transport planning
traffic engineering
modelling

Woolstores Place, Mount Elphinstone - LSP

Transport Impact Assessment

PREPARED FOR:
Mainbeam Holdings Pty Ltd

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Author: Robin White

Project manager: Behnam Bordbar

Client: Mainbeam Holdings Pty Ltd

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1 Introduction

This Transport Impact Assessment has been prepared by Transcore on behalf of Mainbeam Holdings Pty Ltd with regard to a proposed Local Structure Plan at Woolstores Place, Mount Elphinstone in the City of Albany.

The subject site is located on the southwest side of the railway line and Princess Royal Drive and southeast of Frenchman Bay Road in Albany, as shown in **Figure 1.**

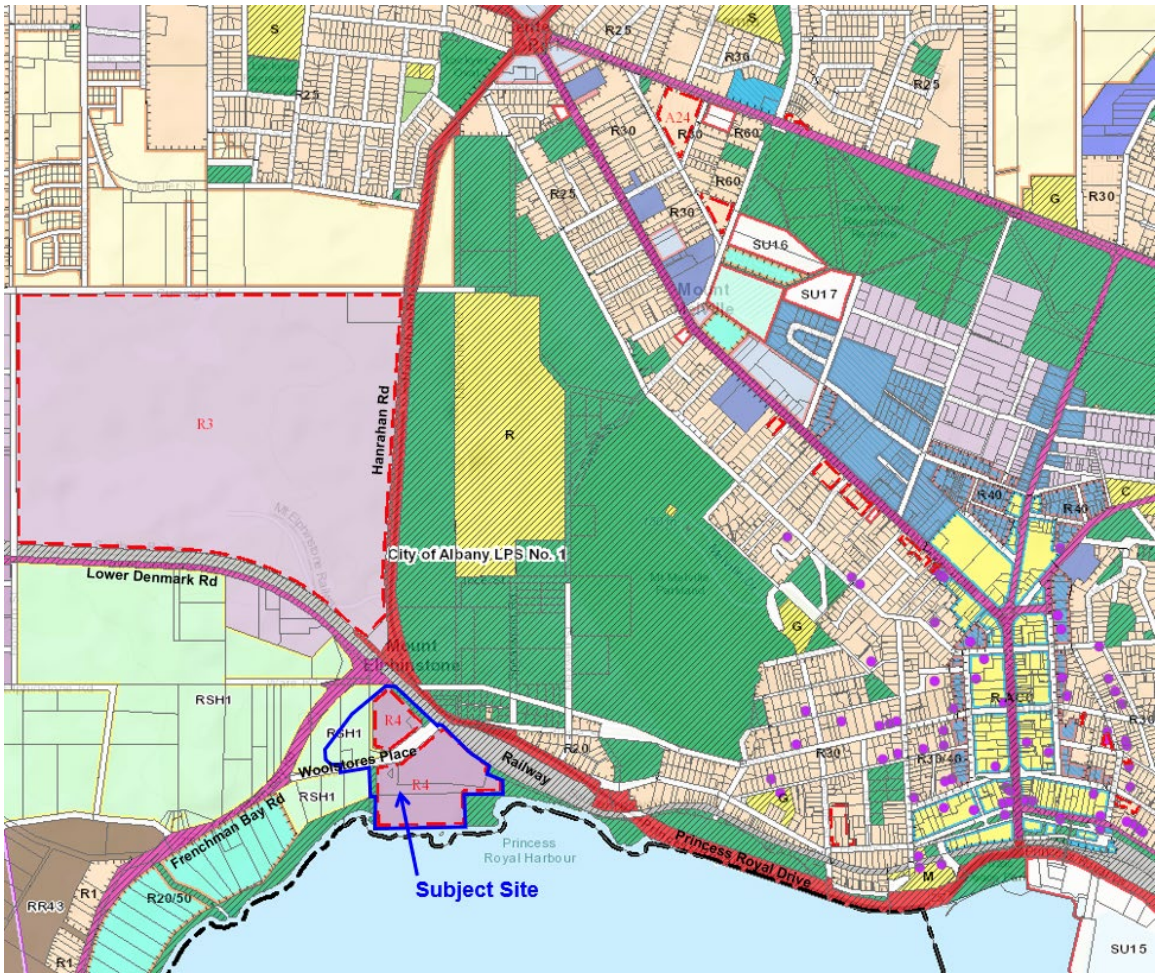

Figure 1: Site location

2 Proposed Local Structure Plan

The proposed Local Structure Plan (LSP) concept plan for this site is included at **Appendix A**.

Current planning by Main Roads WA for the Albany Ring Road includes construction of a grade separated crossing of Frenchman Bay Road over the railway line adjacent to Princess Royal Drive. That planning also includes construction of a new 4-way roundabout to replace the existing Frenchman Bay Rd / Woolstores Place T-intersection. This new roundabout will provide the primary access point for all traffic to and from this LSP area.

It is proposed that an emergency access route from Lower Denmark Road (capable of accommodating a fire appliance) would also be provided on the western side of the railway line. This would either be within the railway reserve and under the planned Frenchman Bay Road bridge.

The proposed LSP identifies nine development sites that are created by the proposed internal road network. Development sites 1 and 2 north of Woolstores Place are intended for commercial / retail development, whereas development sites 3 to 9 south of Woolstores Place are intended for a mix of land uses, primarily short stay / hotel accommodation and residential. Proposed land uses are summarised in **Table 1**.

The proposed land uses include:

- approximately14,000-20,000m^2 GFA of commercial / retail floor space (the majority is likely to be showroom/warehouse development),
- 1100m^2 food and beverage outlets,
- a 240-room hotel,
- short-stay accommodation (80 rooms), and
- approximately 255 to 375 dwelling units (houses, terraces and apartments).

Table 1: Proposed Land Uses

LOT	Land use	Quantity	Units
1	**Commercial / retail**	5000-7000	m^2 GFA
2	**Commercial / retail**	9000-13000	m^2 GFA
3	**Residential (R30-R40)**	15-20	Terraces
4	**Residential (R30-R40)**	10-15	Terraces
	Residential (R50-R160)	40	Apartments
5	**Residential (R30-R40)**	15-25	Terraces
	Residential (R50-R160)	40	Apartments
6	**Residential (R30-R40)**	15-25	Terraces
	Residential (R50-R160)	40-70	Apartments
	Ground Floor food & bev	1100	m^2 GFA
	Short stay accommodation	80	Rooms
7	**Residential (R50-R160)**	40-70	Apartments
8	**Residential (R50-R160)**	40-70	Apartments
9	**Hotel**	240	Rooms

3 Existing Situation

3.1 Existing Land Use

The south-eastern portion of the subject site, south of Woolstores Place, was occupied by the former woolstores industrial land use but is currently in the process of demolition.

The land north of Woolstores Place (bounded by Frenchman Bay Rd to the northwest and the railway to the northeast) is predominantly rural in character.

Four rural-residential lots along the southern side of Woolstores Place currently have driveway access on Woolstores Place.

Existing land uses within the subject site, as at February 2023, are shown in the available Nearmap aerial photograph in **Figure 2**.

Figure 2: Existing Land Use

3.2 Existing Road Network

The existing road network and its classification in the Main Roads WA functional road hierarchy is illustrated in **Figure 3**.

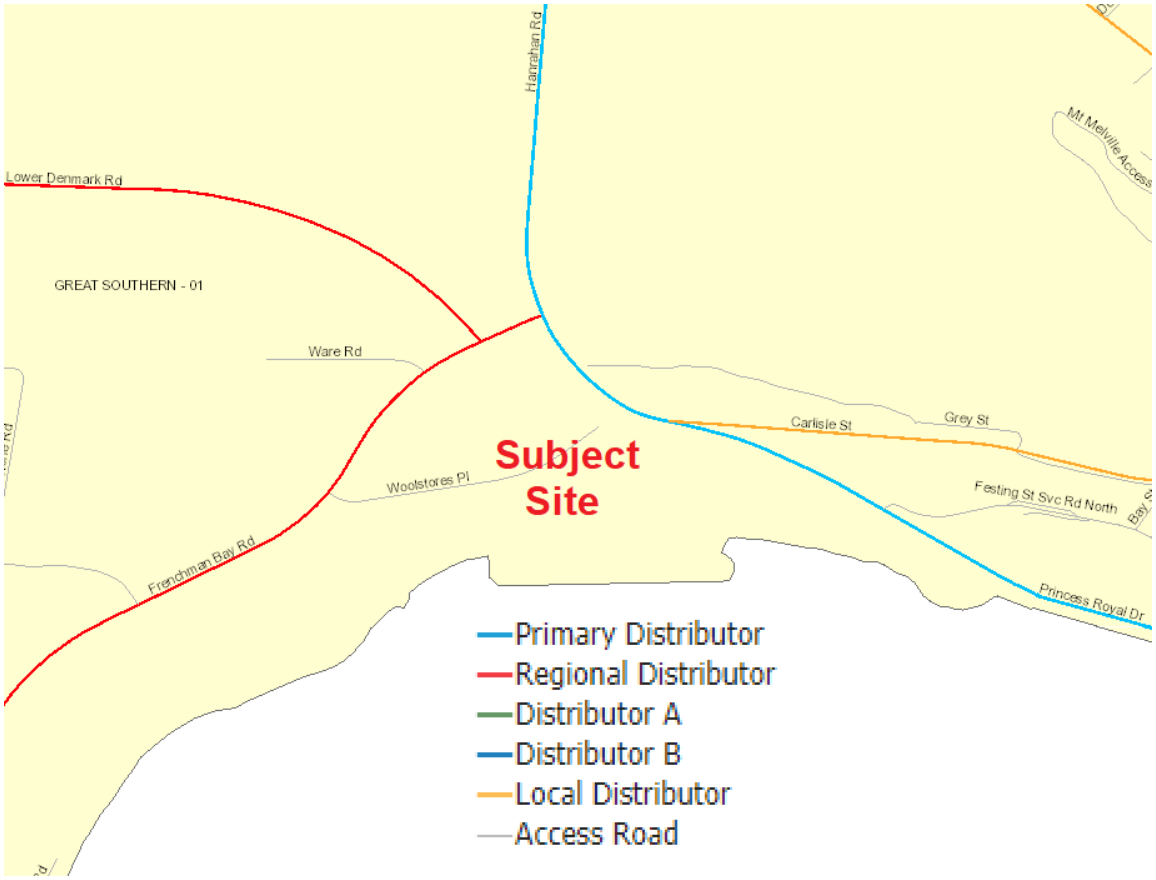

Figure 3: Existing road hierarchy

Frenchman Bay Road is currently constructed as a two-lane rural road (3.7m traffic lanes) with unsealed shoulders in the vicinity of the subject site but widens to two lanes each way from Lower Denmark Road to Princess Royal Drive. Central traffic islands are added along the final 280 metres in conjunction with intersection treatments at Princess Royal Drive, Lower Denmark Road and Ware Road.

Frenchman Bay Road is classified as a Regional Distributor in the Main Roads WA functional road hierarchy. The posted speed limit on this section of Frenchman Bay Road is 70km/h.

Frenchman Bay Road currently has a level crossing of the railway line approximately 70m west of Princess Royal Drive. This railway crossing has boom barrier and flashing light control.

Woolstores Place is constructed as a two lane rural road with sealed width of approximately 6m and unsealed shoulders. The default built up area speed limit of 50km/h applies on Woolstores Place. It is classified as an Access Road in the Main Roads WA functional road hierarchy.

All of the intersections along this section of Frenchman Bay Road (Princess Royal Drive, Lower Denmark Road, Ware Road and Woolstores Place are constructed as T-intersections and operate under Give Way control on the side road approach.

3.3 Existing Traffic Volumes

Existing average weekday traffic (AWT) volumes on the study area road network have been obtained from the Main Roads WA website and are summarised in **Table 2**.

Table 2: Existing Traffic Volumes

Road Name	Location	AWT (HV)	AM Peak	PM Peak	Date
Princess Royal Drive	South of Frenchman Bay Rd	9,307 (15.1%)	866vph 0800-0900	880vph 1515-1615	2020/21
Princess Royal Drive	South of Carlisle St	10,266 (14.8%)	833vph 0800-0900	932vph 1515-1615	2021/22
Hanrahan Road	North of Frenchman Bay Rd	8,440 (18.1%)	772vph 0815-0915	810vph 1445-1545	2022/23
Frenchman Bay Road	South of Woolstores Pl	7,935 (14.8%)	719vph 0800-0900	725vph 1630-1730	2020/21

3.4 Heavy Vehicle Routes

Restricted Access Vehicle (RAV) Network routes are designated for access by large heavy vehicle combinations that require special permits for each trip. Main Roads WA manages the RAV Networks and the permits for trucks to use them. **Figure 4** shows the roads that are permitted for use by Tandem Drive RAV Networks 2, (amber), 4 (dark blue), and 7 (light purple) vehicles in the vicinity of the subject site. Tandem Drive RAV Networks 2, 3 and 4 (which includes Frenchman Bay Road and Lower Denmark Road) permit access by a number of vehicle combinations up to 27.5m long and Tandem Drive RAV Networks 5, 6 and 7 (which includes Princess Royal Drive and Hanrahan Road) extend this to vehicles up to 36.5m long including double road trains.

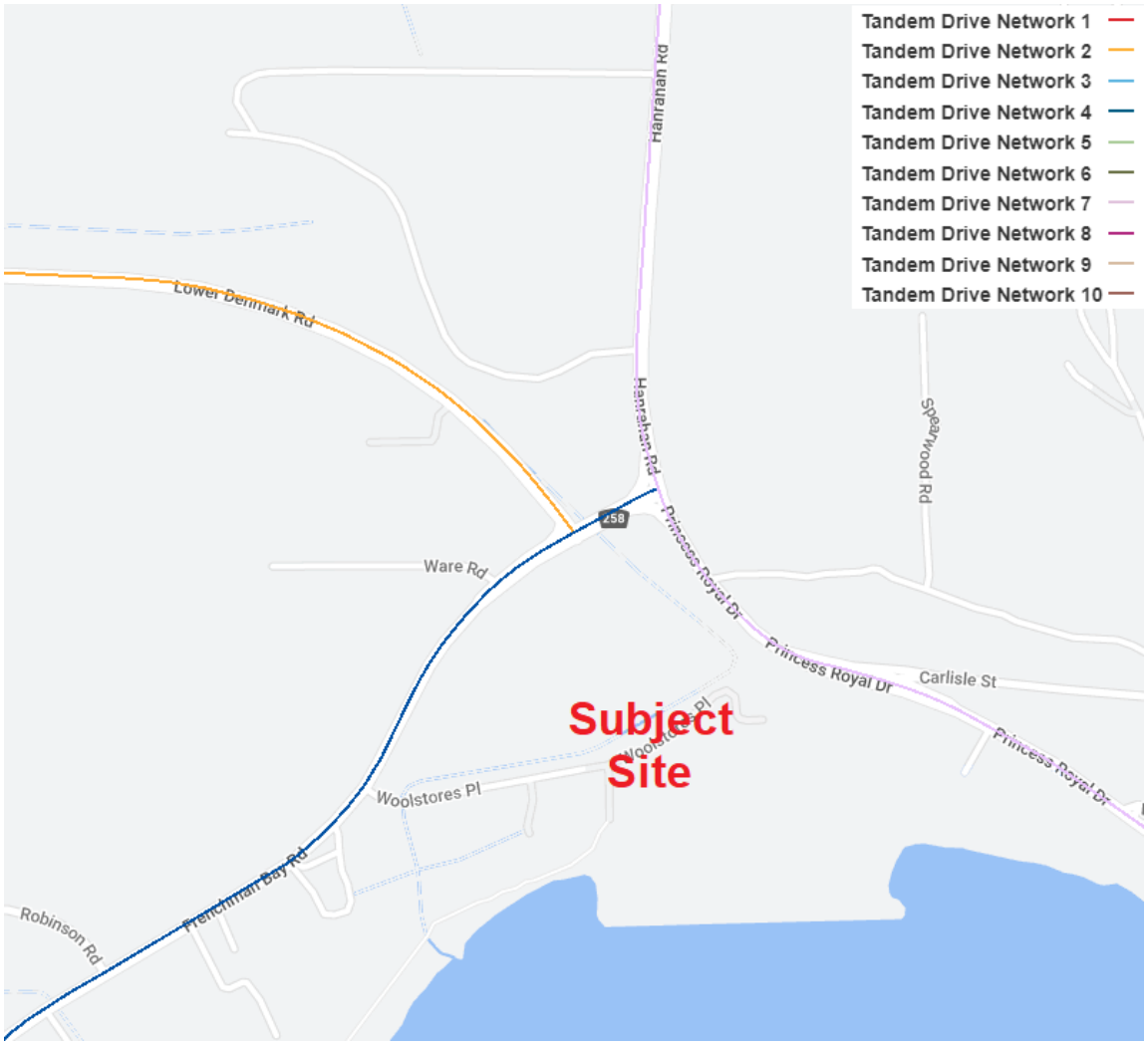

Figure 4: Restricted Access Vehicles Network

3.5 Public Transport

The closest existing bus route to the subject site is Bus Route 805 (Circular Service to Albany via Little Grove), as shown in **Figure 5**.

Route 805 runs on Frenchman Bay Road adjacent to the subject site. It provides one bus service in the morning and one in the afternoon on weekdays at times suited for travel to and from school.

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Figure 5: Existing bus routes

3.6 Pedestrian and Cyclist Facilities

There are currently no pedestrian or cyclist facilities within the subject site.

Frenchman Bay Road has a 3m dual use path on the southern side adjacent to the subject site, reducing to 2m width south of Woolstores Place.

3.7 Changes to Surrounding Road Network

The current Albany Ring Road project is constructing a new heavy haulage freight route around the western side if the City of Albany for transport of goods to and from the Port of Albany, as shown in **Figure 6.** Construction of Phase 1 was completed in April 2022 and completion of Phase 2 construction is scheduled for early 2024.

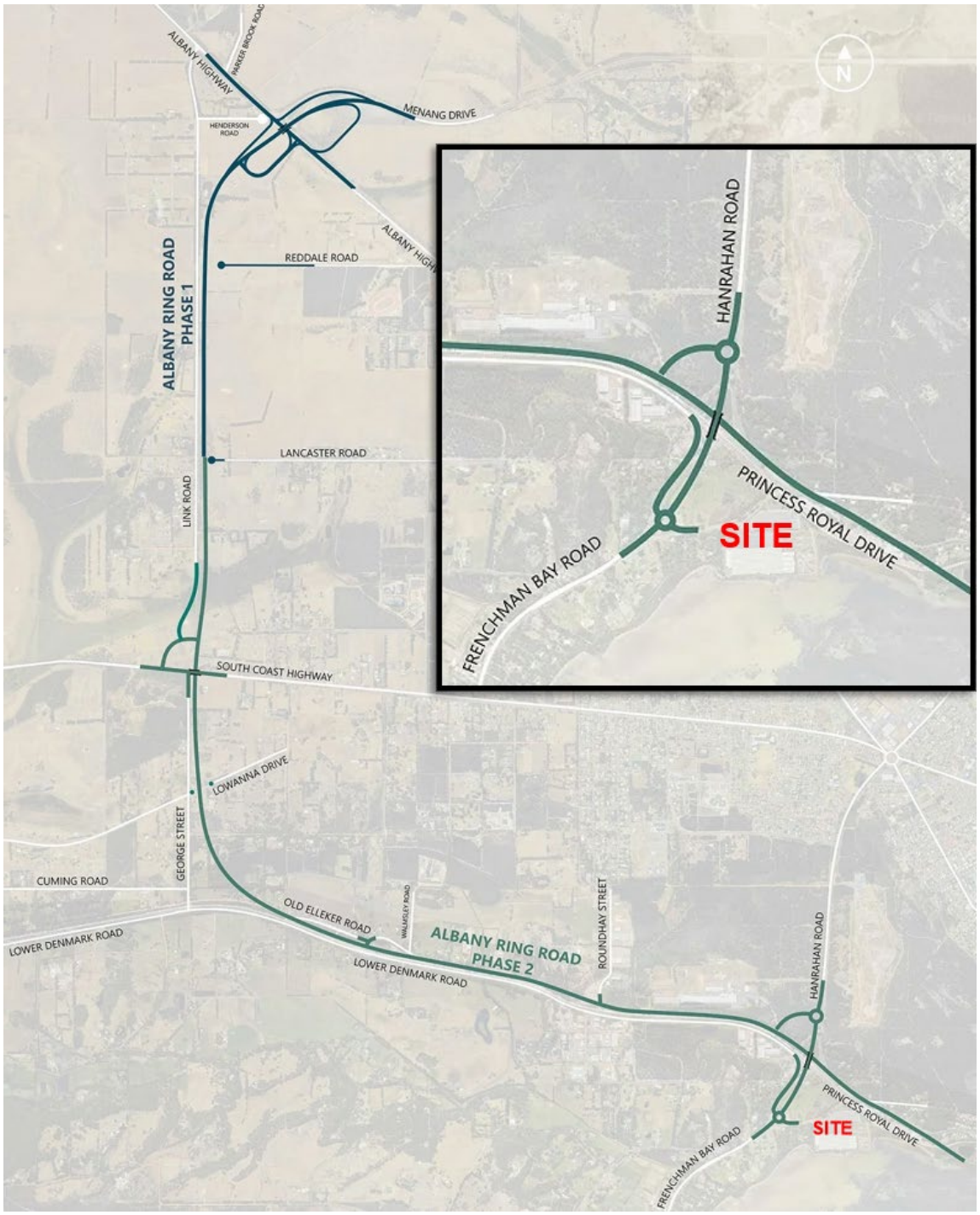


Figure 6: Albany Ring Road

The Albany Ring Road project will result in significant changes to the road network around the subject site. Princess Royal Drive will be extended northwest adjacent to the railway line to connect to Albany Highway. Frenchman Bay Road will be realigned and raised on an embankment and bridge over the railway line and Princess Royal Drive to connect directly into Hanrahan Road with two large roundabouts on Frenchman Bay Rd – Hanrahan Road as shown in **Figure 6**.

The existing Frenchman Bay Road / Woolstores Place T-intersection will be replaced by a new 4-way roundabout with Lower Denmark Road deviated southwards to connect into this new roundabout as well.

4 Proposed Transport Network

4.1 Road Hierarchy

The proposed hierarchy of roads within the subject site is illustrated in **Figure 7** using the road hierarchy defined in the Western Australian Planning Commission *Liveable Neighbourhoods* (LN) policy. The surrounding road network road hierarchy (primary distributor and regional distributor) reflects current status in the Main Roads WA functional road hierarchy.

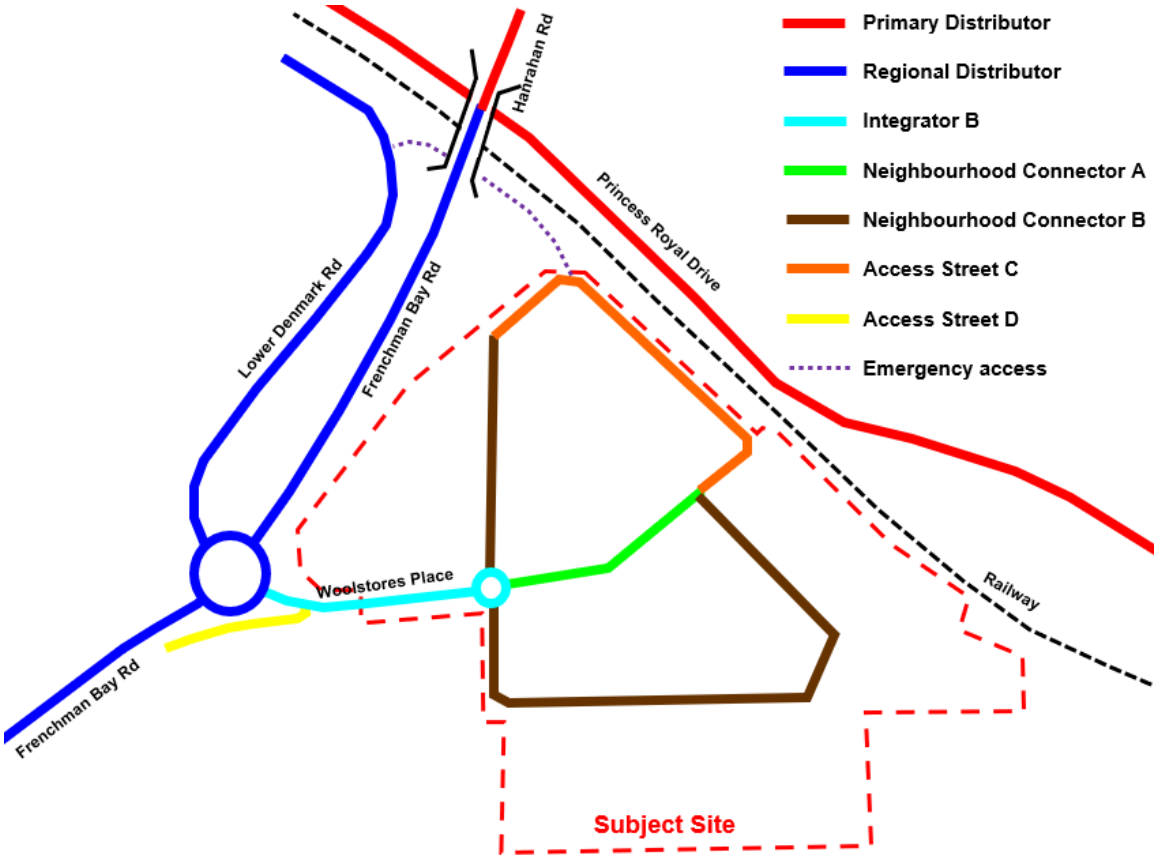


Figure 7: Proposed road hierarchy

The classification of roads in **Figure 7** is based on preliminary analysis of future traffic flows at section 6.3 of this report.

Integrator B roads are suitable for traffic flows up to 15,000vpd and can accommodate traffic flows up to 20,000vpd with suitable intersection treatments. The section of Woolstores Place from Frenchman Bay Road to the internal roundabout is recommended as an Integrator B due to ultimate traffic volumes of more than 7000vpd. The typical Integrator B cross-section has a 6-metre median to provide sheltered right turn facilities for cars turning right to and from side road intersections and major driveways. However, in this particular case it is proposed that the one side

road intersection and any driveways along this section will be restricted to left in / left out only, with the two roundabouts at each end of this section of Woolstores Place providing suitable alternative turning facilities for the few vehicles that would otherwise want to turn right at that side road intersection and driveways. Therefore, the 6-metre median width is not required and can be reduced to 2 to 3-metre width, as is standard for a Neighbourhood Connector A. Accordingly, the standard 29.2m road reserve width of an Integrator B with 6m median in Liveable Neighbourhoods would be reduced to 26.2m with 3m median on this section of Woolstores Place.

Neighbourhood Connector A roads are suitable for traffic flows up to 7000vpd. The section of Woolstores Place east of the internal roundabout will carry traffic flows above 3000vpd and is therefore recommended as a Neighbourhood Connector A.

Neighbourhood Connector B roads are designed for traffic flows up to 3000vpd. Neighbourhood Connector B is recommended for the northern and southern roads connecting to the internal roundabout due to traffic volumes in the 2000 to 3000vpd range, as well as large delivery vehicles on the northern leg servicing the commercial / retail precinct and large buses servicing the accommodation precinct to the south.

Access Street C has a 7.2m road width and is considered appropriate for the eastern sections of access road around the commercial / retail precinct where traffic volumes will be relatively low but will still need to accommodate large delivery vehicles.

Access Street D has a 6m road width and is suitable for low volume residential streets carrying less than 1000vpd.

Proposed cross-sections for the Integrator B and Neighbourhood Connector roads together with standard cross-sections for Access Streets from the WAPC *Liveable Neighbourhoods* policy for these roads are shown in Appendix B.

4.2 Public Transport

The existing bus service along Frenchman Bay Road adjacent to the subject site is noted in section 3.5.

All of the proposed neighbourhood connectors and integrator B roads shown on **Figure 7** would be of suitable standard to accommodate bus services through this LSP area, providing suitable options for a bus route to service this area. This allows suitable flexibility for the Public Transport Authority to plan future bus routes within this area if deemed appropriate in the longer term.

4.3 Pedestrian and Cyclist Facilities

All of the proposed neighbourhood connectors and integrator B roads shown on **Figure 7** would have paths on both sides in accordance with *Liveable Neighbourhoods* guidelines, including a shared path on one side.

Paths would be required on at least one side of all roads in accordance with *Liveable Neighbourhoods* guidelines.

On-street cycle lanes are normally included only on Neighbourhood Connector A roads and above, due to traffic flows above 3000vpd on these categories of roads.

5 Integration with Surrounding Area

The subject site has historically been an intensive industrial site. The proposed structure plan will facilitate the transition to commercial, retail, residential and tourist accommodation uses. This is particularly appropriate given the improved access to this relatively isolated precinct as a result of the current Albany Ring Road project.

The proposed structure plan is designed in accordance with WAPC Liveable Neighbourhoods principles to ensure that good connectivity and integration with the surrounding area are achieved.

6 Analysis of the Transport Network

6.1 Assessment Period

The traffic assessment undertaken for the subject site is based on 2031 traffic projections obtained from the Albany Ring Road project. Full development of the land uses envisaged in the structure plan may take a significantly longer period than that but full development of all land uses within the subject site have been taken into consideration in this traffic assessment anyway.

Some of the land uses involved would be likely to experience peak traffic generation during the Saturday morning / midday period rather than the conventional weekday AM and PM peak periods, so all three of those potential peak periods have been analysed in this traffic assessment.

6.2 Traffic Generation

Traffic generation rates used in this assessment have been derived from various sources including the Western Australian Planning Commission (WAPC) *Transport Impact Assessment Guidelines* (2016), the NSW *Guide to Traffic Generating Developments* (2002), NSW *Updated traffic surveys* (TDT 2013/04a), the ITE *Trip Generation Manual* (11th edition) and ITE *Trip Generation Handbook* (3rd Edition).

Residential traffic generation has been based on the AM and PM peak hour traffic generation rate of 0.8 vehicles per hour (vph) per dwelling recommended in the WAPC TIA Guidelines. It also provides a directional split for those peak period trip rates (AM: 0.2 in / 0.6 out and PM 0.5 in / 0.3 out). Saturday peak hour trip rates are also assumed as 0.8vph/dwelling with even directional split (0.4 in / 0.4 out). Weekday AM and PM peak hour residential traffic generation is typically 10% of daily traffic generation, so the daily trip rate used for houses and terraces in this assessment is 8 vehicle trips per day (vpd) per dwelling.

Residential apartments have significantly lower traffic generation than low density residential development, so relevant trip rates have been sourced from NSW TDT 2013/04a for "High density residential – regional area". The relevant trip rates are Average weekday: 4.58vpd/unit, AM peak: 0.53vph/unit, PM peak: 0.32vph/unit and Saturday peak: 0.59vph/unit. The same directional splits are assumed as for the WAPC residential trip rates.

The largest component of land uses in the commercial / retail precinct are anticipated to be showroom/warehouse type uses, so trip rates for "bulky goods retail stores" have been sourced from NSW TDT 2013/04a. The relevant trip rates are Average weekday: 17vpd/100m^2 GFA, PM peak: 2.7vph/100m^2 GFA and Saturday peak: 3.9vph/100m^2 GFA. That source does not provide an AM peak trip rate as those stores are typically not open before 9am, but a conservative trip rate equal to 25% of the PM trip rate has been assumed during the weekday AM peak hour for this analysis.

Directional splits have been estimated based on information for various relevant land uses in the ITE Trip Generation Manual (AM peak 64% in / 36% out, all other periods 50% in / 50% out).

For the food and beverage land uses trip rates have been sourced from ITE Trip Generation Manual land use #932 (high turnover sitdown restaurant). The relevant trip rates (converted to metric units) are Average weekday: 115.4vpd/100m^2 GFA, AM peak: 10.3vph/100m^2 GFA (55%in / 45% out), PM peak: 9.7vph/100m^2 GFA (51%in / 49% out) and Saturday peak: 12.0vph/100m^2 GFA (51%in / 49% out).

For hotel and short stay accommodation trip rates have been sourced from ITE Trip Generation Manual land use #310 (Hotel). The relevant trip rates are Average weekday: 7.99vpd/room, AM peak: 0.46vph/room (56%in / 44% out), PM peak: 0.59vph/room (51%in / 49% out) and Saturday peak: 0.72vph/room (56%in / 44% out).

The resultant traffic generation of the proposed land uses is summarised in **Table 3**.

Table 3: Traffic Generation

SITE	Land use	Quantity	Units	Weekday Trips	Saturday Trips	Weekday AM (vph)	Weekday PM (vph)	Sat peak (vph)	AM		PM		Sat peak	
									IN	OUT	IN	OUT	IN	OUT
1	Commercial / retail	7000	m^2 GFA	1190	1330	47	189	273	30	17	95	95	137	137
2	Commercial / retail	13000	m^2 GFA	2210	2470	88	351	507	56	32	176	176	254	254
3	Res (med)	20	Terraces	160	160	16	16	16	4	12	10	6	8	8
4	Res (med)	15	Terraces	120	120	12	12	12	3	9	8	5	6	6
4	Res (med-high)	40	Apartments	183	120	21	13	24	5	16	8	5	12	12
5	Res (med-high)	25	Terraces	200	200	20	20	20	5	15	13	8	10	10
5	Res (med-high)	40	Apartments	183	120	21	13	24	5	16	8	5	12	12
6	Res (med-high)	25	Terraces	200	200	20	20	20	5	15	13	8	10	10
6	Res (med-high)	70	Apartments	321	210	37	22	41	9	28	14	8	21	21
6	Ground Floor food & bev	1100	m^2 GFA	1269	1449	113	107	132	62	51	55	53	68	65
6	Short stay accommodation	80	Rooms	639	646	37	47	58	21	16	24	23	32	25
7	Res (high)	70	Apartments	321	210	37	22	41	9	28	14	8	21	21
8	Res (high)	70	Apartments	321	210	37	22	41	9	28	14	8	21	21
9	Hotel	240	Rooms	1918	1937	110	142	173	62	49	72	69	97	76
	TOTAL TRAFFIC			9234	9382	617	997	1382	287	331	521	475	706	676

6.3 Traffic Flow Forecasts

The resultant total daily traffic flows on the structure plan road network are shown in Figure 8. The traffic volumes shown are for a Saturday but as can be seen in Table 3

the total daily traffic generation on a Saturday is only marginally higher than total weekday traffic generation as well.

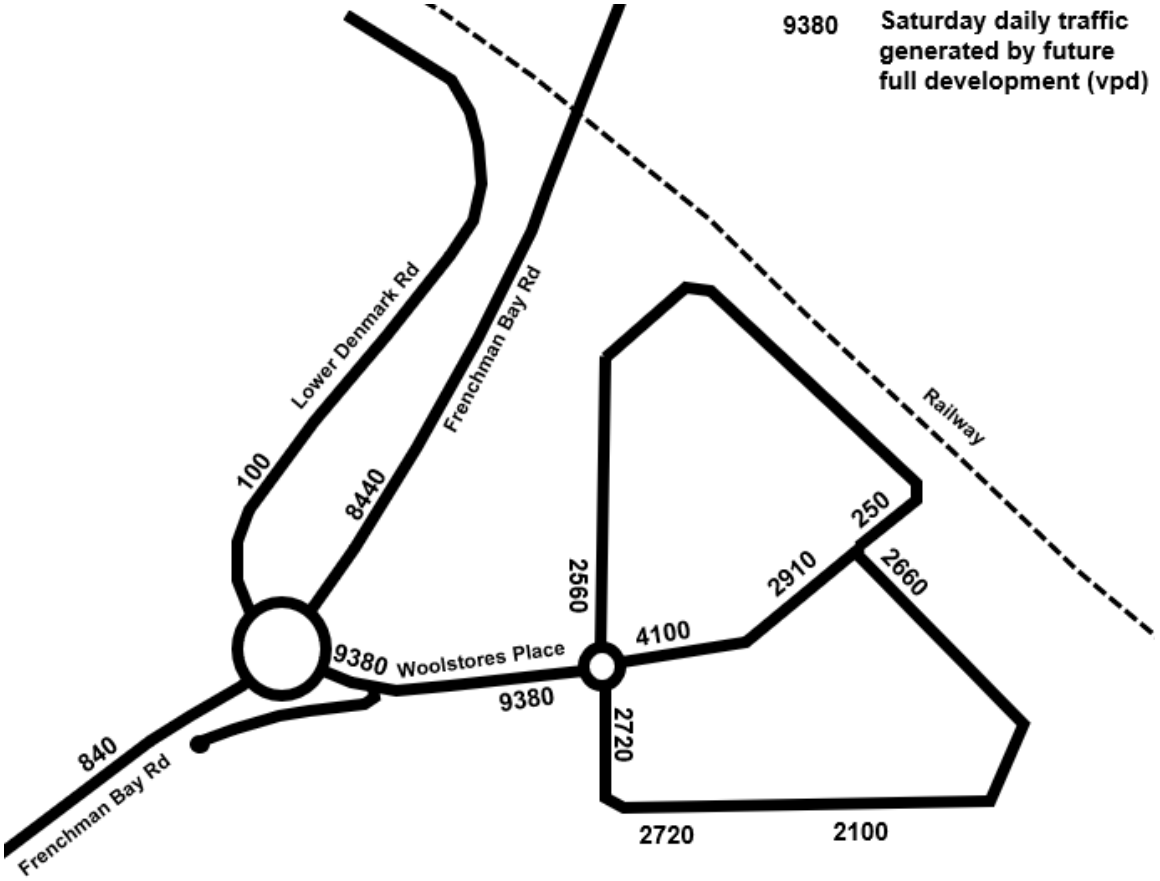


Figure 8: Saturday daily traffic generated by full development

To put this traffic generation into context, the 2031 weekday traffic projections obtained from the Albany Ring Road project (i.e. base traffic without this proposed LSP area) were as follows:

- Frenchman Bay Rd north of Woolstores Place: 10,135vpd
- Frenchman Bay Rd south of Woolstores Place: 8,940vpd
- Lower Denmark Rd west of Frenchman Bay Rd: 1,068vpd

Therefore, full development of the subject site (if completed by 2031) would increase 2031 traffic flows on Lower Denmark Road and Frenchman Bay Road southwest by approximately 9%, and by approximately 83% on the short section of Frenchman Bay Road northeast of Woolstores Place.

2031 weekday AM and PM peak hour traffic projections (from the Albany Ring Road project) at the Frenchman Bay Rd / Lower Denmark Rd / Woolstores Pl roundabout are shown in **Figure 9**, together with traffic flows generated by full development of the subject site.

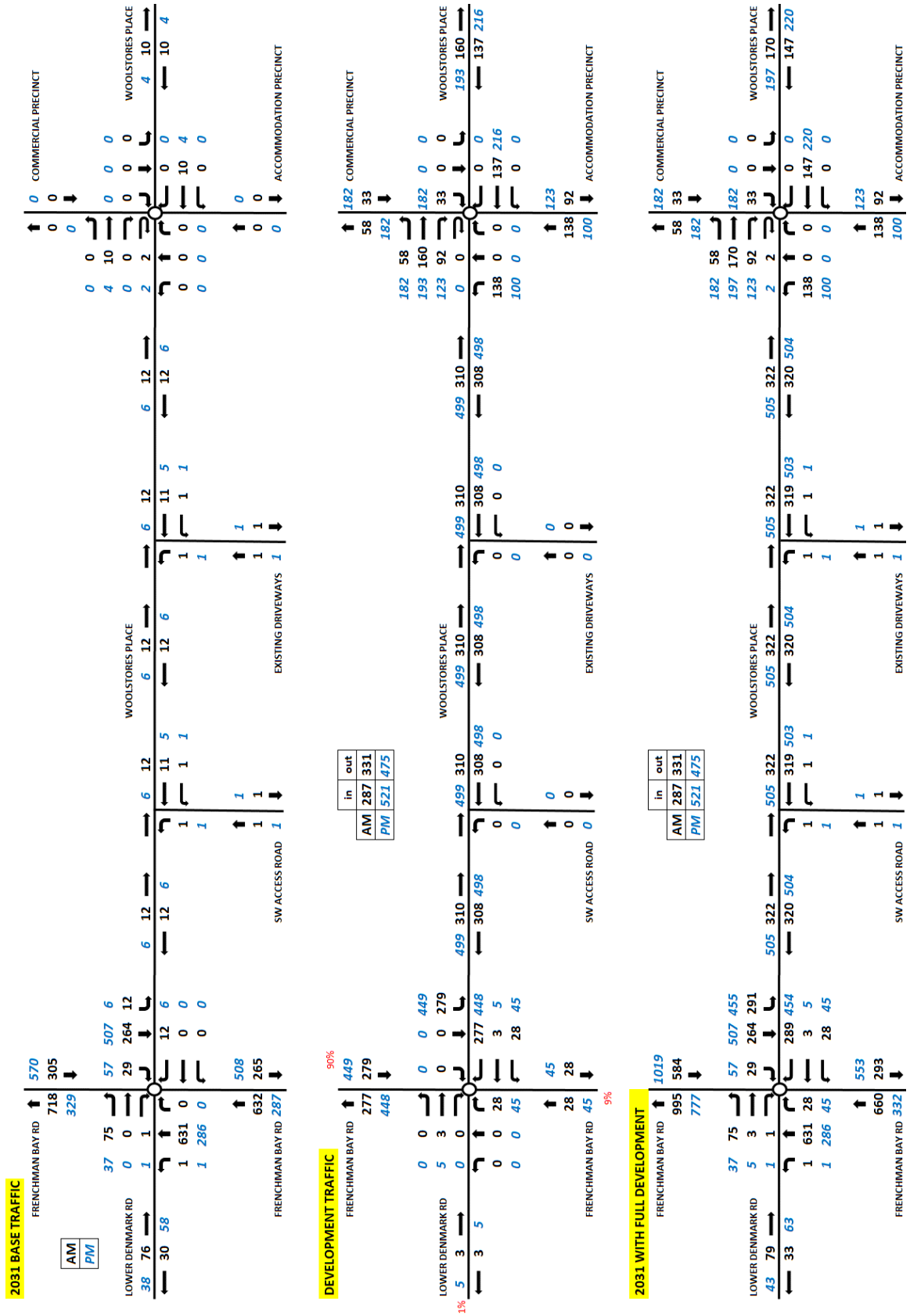


Figure 9: 2031 AM and PM peak traffic with and without development

Corresponding 2031 Saturday peak hour traffic flows are shown in **Figure 10**.

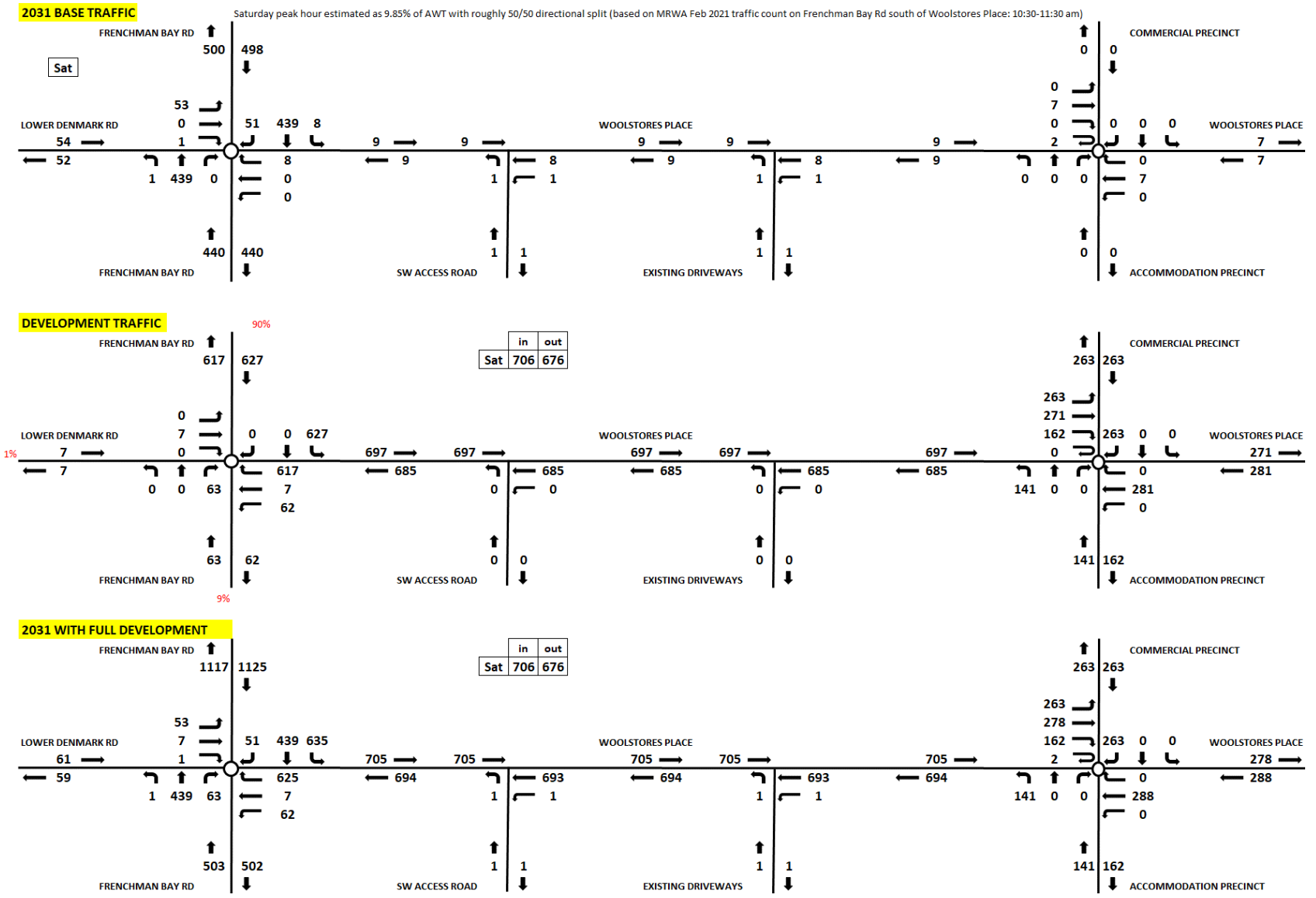


Figure 10: 2031 Saturday peak hour traffic with and without development

6.4 Roads and Intersections

The anticipated future road network in and around the subject site has been detailed in section 4 of this transport impact assessment, including discussion of the proposed road hierarchy in section 4.1.

The key intersection for the proposed LSP area is the planned 4-way roundabout at Frenchman Bay Rd / Lower Denmark Rd / Woolstores Pl, which will be constructed as part of the current Albany Ring Road project. This is understood to have a central island diameter of approximately 50m to accommodate the turn paths of the long vehicles permitted on Frenchman Bay Road and Lower Denmark Road.

Another important intersection for the LSP area will be the internal 4-way roundabout on Woolstores Place. This could be a significantly smaller roundabout (eg. 15m central island diameter) similar to other existing single-lane roundabouts in other parts of Albany. The design of this smaller roundabout could include a trafficable central island to accommodate the turn paths of 19m semi-trailers delivering goods to the commercial / retail precinct on the northern side of Woolstores Place.

As discussed in section 4.1, on the western section of Woolstores Place, the one side road intersection and any driveways along this section will be restricted to left in / left out only, with the two roundabouts at each end of this section of Woolstores Place providing suitable alternative turning facilities for the few vehicles that would otherwise want to turn right at that side road intersection and driveways. Nominal peak hour traffic flows at those left in / left out accesses are shown in **Figure 9** and **Figure 10** based on the small number of existing dwellings along this section of the road.

6.5 Intersection Analysis

Intersection capacity analysis has been undertaken for the two roundabouts proposed on Woolstores Place:

- Frenchman Bay Rd / Lower Denmark Rd / Woolstores Place roundabout; and
- Woolstores Place internal roundabout

Analysis has been undertaken for future (full development) weekday AM and PM peak hours and the Saturday midday peak hour traffic flows in **Figure 9** and **Figure 10**. Based on current Main Roads WA requirements this analysis includes division of heavy vehicles into separate types of vehicle so that the performance characteristics of trucks and articulated vehicles are specifically taken into consideration. The available 2020/21 Frenchman Bay Rd traffic count indicates 15.7% of vehicles are in Austroads classes 2-5 (rigid trucks, buses and cars towing trailers) and 1.2% in Austroads classes 6-9 (articulated vehicles and truck-trailer combinations up to 20m long) but no significant representation in the larger Austroads classes 10, 11 and 12.

Capacity analysis of these intersections has been undertaken using the SIDRA computer software package. SIDRA is an intersection modelling tool commonly used by traffic engineers for all types of intersections. SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

- Degree of Saturation is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for infrequent traffic flow up to one for saturated flow or capacity.
- Level of Service is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).
- Average Delay is the average of all travel time delays for vehicles through the intersection.
- 95% Queue is the queue length below which 95% of all observed queue lengths fall.

The results of the SIDRA analysis are summarised in **Appendix C** and satisfactory intersection performance is shown for each of the intersections shown in **Appendix C**.

The highest peak period in 2031 (without LSP area development) at the Frenchman Bay Rd / Lower Denmark Rd / Woolstores Place roundabout will occur during the weekday AM peak period. The proposed roundabout is shown to operate at degree of saturation 0.396 with overall level of service A and all movements at level of service A or B.

When the traffic generated by future full development of the LSP area is added at the Frenchman Bay Rd / Lower Denmark Rd / Woolstores Place roundabout, the highest peak period will become the Saturday midday peak period. This roundabout will operate at degree of saturation 0.725 with overall level of service A and all movements at level of service A or B. This confirms that the 4-way roundabout planned by Main Roads WA at this intersection will have sufficient capacity to accommodate future full development of the LSP area.

The smaller internal roundabout proposed on Woolstores Place will also have its highest peak period during the Saturday midday peak period. This roundabout will operate at degree of saturation 0.440 with overall level of service A and all movements at level of service A.

6.6 Access to Frontage Properties

The WAPC Liveable Neighbourhoods policy requires that "Development along integrator B and neighbourhood connector streets with ultimate vehicle volumes over

5,000 vehicles per day should be designed either so vehicles entering the street can do so travelling forward, or are provided with alternative forms of vehicle access."

Accordingly, there is to be no direct driveway access to single residential development on the western section of Woolstores Place, which is the only road within the LSP area that is anticipated to carry more than 5,000vpd.

This restriction would not apply to higher density residential development along Woolstores Place or commercial / retail development, as those types of development have large communal or public parking areas where vehicles are able to turn around on site.

All of the other roads in the LSP area are expected to carry less than 5,000vpd, so no restriction on vehicular access is required.

7 Conclusions

This transport impact assessment relates to a proposed Local Structure Plan at Woolstores Place, Mount Elphinstone in the City of Albany.

Current planning by Main Roads WA for the Albany Ring Road includes construction of a grade separated crossing of Frenchman Bay Road over the railway line adjacent to Princess Royal Drive. That planning also includes construction of a new 4-way roundabout to replace the existing Frenchman Bay Rd / Woolstores Place T-intersection. This new roundabout will provide the primary access point for all traffic to and from this LSP area.

Planned road upgrades for the Albany Ring Road project combined with the existing railway line adjacent to the subject site will restrict road access to the subject site to only be available via Woolstores Place. In order to satisfy secondary emergency access requirements, the LSP proposes that an emergency access route from Lower Denmark Road (capable of accommodating a fire appliance) would also be provided on the western side of the railway line. This would be within the railway reserve and under the planned Frenchman Bay Road bridge.

The proposed land uses in this LSP area include:

- approximately14,000-20,000m^2 GFA of commercial / retail floor space (the majority is likely to be showroom/warehouse development),
- 1100m^2 food and beverage outlets,
- a 240 room hotel,
- short-stay accommodation (80 rooms), and
- approximately 255 to 375 dwelling units (houses, terraces and apartments).

The traffic generation associated with the upper limit of these ranges of land uses would total approximately 9,400 vehicles per day (i.e. approximately 4,700 in / 4,700 out) when fully developed. Highest peak hour traffic flows would be anticipated during the Saturday morning / midday peak period, with peak hour traffic flows of up to 706vph in and 676vph out during the busiest hour.

Intersection capacity analysis confirms that the planned Frenchman Bay Rd / Lower Denmark Rd / Woolstores Pl roundabout will operate satisfactorily with this upper limit full development traffic added to the anticipated 2031 base traffic flows on the adjacent road network.

The other significant intersection within the LSP area is another proposed 4-way roundabout on Woolstores Place. Intersection capacity analysis also confirms satisfactory operation of that proposed roundabout under future full-development traffic flows.

Appropriate road hierarchy and road widths have been identified for the proposed internal road network.

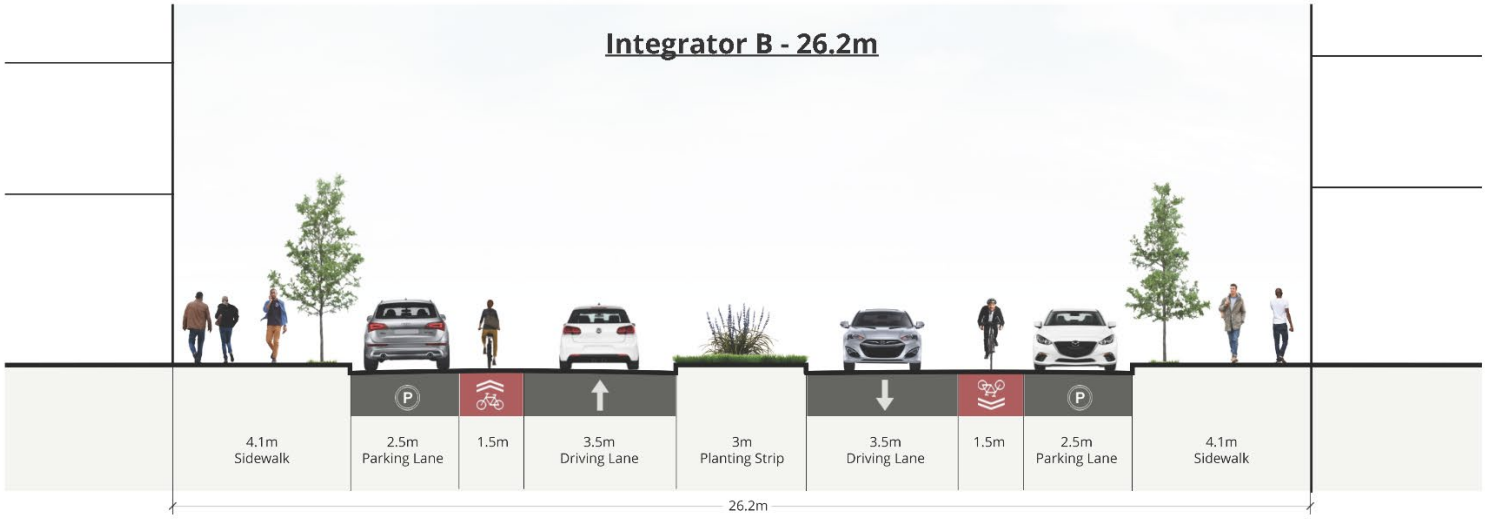
Appendix A

CONCEPT PLAN

DEVELOPMENT CONCEPT
VARIOUS LOTS, WOOLSTORES PLACE
MOUNT ELPHINSTONE, ALBANY

Appendix B

TYPICAL ROAD CROSS-SECTIONS



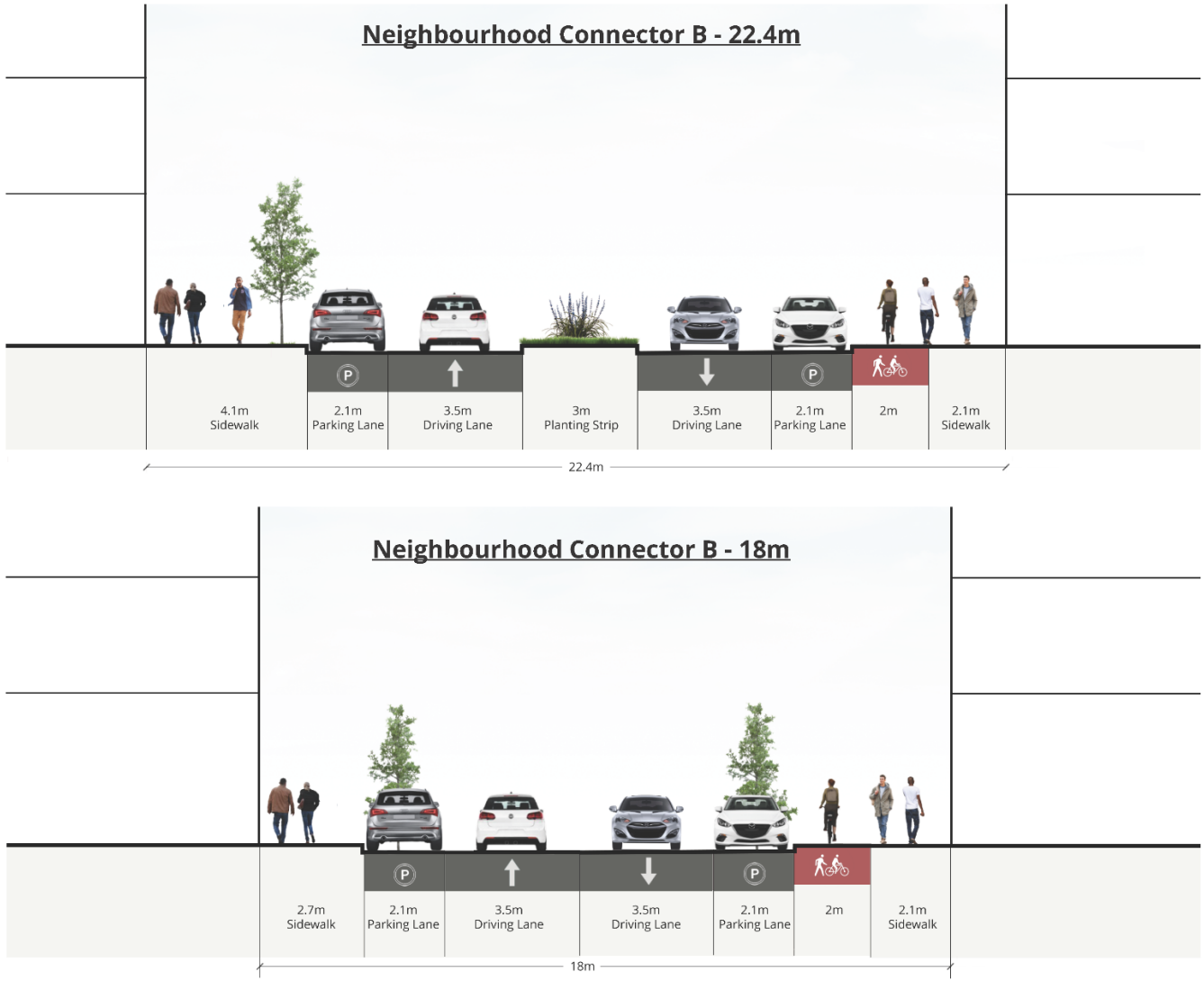
STREET SECTIONS
WOOLSTORES PLACE
MOUNT ELPHINSTONE

DRAFT

0 2.5 m
SCALE @ A3: 1:100

9116-IND-02-A

ROWE GROUP DESIGN



STREET SECTIONS
WOOLSTORES PLACE
MOUNT ELPHINSTONE

DRAFT

0 2.5 m
SCALE @ A3: 1:100
9116-IND-02-A

ROWE GROUP DESIGN

Relevant access street cross-sections from the WAPC Liveable Neighbourhoods policy

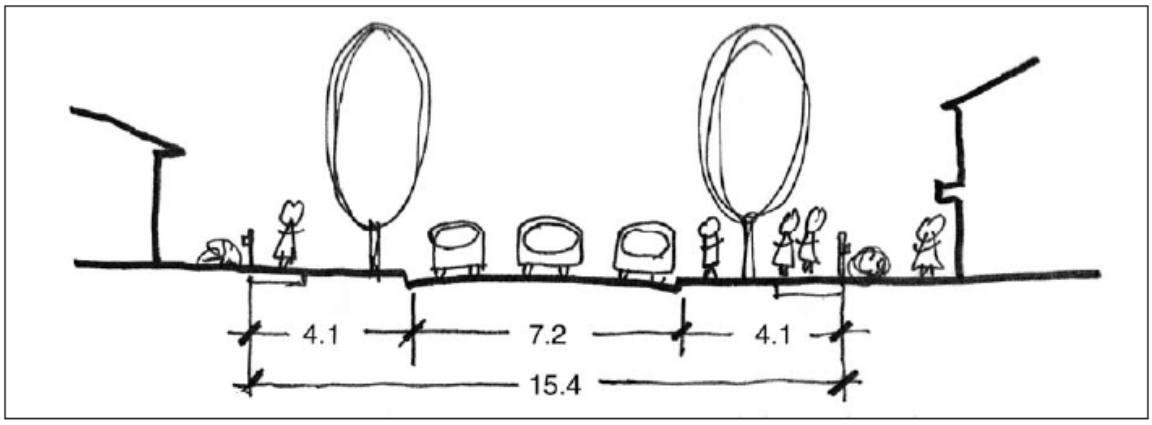


Figure 21: Access street C – yield (or give way) street – Target speed 40 km/hr (< 3000 vehicles per day).

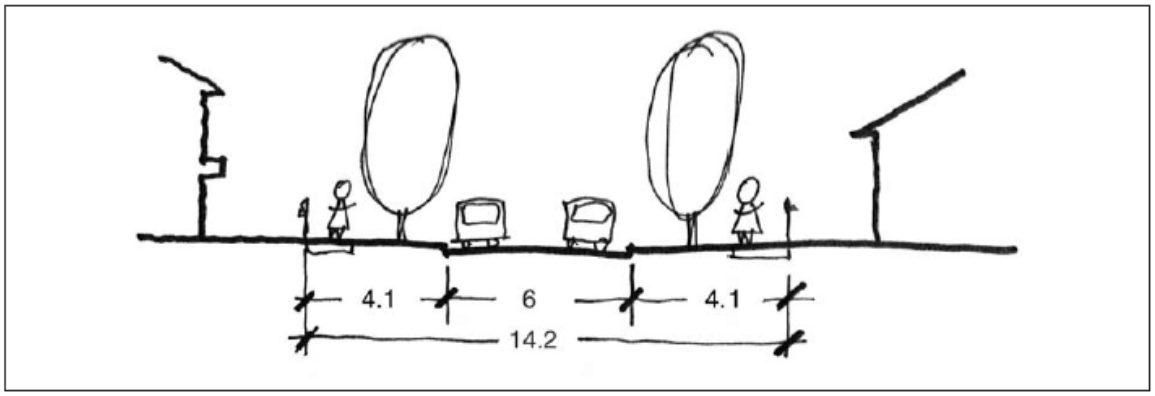


Figure 22: Access street D – narrow yield (or give way) street – Target speed 30 km/hr (< 1000 vehicles per day).

Appendix C

SIDRA INTERSECTION ANALYSIS

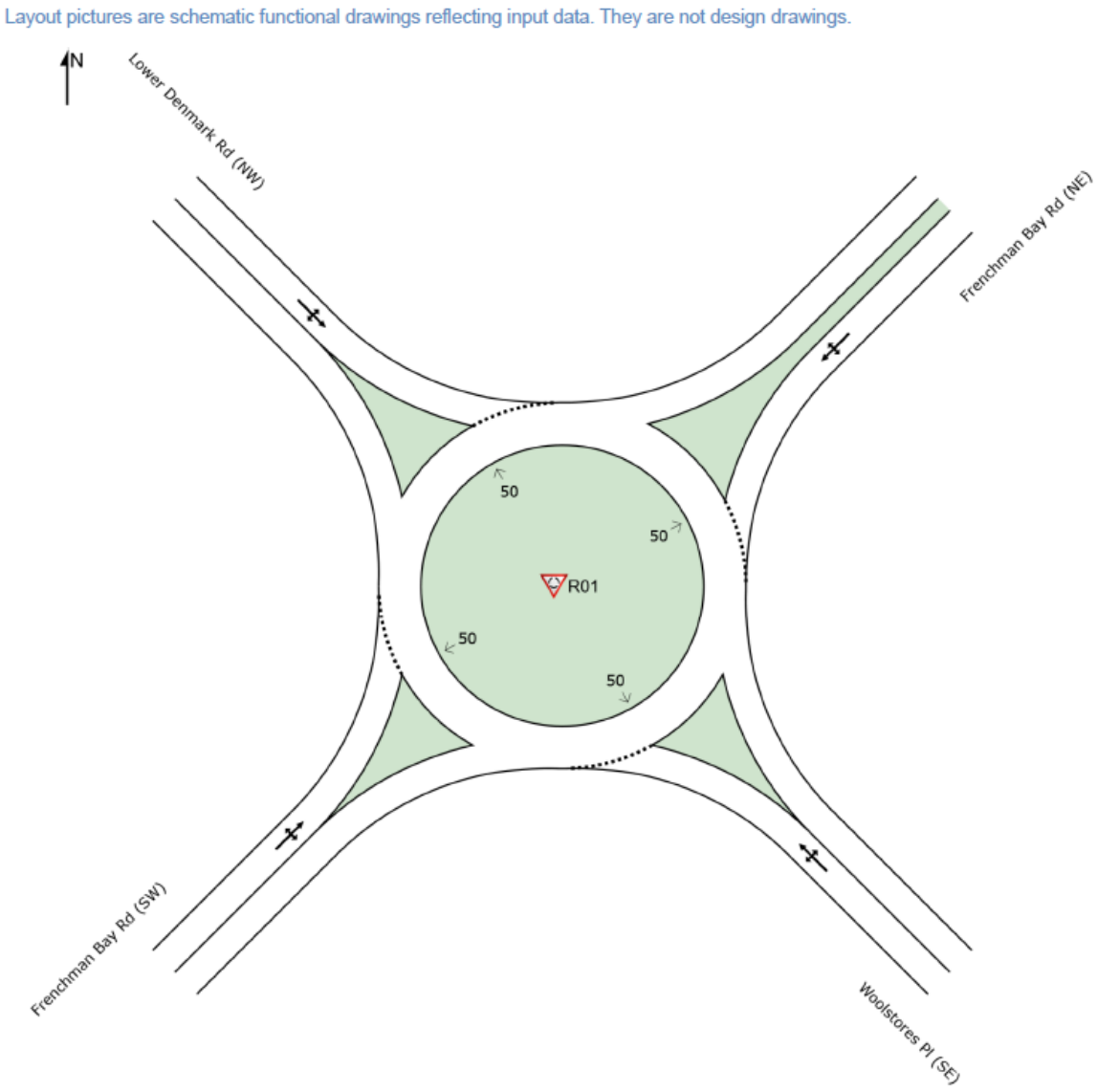


Figure C1. Frenchman Bay Rd / Lower Denmark Rd / Woolstores Place roundabout layout analysed in SIDRA (without LSP area development)

Table C1a. SIDRA results – Frenchman Bay Rd / Lower Denmark Rd / Woolstores Place roundabout – Future weekday AM peak (without LSP area development)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Woolstores Pl (SE)															
4	L2	All MCs	1	3.0	1	3.0	0.011	2.1	LOS A	0.0	0.3	0.29	0.52	0.29	50.1
8	T1	All MCs	1	3.0	1	3.0	0.011	1.0	LOS A	0.0	0.3	0.29	0.52	0.29	50.8
9	R2	All MCs	13	3.0	13	3.0	0.011	8.0	LOS A	0.0	0.3	0.29	0.52	0.29	49.1
Approach			15	3.0	15	3.0	0.011	7.1	LOS A	0.0	0.3	0.29	0.52	0.29	49.3
NorthEast: Frenchman Bay Rd (NE)															
10	L2	All MCs	13	3.0	13	3.0	0.179	3.9	LOS A	0.8	6.5	0.02	0.36	0.02	57.7
8	T1	All MCs	278	16.9	278	16.9	0.179	3.7	LOS A	0.8	6.5	0.02	0.36	0.02	59.4
12	R2	All MCs	31	16.9	31	16.9	0.179	11.6	LOS B	0.8	6.5	0.02	0.36	0.02	56.8
Approach			321	16.4	321	16.4	0.179	4.4	LOS A	0.8	6.5	0.02	0.36	0.02	59.1
NorthWest: Lower Denmark Rd (NW)															
1	L2	All MCs	79	16.9	79	16.9	0.078	6.4	LOS A	0.4	3.2	0.53	0.59	0.53	56.1
2	T1	All MCs	1	3.0	1	3.0	0.078	5.7	LOS A	0.4	3.2	0.53	0.59	0.53	54.9
12	R2	All MCs	1	16.9	1	16.9	0.078	13.7	LOS B	0.4	3.2	0.53	0.59	0.53	54.6
Approach			81	16.7	81	16.7	0.078	6.5	LOS A	0.4	3.2	0.53	0.59	0.53	56.0
SouthWest: Frenchman Bay Rd (SW)															
1	L2	All MCs	1	16.9	1	16.9	0.396	4.1	LOS A	1.8	16.0	0.13	0.32	0.13	58.3
2	T1	All MCs	664	16.9	664	16.9	0.396	3.8	LOS A	1.8	16.0	0.13	0.32	0.13	59.3
3	R2	All MCs	1	3.0	1	3.0	0.396	11.5	LOS B	1.8	16.0	0.13	0.32	0.13	58.3
Approach			666	16.9	666	16.9	0.396	3.8	LOS A	1.8	16.0	0.13	0.32	0.13	59.3
All Vehicles			1083	16.5	1083	16.5	0.396	4.2	LOS A	1.8	16.0	0.13	0.36	0.13	58.9

Table C1b. SIDRA results – Frenchman Bay Rd / Lower Denmark Rd / Woolstores Place roundabout – Future weekday PM peak (without LSP area development)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Woolstores Pl (SE)															
4	L2	All MCs	1	3.0	1	3.0	0.007	3.0	LOS A	0.0	0.2	0.44	0.53	0.44	50.1
8	T1	All MCs	1	3.0	1	3.0	0.007	1.9	LOS A	0.0	0.2	0.44	0.53	0.44	50.8
9	R2	All MCs	6	3.0	6	3.0	0.007	9.0	LOS A	0.0	0.2	0.44	0.53	0.44	49.1
Approach			8	3.0	8	3.0	0.007	7.3	LOS A	0.0	0.2	0.44	0.53	0.44	49.4
NorthEast: Frenchman Bay Rd (NE)															
10	L2	All MCs	6	3.0	6	3.0	0.333	3.9	LOS A	1.5	13.2	0.03	0.36	0.03	57.7
8	T1	All MCs	534	16.9	534	16.9	0.333	3.7	LOS A	1.5	13.2	0.03	0.36	0.03	59.4
12	R2	All MCs	60	16.9	60	16.9	0.333	11.6	LOS B	1.5	13.2	0.03	0.36	0.03	56.8
Approach			600	16.8	600	16.8	0.333	4.4	LOS A	1.5	13.2	0.03	0.36	0.03	59.1
NorthWest: Lower Denmark Rd (NW)															
1	L2	All MCs	39	16.9	39	16.9	0.032	4.8	LOS A	0.1	1.0	0.31	0.48	0.31	57.0
2	T1	All MCs	1	3.0	1	3.0	0.032	4.2	LOS A	0.1	1.0	0.31	0.48	0.31	56.3
12	R2	All MCs	1	16.9	1	16.9	0.032	12.2	LOS B	0.1	1.0	0.31	0.48	0.31	55.4
Approach			41	16.5	41	16.5	0.032	4.9	LOS A	0.1	1.0	0.31	0.48	0.31	56.9
SouthWest: Frenchman Bay Rd (SW)															
1	L2	All MCs	1	16.9	1	16.9	0.189	4.2	LOS A	0.7	6.0	0.14	0.33	0.14	58.2
2	T1	All MCs	301	16.9	301	16.9	0.189	3.8	LOS A	0.7	6.0	0.14	0.33	0.14	59.3
3	R2	All MCs	1	3.0	1	3.0	0.189	11.5	LOS B	0.7	6.0	0.14	0.33	0.14	58.2
Approach			303	16.9	303	16.9	0.189	3.8	LOS A	0.7	6.0	0.14	0.33	0.14	59.3
All Vehicles			953	16.7	953	16.7	0.333	4.3	LOS A	1.5	13.2	0.08	0.36	0.08	59.0

Table C1c. SIDRA results – Frenchman Bay Rd / Lower Denmark Rd / Woolstores Place roundabout – Future Saturday peak hour (without LSP area development)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Woolstores Pl (SE)															
4	L2	All MCs	1	3.0	1	3.0	0.008	2.7	LOS A	0.0	0.3	0.40	0.53	0.40	50.0
8	T1	All MCs	1	3.0	1	3.0	0.008	1.6	LOS A	0.0	0.3	0.40	0.53	0.40	50.7
9	R2	All MCs	8	3.0	8	3.0	0.008	8.6	LOS A	0.0	0.3	0.40	0.53	0.40	48.9
Approach			11	3.0	11	3.0	0.008	7.3	LOS A	0.0	0.3	0.40	0.53	0.40	49.2
NorthEast: Frenchman Bay Rd (NE)															
10	L2	All MCs	8	3.0	8	3.0	0.290	3.9	LOS A	1.3	11.0	0.03	0.37	0.03	57.7
8	T1	All MCs	462	14.3	462	14.3	0.290	3.6	LOS A	1.3	11.0	0.03	0.37	0.03	60.0
12	R2	All MCs	54	14.3	54	14.3	0.290	11.5	LOS B	1.3	11.0	0.03	0.37	0.03	57.5
Approach			524	14.1	524	14.1	0.290	4.4	LOS A	1.3	11.0	0.03	0.37	0.03	59.7
NorthWest: Lower Denmark Rd (NW)															
1	L2	All MCs	56	14.3	56	14.3	0.048	5.3	LOS A	0.2	1.7	0.40	0.53	0.40	57.3
2	T1	All MCs	1	3.0	1	3.0	0.048	4.7	LOS A	0.2	1.7	0.40	0.53	0.40	55.7
12	R2	All MCs	1	14.3	1	14.3	0.048	12.7	LOS B	0.2	1.7	0.40	0.53	0.40	55.8
Approach			58	14.1	58	14.1	0.048	5.4	LOS A	0.2	1.7	0.40	0.53	0.40	57.2
SouthWest: Frenchman Bay Rd (SW)															
1	L2	All MCs	1	14.3	1	14.3	0.283	4.1	LOS A	1.1	9.6	0.14	0.33	0.14	58.9
2	T1	All MCs	462	14.3	462	14.3	0.283	3.8	LOS A	1.1	9.6	0.14	0.33	0.14	59.9
3	R2	All MCs	1	3.0	1	3.0	0.283	11.5	LOS B	1.1	9.6	0.14	0.33	0.14	58.2
Approach			464	14.3	464	14.3	0.283	3.8	LOS A	1.1	9.6	0.14	0.33	0.14	59.9
All Vehicles			1057	14.1	1057	14.1	0.290	4.2	LOS A	1.3	11.0	0.10	0.36	0.10	59.6

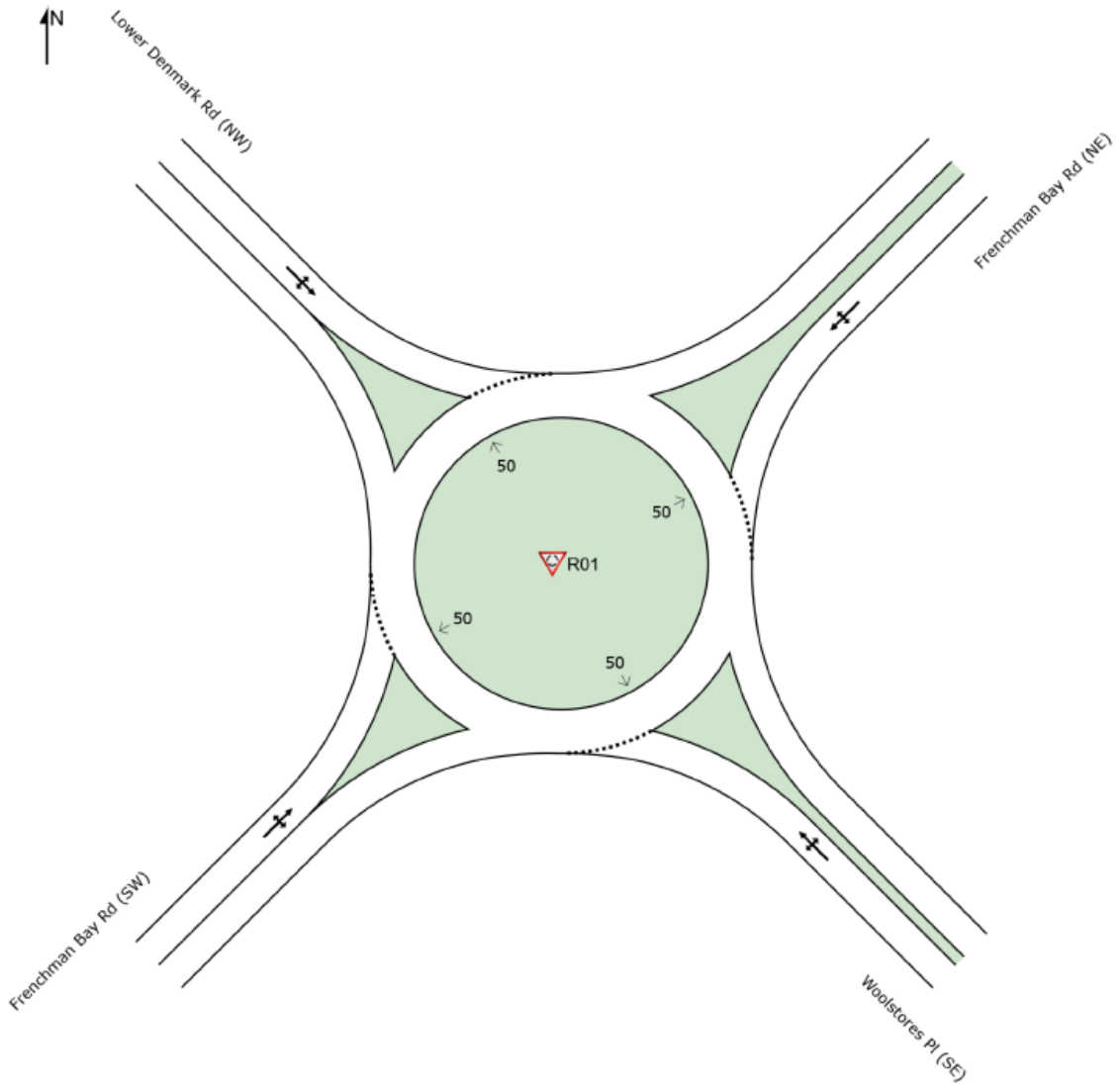


Figure C2. Frenchman Bay Rd / Lower Denmark Rd / Woolstores Place roundabout layout analysed in SIDRA (with LSP area development)

Table C2a. SIDRA results – Frenchman Bay Rd / Lower Denmark Rd / Woolstores Place roundabout – Future weekday AM peak (with LSP area full development)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Woolstores Pl (SE)															
4	L2	All MCs	29	3.0	29	3.0	0.245	2.3	LOS A	1.1	8.1	0.36	0.57	0.36	49.4
8	T1	All MCs	3	3.0	3	3.0	0.245	1.2	LOS A	1.1	8.1	0.36	0.57	0.36	50.1
9	R2	All MCs	304	3.0	304	3.0	0.245	8.3	LOS A	1.1	8.1	0.36	0.57	0.36	48.4
Approach			337	3.0	337	3.0	0.245	7.7	LOS A	1.1	8.1	0.36	0.57	0.36	48.5
NorthEast: Frenchman Bay Rd (NE)															
10	L2	All MCs	306	3.0	306	3.0	0.364	3.9	LOS A	2.0	15.9	0.13	0.38	0.13	56.9
8	T1	All MCs	278	16.9	278	16.9	0.364	3.7	LOS A	2.0	15.9	0.13	0.38	0.13	58.9
12	R2	All MCs	31	16.9	31	16.9	0.364	11.7	LOS B	2.0	15.9	0.13	0.38	0.13	56.3
Approach			615	10.0	615	10.0	0.364	4.2	LOS A	2.0	15.9	0.13	0.38	0.13	57.9
NorthWest: Lower Denmark Rd (NW)															
1	L2	All MCs	79	16.9	79	16.9	0.113	9.2	LOS A	0.7	6.1	0.78	0.71	0.78	54.0
2	T1	All MCs	3	3.0	3	3.0	0.113	8.4	LOS A	0.7	6.1	0.78	0.71	0.78	51.9
12	R2	All MCs	1	16.9	1	16.9	0.113	16.5	LOS B	0.7	6.1	0.78	0.71	0.78	52.6
Approach			83	16.4	83	16.4	0.113	9.3	LOS A	0.7	6.1	0.78	0.71	0.78	53.9
SouthWest: Frenchman Bay Rd (SW)															
1	L2	All MCs	1	16.9	1	16.9	0.512	5.3	LOS A	3.2	27.4	0.51	0.46	0.51	55.8
2	T1	All MCs	664	16.9	664	16.9	0.512	5.0	LOS A	3.2	27.4	0.51	0.46	0.51	56.7
3	R2	All MCs	29	3.0	29	3.0	0.512	12.6	LOS B	3.2	27.4	0.51	0.46	0.51	54.5
Approach			695	16.3	695	16.3	0.512	5.3	LOS A	3.2	27.4	0.51	0.46	0.51	56.6
All Vehicles			1729	11.5	1729	11.5	0.512	5.6	LOS A	3.2	27.4	0.36	0.47	0.36	55.5

Table C2b. SIDRA results – Frenchman Bay Rd / Lower Denmark Rd / Woolstores Place roundabout – Future weekday PM peak (with LSP area full development)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Woolstores Pl (SE)															
4	L2	All MCs	47	3.0	47	3.0	0.455	4.0	LOS A	2.9	21.7	0.64	0.68	0.65	48.1
8	T1	All MCs	5	3.0	5	3.0	0.455	2.9	LOS A	2.9	21.7	0.64	0.68	0.65	48.7
9	R2	All MCs	478	3.0	478	3.0	0.455	9.9	LOS A	2.9	21.7	0.64	0.68	0.65	47.1
Approach			531	3.0	531	3.0	0.455	9.3	LOS A	2.9	21.7	0.64	0.68	0.65	47.2
NorthEast: Frenchman Bay Rd (NE)															
10	L2	All MCs	479	3.0	479	3.0	0.641	4.1	LOS A	5.5	45.1	0.26	0.39	0.26	55.9
8	T1	All MCs	534	16.9	534	16.9	0.641	3.9	LOS A	5.5	45.1	0.26	0.39	0.26	58.1
12	R2	All MCs	60	16.9	60	16.9	0.641	11.8	LOS B	5.5	45.1	0.26	0.39	0.26	55.6
Approach			1073	10.7	1073	10.7	0.641	4.4	LOS A	5.5	45.1	0.26	0.39	0.26	57.2
NorthWest: Lower Denmark Rd (NW)															
1	L2	All MCs	39	16.9	39	16.9	0.052	7.3	LOS A	0.3	2.5	0.66	0.64	0.66	55.4
2	T1	All MCs	5	3.0	5	3.0	0.052	6.6	LOS A	0.3	2.5	0.66	0.64	0.66	53.9
12	R2	All MCs	1	16.9	1	16.9	0.052	14.6	LOS B	0.3	2.5	0.66	0.64	0.66	53.9
Approach			45	15.3	45	15.3	0.052	7.4	LOS A	0.3	2.5	0.66	0.64	0.66	55.2
SouthWest: Frenchman Bay Rd (SW)															
1	L2	All MCs	1	16.9	1	16.9	0.304	5.9	LOS A	1.8	15.7	0.60	0.54	0.60	54.8
2	T1	All MCs	301	16.9	301	16.9	0.304	5.5	LOS A	1.8	15.7	0.60	0.54	0.60	55.7
3	R2	All MCs	47	3.0	47	3.0	0.304	13.2	LOS B	1.8	15.7	0.60	0.54	0.60	53.2
Approach			349	15.0	349	15.0	0.304	6.6	LOS A	1.8	15.7	0.60	0.54	0.60	55.5
All Vehicles			1998	9.5	1998	9.5	0.641	6.2	LOS A	5.5	45.1	0.43	0.50	0.43	54.2

Table C2c. SIDRA results – Frenchman Bay Rd / Lower Denmark Rd / Woolstores Place roundabout – Future Saturday peak hour (with LSP area full development)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: Woolstores Pl (SE)															
4	L2	All MCs	65	3.0	65	3.0	0.609	4.7	LOS A	5.2	39.3	0.71	0.74	0.80	47.8
8	T1	All MCs	7	3.0	7	3.0	0.609	3.6	LOS A	5.2	39.3	0.71	0.74	0.80	48.5
9	R2	All MCs	658	3.0	658	3.0	0.609	10.6	LOS B	5.2	39.3	0.71	0.74	0.80	46.9
Approach			731	3.0	731	3.0	0.609	10.0	LOS B	5.2	39.3	0.71	0.74	0.80	47.0
NorthEast: Frenchman Bay Rd (NE)															
10	L2	All MCs	668	3.0	668	3.0	0.725	4.3	LOS A	8.1	64.4	0.39	0.42	0.39	55.0
8	T1	All MCs	462	14.3	462	14.3	0.725	4.0	LOS A	8.1	64.4	0.39	0.42	0.39	58.1
12	R2	All MCs	54	14.3	54	14.3	0.725	12.0	LOS B	8.1	64.4	0.39	0.42	0.39	55.8
Approach			1184	7.9	1184	7.9	0.725	4.5	LOS A	8.1	64.4	0.39	0.42	0.39	56.5
NorthWest: Lower Denmark Rd (NW)															
1	L2	All MCs	56	14.3	56	14.3	0.110	12.4	LOS B	0.8	6.5	0.89	0.76	0.89	52.3
2	T1	All MCs	7	3.0	7	3.0	0.110	11.6	LOS B	0.8	6.5	0.89	0.76	0.89	48.7
12	R2	All MCs	1	14.3	1	14.3	0.110	19.5	LOS B	0.8	6.5	0.89	0.76	0.89	51.1
Approach			64	13.0	64	13.0	0.110	12.4	LOS B	0.8	6.5	0.89	0.76	0.89	52.0
SouthWest: Frenchman Bay Rd (SW)															
1	L2	All MCs	1	14.3	1	14.3	0.543	8.4	LOS A	4.8	40.3	0.85	0.76	0.96	54.1
2	T1	All MCs	462	14.3	462	14.3	0.543	8.0	LOS A	4.8	40.3	0.85	0.76	0.96	54.9
3	R2	All MCs	66	3.0	66	3.0	0.543	15.7	LOS B	4.8	40.3	0.85	0.76	0.96	51.3
Approach			529	12.9	529	12.9	0.543	9.0	LOS A	4.8	40.3	0.85	0.76	0.96	54.6
All Vehicles			2508	7.7	2508	7.7	0.725	7.3	LOS A	8.1	64.4	0.59	0.60	0.65	53.2

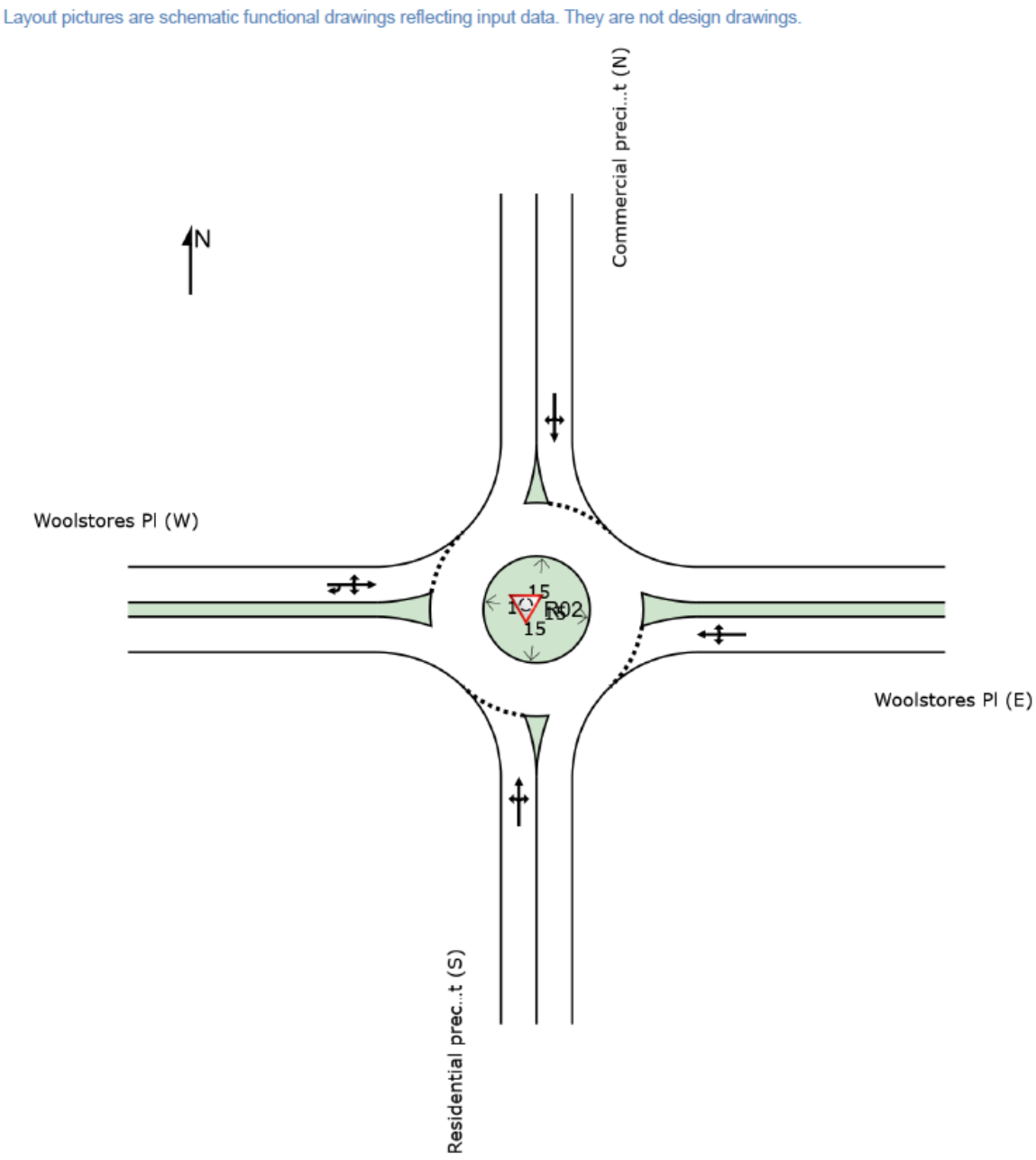


Figure C3. Woolstores Place internal roundabout layout analysed in SIDRA (with LSP area development)

Table C3a. SIDRA results – Woolstores Place internal roundabout – Future weekday AM peak (with LSP area full development)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Residential precinct (S)															
1	L2	All MCs	145	3.0	145	3.0	0.125	3.7	LOS A	0.5	4.0	0.30	0.48	0.30	36.0
2	T1	All MCs	1	3.0	1	3.0	0.125	3.6	LOS A	0.5	4.0	0.30	0.48	0.30	37.3
3	R2	All MCs	1	3.0	1	3.0	0.125	7.5	LOS A	0.5	4.0	0.30	0.48	0.30	35.5
Approach			147	3.0	147	3.0	0.125	3.7	LOS A	0.5	4.0	0.30	0.48	0.30	36.0
East: Woolstores Pl (E)															
4	L2	All MCs	1	3.0	1	3.0	0.129	3.8	LOS A	0.5	3.9	0.24	0.40	0.24	36.7
8	T1	All MCs	155	3.0	155	3.0	0.129	3.7	LOS A	0.5	3.9	0.24	0.40	0.24	39.5
9	R2	All MCs	1	3.0	1	3.0	0.129	7.6	LOS A	0.5	3.9	0.24	0.40	0.24	38.4
Approach			157	3.0	157	3.0	0.129	3.7	LOS A	0.5	3.9	0.24	0.40	0.24	39.5
North: Commercial precinct (N)															
10	L2	All MCs	1	3.0	1	3.0	0.033	4.2	LOS A	0.1	1.0	0.33	0.61	0.33	35.0
8	T1	All MCs	1	3.0	1	3.0	0.033	4.1	LOS A	0.1	1.0	0.33	0.61	0.33	32.7
12	R2	All MCs	35	3.0	35	3.0	0.033	8.1	LOS A	0.1	1.0	0.33	0.61	0.33	34.1
Approach			37	3.0	37	3.0	0.033	7.9	LOS A	0.1	1.0	0.33	0.61	0.33	34.1
West: Woolstores Pl (W)															
1	L2	All MCs	61	3.0	61	3.0	0.203	3.3	LOS A	0.9	7.0	0.03	0.47	0.03	38.9
2	T1	All MCs	179	3.0	179	3.0	0.203	3.2	LOS A	0.9	7.0	0.03	0.47	0.03	39.7
12	R2	All MCs	97	3.0	97	3.0	0.203	7.1	LOS A	0.9	7.0	0.03	0.47	0.03	35.6
3u	U	All MCs	2	2.7	2	2.7	0.203	8.8	LOS A	0.9	7.0	0.03	0.47	0.03	38.0
Approach			339	3.0	339	3.0	0.203	4.4	LOS A	0.9	7.0	0.03	0.47	0.03	38.5
All Vehicles			680	3.0	680	3.0	0.203	4.3	LOS A	0.9	7.0	0.15	0.46	0.15	38.0

Table C3b. SIDRA results – Woolstores Place internal roundabout – Future weekday PM peak (with LSP area full development)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Residential precinct (S)															
1	L2	All MCs	105	3.0	105	3.0	0.106	4.6	LOS A	0.5	3.6	0.46	0.56	0.46	34.9
2	T1	All MCs	1	3.0	1	3.0	0.106	4.6	LOS A	0.5	3.6	0.46	0.56	0.46	36.2
3	R2	All MCs	1	3.0	1	3.0	0.106	8.5	LOS A	0.5	3.6	0.46	0.56	0.46	34.5
Approach			107	3.0	107	3.0	0.106	4.7	LOS A	0.5	3.6	0.46	0.56	0.46	34.9
East: Woolstores Pl (E)															
4	L2	All MCs	1	3.0	1	3.0	0.220	4.6	LOS A	1.0	7.9	0.43	0.49	0.43	35.1
8	T1	All MCs	232	3.0	232	3.0	0.220	4.6	LOS A	1.0	7.9	0.43	0.49	0.43	38.1
9	R2	All MCs	1	3.0	1	3.0	0.220	8.5	LOS A	1.0	7.9	0.43	0.49	0.43	37.0
Approach			234	3.0	234	3.0	0.220	4.6	LOS A	1.0	7.9	0.43	0.49	0.43	38.1
North: Commercial precinct (N)															
10	L2	All MCs	1	3.0	1	3.0	0.181	4.7	LOS A	0.8	6.0	0.41	0.64	0.41	34.5
8	T1	All MCs	1	3.0	1	3.0	0.181	4.6	LOS A	0.8	6.0	0.41	0.64	0.41	32.2
12	R2	All MCs	192	3.0	192	3.0	0.181	8.6	LOS A	0.8	6.0	0.41	0.64	0.41	33.6
Approach			194	3.0	194	3.0	0.181	8.5	LOS A	0.8	6.0	0.41	0.64	0.41	33.6
West: Woolstores Pl (W)															
1	L2	All MCs	192	3.0	192	3.0	0.316	3.3	LOS A	1.7	13.0	0.03	0.47	0.03	39.0
2	T1	All MCs	207	3.0	207	3.0	0.316	3.2	LOS A	1.7	13.0	0.03	0.47	0.03	39.8
12	R2	All MCs	129	3.0	129	3.0	0.316	7.1	LOS A	1.7	13.0	0.03	0.47	0.03	35.6
3u	U	All MCs	2	2.7	2	2.7	0.316	8.8	LOS A	1.7	13.0	0.03	0.47	0.03	38.1
Approach			531	3.0	531	3.0	0.316	4.2	LOS A	1.7	13.0	0.03	0.47	0.03	38.6
All Vehicles			1065	3.0	1065	3.0	0.316	5.1	LOS A	1.7	13.0	0.23	0.51	0.23	37.1

Table C3c. SIDRA results – Woolstores Place internal roundabout – Future Saturday peak hour (with LSP area full development)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Residential precinct (S)															
1	L2	All MCs	148	3.0	148	3.0	0.167	5.6	LOS A	0.9	6.5	0.58	0.63	0.58	33.4
2	T1	All MCs	1	3.0	1	3.0	0.167	5.6	LOS A	0.9	6.5	0.58	0.63	0.58	34.6
3	R2	All MCs	1	3.0	1	3.0	0.167	9.5	LOS A	0.9	6.5	0.58	0.63	0.58	33.1
Approach			151	3.0	151	3.0	0.167	5.6	LOS A	0.9	6.5	0.58	0.63	0.58	33.4
East: Woolstores Pl (E)															
4	L2	All MCs	1	3.0	1	3.0	0.315	5.4	LOS A	1.7	12.8	0.56	0.57	0.56	34.0
8	T1	All MCs	303	3.0	303	3.0	0.315	5.4	LOS A	1.7	12.8	0.56	0.57	0.56	37.2
9	R2	All MCs	1	3.0	1	3.0	0.315	9.4	LOS A	1.7	12.8	0.56	0.57	0.56	36.2
Approach			305	3.0	305	3.0	0.315	5.4	LOS A	1.7	12.8	0.56	0.57	0.56	37.1
North: Commercial precinct (N)															
10	L2	All MCs	1	3.0	1	3.0	0.282	5.5	LOS A	1.4	10.4	0.52	0.68	0.52	33.9
8	T1	All MCs	1	3.0	1	3.0	0.282	5.4	LOS A	1.4	10.4	0.52	0.68	0.52	31.4
12	R2	All MCs	277	3.0	277	3.0	0.282	9.4	LOS A	1.4	10.4	0.52	0.68	0.52	33.0
Approach			279	3.0	279	3.0	0.282	9.4	LOS A	1.4	10.4	0.52	0.68	0.52	33.0
West: Woolstores Pl (W)															
1	L2	All MCs	277	3.0	277	3.0	0.440	3.3	LOS A	2.9	22.2	0.04	0.46	0.04	39.1
2	T1	All MCs	293	3.0	293	3.0	0.440	3.2	LOS A	2.9	22.2	0.04	0.46	0.04	39.8
12	R2	All MCs	171	3.0	171	3.0	0.440	7.1	LOS A	2.9	22.2	0.04	0.46	0.04	35.7
3u	U	All MCs	2	2.7	2	2.7	0.440	8.8	LOS A	2.9	22.2	0.04	0.46	0.04	38.1
Approach			742	3.0	742	3.0	0.440	4.2	LOS A	2.9	22.2	0.04	0.46	0.04	38.7
All Vehicles			1477	3.0	1477	3.0	0.440	5.6	LOS A	2.9	22.2	0.29	0.54	0.29	36.6