APPENDIX 6. INVESTIGATIONS – TRAFFIC

25 PIERSON STREET, LOCKLEYS CODE AMENDMENT

TRANSPORT INVESTIGATIONS REPORT

CIRQA™

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DOCUMENT CONTROL

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1. INTRODUCTION

CIRQA has been engaged to provide traffic impact investigations for the proposed 25 Pierson Street, Lockleys Code Amendment. Specifically, CIRQA's investigations relate to the proposed rezoning of land (from Employment Zone to the Urban Renewal Neighbourhood Zone and Suburban Neighbourhood Zone).

This report includes assessment of the potential traffic generation associated with the potential rezoning and redevelopment of the subject land, the associated impact on the adjacent existing road network, active and sustainable transport provisions and consideration of appropriate infrastructure upgrades/ requirements.

2. BACKGROUND

2.1 STUDY AREA

The subject site is located approximately 6 km north-west of Adelaide's Central Business District (CBD) and comprises a site area of approximately 48,800 m². The site is bound by the River Torrens (Karrawirra Parri) and associated reserve to the north, Pierson Street to the south and residential dwellings to the east and west. Figure 1 illustrates the subject site and adjacent road network.

Figure 1 – Subject site and adjacent road network

The Planning and Design Code (update 29 June 2023 (2023.9)) identifies that the site is currently located within the Employment Zone. The primary purpose of this zone is to provide land that accommodates commercial uses. The existing land use comprises approximately 26,000 m² of gross floor area (the Westpac Mortgage Centre of which approximately 70% is office area and the remainder is storage or similar uses) and a child care centre. Approximately 560 parking spaces are provided on the site.

The site is serviced directly via Pierson Street. Three two-way crossovers are provided on Pierson Street. The first crossover allows access to the main carpark, while the second and third crossovers are for service and delivery vehicles. All turning movements are possible at the three access points.

In addition, vehicular connections are also provided to Tracey Crescent (north-eastern corner of the site) and Azalea Drive (north-western corner of the

site). The two connections are gated and generally utilised for service and emergency access movements.

2.2 ADJACENT ROAD NETWORK

Pierson Street is a local road under the care and control of the City of West Torrens. Pierson Street comprises a 9.0 m wide carriageway (approximate), with a single traffic lane in each direction. The default urban speed limit of 50 km/h applies on Pierson Street. Traffic data recorded by the Department for Infrastructure and Planning (DIT) in 2019 (pre-COVID19) indicates that Pierson Street carries 4,000 vehicles per day (vpd).

To the west of the site Pierson Street intersects with Rowells Road at a signalised T-intersection. All turning movements are permitted at this intersection. Rowells Road is a secondary arterial road under the care of control of DIT. Rowells Road, a continuation of Findon Road (the change of name occurs at the bridge over the River Torrens), comprises a 12 m wide carriageway (approximate), although at Pierson Street the carriageway is approximately 14.5 m with a single traffic lane in each direction.

Rowells Road operates with one lane in each direction with part-time bicycle lanes (7:30 am to 9:00 am and 4:30 pm to 6:00 pm Monday to Friday) on both sides of the road. There is a small section that has full-time bicycle lanes on both sides of the road in the immediate area of the intersection with Pierson Street. Outside of these peak periods, parking is permitted on Rowells Road. Traffic data obtained from DIT indicates that this section of Rowells Road north of the Pierson Street intersection has an Annual Average Daily Traffic (AADT) volume in the order of 20,500 vpd, of which approximately 6% are commercial vehicles. South of Pierson Street the AADT volume is in the order of 17,900 vpd, of which approximately 5.5% are commercial vehicles.

To the east of the site, Pierson Street intersects with White Avenue as a reprioritised T-intersection to the south. Access from the northern section of White Avenue at the intersection is controlled by a Give-Way sign. White Avenue forms a reprioritised T-intersection at Garden Terrace approximately 120 m south of the intersection with Pierson Street. This forms a priority for traffic to access Holbrooks Road to the east. South of the reprioritised intersection with Garden Terrace, White Terrace provides direct access to Henley Beach Road. This section of White Terrace has traffic management devices in the form of single lane angled slow points to deter through traffic.

White Avenue is a local road under the care and control of the City of West Torrens. White Avenue comprises a 9 m wide carriageway (approximate), with a single traffic lane in each direction separated by a broken centreline. The default urban speed limit of 50 km/h applies on White Avenue.

2.3 WALKING AND CYCLING

Sealed footpaths are provided on both sides of Pierson Street, Rowells Road and White Avenue. No formal cycling facilities are provided on Pierson Street or White Avenue. As such, cyclists are required to use the traffic lanes (under a standard shared arrangement) or the adjacent footpath network. Cyclist facilities are provided on Rowells Road at restricted times (7:30 am to 9:00 am and 4:30 pm to 6:00 pm Monday to Friday).

The River Torrens Linear Trail (cycling and walking path) is located at the rear of the subject site (northern side) and provides a connection from West Beach to Adelaide CBD and to Athelstone. The linear trail connects to Rowells Road/ Findon Road at two locations (130 m north and 175 m north of Pierson Street).

Pedestrian crossing movements are facilitated at the signalised intersection of Pierson Street and Rowells Road. Adjacent the subject site, Pierson Street contains no formal pedestrian crossing facilities.

2.4 PUBLIC TRANSPORT

Several public transport services operate within close vicinity to the subject site. Specifically, regular bus services operate along Pierson Street and Rowells Road. Adjacent the subject site, bus stop 12 (in both directions) is located on Pierson Street directly in front of the subject site. On Rowells Road bus stop 208 is located 40 m north of Pierson Street.

Bus stop 12 (Pierson Street) is serviced by the H22 bus route – Henley Beach South to Wattle Park.

Bus stop 208 (Rowells Road) is serviced by the following bus routes:

- 671 – Fulham Gardens to Brighton Secondary School
- J7 – West Lakes Interchange to Marion Centre Interchange
- J7M – West Lakes Interchange/Marion Centre Interchange to Camden Park
- J8 – West Lakes Interchange to Marion Centre Interchange

3. PROPOSED REZONING

It is proposed to rezone the site to the Urban Renewal Neighbourhood Zone and Suburban Neighbourhood Zone. It is anticipated that the rezoning will allow a mix of medium-density dwellings to be developed within the site. It is also noted that a previous Code Amendment was proposed for the site but did not proceed.

3.1 ANTICIPATED DEVELOPMENT YIELDS

CIRQA has been advised that a range of potential development yields could be accommodated by the rezoning. For the purpose of this assessment, the expected yields are expected to be lower than anticipated in the previous code amendment (more likely 250 or less), however, for the purpose of this assessment, the maximum yields have been adopted. Specifically, it has been assumed that up to 360 medium-density dwellings could be accommodated on the site. Lower yields will therefore result in better traffic outcomes than suggested by the following assessment.

3.2 ACCESS AND TRANSPORT INFRASTRUCTURE

Access provisions on Pierson Street for future development within the site should be consolidated where possible (i.e. direct property access to Pierson Street minimised where possible and properties fronting this street should generally be rear-loading). Generally, it is considered that two primary intersections could be accommodated along the site's Pierson Street frontage (albeit should avoid being located in close proximity to Malarus Avenue unless appropriate traffic control is implemented).

Additional vehicular access could also be accommodated via Tracey Crescent and Azalea Drive. These connections should be minor in nature and the internal road design should encourage primary flows to be via the new intersection(s) on Pierson Street. Nevertheless, minor connections would maximise road network permeability and also assist with servicing (refuse collection) for both the subject site and the dwellings on the existing roads given there are no existing turnaround facilities (particularly relevant for Azalea Drive).

The internal road network should be designed in accordance with the City of West Torrens' engineering guidelines. In particular, the design of the road network should include consideration of on-street parking provisions, pedestrian and cyclist connectivity, waste collection provisions and appropriate traffic management treatments at all new intersections. In particular, strong pedestrian and cyclist connections should be provided between development within the site and the nearby Linear Trail.

It is noted that the Planning and Design Code generally seeks the provision of 0.33 on-street parking spaces be 'retained' per dwelling. The Code does not

specifically identify a rate for the 'creation' of on-street spaces within a new road, however, generally it is anticipated that the above rate would be assessed as being a reasonable indicator of the intent of the Code. Such a level of provision is considered appropriate, albeit there will likely be additional opportunities for off-street visitor parking (particularly within the apartment sites).

4. TRAFFIC GENERATION AND DISTRIBUTION

4.1 GENERATION RATES

In order to determine the impacts of the proposed rezoning on the adjacent road network, traffic volumes associated with the existing and potential future site (based upon the above yields) have been forecast.

Traffic volumes have generally been forecast using rates adopted from the NSW RTA's *"Guide to Traffic Generating Developments"* (the RTA Guide) or other rates considered appropriate based on CIRQA's experience.

- Office
  - 1.6 am and 1.2 pm peak hour trips per 100 m² of gross floor area;
- Storage
  - 0.5 peak hour trips per 100 m² of gross floor area;
- Medium density residential
  - 0.65 am and pm peak hour trips per dwelling; and
- High density residential
  - 0.53 am and pm peak hour trips per dwelling.

For the purposes of this assessment, it has been assumed that the child care centre on the subject site was primarily ancillary to the Westpac Mortgage Centre and, accordingly, generated minimal additional movements.

4.2 EXISTING TRAFFIC

The above office and storage trip rates are applicable to the existing uses on site. Based on these rates, it is estimated that the existing site uses generate in the order of 330 am and 260 pm peak hour trips.

For the distribution of these movements, it is assumed that 80% of movements will be into the site and 20% out for the am peak hour and vice versa for the pm peak hour. The assumed distribution of movements to/from the broader road network is identified in Figure 2. This has been based on anticipated origins for staff associated with the site as well as the level of connectivity within the surrounding road network. While there may be some distribution to other adjacent local roads (not identified in the distribution figure), the number of movements would be relatively low.

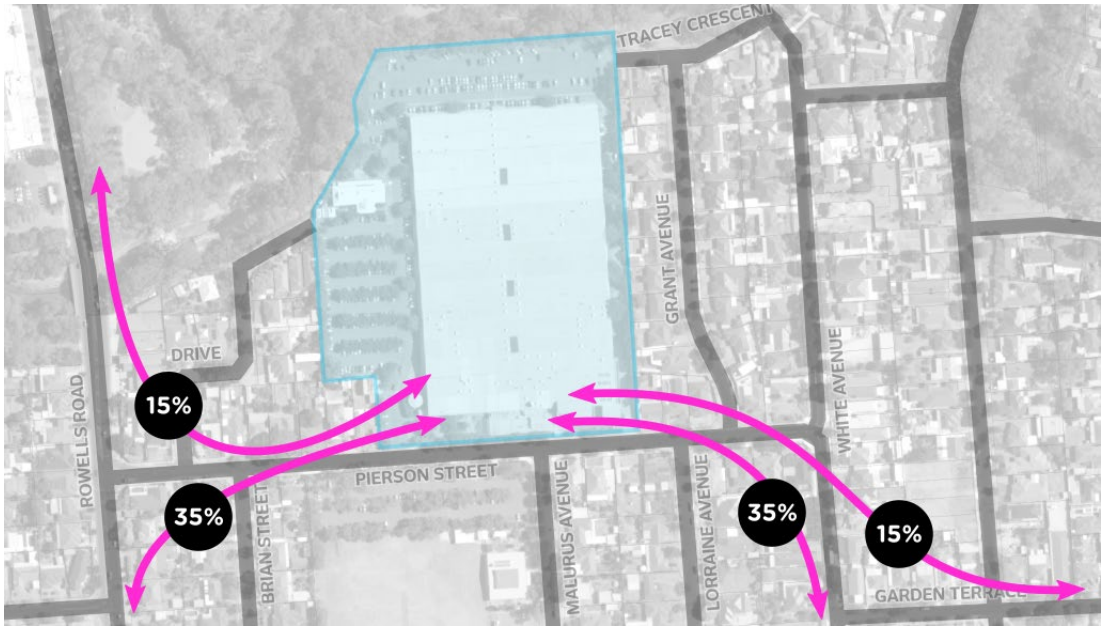

Figure 2 – Assumed distribution of current traffic from the subject site

On the basis of the above forecasts, it has been determined that the section of Pierson Street west of the site currently accommodates approximately 150 vpd associated with the site. Similarly, the section of Pierson Street east of the site accommodates approximately 150 peak hour movements associated with the site. These values have been averaged between the am and pm peak hour forecasts.

Based on the above, Figure 3 illustrates the estimated number of existing movements distributed via the intersection of Pierson Street and Rowells Road.

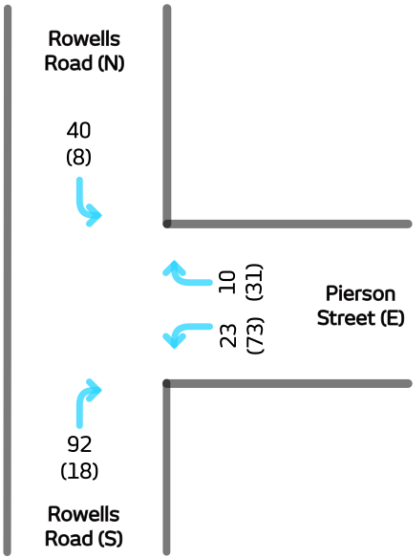

Figure 3 – Forecast existing movements associated with the site at the Pierson Street/Rowells Road intersection

4.3 FUTURE TRAFFIC GENERATION

In order to provide a conservative assessment, the medium density generation rate has been applied to all dwellings within the site. On this basis, it is forecast that up to 235 trips could be generated by the future residential uses in the am and pm peak hours.

The redevelopment of the site for residential use would therefore result in a reduction in the level of traffic generated to and from the site (and an overall positive impact).

In respect to the distribution of these movements, the following assessment assumes that 80% of movements will be out of the site and 20% into the site during the am peak hour (vice versa during the pm peak hour). It is anticipated that there will be a slightly different distribution of movements with a higher level of movements likely to/from the Adelaide CBD (compared to the current situation). Accordingly, the assessment of the future volumes has been based on the forecast distribution illustrated in Figure 4.

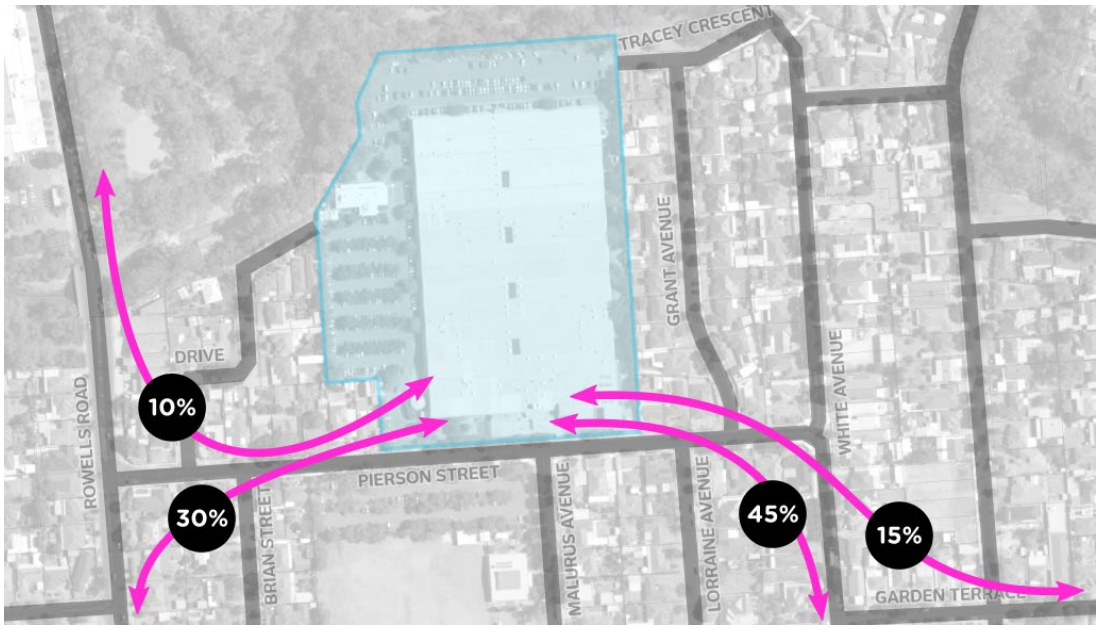

Figure 4 – Forecast distribution of future (residential) movements

On the basis of these forecasts, it has been determined that the section of Pierson Street west of the site would accommodate approximately 95 vpd associated with the site. Whereas the section of Pierson Street east of the site would accommodate approximately 140 peak hour movements associated with the site. Therefore, volumes are forecast to reduce on both sections of Pierson Street (as well as the broader road network).

The distribution of the future movements via the intersection of Pierson Street and Rowells Road has been forecast as illustrated in Figure 5.

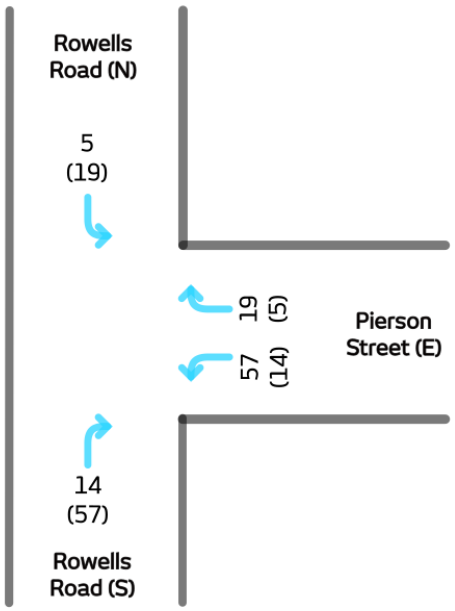

Figure 5 – Forecast future movements associated with the site at the Pierson Street/Rowells Road intersection

5. TRAFFIC IMPACT

As demonstrated above, the anticipated distribution of traffic associated with the potential redevelopment of the site to the adjacent road network will likely be less than that currently associated with the site. It is noted that there is potential for slight increases on Azalea Drive and Tracey Crescent (if vehicular connections are provided). However, the distribution of traffic via these two roads would be minimal and have little impact on conditions on the roads. It is therefore not considered necessary to remove these connections as an option for future development, as preferred by the City of West Torrens.

In order to ensure the altered distribution of movements does not adversely impact the intersection of Pierson Street and Rowells Road, SIDRA intersection modelling software has been used to provide a high-level analysis of existing and future conditions. This has been based on the forecast volumes detailed above as well as existing traffic movement data recorded at the intersection by DIT in 2019. For the future scenario, the forecast existing movements associated with the site have been subtracted from the total volumes with the additional future volumes then included.

The detailed output is provided in Appendix A. The SIDRA analysis identifies that the proposed rezoning and subsequent redevelopment would improve conditions in both the am and pm peak periods at the intersection. Of particular note, the future traffic volumes would result in a reduced queue for right-turn movements from Rowells Road to Pierson Street. This is a particular improvement given the restricted length of the existing right-turn lane (which the SIDRA analysis suggests is currently near capacity). It is also reiterated that the above traffic forecasts are conservative (as they are based on higher yields than will likely be realised) and conditions will be even better than suggested above.

The assessment of the distribution of movements and the SIDRA analysis for the intersection of Rowells Road/Pierson Street confirms that the proposed rezoning would have a positive impact from a traffic engineering perspective.

6. SUMMARY

The subject rezoning (Code Amendment) within Lockleys will facilitate the future redevelopment of the subject land for residential development. A traffic assessment has been undertaken on an assumed (conservative) yield of 360 dwellings, however, it is anticipated that the yield will be much lower than this.

It is considered desirable that at least one primary intersection be provided on Pierson Street to service the subject site, albeit additional intersections and minor direct access may be considered (subject to appropriate analysis, design and liaison with Council). It is desirable that the access on Pierson Street accommodate the majority of vehicle movements associated with the site (and the internal road network should be designed accordingly). Additional access may also be provided via Azalea Drive and Tracey Crescent, however should be minor (secondary) in nature.

The intersections (access points) should connect to an internal road network designed and constructed in accordance with the City of West Torrens' requirements. The planning and design of the internal layout shall ensure adequate provisions for on-street parking, waste collection vehicle movements and appropriate traffic control treatments within the site. A high level of permeability for pedestrians and cyclists should be provided including connections to/from the adjacent Linear Trail.

An assessment has been undertaken of the traffic generation associated with the subject site. This includes a forecast of existing generation as well as that associated with the anticipated future yields. The forecasts identify that there will be a reduction in traffic generation associated with the ultimate redevelopment of the site. The rezoning and subsequent redevelopment would therefore result in a positive impact on the adjacent road network. Additionally, SIDRA analysis has been prepared for the intersection of Pierson Street and Rowells Road which confirms improved conditions would be realised as a result of the redevelopment of the site for residential use.

APPENDIX A

SIDRA ANALYSIS RESULTS

INTERSECTION SUMMARY

Site: 101 [Rowells Road/Pierson Street - Existing AM]

Westpac Mortgage Centre DPA
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Intersection Performance - Hourly Values								
Performance Measure	**Vehicles**			**Pedestrians**			**Persons**	
Travel Speed (Average)	43.5	km/h		2.1	km/h		42.5	km/h
Travel Distance (Total)	2438.2	veh-km/h		3.5	ped-km/h		2929.4	pers-km/h
Travel Time (Total)	56.0	veh-h/h		1.7	ped-h/h		68.9	pers-h/h
Demand Flows (Total)	2405	veh/h		105	ped/h		2992	pers/h
Percent Heavy Vehicles (Demand)	2.4	%						
Degree of Saturation	0.645			0.053				
Practical Spare Capacity	39.6	%						
Effective Intersection Capacity	3731	veh/h						
Control Delay (Total)	14.01	veh-h/h		0.96	ped-h/h		17.77	pers-h/h
Control Delay (Average)	21.0	sec		32.8	sec		21.4	sec
Control Delay (Worst Lane)	60.6	sec						
Control Delay (Worst Movement)	60.6	sec		50.5	sec		60.6	sec
Geometric Delay (Average)	1.4	sec						
Stop-Line Delay (Average)	19.5	sec						
Idling Time (Average)	16.6	sec						
Intersection Level of Service (LOS)	LOS C			LOS D				
95% Back of Queue - Vehicles (Worst Lane)	24.0	veh						
95% Back of Queue - Distance (Worst Lane)	171.0	m						
Queue Storage Ratio (Worst Lane)	0.21							
Total Effective Stops	1501	veh/h		75	ped/h		1876	pers/h
Effective Stop Rate	0.62	per veh		0.71	per ped		0.63	per pers
Proportion Queued	0.67			0.71			0.67	
Performance Index	170.7			2.1			172.8	
Cost (Total)	1552.51	$/h		43.17	$/h		1595.68	$/h
Fuel Consumption (Total)	214.8	L/h						
Carbon Dioxide (Total)	508.1	kg/h						
Hydrocarbons (Total)	0.042	kg/h						
Carbon Monoxide (Total)	0.554	kg/h						
NOx (Total)	0.593	kg/h						

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values								
Performance Measure	**Vehicles**			**Pedestrians**			**Persons**	
Demand Flows (Total)	1,154,526	veh/y		50,526	ped/y		1,435,958	pers/y
Delay	6,723	veh-h/y		460	ped-h/y		8,527	pers-h/y
Effective Stops	720,388	veh/y		35,868	ped/y		900,334	pers/y
Travel Distance	1,170,349	veh-km/y		1,695	ped-km/y		1,406,114	pers-km/y
Travel Time	26,876	veh-h/y		822	ped-h/y		33,073	pers-h/y
Cost	745,203	$/y		20,722	$/y		765,924	$/y
Fuel Consumption	103,102	L/y						
Carbon Dioxide	243,887	kg/y						
Hydrocarbons	20	kg/y						
Carbon Monoxide	266	kg/y						
NOx	285	kg/y						

MOVEMENT SUMMARY

Site: 101 [Rowells Road/Pierson Street - Existing AM]

Westpac Mortgage Centre DPA
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total 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: Rowells Road [S]											
2	T1	791	2.6	0.645	7.6	LOS A	20.6	147.1	0.49	0.45	53.3
3	R2	131	2.6	0.573	60.6	LOS E	7.4	53.2	0.99	0.80	28.5
Approach		921	2.6	0.645	15.1	LOS B	20.6	147.1	0.56	0.50	47.4
East: Pierson Street [E]											
4	L2	60	2.7	0.096	33.2	LOS C	2.4	16.9	0.71	0.71	35.8
6	R2	176	2.7	0.628	55.3	LOS E	9.7	69.5	0.97	0.81	29.3
Approach		236	2.7	0.628	49.7	LOS D	9.7	69.5	0.91	0.78	30.7
North: Rowells Road [N]											
7	L2	301	2.2	0.589	24.1	LOS C	23.4	166.9	0.71	0.73	41.1
8	T1	947	2.2	0.589	18.5	LOS B	24.0	171.0	0.71	0.67	45.5
Approach		1248	2.2	0.589	19.8	LOS B	24.0	171.0	0.71	0.68	44.4
All Vehicles		2405	2.4	0.645	21.0	LOS C	24.0	171.0	0.67	0.62	43.5

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	50.5	LOS E	0.2	0.2	0.92	0.92
P2	East Full Crossing	53	15.0	LOS B	0.1	0.1	0.50	0.50
All Pedestrians		105	32.8	LOS D			0.71	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

INTERSECTION SUMMARY

Site: 101 [Rowells Road/Pierson Street - Existing PM]

Westpac Mortgage Centre DPA
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Intersection Performance - Hourly Values								
Performance Measure	**Vehicles**			**Pedestrians**			**Persons**	
Travel Speed (Average)	45.8	km/h		2.2	km/h		44.6	km/h
Travel Distance (Total)	2237.1	veh-km/h		3.5	ped-km/h		2688.0	pers-km/h
Travel Time (Total)	48.8	veh-h/h		1.6	ped-h/h		60.2	pers-h/h
Demand Flows (Total)	2207	veh/h		105	ped/h		2754	pers/h
Percent Heavy Vehicles (Demand)	2.4	%						
Degree of Saturation	0.646			0.040				
Practical Spare Capacity	39.3	%						
Effective Intersection Capacity	3416	veh/h						
Control Delay (Total)	10.67	veh-h/h		0.88	ped-h/h		13.68	pers-h/h
Control Delay (Average)	17.4	sec		30.0	sec		17.9	sec
Control Delay (Worst Lane)	68.5	sec						
Control Delay (Worst Movement)	68.5	sec		47.8	sec		68.5	sec
Geometric Delay (Average)	0.9	sec						
Stop-Line Delay (Average)	16.5	sec						
Idling Time (Average)	13.7	sec						
Intersection Level of Service (LOS)	LOS B			LOS C				
95% Back of Queue - Vehicles (Worst Lane)	25.5	veh						
95% Back of Queue - Distance (Worst Lane)	182.6	m						
Queue Storage Ratio (Worst Lane)	0.22							
Total Effective Stops	1257	veh/h		71	ped/h		1580	pers/h
Effective Stop Rate	0.57	per veh		0.67	per ped		0.57	per pers
Proportion Queued	0.62			0.67			0.62	
Performance Index	146.5			2.0			148.5	
Cost (Total)	1350.21	$/h		41.12	$/h		1391.33	$/h
Fuel Consumption (Total)	193.6	L/h						
Carbon Dioxide (Total)	458.0	kg/h						
Hydrocarbons (Total)	0.038	kg/h						
Carbon Monoxide (Total)	0.510	kg/h						
NOx (Total)	0.542	kg/h						

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values								
Performance Measure	**Vehicles**			**Pedestrians**			**Persons**	
Demand Flows (Total)	1,059,537	veh/y		50,526	ped/y		1,321,971	pers/y
Delay	5,120	veh-h/y		421	ped-h/y		6,565	pers-h/y
Effective Stops	603,580	veh/y		33,969	ped/y		758,265	pers/y
Travel Distance	1,073,785	veh-km/y		1,695	ped-km/y		1,290,237	pers-km/y
Travel Time	23,443	veh-h/y		783	ped-h/y		28,915	pers-h/y
Cost	648,100	$/y		19,736	$/y		667,836	$/y
Fuel Consumption	92,927	L/y						
Carbon Dioxide	219,845	kg/y						
Hydrocarbons	18	kg/y						
Carbon Monoxide	245	kg/y						
NOx	260	kg/y						

MOVEMENT SUMMARY

Site: 101 [Rowells Road/Pierson Street - Existing PM]

Westpac Mortgage Centre DPA
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total 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: Rowells Road [S]											
2	T1	849	2.6	0.640	9.7	LOS A	25.5	182.6	0.57	0.53	51.8
3	R2	22	2.6	0.242	68.5	LOS E	1.3	9.5	0.99	0.71	26.8
Approach		872	2.6	0.640	11.2	LOS B	25.5	182.6	0.58	0.53	50.6
East: Pierson Street [E]											
4	L2	113	2.7	0.212	39.0	LOS D	5.0	35.5	0.80	0.75	33.9
6	R2	192	2.7	0.646	52.7	LOS D	10.3	74.0	0.95	0.81	30.0
Approach		304	2.7	0.646	47.6	LOS D	10.3	74.0	0.90	0.79	31.3
North: Rowells Road [N]											
7	L2	83	2.2	0.443	18.9	LOS B	15.8	112.9	0.58	0.56	44.6
8	T1	948	2.2	0.443	13.3	LOS B	16.0	113.8	0.58	0.54	49.0
Approach		1032	2.2	0.443	13.8	LOS B	16.0	113.8	0.58	0.54	48.6
All Vehicles		2207	2.4	0.646	17.4	LOS B	25.5	182.6	0.62	0.57	45.8

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	47.8	LOS E	0.2	0.2	0.89	0.89
P2	East Full Crossing	53	12.2	LOS B	0.1	0.1	0.45	0.45
All Pedestrians		105	30.0	LOS C			0.67	0.67

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

INTERSECTION SUMMARY

Site: 101 [Rowells Road/Pierson Street - Future AM]

Westpac Mortgage Centre DPA
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Intersection Performance - Hourly Values								
Performance Measure	**Vehicles**			**Pedestrians**			**Persons**	
Travel Speed (Average)	45.0	km/h		2.2	km/h		43.9	km/h
Travel Distance (Total)	2363.4	veh-km/h		3.5	ped-km/h		2839.6	pers-km/h
Travel Time (Total)	52.5	veh-h/h		1.6	ped-h/h		64.6	pers-h/h
Demand Flows (Total)	2332	veh/h		105	ped/h		2903	pers/h
Percent Heavy Vehicles (Demand)	2.4	%						
Degree of Saturation	0.614			0.040				
Practical Spare Capacity	46.6	%						
Effective Intersection Capacity	3797	veh/h						
Control Delay (Total)	11.89	veh-h/h		0.88	ped-h/h		15.14	pers-h/h
Control Delay (Average)	18.4	sec		30.0	sec		18.8	sec
Control Delay (Worst Lane)	70.2	sec						
Control Delay (Worst Movement)	70.2	sec		47.8	sec		70.2	sec
Geometric Delay (Average)	1.3	sec						
Stop-Line Delay (Average)	17.1	sec						
Idling Time (Average)	14.3	sec						
Intersection Level of Service (LOS)	LOS B			LOS C				
95% Back of Queue - Vehicles (Worst Lane)	22.5	veh						
95% Back of Queue - Distance (Worst Lane)	161.0	m						
Queue Storage Ratio (Worst Lane)	0.20							
Total Effective Stops	1388	veh/h		71	ped/h		1737	pers/h
Effective Stop Rate	0.60	per veh		0.67	per ped		0.60	per pers
Proportion Queued	0.63			0.67			0.64	
Performance Index	157.3			2.0			159.4	
Cost (Total)	1446.49	$/h		41.12	$/h		1487.61	$/h
Fuel Consumption (Total)	205.3	L/h						
Carbon Dioxide (Total)	485.6	kg/h						
Hydrocarbons (Total)	0.040	kg/h						
Carbon Monoxide (Total)	0.534	kg/h						
NOx (Total)	0.570	kg/h						

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values								
Performance Measure	**Vehicles**			**Pedestrians**			**Persons**	
Demand Flows (Total)	1,119,158	veh/y		50,526	ped/y		1,393,516	pers/y
Delay	5,707	veh-h/y		421	ped-h/y		7,269	pers-h/y
Effective Stops	666,339	veh/y		33,969	ped/y		833,576	pers/y
Travel Distance	1,134,420	veh-km/y		1,695	ped-km/y		1,363,000	pers-km/y
Travel Time	25,203	veh-h/y		783	ped-h/y		31,026	pers-h/y
Cost	694,316	$/y		19,736	$/y		714,051	$/y
Fuel Consumption	98,529	L/y						
Carbon Dioxide	233,083	kg/y						
Hydrocarbons	19	kg/y						
Carbon Monoxide	256	kg/y						
NOx	273	kg/y						

MOVEMENT SUMMARY

Site: 101 [Rowells Road/Pierson Street - Future AM]

Westpac Mortgage Centre DPA
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total 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: Rowells Road [S]											
2	T1	791	2.6	0.614	9.2	LOS A	22.5	161.0	0.54	0.50	52.1
3	R2	48	2.6	0.531	70.2	LOS E	3.0	21.4	1.00	0.75	26.5
Approach		839	2.6	0.614	12.7	LOS B	22.5	161.0	0.57	0.51	49.4
East: Pierson Street [E]											
4	L2	96	2.7	0.180	38.6	LOS D	4.2	29.9	0.79	0.74	34.0
6	R2	185	2.7	0.605	52.3	LOS D	9.9	71.0	0.95	0.81	30.0
Approach		281	2.7	0.605	47.6	LOS D	9.9	71.0	0.89	0.79	31.3
North: Rowells Road [N]											
7	L2	264	2.2	0.524	19.9	LOS B	19.8	141.3	0.62	0.66	43.3
8	T1	947	2.2	0.524	14.3	LOS B	20.3	144.4	0.62	0.60	48.0
Approach		1212	2.2	0.524	15.5	LOS B	20.3	144.4	0.62	0.61	46.9
All Vehicles		2332	2.4	0.614	18.4	LOS B	22.5	161.0	0.63	0.60	45.0

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	47.8	LOS E	0.2	0.2	0.89	0.89
P2	East Full Crossing	53	12.2	LOS B	0.1	0.1	0.45	0.45
All Pedestrians		105	30.0	LOS C			0.67	0.67

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

INTERSECTION SUMMARY

Site: 101 [Rowells Road/Pierson Street - Future PM]

Westpac Mortgage Centre DPA
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Intersection Performance - Hourly Values								
Performance Measure	**Vehicles**			**Pedestrians**			**Persons**	
Travel Speed (Average)	46.7	km/h		2.1	km/h		45.4	km/h
Travel Distance (Total)	2199.7	veh-km/h		3.5	ped-km/h		2643.2	pers-km/h
Travel Time (Total)	47.1	veh-h/h		1.7	ped-h/h		58.3	pers-h/h
Demand Flows (Total)	2171	veh/h		105	ped/h		2710	pers/h
Percent Heavy Vehicles (Demand)	2.4	%						
Degree of Saturation	0.638			0.066				
Practical Spare Capacity	41.1	%						
Effective Intersection Capacity	3403	veh/h						
Control Delay (Total)	9.69	veh-h/h		0.93	ped-h/h		12.56	pers-h/h
Control Delay (Average)	16.1	sec		31.8	sec		16.7	sec
Control Delay (Worst Lane)	65.9	sec						
Control Delay (Worst Movement)	65.9	sec		52.4	sec		65.9	sec
Geometric Delay (Average)	0.9	sec						
Stop-Line Delay (Average)	15.2	sec						
Idling Time (Average)	12.6	sec						
Intersection Level of Service (LOS)	LOS B			LOS D				
95% Back of Queue - Vehicles (Worst Lane)	21.8	veh						
95% Back of Queue - Distance (Worst Lane)	156.3	m						
Queue Storage Ratio (Worst Lane)	0.19							
Total Effective Stops	1146	veh/h		72	ped/h		1447	pers/h
Effective Stop Rate	0.53	per veh		0.68	per ped		0.53	per pers
Proportion Queued	0.58			0.68			0.58	
Performance Index	136.6			2.1			138.7	
Cost (Total)	1280.20	$/h		42.47	$/h		1322.68	$/h
Fuel Consumption (Total)	185.6	L/h						
Carbon Dioxide (Total)	439.2	kg/h						
Hydrocarbons (Total)	0.036	kg/h						
Carbon Monoxide (Total)	0.492	kg/h						
NOx (Total)	0.511	kg/h						

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Intersection Performance - Annual Values								
Performance Measure	**Vehicles**			**Pedestrians**			**Persons**	
Demand Flows (Total)	1,041,853	veh/y		50,526	ped/y		1,300,750	pers/y
Delay	4,653	veh-h/y		447	ped-h/y		6,030	pers-h/y
Effective Stops	550,110	veh/y		34,602	ped/y		694,734	pers/y
Travel Distance	1,055,853	veh-km/y		1,695	ped-km/y		1,268,718	pers-km/y
Travel Time	22,628	veh-h/y		809	ped-h/y		27,963	pers-h/y
Cost	614,498	$/y		20,388	$/y		634,886	$/y
Fuel Consumption	89,110	L/y						
Carbon Dioxide	210,829	kg/y						
Hydrocarbons	17	kg/y						
Carbon Monoxide	236	kg/y						
NOx	245	kg/y						

MOVEMENT SUMMARY

Site: 101 [Rowells Road/Pierson Street - Future PM]

Westpac Mortgage Centre DPA
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total 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: Rowells Road [S]											
2	T1	849	2.6	0.630	7.1	LOS A	21.8	156.3	0.49	0.45	53.7
3	R2	63	2.6	0.462	65.9	LOS E	3.7	26.7	1.00	0.76	27.4
Approach		913	2.6	0.630	11.2	LOS B	21.8	156.3	0.52	0.47	50.4
East: Pierson Street [E]											
4	L2	51	2.7	0.101	39.2	LOS D	2.2	15.7	0.78	0.71	33.8
6	R2	164	2.7	0.638	57.4	LOS E	9.3	66.3	0.98	0.82	28.8
Approach		215	2.7	0.638	53.2	LOS D	9.3	66.3	0.94	0.79	29.9
North: Rowells Road [N]											
7	L2	95	2.2	0.436	17.8	LOS B	15.4	109.6	0.56	0.55	45.1
8	T1	948	2.2	0.436	12.2	LOS B	15.5	110.6	0.56	0.52	49.6
Approach		1043	2.2	0.436	12.7	LOS B	15.5	110.6	0.56	0.52	49.2
All Vehicles		2171	2.4	0.638	16.1	LOS B	21.8	156.3	0.58	0.53	46.7

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	52.4	LOS E	0.2	0.2	0.94	0.94
P2	East Full Crossing	53	11.3	LOS B	0.1	0.1	0.43	0.43
All Pedestrians		105	31.8	LOS D			0.68	0.68

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.