TRAFFIC AND PARKING IMPACT ASSESSMENT

Proposed Mixed Use development

51 Drummond Street, Belmore

Prepared for: Wardell Building Pty Ltd

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1.INTRODUCTION

Motion Traffic Engineers was commissioned by Wardell Building Pty Ltd to undertake a traffic and parking impact assessment of a proposed mixed-use development at 51 Drummond Street in Belmore.

The site is currently a warehouse with frontages to Drummond Street and Drummond Lane.

This traffic report presents an assessment of the anticipated transport implications of the proposed mixed use development, with the following considerations:

- Background and existing traffic and parking conditions of the Proposed mixed use development site
- Assessment of the public transport network within the vicinity of the site
- Adequacy of car, bicycle and motorcycle parking provision
- The projected traffic generation of the proposed mixed use development and;
- The transport impact of the proposed mixed use development on the surrounding road network.

In the course of preparing this assessment, the mixed use site and its environs have been inspected, plans of the development are examined, all relevant traffic and parking data have been collected and analysed.

2. BACKGROUND AND EXISTING CONDITIONS OF THE PROPOSED SITE

2.1. Location and Land Use

The proposed mixed use site is located at 51 Drummond Street in Belmore.

The site is located South of Belmore Shopping Centre and within 800m from Belmore Train Station. The immediate surroundings of the site are a mix of residential dwellings to the north and businesses premises towards the south. The land zoning is *Local centre (B2) zone*.

Figures 1 and 2 show the location of the Proposed mixed use site from aerial and street map perspective respectively. Figure 2 also shows the location of the surveyed intersections in relation to the site.

Figure 3 shows a photography of the site frontage taken from Drummond Street.

Figure 1: Location of the Proposed mixed use mixed use site on Aerial

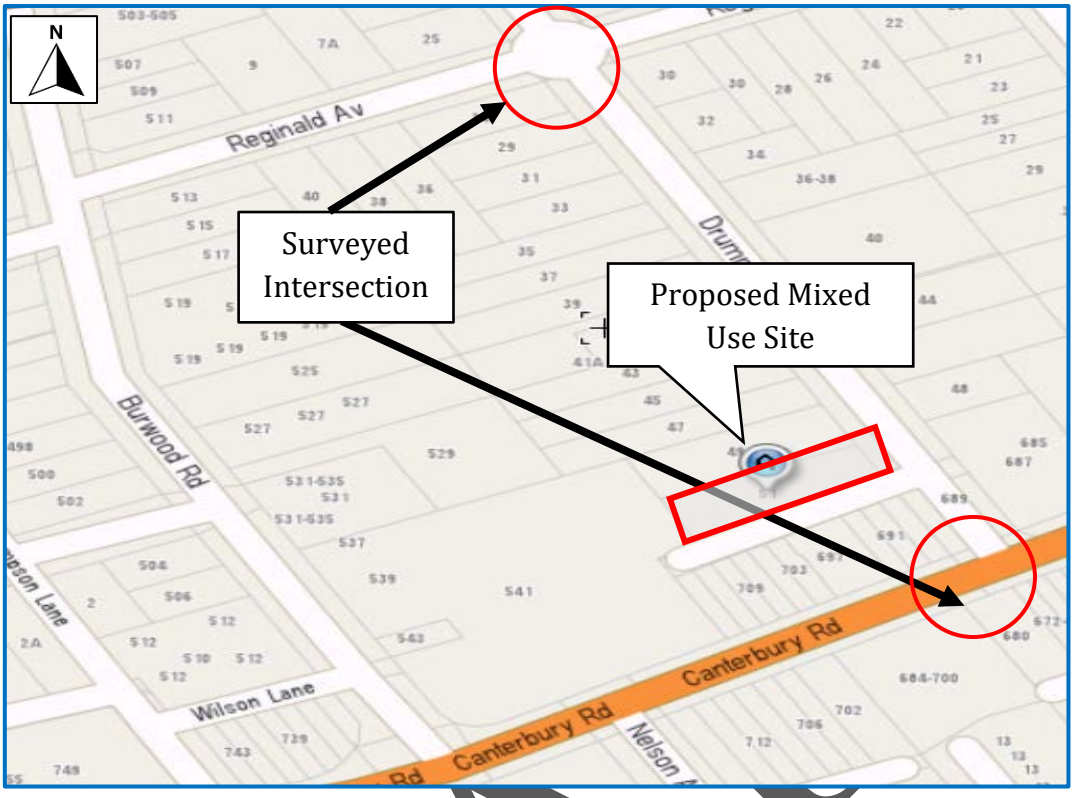

Figure 2: Location of the Proposed mixed use site on Aerial

Figure 3A: Photograph of the Site from Drummond Street

2.2. Road Network

This section discusses the road network adjacent to the site.

Canterbury Road is an arterial road with two lanes of traffic each way. The sign posted speed limit is 60km/hr. On-street parking is permitted along selective sections of Canterbury Road with clearways applying between 6am-10am and 3pm-7pm. A school zone speed limit of 40km/hr applies between 8am-9:30am and 2:30pm-4pm on school days. Figure 4a shows a photograph of Canterbury Road.

Drummond Street is a local road with one lane of traffic each way. The default speed limit is 50km/hr. Time Unrestricted parking is permitted on both sides of the road. Figure 4b shows a photograph of Drummond Street.

Reginald Avenue is a local road and has one lane of traffic each way. Reginald Avenue has a default speed limit of 50km/hr. Time unrestricted on-street parking is available on both sides of the road. Figure 4c shows a photograph of Reginald Avenue.

Drummond Lane is a service Lane with default speed limit of 40km/hr. Figure 4e shows a photograph of Drummond Lane

Figure 4a: Canterbury Road Looking West from Drummond Street

Figure 4b: Drummond Street Looking South from Drummond Lane

Figure 4c: Reginald Avenue Looking East from Drummond Street

Figure 4d: Burwood Road Looking North from Canterbury Road

Figure 4e: Drummond Lane Looking West from Drummond Street

2.3.Public Transport

Train Station

The proposed mixed use development is within 800 metres away from Belmore train station. People travelling to and from work and for social or recreational activities along a train line will find it convenient to walk to the train station.

Bus Service

Additionally, the site is within close proximity to bus stop on Canterbury Road, services by Bus route 415 and 487. Bus route 415 provides service to suburbs like Belfield, Burwood, Strathfield and Canterbury and train stations like Belmore station, Strathfield Station and Burwood Station. Bus route 487 provides access to suburbs such as Roselands, Punchbowl, Bankstown, Canterbury and Campsie and train stations like Canterbury station, Campsie Station and Bankstown Station. Figure 5 shows the proximity of the site to public transport services.

Overall, the site has good access to the local public transport network.

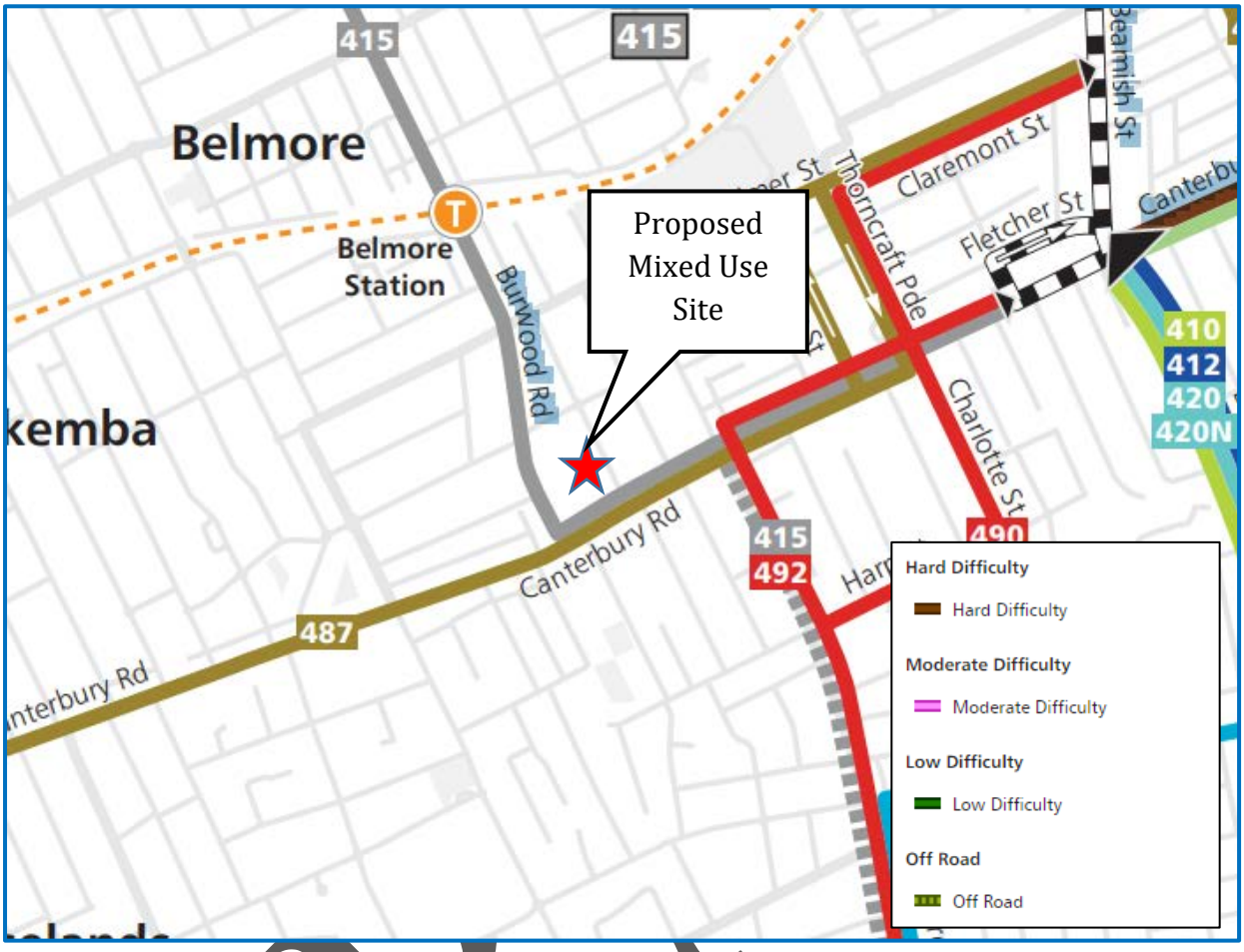

Figure 5: Location of the Proposed Mixed Use site in Relation to the Public Transport

2.4.Public Parking

The mixed use site is located south of Belmore Shopping Centre and is within approximately 800 metres of Belmore Train Station. On-street parking is available along Drummond Street, and Reginald Street, where parking is unrestricted on both sides of the road. Site investigations show that there are a reasonable number vacant car spaces along these streets.

These on-street parking spaces can be utilised by visitors should any additional visitor parking demand arises.

2.5. Intersection Description

As part of the traffic impact assessment, the performance of the nearby intersection was surveyed and assessed:

- Priority intersection of Canterbury Road with Drummond Street

- Roundabout intersection of Drummond Street with Reginald Avenue

External traffic travelling to and from the development is likely to travel through the intersection mentioned above.

The priority intersection of Canterbury Road with Drummond Street is a three-leg intersection with no right turn on Canterbury Road to Drummond Street. Drivers on Drummond Street are required to give way to vehicles on Canterbury Road. Figure 7a presents the layout of the intersection using SIDRA. Figure 7b presents an aerial view of this intersection. The number on the lane represents the length of a short lane in metres.

The roundabout intersection of Drummond Street with Reginald Avenue is a four-leg intersection with all turning movements permitted and drivers giving way appropriately. Figure 7c presents the layout of this intersection using SIDRA. Figure 7d presents an ariel view of this intersection. The number on the island is the diameter n metres.

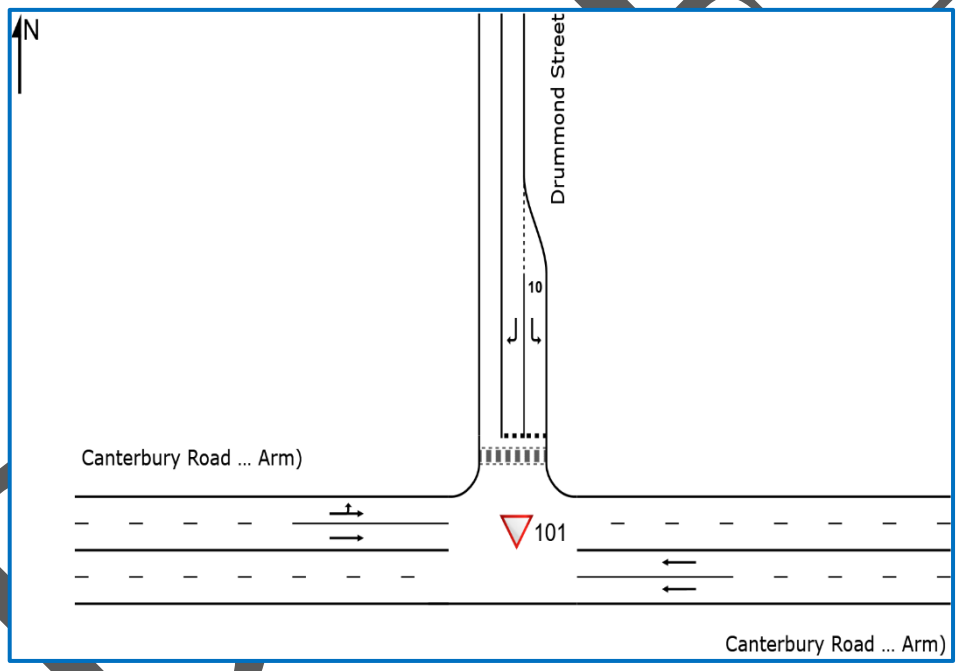

Figure 7a: Priority Intersection of Drummond Street with Canterbury Road (SIDRA)

Figure 7b: Priority Intersection of Drummond Street with Canterbury Road Aerial View

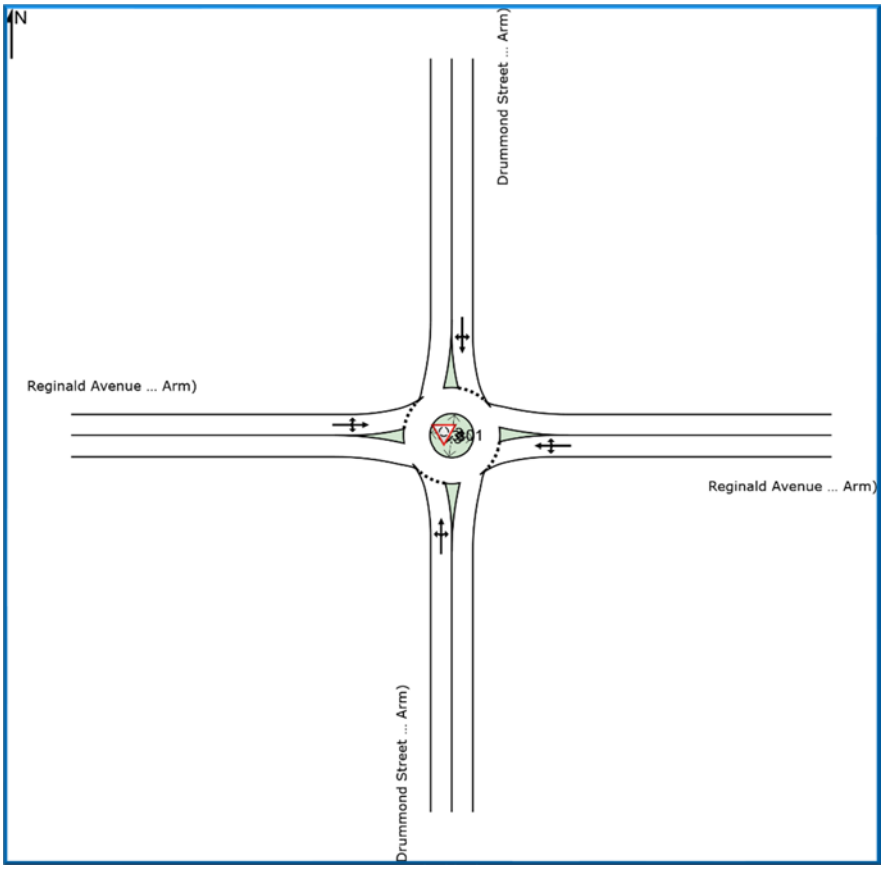

Figure 7c: Roundabout Intersection of Drummond Street with Reginald Avenue (SIDRA)

Figure 7d: Roundabout Intersection of Drummond Street with Reginald Avenue Ariel View

2.6. Existing Traffic Volumes

As part of the traffic assessment, traffic counts have been undertaken at the above-mentioned intersections and the AM and PM peak hours are identified accordingly. The AM peak hour is 8am to 9am and the PM peak hour is 5pm to 6pm..

The following figures present the traffic volumes in vehicles for the weekday peak hours.

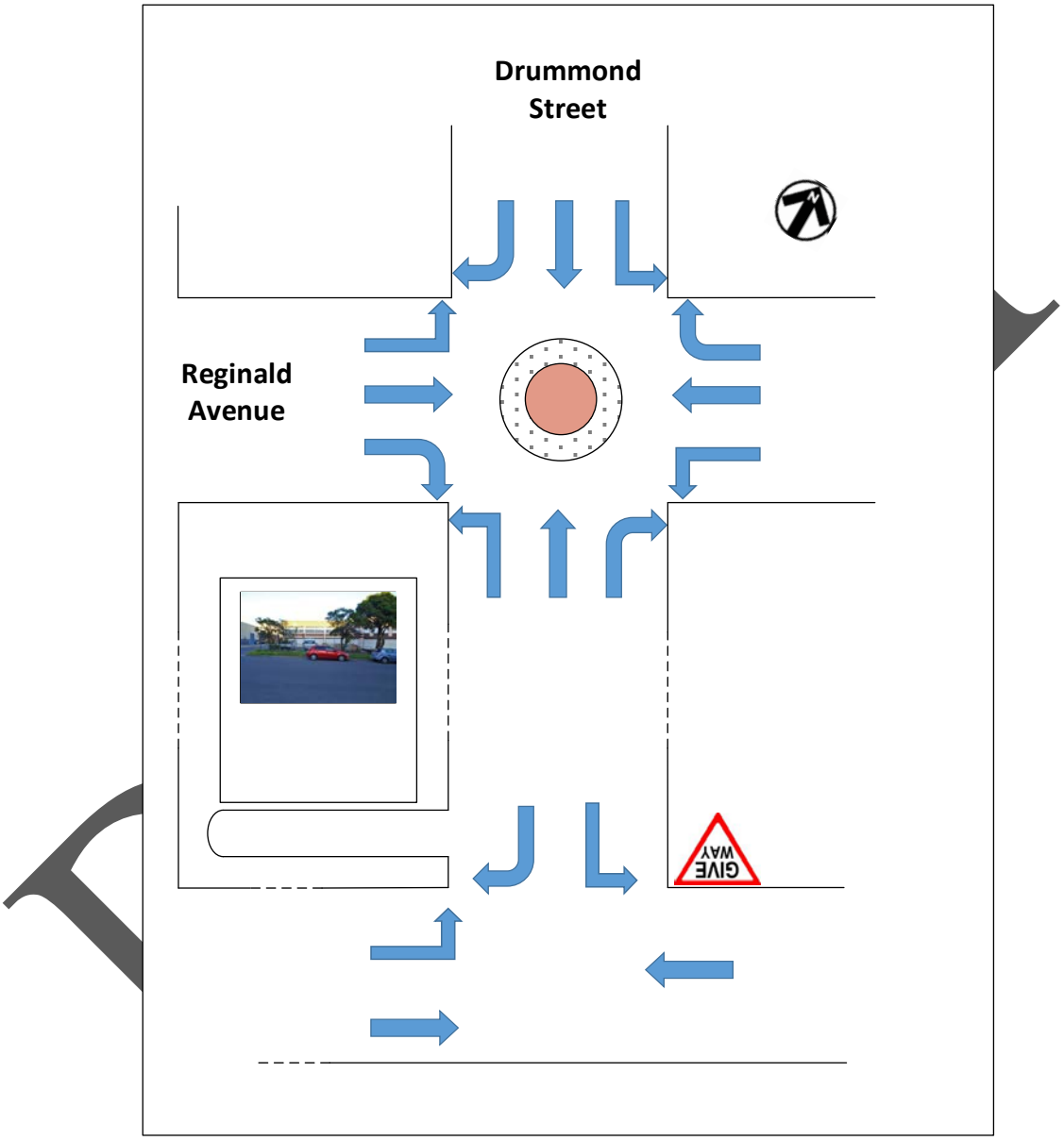

Figure 8a: Existing Weekday Traffic Volumes AM Peak Hour

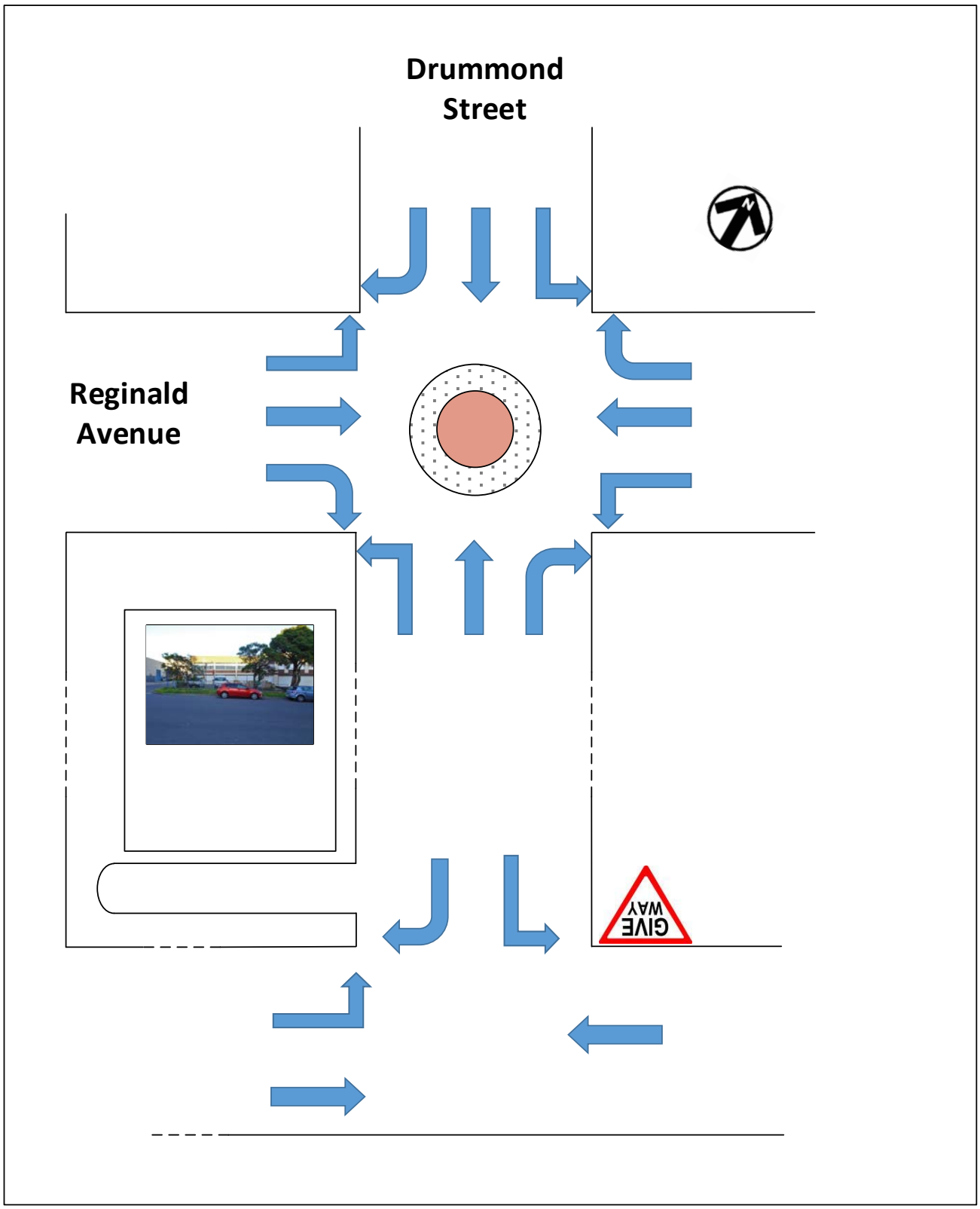

Figure 8b: Existing Weekday Traffic Volumes PM Peak Hour

2.7. Intersection Assessment with Existing Traffic

An intersection assessment has been undertaken for the:

- Priority intersection of Canterbury Road with Drummond Street
- Roundabout intersection of Drummond Street with Reginald Avenue

The existing intersection operating performance was assessed using the SIDRA software package (version 9) to determine the Degree of Saturation (DS), Average Delay (AVD in seconds) and Level of Service (LoS) at each intersection. The SIDRA program provides Level of Service Criteria Tables for various intersection types. The key indicator of intersection performance is Level of Service, where results are placed on a continuum from 'A' to 'F', as shown in Table 1.

LoS	Traffic Signal / Roundabout	Give Way / Stop Sign / T-Junction control
A	Good operation	Good operation
B	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	Satisfactory	Satisfactory, but accident study required
D	Operating near capacity	Near capacity & accident study required
E	At capacity, at signals incidents will cause excessive delays.	At capacity, requires other control mode
F	Unsatisfactory and requires additional capacity, Roundabouts require other control mode	At capacity, requires other control mode

Table 1: Intersection Level of Service

The Average Vehicle Delay (AVD) provides a measure of the operational performance of an intersection as indicated below, which relates AVD to LOS. The AVD's should be taken as a guide only as longer delays could be tolerated in some locations (i.e. inner city conditions) and on some roads (i.e. minor side street intersecting with a major arterial route). For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (sign control) the critical movement for level of service assessment should be that movement with the highest average delay.

LoS	Average Delay per Vehicles (seconds/vehicle)
A	Less than 14
B	15 to 28
C	29 to 42
D	43 to 56
E	57 to 70
F	>70

Table 2: Intersection Average Delay (AVD)

The degree of saturation (DS) is another measure of the operational performance of individual intersections. For intersections controlled by traffic signals both queue length and delay increase rapidly as DS approaches 1. It is usual to attempt to keep DS to less than 0.9. Degrees of Saturation in the order of 0.7 generally represent satisfactory intersection operation. When DS exceed 0.9 queues can be anticipated.

The results of the intersection analysis are as follows:

Intersection/ Performance criteria	AM Peak Hour Existing	PM Peak Hour Existing
Drummond Street/Canterbury Road		
LoS	A*	A*
AVD	1.5	0.6
DS	0.588	0.347
Drummond Street/Reginald Avenue		
LoS	A	A
AVD	4.7	4.6
DS	0.136	0.120

Table 3: Existing Intersection Performances

The right turn from Drummond Street has a LoS F. In practise the signalised of Canterbury Road with Burwood stops eastbound traffic on Canterbury road and provides better traffic gapes for a driver to turn right into Canterbury Road. As presented in Table 3, both intersections overall are currently operating at excellent condition with spare capacity to accommodate additional traffic both AM and PM peak hours.

The full intersection results are presented in Appendix A.

2.8.Conclusion of Existing conditions

The proposed mixed-use development is located in an area where there are a reasonable number of vacant car spaces on a weekday along Drummond Lane, Drummond Street and Reginald Avenue.

The nearby intersection performs well overall with sufficient spare capacity to accommodate additional traffic.

The site has good access to public transport.

3.PROPOSED MIXED USE DEVELOPMENT

A description of the development for which approval is now sought features the following elements:

- Demolition of existing building and structures
- Construction of new mixed use building

3.1. Mixed Use landuses

The proposed mixed use development consists of:

Ground Floor

- Commercial area of 200 m^2 GFA
- Two two-bedroom unit

First Floor

- One one-bedroom unit
- Four two-bedroom units
- One three-bedroom units

Second to Fourth Floor

- One one-bedroom units each
- Four two-bedroom units each
- One three-bedroom units each

3.2. Parking

Parking is provided on two basement levels. Access and egress to the ground level parking area are via a two-way driveway runs off Drummond Lane

- Twenty car spaces including five visitors parking and two accessible parking on basement one
- Twenty-two car spaces including one accessible parking space and a car wash bay is provided on basement two
- Four bicycle spaces each are provided on both basements

A full scaled plan of the proposed mixed-use development is provided as part of the Development Application.

4. PARKING REQUIREMENTS

4.1.Car Parking

The *Canterbury Development Control Plan 2012* (DCP) for Shop Top Housing (B2 Zones Large local centres) and for commercial

multi-dwelling residential building car parking rate for are as listed below:

- One space per 33 m^2 for Commercial areas
- 0.8 space per dwelling for one-bedroom units
- 1 space per dwelling for two-bedroom units
- 1 space per dwelling for three or more-bedroom units

Table 4a below presents the minimum car parking requirement for the proposed mixed use development based on the car parking rates listed above.

Land Use	Number of Rooms/GFA (m^2)	Car Parking Rate	Car Spaces Required	Car Spaces Provided
Commercial	200	1 space per 33 m2	6	37
1 Bed room	4	0.8 space per dwelling	3	
2 bedroom	18	1 space per dwelling	18	
3 bedroom	4	1 spaces per dwelling	4	
Visitor				5
Total			31	42

Table 4a: Summary of development control plan Car Parking Requirements

As presented in Table 4a above, the proposed mixed-use development complies with *Canterbury Development Control Plan 2012* and *SEPP 65*.

The residential apartments fall under SEPP 65 since the mixed-use site is located within 800 metres of Belmore Train Station. SEPP 65 states that the minimum car parking requirements for residential dwelling are set out by *RTA Guide to Traffic Generating Developments (2002)* or by the relevant council and lesser among the two is to be adopted. Parking calculation is carried out for the residential component using corresponding rates and the results are collated.

Hence, the car parking rates outlined by *RTA Guide to Traffic Generating Developments (2002)* for residential apartments and visitor car parking applies as follows:

- 0.9 car spaces per two-bedroom unit
- 1.4 car spaces per three-bedroom unit
- One visitor car space per five units

Table 4b below presents the minimum car parking requirement for the proposed mixed use development based on the car parking rates listed above.

Land Use	Number of Rooms/GFA (m^2)	Car Parking Rate	Car Spaces Required	Car Spaces Provided
Commercial	200	1 space per 33 m^2	6	36
1 Bed room	4	0.6 space per dwelling	2	
2 bedrooms	18	0.9 space per dwelling	16	
3 bedrooms	4	1.4 spaces per dwelling	6	
Visitor	26	1 space per 5 dwelling	5	5
Total			35	41

Table 4b: Summary of SEPP 65 Car Parking Requirements

As presented in Table 4b above, the proposed mixed-use development is providing a total number of 41 parking spaces versus 35 spaces as required by the SEPP 65. The proposed mixed-use development satisfies the statutory car parking requirements.

From Tables 4a and 4b, it can be observed that the car parking requirements set by the *RTA Guide to Traffic Generating Developments (2002* is lesser than the *Canterbury DCP 2012* car parking requirements. According to SEPP65, lesser of the car parking requirements is the be adopted for the car parking assessment. Hence, the car parking requirements set by the RTA guide is adopted for this study, Therefore, the provision of car parking spaces is considered adequate.

4.2. Bicycle Parking

The *Canterbury Development Control Plan 2012* stipulates minimum bicycle parking rates that are required to be adopted as follow:

- One bicycle parking space per five dwellings for residents
- One bicycle parking space per ten dwellings for visitors

Table 4b shows the minimum bicycle parking requirements for the development and the proposed parking provision in response.

Land Use	Number of dwellings	Parking Rate	Spaces Required	Spaces Provided
Residents	26	1 space per 5 dwellings	5	4
Visitor	26	1 space per 10 dwellings	2	4
Total			8	8

Table 4b: Summary of development control plan Bicycle Parking Requirements

As presented in table 4b above, the proposed mixed-use development complies with *Canterbury Development Control Plan*.

4.3. Motorcycle Parking

The *Canterbury Development Control Plan 2012* does not outline the requirements for motorcycle spaces hence no motorcycle spaces are provided. This is acceptable.

4.4. Car wash Bay

The *Canterbury Development Control Plan 2012* outlines the car wash bay requirements as follows:

- at least one car wash bay for any development which comprises of more than 10 dwellings.

Table 4c shows the minimum car wash bay requirements for the development and the proposed provision in response.

Land Use	Number of dwellings	Parking Rate	Spaces Required	Spaces Provided
Residents	26	1 space for development with more than 10 dwellings	1	0
Total			1	

Table 4c: Summary of development control plan Car wash bay Requirements

As presented in table 4c above, the car wash bay provision does not meet the requirements set by the *Canterbury Development Control Plan 2012*. Hence, this is acceptable.

4.5. Accessible parking

As *Canterbury Development Control Plan 2012*, one accessible parking space per required adaptable dwelling designed and constructed in accordance with AS2890.1. The provision satisfies the requirements set by the DCP. Therefore, this is acceptable.

5. TRAFFIC GENERATION AND IMPACT

5.1.Proposed Traffic Generation

The *NSW RTA Guide to Traffic Generating Developments* outlines the trip generation rates for a high-density residential dwellings and the commercial area as follows.

- Two trips per 100 m^2 per total area for commercial unit
- 0.5 trips per one bedroom for the weekday AM and PM peak Hour
- 0.65 trips per two- and three- bedroom apartments for the weekday AM and PM peak Hour

Application of the above-mentioned rates to the proposed mixed-use development results the peak hour trip generation presented in Table 5a below:

Peak Hour	Use	Number of Rooms/GFA	Trip Generation Rate	Trips Generated
AM	Commercial	200	2 per 100 m^2	4
PM				
AM	1 bedroom	4	0.5	2
PM				
AM	2-3 bedrooms	22	0.65	15
PM				
Total				21

Table 5a: trip generation by the proposed mixed-use development

5.2. Trip Distribution

The proposed mixed use development is a low trip generator in both AM and PM peak hours.

It is assumed that the residential trips are all outbound in the AM peak hour, and all inbound in the PM peak hour. The commercial trips are all inbound in the AM peak hour and all outbound in the PM peak hour.

Weekday Rates	Origin	Destination	Total
AM Peak Hour	17	4	21
PM Peak Hour	4	17	21

Table 5b: trip distribution

5.3. Existing with Mixed Use Traffic Volumes

The additional development trips are assigned onto the local traffic network. The following figures present the future traffic volume with the development trips (in red for origin trips and blue for destination trips) for the weekday AM and PM peak hours.

The additional development trips represent a small proportion of the existing traffic volumes.

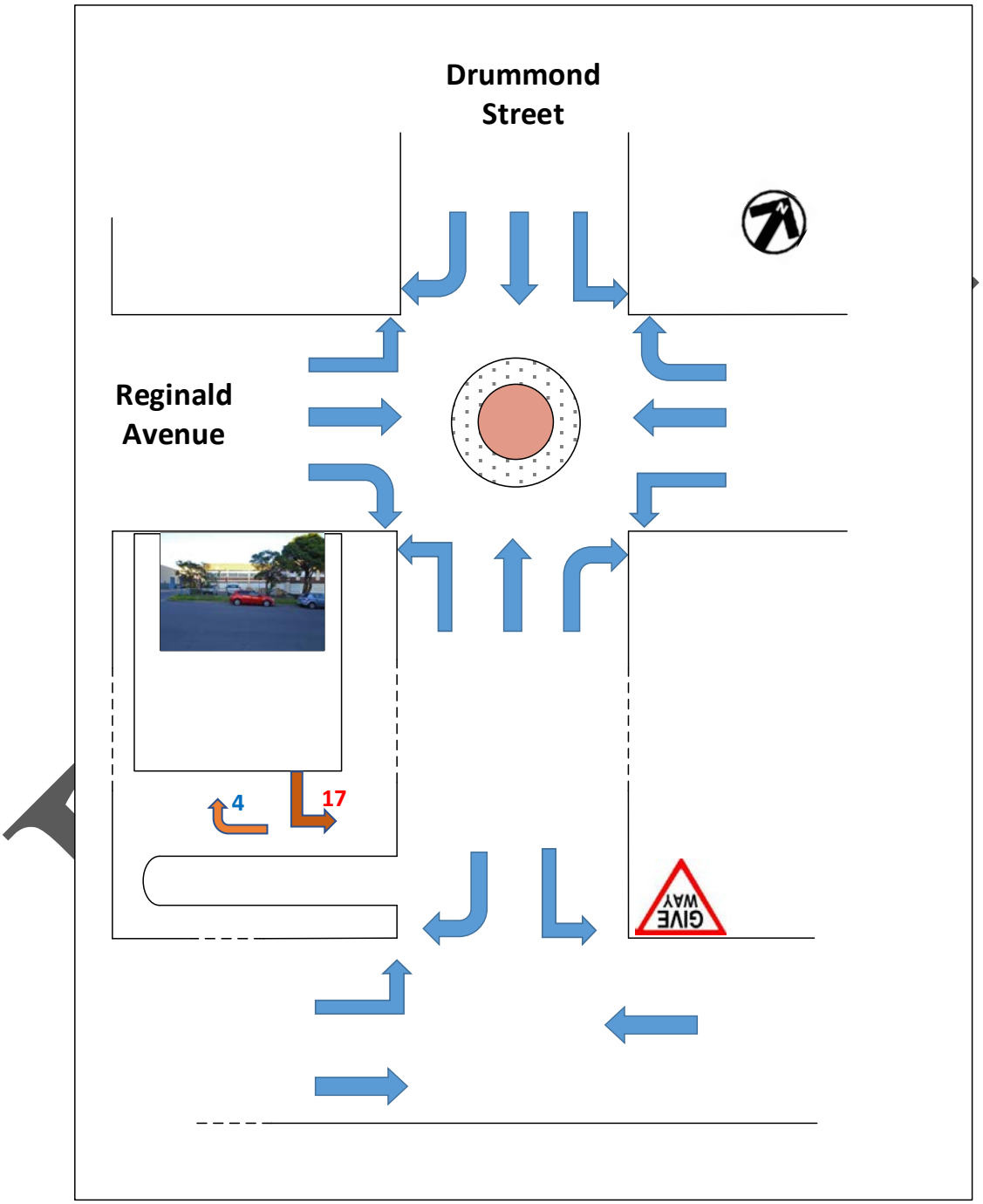

Figure 9a: Existing Weekday Traffic Volumes with mixed use traffic AM Peak Hour

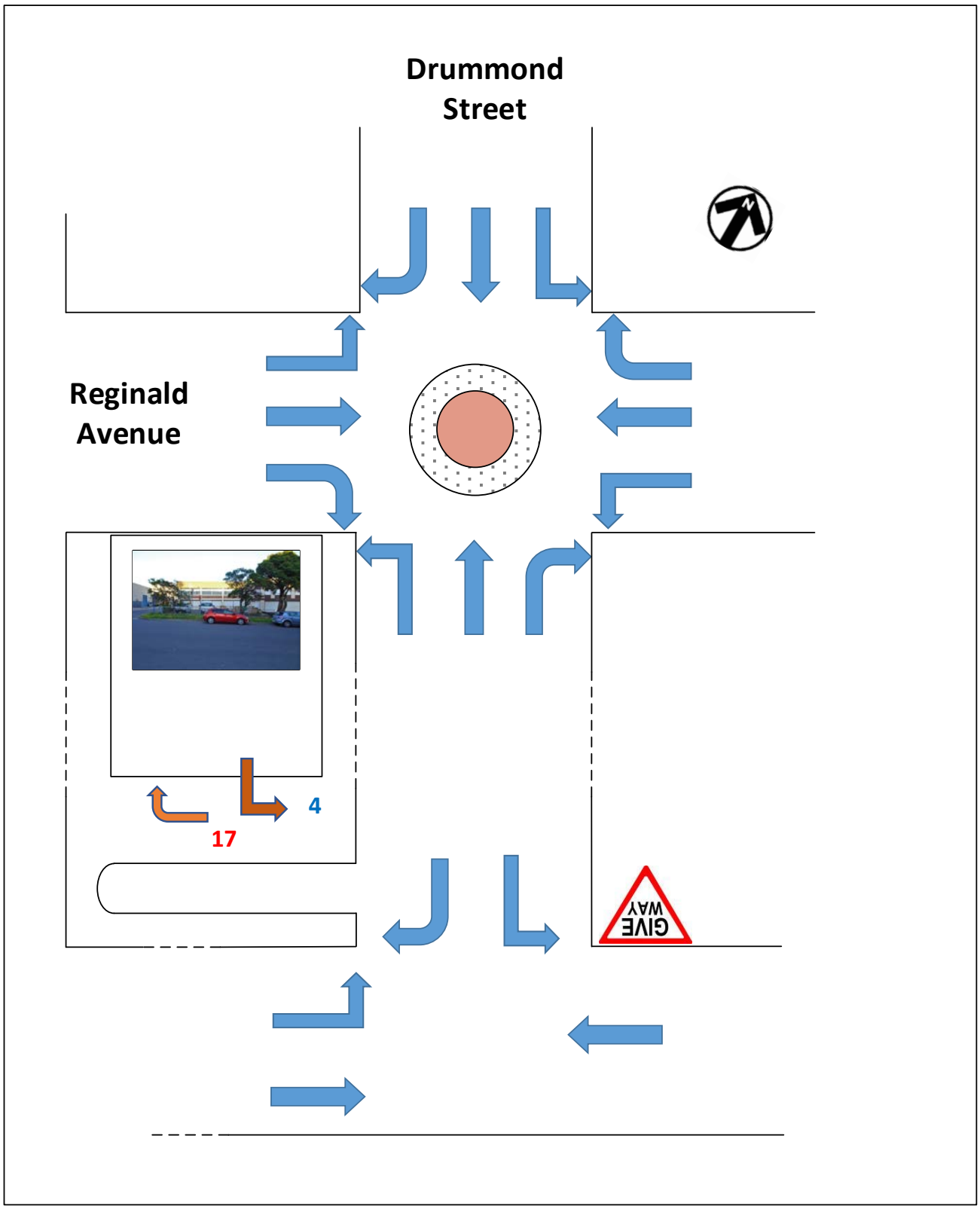

Figure 9b: Existing Weekday Traffic Volumes with mixed use traffic PM Peak Hour

5.4.Traffic Impact Assessment

This section assesses the following intersections for the existing traffic with the mixed use traffic. The results of the intersection assessment are as follows:

Intersection/ Performance criteria	Performance with Existing Traffic		Projected Performance with Existing and mixed use traffic	
	AM Peak Hour Existing	PM Peak Hour Existing	AM Peak Hour Projected	PM Peak Hour Projected
Drummond Street/Canterbury Road				
LoS	A*	A*	A*	A*
AVD	1.5	0.6	1.1	0.4
DS	0.588	0.347	0.482	0.347
Drummond Street/Reginald Avenue				
LoS	A	A	A	A
AVD	4.7	4.6	4.7	4.6
DS	0.136	0.120	0.138	0.122

Table 6: Projected intersection performance with mixed use traffic

The right turn from Drummond Street has a LoS F. In practise the signalised of Canterbury Road with Burwood stops eastbound traffic on Canterbury road and provides better traffic gapes for a driver to turn right into Canterbury Road.

As presented in Table 6 above, the additional trips generated by the proposed mixed-use development have minimum impact on the intersection performances in both AM and PM peak hours. The LoS, AVD and DS of each intersection are not significantly affected by the addition of mixed use traffic.

The traffic impacts of the proposed mixed use development are therefore considered acceptable.

The full SIDRA results are presented in Appendix B for the future conditions with the mixed use traffic.

6. CONCLUSIONS

This traffic impact assessment reports relates to a proposed mixed use development at 51 Drummond Street, Belmore. Based on the analysis and discussions presented in this report, the following conclusions are made:

- The mixed use site is located in a local centre zone with good access to local public transport service. Vacant on-street parking spaces can be located on the residential streets nearby.
- The surrounding intersections currently operates at good level of services.
- The proposed mixed-use development complies with the car parking requirements Council's Development Control Plan.
- The proposed mixed use development is expected to generate low number of additional trips in both AM and PM peak hours.
- According to the intersection assessment, the additional trips can be accommodated in the nearby intersections without significantly affecting the performance of any turn movement, approach arm or the overall intersection. The traffic impacts of the proposed mixed use development are therefore considered acceptable.

There are no traffic engineering reasons why a development consent for the proposed mixed use development at 51 Drummond Street, Belmore should be refused.

APPENDIX A

INTERSECTION ASSESSMENT FOR EXISTING TRAFFIC

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Canterbury Road (Eastern Arm)														
5	T1	1006	0.0	1006	0.0	0.258	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1006	0.0	1006	0.0	0.258	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
North: Drummond Street														
7	L2	25	0.0	25	0.0	0.040	8.4	LOS A	0.1	0.9	0.54	0.73	0.54	47.3
9	R2	20	0.0	20	0.0	0.370	74.3	LOS F	0.9	6.5	0.97	1.01	1.08	25.5
Approach		45	0.0	45	0.0	0.370	37.7	LOS C	0.9	6.5	0.73	0.85	0.78	34.3
West: Canterbury Road (Western Arm)														
10	L2	13	0.0	13	0.0	0.344	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	58.1
11	T1	1328	0.0	1328	0.0	0.344	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.7
Approach		1341	0.0	1341	0.0	0.344	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.7
All Vehicles		2392	0.0	2392	0.0	0.370	0.8	NA	0.9	6.5	0.01	0.02	0.01	59.0

Table A1: Weekday Priority Intersection Performance of Drummond Street with Canterbury Road for the AM Peak Hour

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Drummond Street (Southern Arm)														
1	L2	22	0.0	22	0.0	0.053	4.7	LOS A	0.3	1.8	0.30	0.51	0.30	45.8
2	T1	24	0.0	24	0.0	0.053	4.4	LOS A	0.3	1.8	0.30	0.51	0.30	46.4
3	R2	13	0.0	13	0.0	0.053	7.4	LOS A	0.3	1.8	0.30	0.51	0.30	46.2
Approach		59	0.0	59	0.0	0.053	5.2	LOS A	0.3	1.8	0.30	0.51	0.30	46.1
East: Reginald Avenue (Eastern Arm)														
4	L2	8	0.0	8	0.0	0.090	4.3	LOS A	0.5	3.2	0.22	0.44	0.22	46.2
5	T1	97	0.0	97	0.0	0.090	4.1	LOS A	0.5	3.2	0.22	0.44	0.22	46.9
6	R2	4	0.0	4	0.0	0.090	7.1	LOS A	0.5	3.2	0.22	0.44	0.22	46.7
Approach		109	0.0	109	0.0	0.090	4.2	LOS A	0.5	3.2	0.22	0.44	0.22	46.8
North: Drummond Street (Northern Arm)														
7	L2	4	0.0	4	0.0	0.051	4.9	LOS A	0.2	1.7	0.35	0.58	0.35	45.1
8	T1	17	0.0	17	0.0	0.051	4.7	LOS A	0.2	1.7	0.35	0.58	0.35	45.7
9	R2	34	0.0	34	0.0	0.051	7.6	LOS A	0.2	1.7	0.35	0.58	0.35	45.5
Approach		55	0.0	55	0.0	0.051	6.5	LOS A	0.2	1.7	0.35	0.58	0.35	45.6
West: Reginald Avenue (Western Arm)														
10	L2	8	0.0	8	0.0	0.136	4.2	LOS A	0.7	5.1	0.16	0.45	0.16	46.3
11	T1	152	0.0	152	0.0	0.136	3.9	LOS A	0.7	5.1	0.16	0.45	0.16	46.9
12	R2	21	0.0	21	0.0	0.136	6.9	LOS A	0.7	5.1	0.16	0.45	0.16	46.7
Approach		181	0.0	181	0.0	0.136	4.3	LOS A	0.7	5.1	0.16	0.45	0.16	46.9
All Vehicles		404	0.0	404	0.0	0.136	4.7	LOS A	0.7	5.1	0.22	0.48	0.22	46.6

Table A2: Weekday Roundabout Intersection Performance of Drummond Street with Reginald Avenue for the AM Peak Hour

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Canterbury Road (Eastern Arm)														
5	T1	1353	0.0	1353	0.0	0.347	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		1353	0.0	1353	0.0	0.347	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
North: Drummond Street														
7	L2	20	0.0	20	0.0	0.024	6.6	LOS A	0.1	0.6	0.44	0.61	0.44	48.5
9	R2	8	0.0	8	0.0	0.091	35.6	LOS C	0.2	1.4	0.91	0.96	0.91	34.9
Approach		28	0.0	28	0.0	0.091	14.9	LOS B	0.2	1.4	0.58	0.71	0.58	43.6
West: Canterbury Road (Western Arm)														
10	L2	33	0.0	33	0.0	0.244	5.6	LOS A	0.0	0.0	0.00	0.04	0.00	57.9
11	T1	916	0.0	916	0.0	0.244	0.1	LOS A	0.0	0.0	0.00	0.02	0.00	59.7
Approach		949	0.0	949	0.0	0.244	0.3	NA	0.0	0.0	0.00	0.02	0.00	59.6
All Vehicles		2330	0.0	2330	0.0	0.347	0.3	NA	0.2	1.4	0.01	0.02	0.01	59.5

Table A3: Weekday Priority Intersection Performance of Drummond Street with Canterbury Road for the PM Peak Hour

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Drummond Street (Southern Arm)														
1	L2	12	0.0	12	0.0	0.032	4.9	LOS A	0.1	1.0	0.34	0.51	0.34	45.7
2	T1	16	0.0	16	0.0	0.032	4.6	LOS A	0.1	1.0	0.34	0.51	0.34	46.4
3	R2	6	0.0	6	0.0	0.032	7.6	LOS A	0.1	1.0	0.34	0.51	0.34	46.2
Approach		34	0.0	34	0.0	0.032	5.2	LOS A	0.1	1.0	0.34	0.51	0.34	46.1
East: Reginald Avenue (Eastern Arm)														
4	L2	8	0.0	8	0.0	0.120	4.3	LOS A	0.6	4.3	0.20	0.44	0.20	46.3
5	T1	137	0.0	137	0.0	0.120	4.0	LOS A	0.6	4.3	0.20	0.44	0.20	46.9
6	R2	7	0.0	7	0.0	0.120	7.0	LOS A	0.6	4.3	0.20	0.44	0.20	46.7
Approach		152	0.0	152	0.0	0.120	4.2	LOS A	0.6	4.3	0.20	0.44	0.20	46.9
North: Drummond Street (Northern Arm)														
7	L2	6	0.0	6	0.0	0.045	4.5	LOS A	0.2	1.5	0.25	0.56	0.25	45.3
8	T1	12	0.0	12	0.0	0.045	4.2	LOS A	0.2	1.5	0.25	0.56	0.25	45.9
9	R2	34	0.0	34	0.0	0.045	7.2	LOS A	0.2	1.5	0.25	0.56	0.25	45.7
Approach		52	0.0	52	0.0	0.045	6.2	LOS A	0.2	1.5	0.25	0.56	0.25	45.7
West: Reginald Avenue (Western Arm)														
10	L2	9	0.0	9	0.0	0.080	4.1	LOS A	0.4	2.8	0.13	0.46	0.13	46.3
11	T1	83	0.0	83	0.0	0.080	3.9	LOS A	0.4	2.8	0.13	0.46	0.13	47.0
12	R2	14	0.0	14	0.0	0.080	6.8	LOS A	0.4	2.8	0.13	0.46	0.13	46.8
Approach		106	0.0	106	0.0	0.080	4.3	LOS A	0.4	2.8	0.13	0.46	0.13	46.9
All Vehicles		344	0.0	344	0.0	0.120	4.6	LOS A	0.6	4.3	0.20	0.47	0.20	46.6

Table A4: Weekday Roundabout Intersection Performance of Drummond Street with Reginald Avenue for the PM Peak Hour

APPENDIX B

INTERSECTION ASSESSMENT FOR FUTURE CONDITION WITH MIXED USE TRAFFIC

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Canterbury Road (Eastern Arm)														
5	T1	1006	0.0	1006	0.0	0.258	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1006	0.0	1006	0.0	0.258	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
North: Drummond Street														
7	L2	32	0.0	32	0.0	0.051	8.4	LOS A	0.2	1.2	0.54	0.74	0.54	47.3
9	R2	27	0.0	27	0.0	0.502	84.2	LOS F	1.3	9.1	0.97	1.03	1.16	23.8
Approach		59	0.0	59	0.0	0.502	43.1	LOS D	1.3	9.1	0.74	0.87	0.83	32.6
West: Canterbury Road (Western Arm)														
10	L2	17	0.0	17	0.0	0.345	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	58.1
11	T1	1328	0.0	1328	0.0	0.345	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.7
Approach		1345	0.0	1345	0.0	0.345	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.7
All Vehicles		2410	0.0	2410	0.0	0.502	1.2	NA	1.3	9.1	0.02	0.03	0.02	58.6

Table B1: Weekday Priority Intersection Performance of Drummond Street with Canterbury Road for the AM Peak Hour with mixed use traffic

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Drummond Street (Southern Arm)														
1	L2	22	0.0	22	0.0	0.055	4.7	LOS A	0.3	1.9	0.30	0.51	0.30	45.8
2	T1	27	0.0	27	0.0	0.055	4.4	LOS A	0.3	1.9	0.30	0.51	0.30	46.4
3	R2	13	0.0	13	0.0	0.055	7.4	LOS A	0.3	1.9	0.30	0.51	0.30	46.2
Approach		62	0.0	62	0.0	0.055	5.1	LOS A	0.3	1.9	0.30	0.51	0.30	46.2
East: Reginald Avenue (Eastern Arm)														
4	L2	8	0.0	8	0.0	0.090	4.3	LOS A	0.5	3.2	0.22	0.44	0.22	46.2
5	T1	97	0.0	97	0.0	0.090	4.1	LOS A	0.5	3.2	0.22	0.44	0.22	46.9
6	R2	4	0.0	4	0.0	0.090	7.1	LOS A	0.5	3.2	0.22	0.44	0.22	46.7
Approach		109	0.0	109	0.0	0.090	4.2	LOS A	0.5	3.2	0.22	0.44	0.22	46.8
North: Drummond Street (Northern Arm)														
7	L2	4	0.0	4	0.0	0.051	4.9	LOS A	0.2	1.7	0.35	0.58	0.35	45.1
8	T1	17	0.0	17	0.0	0.051	4.7	LOS A	0.2	1.7	0.35	0.58	0.35	45.7
9	R2	34	0.0	34	0.0	0.051	7.6	LOS A	0.2	1.7	0.35	0.58	0.35	45.5
Approach		55	0.0	55	0.0	0.051	6.5	LOS A	0.2	1.7	0.35	0.58	0.35	45.6
West: Reginald Avenue (Western Arm)														
10	L2	8	0.0	8	0.0	0.137	4.2	LOS A	0.7	5.1	0.17	0.45	0.17	46.2
11	T1	152	0.0	152	0.0	0.137	3.9	LOS A	0.7	5.1	0.17	0.45	0.17	46.9
12	R2	21	0.0	21	0.0	0.137	6.9	LOS A	0.7	5.1	0.17	0.45	0.17	46.7
Approach		181	0.0	181	0.0	0.137	4.3	LOS A	0.7	5.1	0.17	0.45	0.17	46.8
All Vehicles		407	0.0	407	0.0	0.137	4.7	LOS A	0.7	5.1	0.23	0.48	0.23	46.6

Table B2: Weekday Roundabout Intersection Performance of Drummond Street with Reginald Avenue for the AM Peak Hour with mixed use traffic

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Canterbury Road (Eastern Arm)														
5	T1	1353	0.0	1353	0.0	0.347	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		1353	0.0	1353	0.0	0.347	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
North: Drummond Street														
7	L2	20	0.0	20	0.0	0.024	6.6	LOS A	0.1	0.6	0.44	0.61	0.44	48.5
9	R2	8	0.0	8	0.0	0.091	35.8	LOS C	0.2	1.4	0.92	0.96	0.92	34.8
Approach		28	0.0	28	0.0	0.091	14.9	LOS B	0.2	1.4	0.57	0.71	0.57	43.6
West: Canterbury Road (Western Arm)														
10	L2	43	0.0	43	0.0	0.246	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	57.8
11	T1	916	0.0	916	0.0	0.246	0.1	LOS A	0.0	0.0	0.00	0.03	0.00	59.6
Approach		959	0.0	959	0.0	0.246	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.6
All Vehicles		2340	0.0	2340	0.0	0.347	0.4	NA	0.2	1.4	0.01	0.02	0.01	59.4

Table B3: Weekday Priority Intersection Performance of Drummond Street with Canterbury Road for the PM Peak Hour with mixed use traffic

Vehicle Movement Performance															
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Drummond Street (Southern Arm)														
1	L2	12	0.0	12	0.0	0.031	4.9	LOS A	0.1	1.0	0.34	0.51	0.34	45.7
2	T1	16	0.0	16	0.0	0.031	4.6	LOS A	0.1	1.0	0.34	0.51	0.34	46.4
3	R2	6	0.0	6	0.0	0.031	7.6	LOS A	0.1	1.0	0.34	0.51	0.34	46.2
Approach		34	0.0	34	0.0	0.031	5.2	LOS A	0.1	1.0	0.34	0.51	0.34	46.1
East: Reginald Avenue (Eastern Arm)														
4	L2	8	0.0	8	0.0	0.122	4.3	LOS A	0.6	4.4	0.21	0.45	0.21	46.2
5	T1	137	0.0	137	0.0	0.122	4.1	LOS A	0.6	4.4	0.21	0.45	0.21	46.9
6	R2	7	0.0	7	0.0	0.122	7.0	LOS A	0.6	4.4	0.21	0.45	0.21	46.7
Approach		152	0.0	152	0.0	0.122	4.2	LOS A	0.6	4.4	0.21	0.45	0.21	46.8
North: Drummond Street (Northern Arm)														
7	L2	6	0.0	6	0.0	0.051	4.5	LOS A	0.2	1.7	0.25	0.55	0.25	45.4
8	T1	19	0.0	19	0.0	0.051	4.2	LOS A	0.2	1.7	0.25	0.55	0.25	46.0
9	R2	34	0.0	34	0.0	0.051	7.2	LOS A	0.2	1.7	0.25	0.55	0.25	45.8
Approach		59	0.0	59	0.0	0.051	6.0	LOS A	0.2	1.7	0.25	0.55	0.25	45.8
West: Reginald Avenue (Western Arm)														
10	L2	9	0.0	9	0.0	0.079	4.1	LOS A	0.4	2.8	0.13	0.46	0.13	46.3
11	T1	83	0.0	83	0.0	0.079	3.9	LOS A	0.4	2.8	0.13	0.46	0.13	47.0
12	R2	14	0.0	14	0.0	0.079	6.8	LOS A	0.4	2.8	0.13	0.46	0.13	46.8
Approach		106	0.0	106	0.0	0.079	4.3	LOS A	0.4	2.8	0.13	0.46	0.13	46.9
All Vehicles		351	0.0	351	0.0	0.122	4.6	LOS A	0.6	4.4	0.21	0.47	0.21	46.6

Table B4: Weekday Roundabout Intersection Performance of Drummond Street with Reginald Avenue for the PM Peak Hour with mixed use traffic