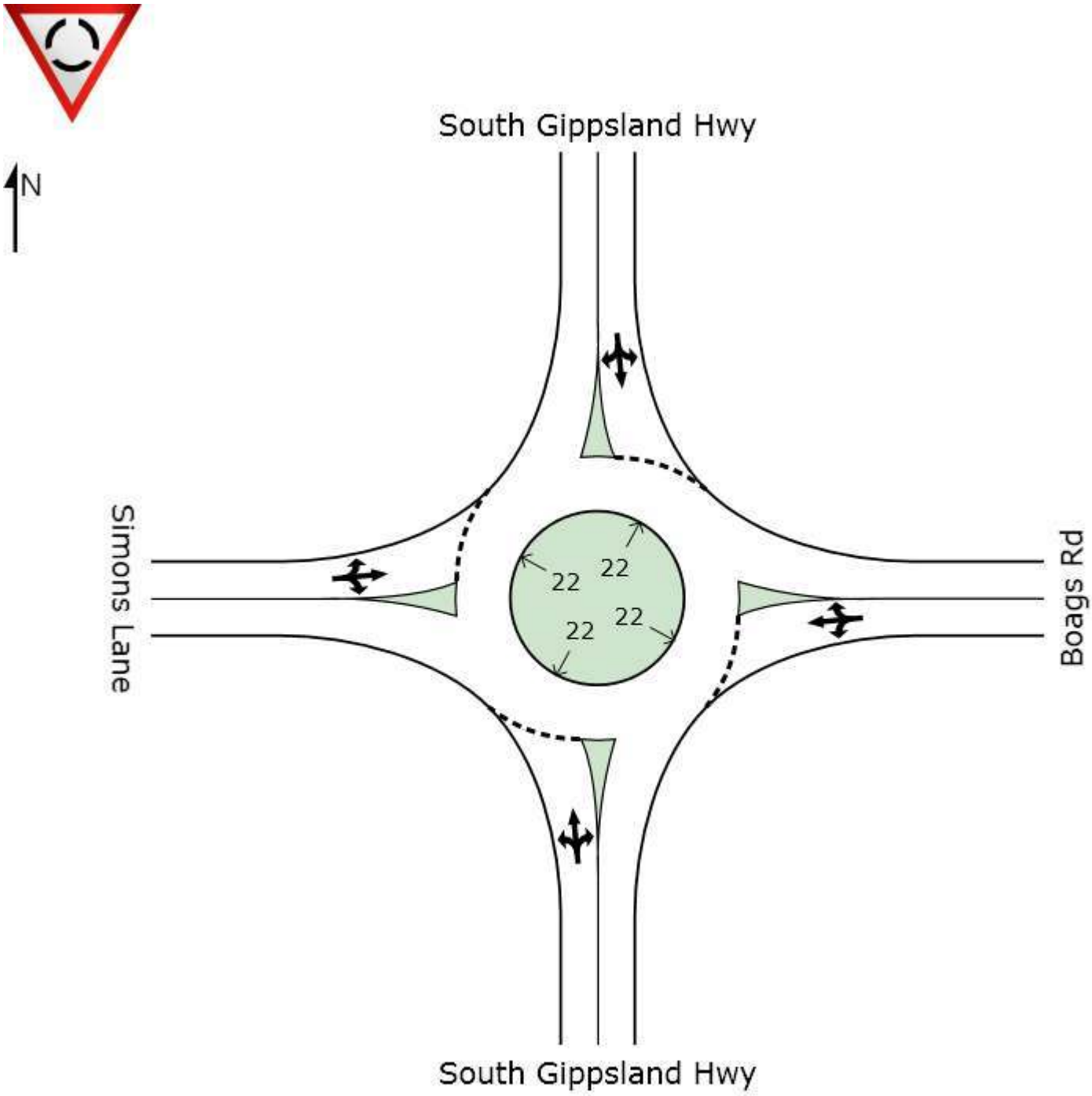
Site: J5 Option 1 Roundabout

Sth Leongatha, Option 1, Junction 5 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Gippsland Hwy											
1	L	5	2.0	0.316	10.8	LOS A	2.4	17.4	0.44	0.65	57.8
2	T	328	4.8	0.311	8.8	LOS A	2.4	17.4	0.44	0.58	56.8
3	R	38	1.1	0.312	15.9	LOS A	2.4	17.4	0.44	0.81	54.3
Approach		372	4.4	0.311	9.5	LOS A	2.4	17.4	0.44	0.61	56.5
East: Boags Rd											
4	L	17	1.2	0.128	12.3	LOS A	0.9	6.3	0.60	0.72	56.3
5	T	54	1.2	0.128	11.4	LOS A	0.9	6.3	0.60	0.68	56.4
6	R	46	1.1	0.128	15.9	LOS A	0.9	6.3	0.60	0.81	50.8
Approach		117	1.2	0.128	13.3	LOS A	0.9	6.3	0.60	0.74	54.1
North: South Gippsland Hwy											
7	L	39	1.1	0.379	8.0	LOS A	3.3	23.6	0.32	0.56	51.2
8	T	389	4.8	0.380	7.2	LOS A	3.3	23.6	0.32	0.50	51.8
9	R	101	1.0	0.380	13.4	LOS A	3.3	23.6	0.32	0.77	48.0
Approach		529	3.8	0.380	8.4	LOS A	3.3	23.6	0.32	0.55	51.0
West: Simons Lane											
10	L	131	1.0	0.188	10.6	LOS A	1.4	9.6	0.57	0.69	55.1
11	T	32	1.0	0.189	11.0	LOS A	1.4	9.6	0.57	0.67	56.7
12	R	22	1.4	0.188	17.0	LOS A	1.4	9.6	0.57	0.81	52.9
Approach		185	1.1	0.188	11.4	LOS A	1.4	9.6	0.57	0.70	55.1
All Vehicles		1204	3.3	0.380	9.7	LOS A	3.3	23.6	0.42	0.61	53.4

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Degree of Saturation.
Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.


South Gippsland Hwy
N
Simons Lane
Boags Rd
22
22
22
22
South Gippsland Hwy

MOVEMENT SUMMARY

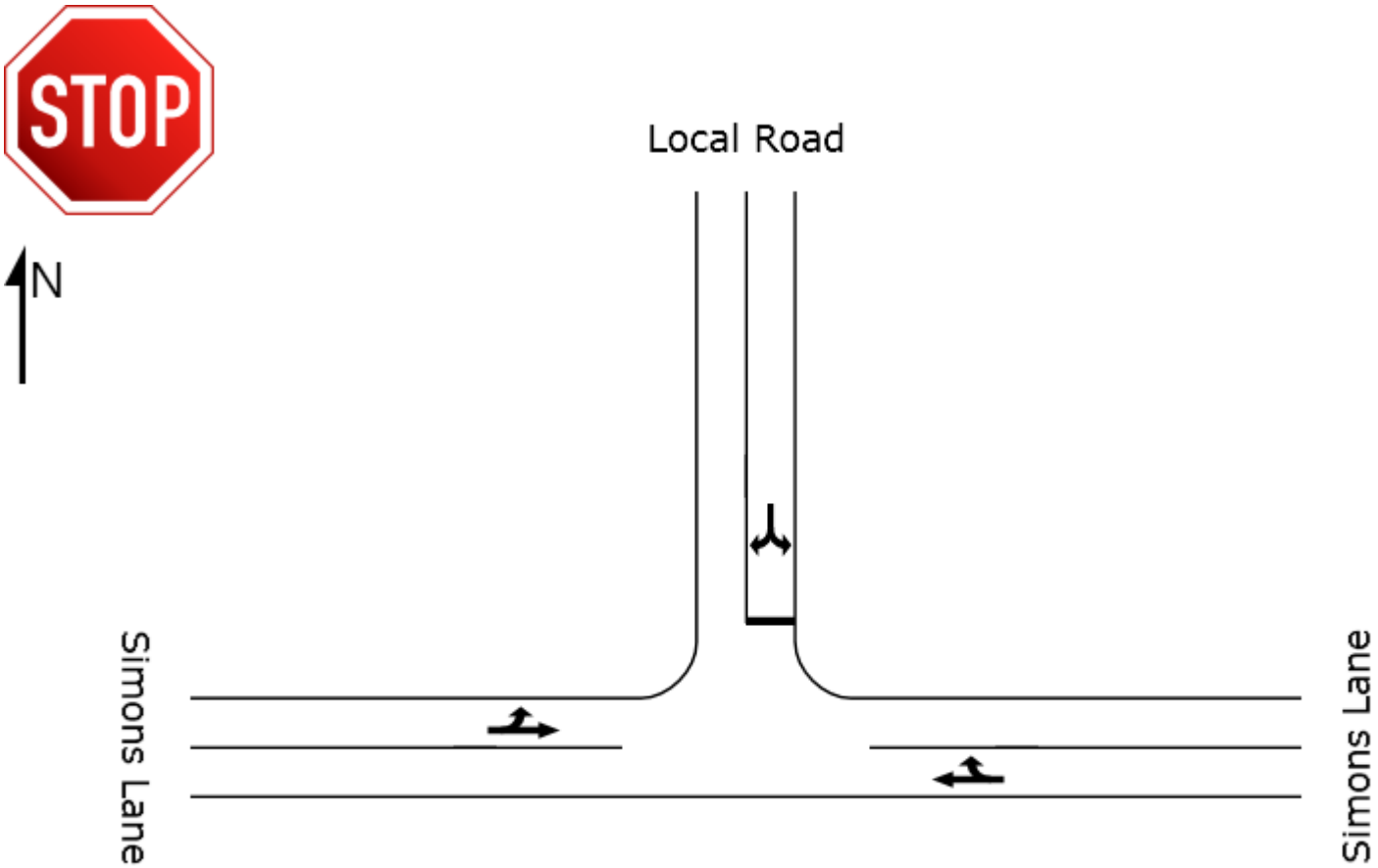
Site: J5 Option 2 Roundabout

Sth Leongatha, Option 2, Junction 5 PM Peak
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: South Gippsland Hwy											
1	L	5	2.0	0.298	10.6	LOS A	2.3	16.9	0.40	0.64	58.1
2	T	328	4.8	0.300	8.6	LOS A	2.3	16.9	0.40	0.56	57.2
3	R	38	1.1	0.299	15.7	LOS A	2.3	16.9	0.40	0.80	54.4
Approach		372	4.4	0.300	9.3	LOS A	2.3	16.9	0.40	0.59	56.8
East: Boags Rd											
4	L	17	1.2	0.122	12.1	LOS A	0.8	6.0	0.58	0.70	56.4
5	T	48	1.1	0.122	11.2	LOS A	0.8	6.0	0.58	0.67	56.5
6	R	50	1.1	0.122	15.7	LOS A	0.8	6.0	0.58	0.80	50.9
Approach		115	1.1	0.122	13.3	LOS A	0.8	6.0	0.58	0.73	54.0
North: South Gippsland Hwy											
7	L	39	1.1	0.358	7.9	LOS A	3.0	21.6	0.30	0.56	51.4
8	T	392	4.8	0.358	7.1	LOS A	3.0	21.6	0.30	0.49	52.0
9	R	70	1.0	0.358	13.3	LOS A	3.0	21.6	0.30	0.78	48.1
Approach		502	4.0	0.358	8.0	LOS A	3.0	21.6	0.30	0.54	51.4
West: Simons Lane											
10	L	48	1.1	0.097	10.5	LOS A	0.7	4.7	0.54	0.66	55.3
11	T	28	1.1	0.097	10.8	LOS A	0.7	4.7	0.54	0.64	57.0
12	R	20	1.0	0.097	16.8	LOS A	0.7	4.7	0.54	0.79	53.1
Approach		96	1.1	0.097	11.9	LOS A	0.7	4.7	0.54	0.68	55.3
All Vehicles		1085	3.5	0.358	9.4	LOS A	3.0	21.6	0.38	0.59	53.6

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Degree of Saturation.
Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.
Roundabout LOS Method: Same as Signalised Intersections.
Roundabout Capacity Model: SIDRA Standard.


STOP
N
Local Road
Simons Lane
Simons Lane

MOVEMENT SUMMARY

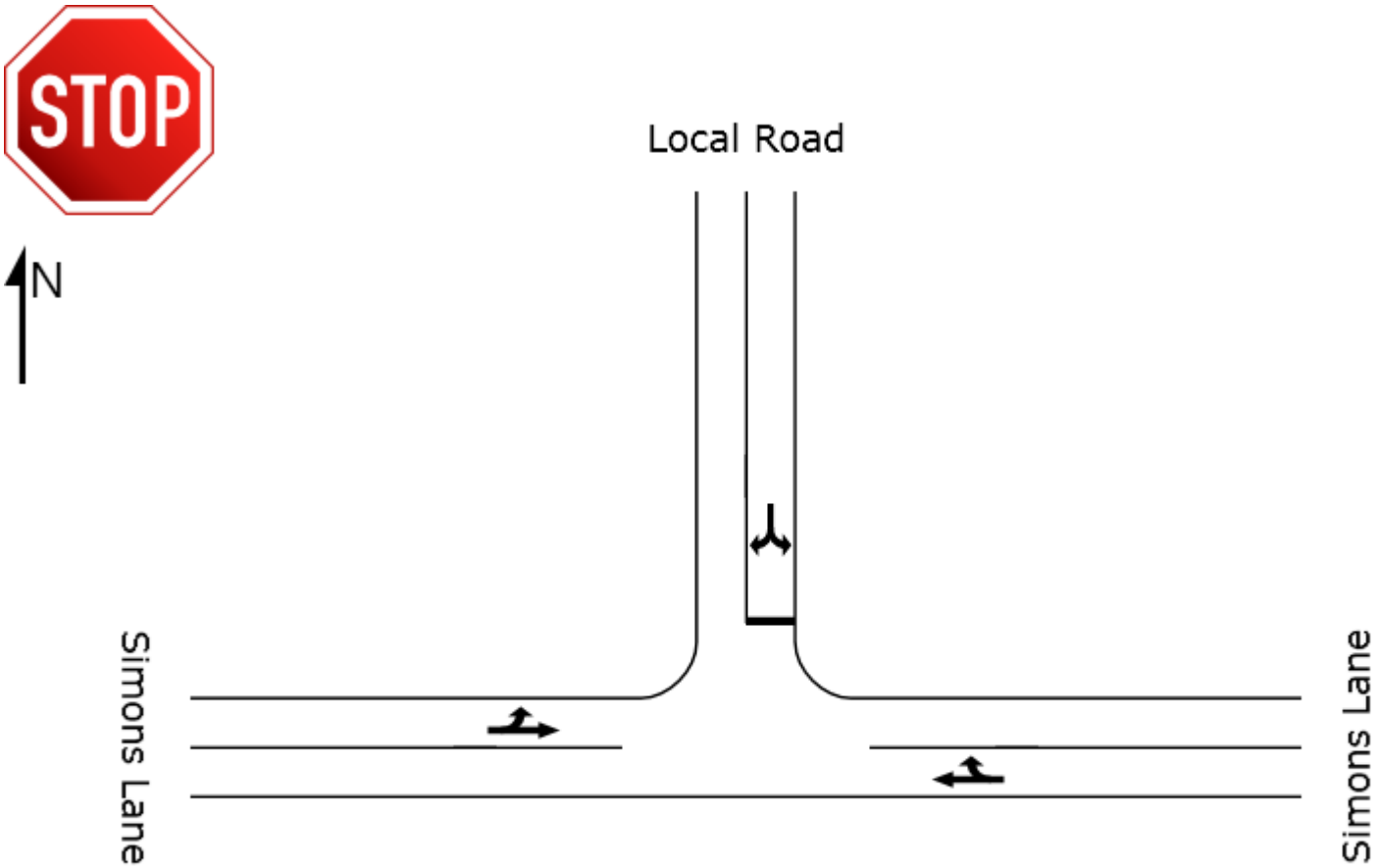
Site: J6 Option 1 Stop

Sth Leongatha, Option 1, Junction 6 PM Peak
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Simons Lane											
5	T	50	4.9	0.037	0.7	LOS A	0.3	1.9	0.31	0.00	69.0
6	R	13	1.6	0.037	10.9	LOS A	0.3	1.9	0.31	1.12	58.2
Approach		63	4.2	0.037	2.8	LOS A	0.3	1.9	0.31	0.23	66.8
North: Local Road											
7	L	12	1.8	0.019	12.9	LOS A	0.1	0.6	0.30	0.84	48.0
9	R	4	2.4	0.019	12.5	LOS A	0.1	0.6	0.30	0.90	48.4
Approach		16	2.0	0.019	12.8	LOS A	0.1	0.6	0.30	0.86	48.1
West: Simons Lane											
10	L	34	1.2	0.099	10.1	LOS A	0.0	0.0	0.00	1.32	57.1
11	T	153	4.8	0.099	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		187	4.1	0.099	1.8	LOS A	0.0	0.0	0.00	0.24	75.1
All Vehicles		265	4.0	0.099	2.7	NA	0.3	1.9	0.09	0.28	70.6

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Degree of Saturation.
Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.


STOP
N
Local Road
Simons Lane
Simons Lane

MOVEMENT SUMMARY

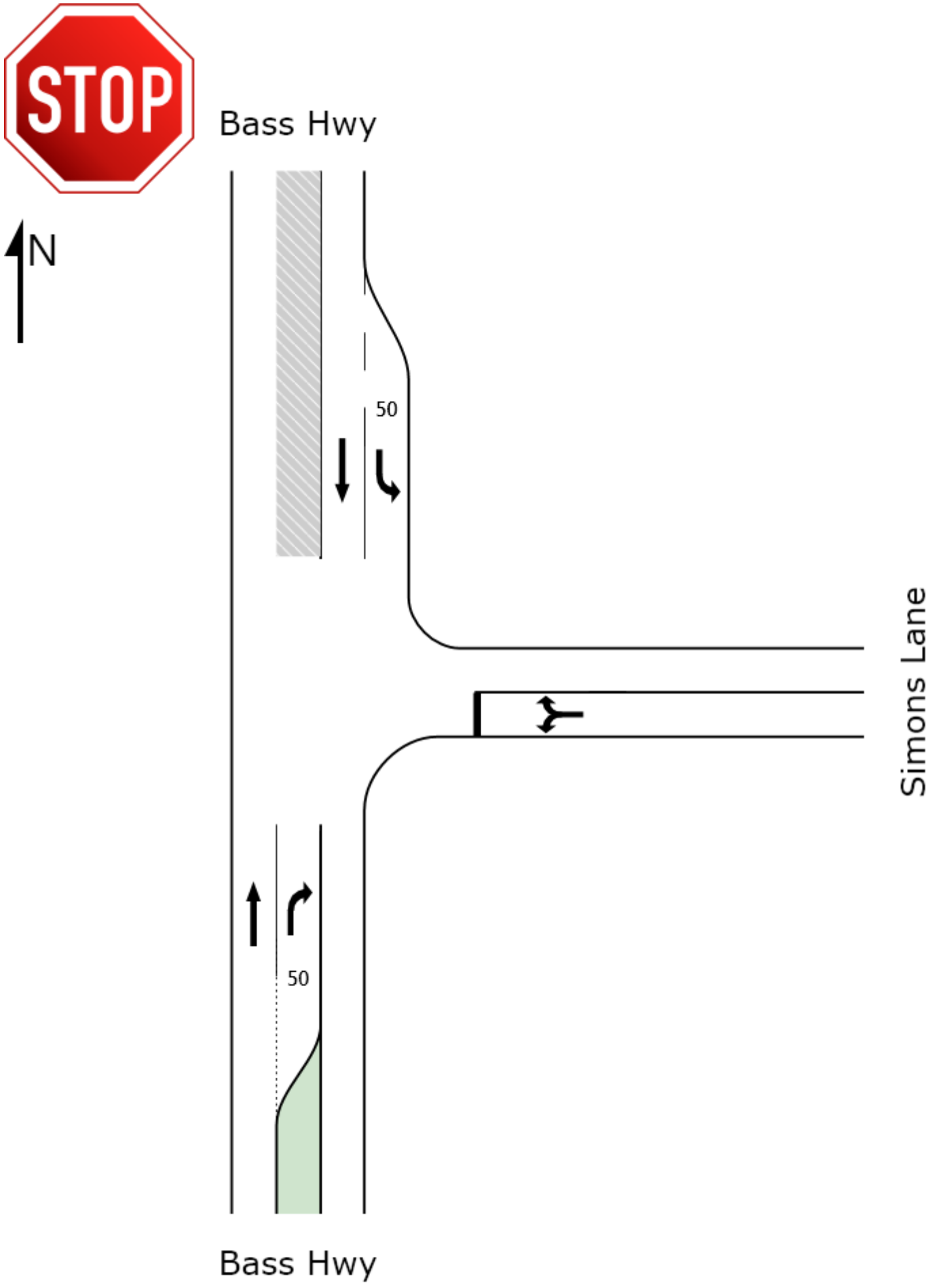
Site: J6 Option 2 Stop

Sth Leongatha, Option 2, Junction 6 PM Peak
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Simons Lane											
5	T	1	9.1	0.010	0.0	LOS A	0.0	0.3	0.01	0.00	79.2
6	R	13	1.6	0.010	10.2	LOS A	0.0	0.3	0.01	0.76	56.9
Approach		14	2.3	0.010	9.4	LOS A	0.0	0.3	0.01	0.70	58.4
North: Local Road											
7	L	12	1.8	0.010	11.7	LOS A	0.0	0.3	0.01	0.99	48.6
9	R	0	0.0	0.010	11.2	LOS A	0.0	0.3	0.01	1.03	49.0
Approach		12	1.8	0.010	11.7	LOS A	0.0	0.3	0.01	0.99	48.6
West: Simons Lane											
10	L	0	0.0	0.001	10.1	LOS A	0.0	0.0	0.00	1.51	57.1
11	T	1	9.1	0.001	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		1	8.3	0.001	0.8	LOS A	0.0	0.0	0.00	0.13	77.7
All Vehicles		27	2.3	0.010	10.0	NA	0.0	0.3	0.01	0.80	54.0

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Degree of Saturation.
Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.


STOP
Bass Hwy
N
50
Simons Lane
50
Bass Hwy

MOVEMENT SUMMARY

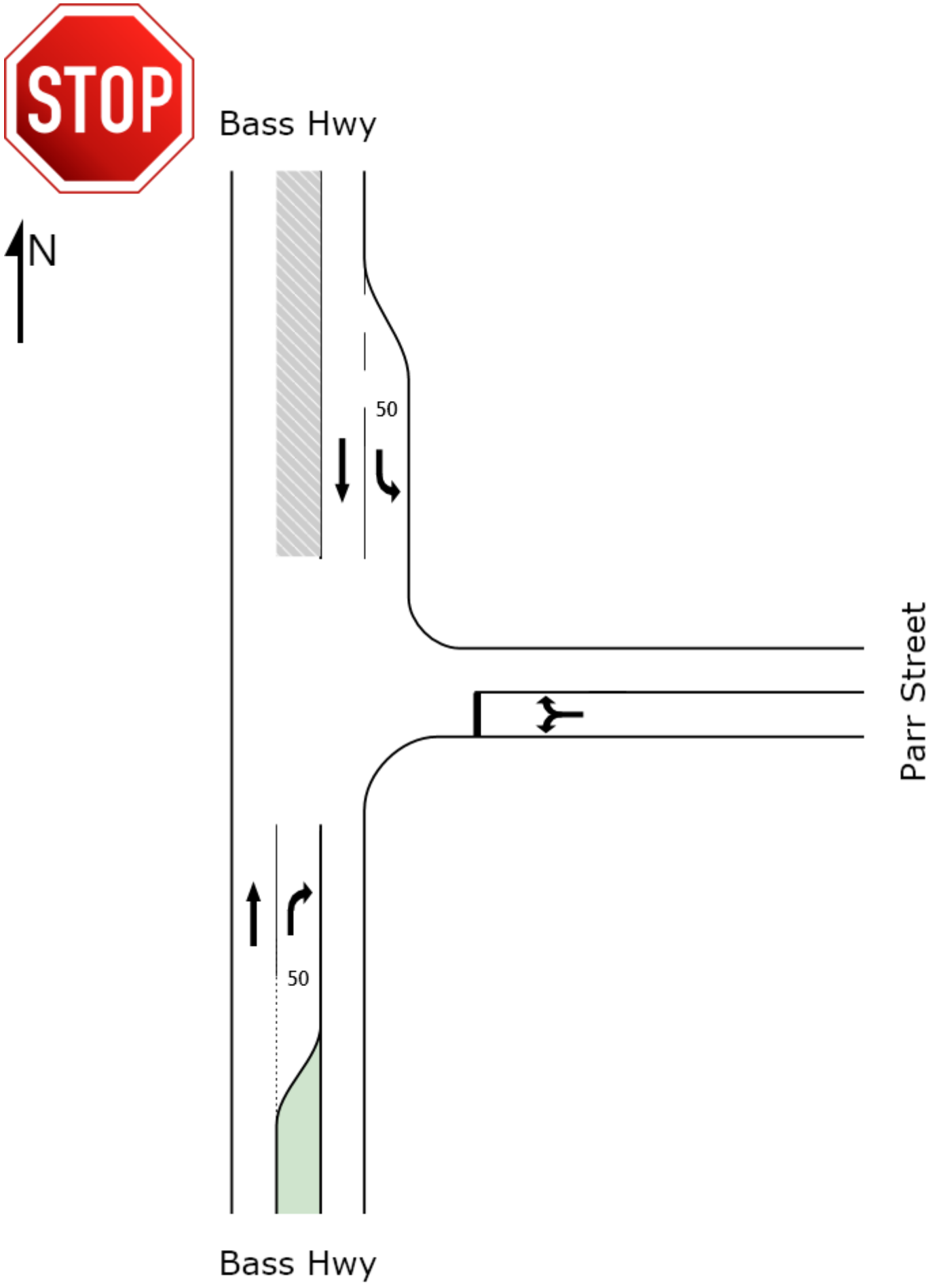
Site: J7 Option 1 Stop

Sth Leongatha, Option 1, Junction 7 (Simons Lane) PM Peak
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Bass Hwy											
2	T	251	4.7	0.133	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
3	R	85	1.0	0.087	12.0	LOS A	0.4	3.1	0.44	0.74	54.4
Approach		336	3.8	0.133	3.0	LOS A	0.4	3.1	0.11	0.19	72.3
East: Simons Lane											
4	L	26	1.2	0.116	17.9	LOS A	0.5	3.7	0.56	0.88	44.1
6	R	26	1.2	0.116	17.8	LOS A	0.5	3.7	0.56	1.00	44.2
Approach		51	1.2	0.116	17.9	LOS A	0.5	3.7	0.56	0.94	44.2
North: Bass Hwy											
7	L	96	1.0	0.052	10.1	LOS A	0.0	0.0	0.00	0.71	57.1
8	T	297	4.8	0.157	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		393	3.9	0.157	2.5	LOS A	0.0	0.0	0.00	0.17	73.5
All Vehicles		780	3.7	0.157	3.7	NA	0.5	3.7	0.08	0.23	69.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Degree of Saturation.
Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.


STOP
Bass Hwy
N
50
Parr Street
50
Bass Hwy

MOVEMENT SUMMARY

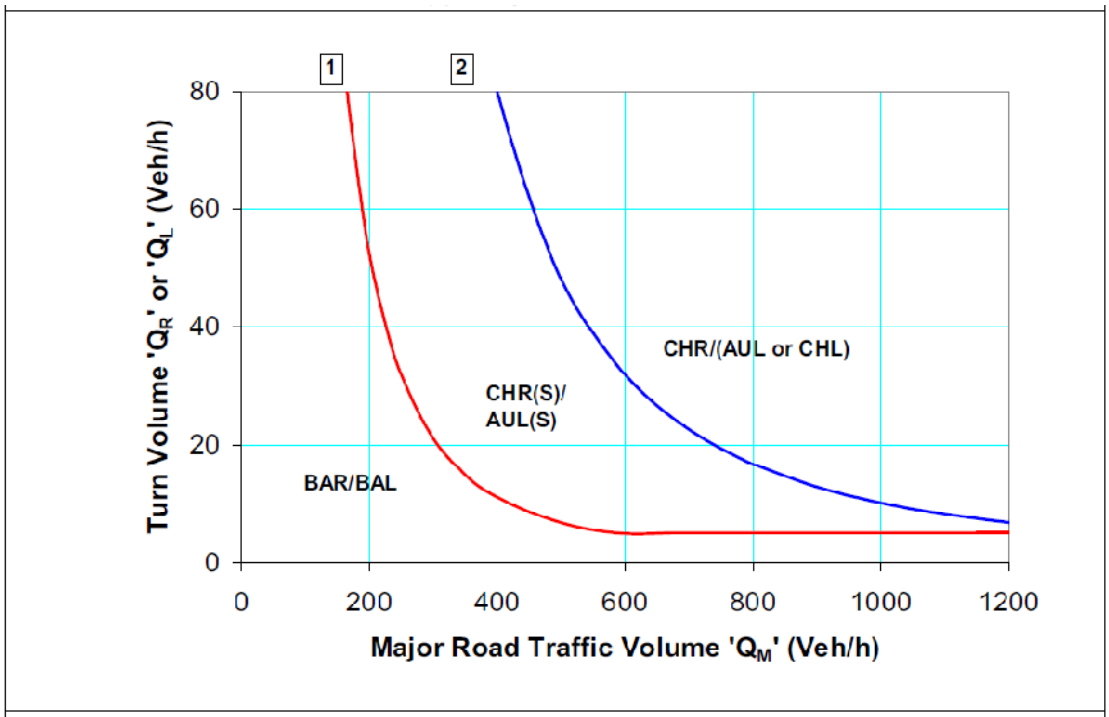
Site: J7 Option 2 Stop

Sth Leongatha, Option 2, Junction 7 (Parr Street) PM Peak
Stop (Two-Way)

Movement Performance - Vehicles

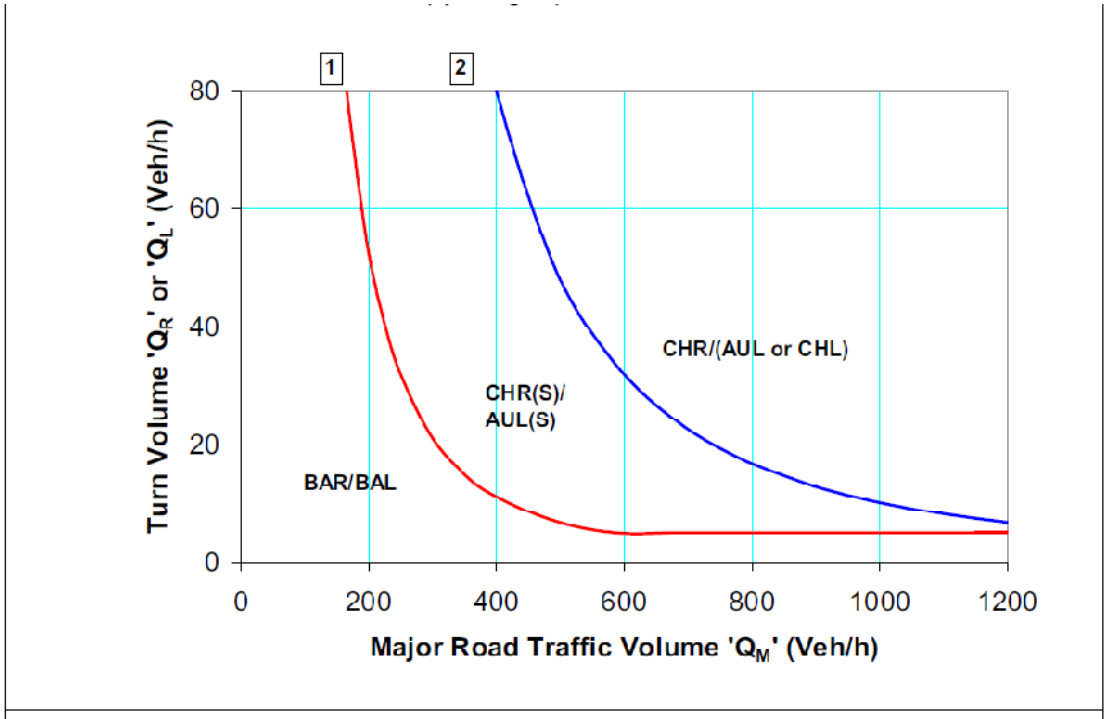
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Bass Hwy											
2	T	251	4.7	0.133	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
3	R	85	1.0	0.087	12.0	LOS A	0.4	3.1	0.44	0.74	54.4
Approach		336	3.8	0.133	3.0	LOS A	0.4	3.1	0.11	0.19	72.3
East: Parr Street											
4	L	26	1.2	0.116	17.9	LOS A	0.5	3.7	0.56	0.88	44.1
6	R	26	1.2	0.116	17.8	LOS A	0.5	3.7	0.56	1.00	44.2
Approach		51	1.2	0.116	17.9	LOS A	0.5	3.7	0.56	0.94	44.2
North: Bass Hwy											
7	L	96	1.0	0.052	10.1	LOS A	0.0	0.0	0.00	0.71	57.1
8	T	297	4.8	0.157	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		393	3.9	0.157	2.5	LOS A	0.0	0.0	0.00	0.17	73.5
All Vehicles		780	3.7	0.157	3.7	NA	0.5	3.7	0.08	0.23	69.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Degree of Saturation.
Approach LOS values are based on the worst degree of saturation (v/c ratio) for any vehicle movement.



(b) Design speed < 100 km/h

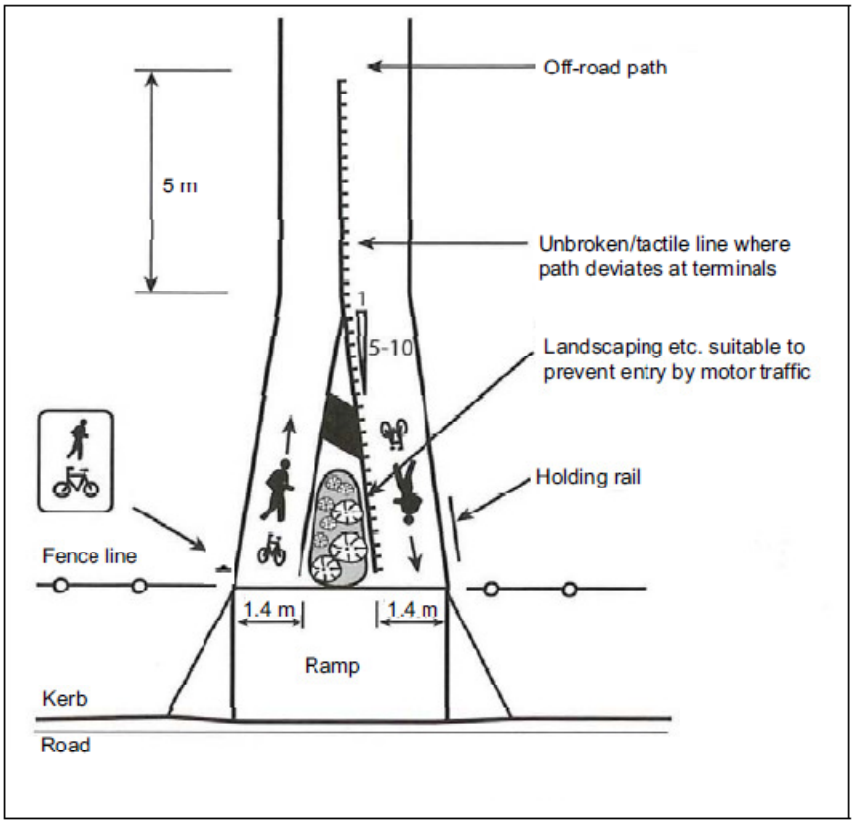
Source: Arndt and Troutbeck (2006).



(b) Design speed < 100 km/h

Source: Arndt and Troutbeck (2006).

APPENDIX F – ENTRY AND EXIT TERMINALS



Source: Based on VicRoads (2005).