ML
Traffic Engineers

TRAFFIC AND PARKING IMPACT ASSESSMENT OF A PROPOSED RESIDENTIAL DEVELOPMENT

74-80 Restwell Street and 1-9 Leonard Street in Bankstown

Traffic and Parking Impact Report

Prepared for: Le Chateau Developments Pty Ltd

A1514141N (Version 1a)

May 2015

1. INTRODUCTION

ML Traffic Engineers was commissioned by Le Chateau Developments Pty Ltd to undertake a traffic and parking impact assessment of proposed residential development at 74-80 Restwell Street and 1-9 Leonard Street in Bankstown. The site has frontage to Restwell Street and Leonard Street. The site is currently unoccupied with no permanent structures on sight.

The development site is on the southern outskirts of Bankstown

This traffic report focuses on the proposed development and changes in car usage and car park utilisation and additional trips from the proposed development.

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

2. BACKGROUND AND EXISTING CONDITIONS OF THE PROPOSED LOCATION

2.1 Location and Land Use

The development site is located at 74-80 Restwell Street and 1-9 Leonard Street in Bankstown. The site has frontage to Restwell Street and Leonard Street. The site is currently unoccupied with no permanent structures on sight. The nearby landuses are residential with a school opposite the site (Bankstown Public School) and there are commercial business to the north near Stanley Street.

The development site is on the southern outskirts of Bankstown and is within walking distance to Bankstown Train Station and the bus services.

Figures 1 and 2 show the location of the development site from the aerial and street map perspective respectively.

Figure 3 shows photographs of the site

Figure 1: Location of the Subject Site on Aerial

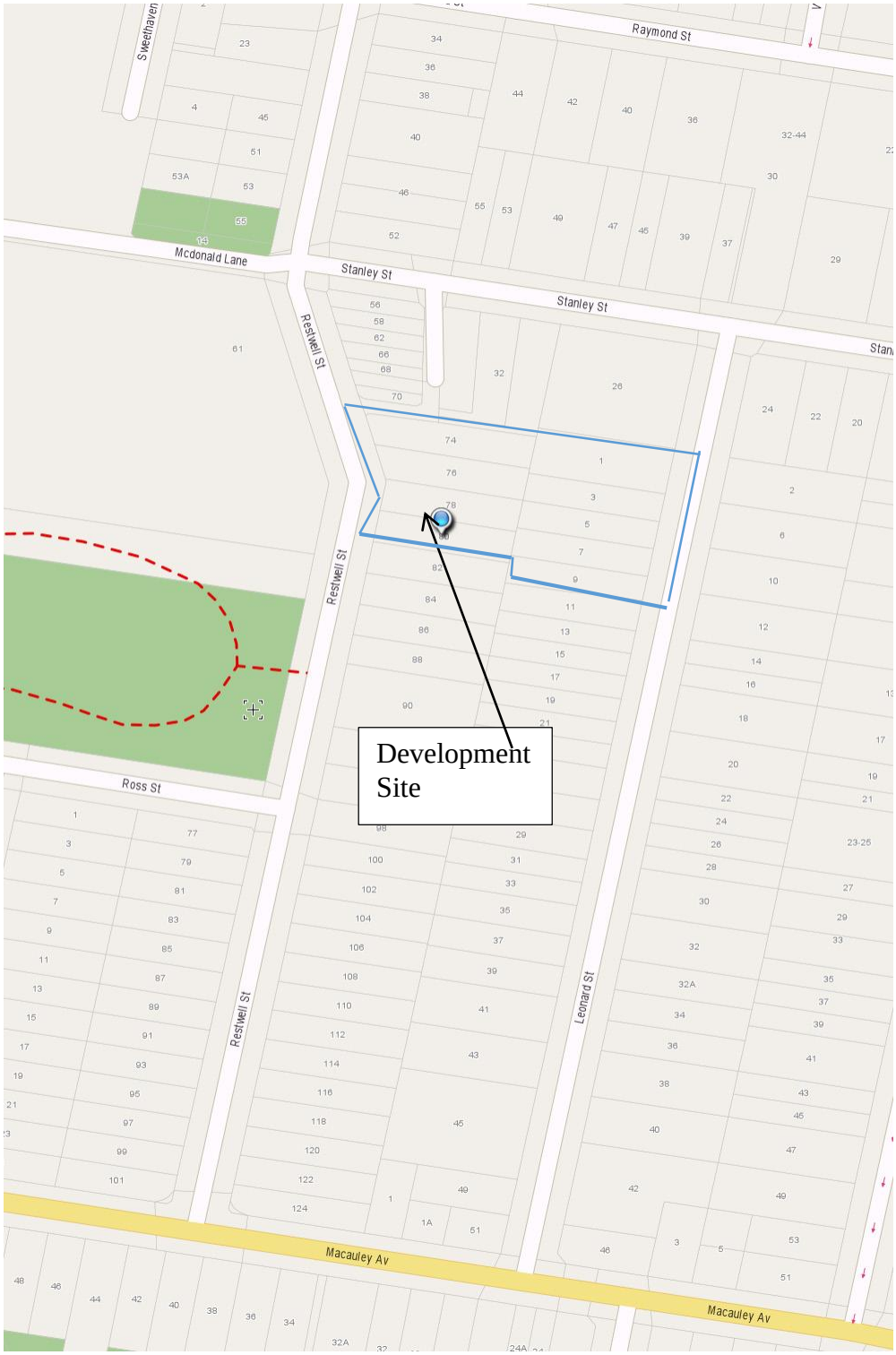

Figure 2: Street Map of the Location of the Development Site

Figure 3: Photograph of the Development Site from Restwell Street

2.2 Road Network

This section describes the roads near the proposed development.

Restwell Street is a collector road and has one lane each way with a sign posted speed limit of 50km/hr. On street parking is permitted and is subject to restrictions especially adjacent to the school and elsewhere a one hour restriction during weekday and Saturday business hours. A school zone speed of 40km/hr applies to the weekday drop off and pick up periods on school days. A double barrier centre

line is present adjacent to the development site. Figure 4 shows a photograph of Restwell Street near the development site.

Leonard Street is a local road and has one lanes each way with a sign posted speed limit of 50km/hr. On street parking is permitted and is not time restricted on both sides of the road.

Figure 4: Restwell Street looking south from adjacent the Development Site

2.3 Public Parking Opportunities

The development site has frontage to Restwell Street and Leonard Street. On street parking is permitted on Leonard Street and is not time restricted overall. On street parking is time restricted on Restwell Street as well as restrictions adjacent to the Bankstown Public School.

The site visit showed that there are a reasonable number of vacant car spaces available – see Figure 4.

2.4 Intersection Description

As part of the traffic assessment, four intersections are assessed:

- signalised intersection of Stacey Street with Stanley Street and Salvia Avenue
- signalised intersection of Stacey Street with Macauley Street
- priority intersection of Macauley Street with Leonard Street
- priority intersection of Stanley Street with Leonard Street

External traffic travelling to and from the development site will most likely need to travel through this intersection.

The priority intersection of Macauley Street with Leonard Street is a three leg intersection with drivers from Leonard Street need to give way to traffic on Macauley Street. Figure 5 presents the layout of this intersection using SIDRA – an industry standard intersection software program.

The priority intersection of Stanley Street with Leonard Street is a three leg intersection with drivers from Leonard Street need to give way to traffic on Stanley Street. Figure 6 presents the layout of this intersection.

The signalised intersection of Stacey Street with Stanley Street and Salvia Avenue is a four leg intersection with all turn movements permitted except for the right turn into Salvia Street. Pedestrian crossings are provided on Stanley Street and Stacey Street north. Figure 7 presents the layout in SIDRA. The numbers on the lane represent the length of short lanes in metres.

The signalised intersection of Stacey Street with Macauley Street is a three leg intersection with all turn movements permitted. Pedestrian crossings are provided on Macauley Street and Stacey Street south. Figure 8 presents the layout in SIDRA.

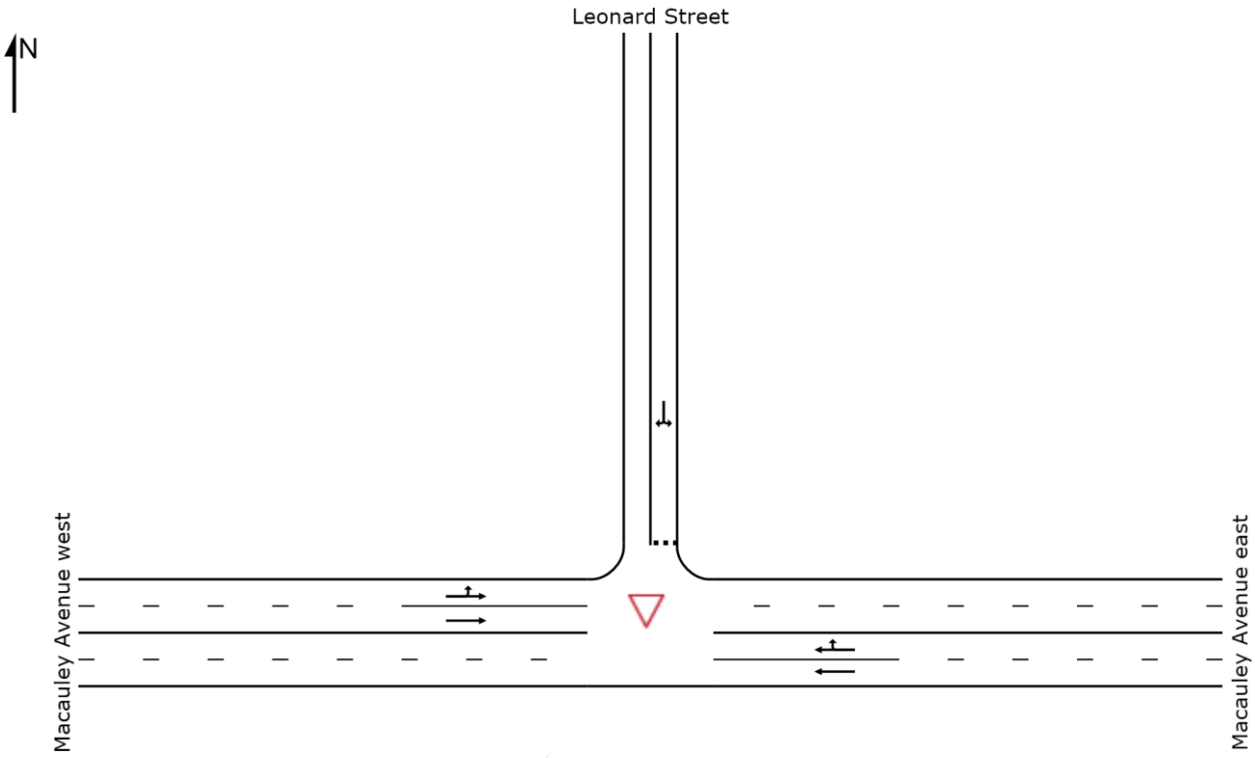

Figure 5: Priority Intersection of Macauley Street with Leonard Street (SIDRA)

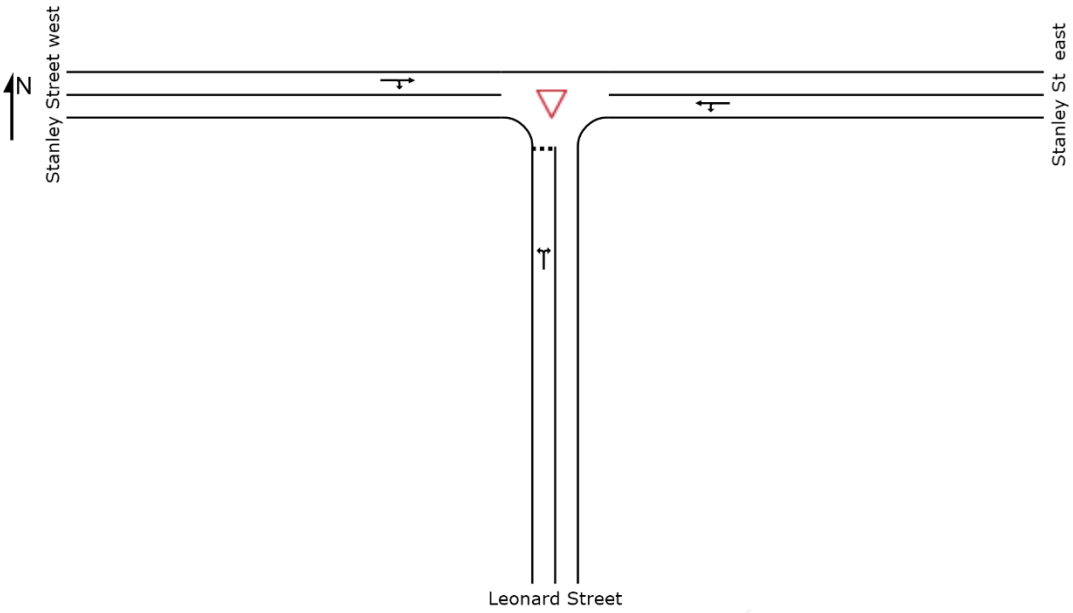

Figure 6: Priority Intersection of Stanley Street with Leonard Street (SIDRA)

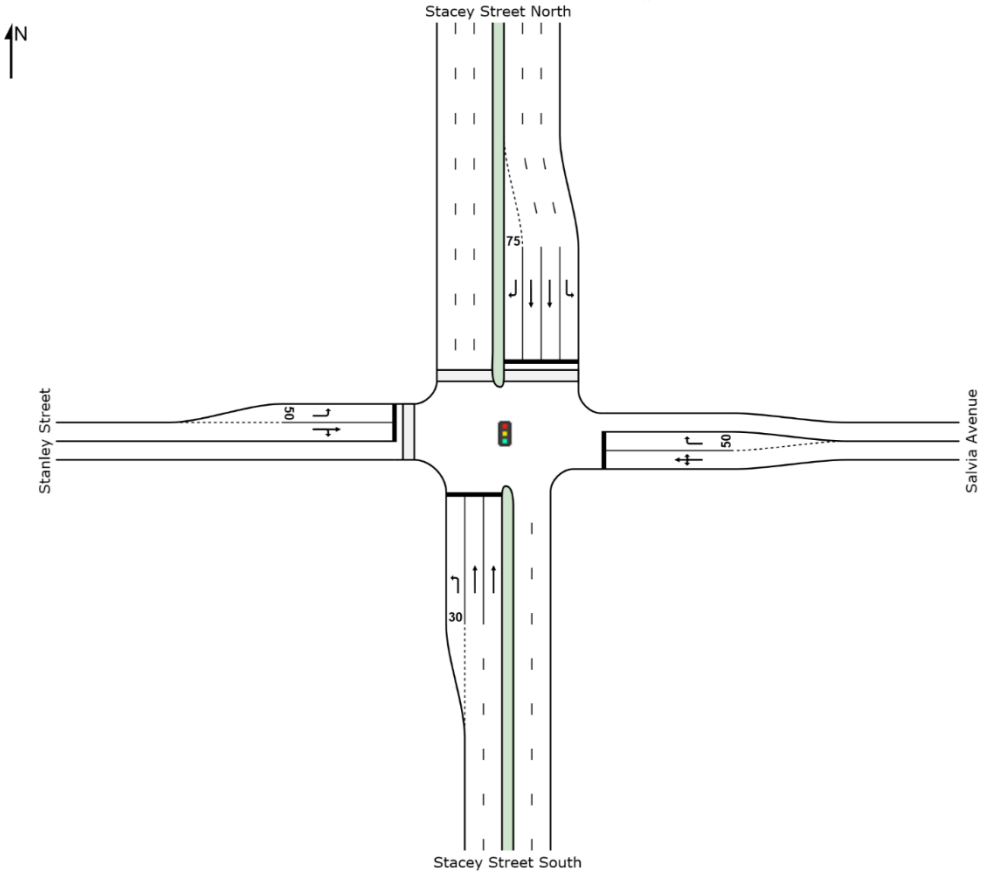

Figure 7: Signalised Intersection of Stacey Street with Stanley Street and Salvia Avenue (SIDRA)

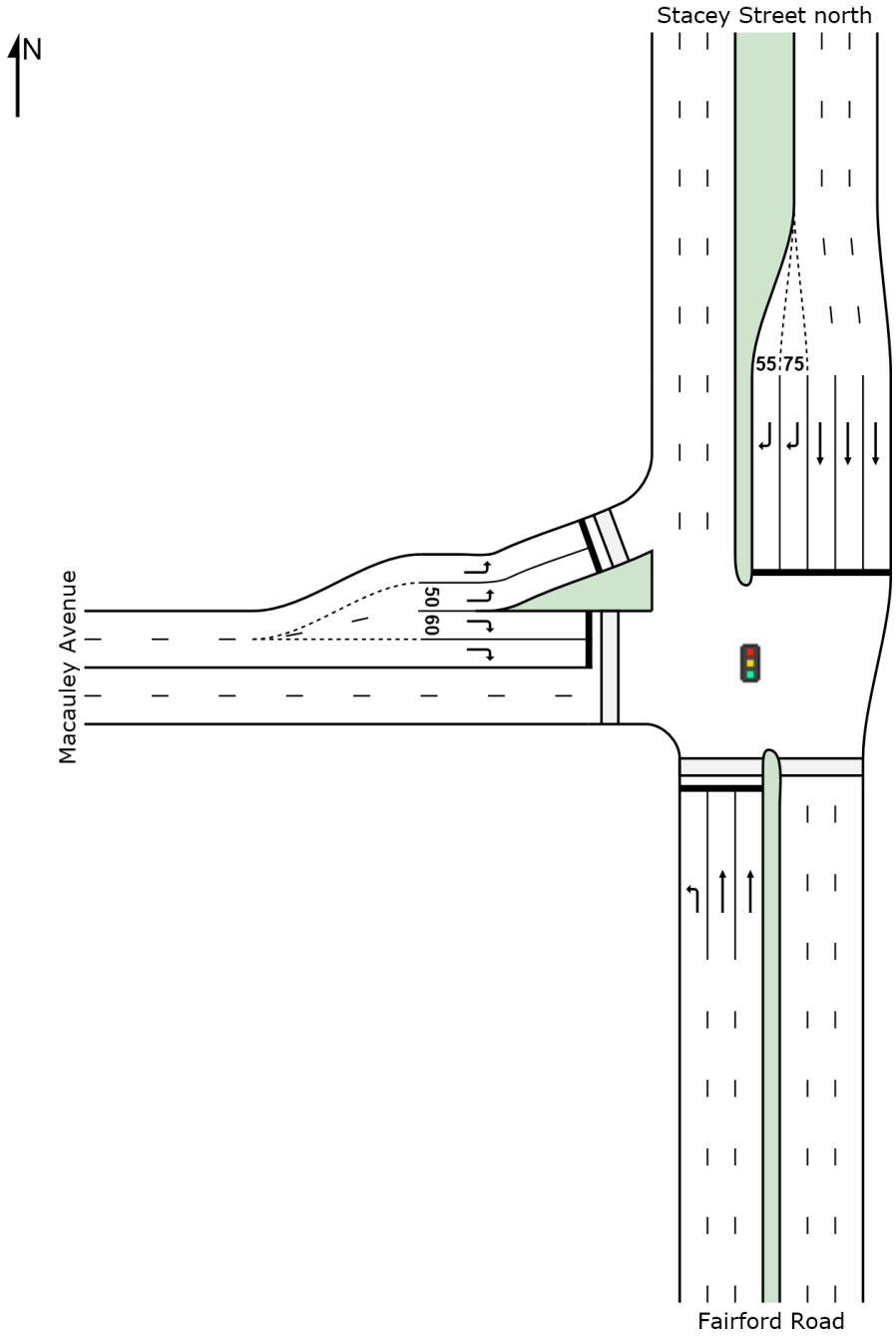

Figure 8: Signalised Intersection of Stacey Street with Macauley Street (SIDRA)

2.5 Existing Traffic Volumes

As part of the traffic assessment, traffic counts have been undertaken at the adjacent intersection for the weekday AM and PM peak period. The peak hours were 7:45am to 8:45am and 5pm to 6pm for the weekday AM and PM peak hours respectively. The traffic surveys were undertaken on the 21st April 2015.

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

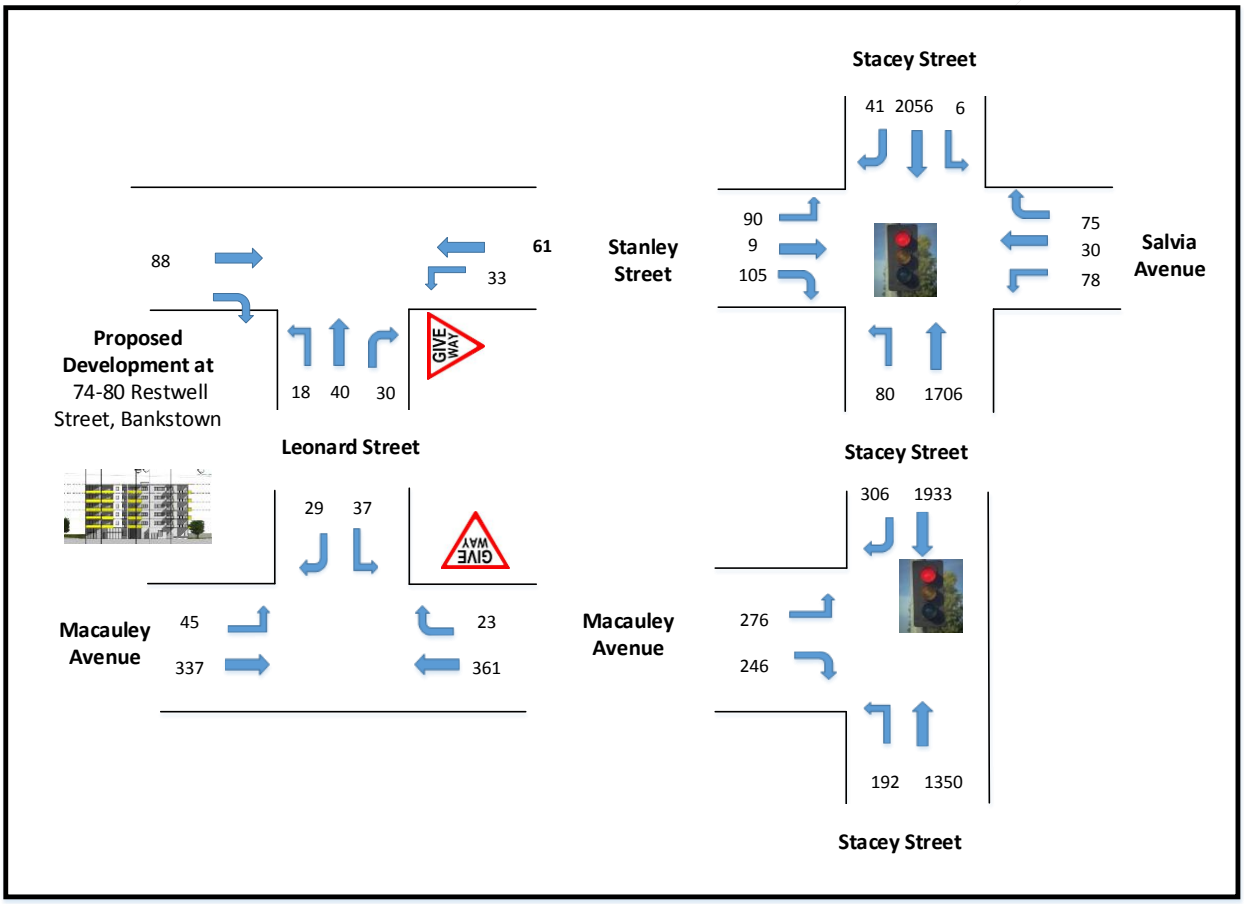

Figure 9: Existing Weekday Traffic Volumes AM Peak Hour

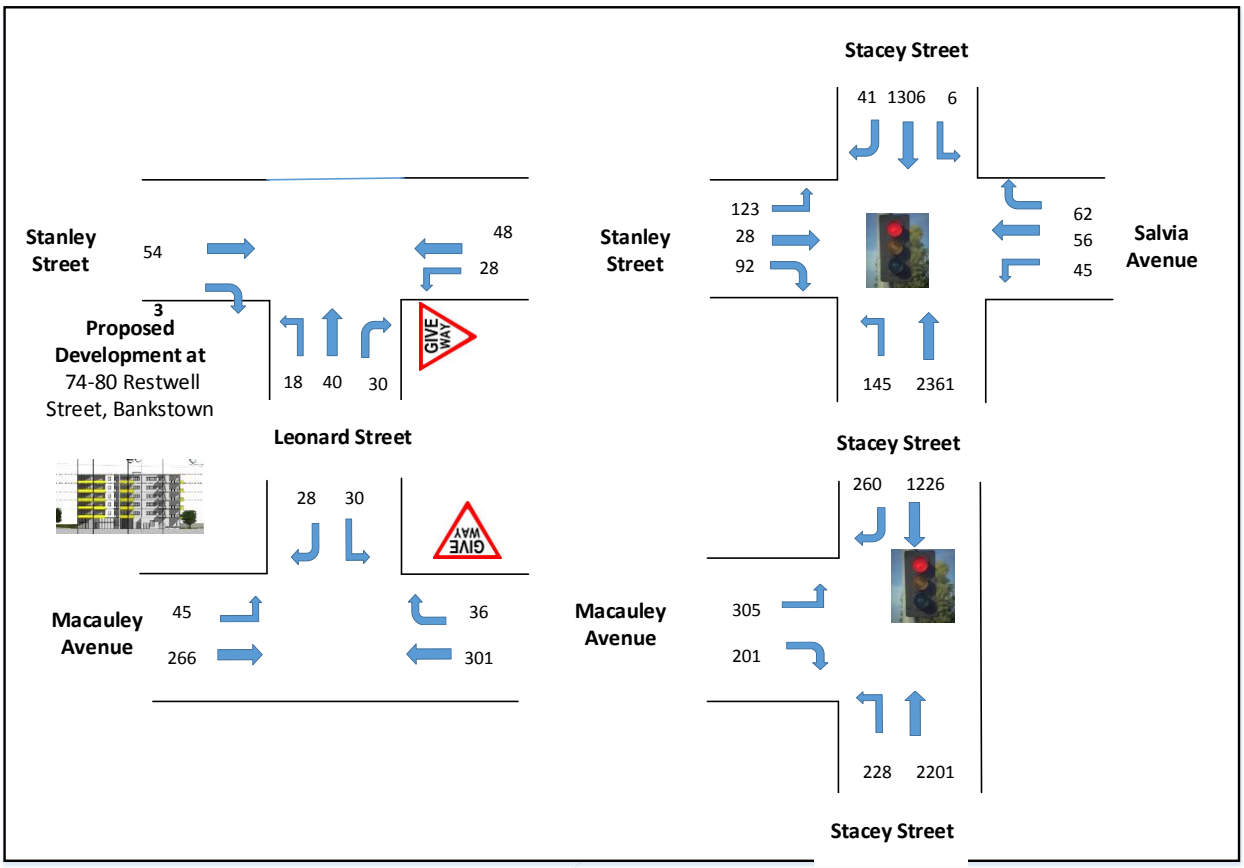

Figure 10: Existing Weekday Traffic Volumes PM Peak Hour

2.6 Intersection Assessment

An intersection assessment has been undertaken for the four intersections.

The existing intersection operating performance was assessed using the SIDRA software package (version 6) 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:

Signalised intersection of Stacey Street with Stanley Street and Salvia Avenue

- The overall intersection is a LoS B for both peak hours
- There is spare capacity at this intersection in both peak hours

Signalised intersection of Stacey Street with Macauley Avenue

- The overall intersection is a LoS B for both peak hours
- There is spare capacity at this intersection in both peak hours

Priority intersection of Macauley Avenue with Leonard Street

- All turn movements have a LoS A or B for both peak hours
- There is spare capacity at this intersection in both peak hours

Priority intersection of Stanley Street with Leonard Street

- All turn movements have a LoS A or B for both peak hours
- There is spare capacity at this intersection in both peak hours

The full Sidra results are presented in Appendix A.

2.7 Public Transport

The proposed residential development has excellent access to public transport because of the proximity to the train station and the bus interchange.

The Bankstown bus interchange services the western area with buses to the south, such as Condell Park, and other areas such as Parramatta, Bass Hill or the western region of Sydney in general (see Figure11). The bus interchange is about ten minute walk away.

Bankstown Railway Station, located within close proximity (5 minutes' walk) to the subject site, provides all connections various destinations along the Bankstown

line and connects to the inner west line at Lidcombe, and to the south and Cumberland line at Cabramatta and Liverpool and eventually Campbelltown. The service is frequent (typically every 15 minute intervals from early morning until evenings, with late services operating at 20 to 30 minute intervals) in each direction.

The Bankstown CBD can be considered as an important transport interchange in the west of Sydney. There are many public transport options available.

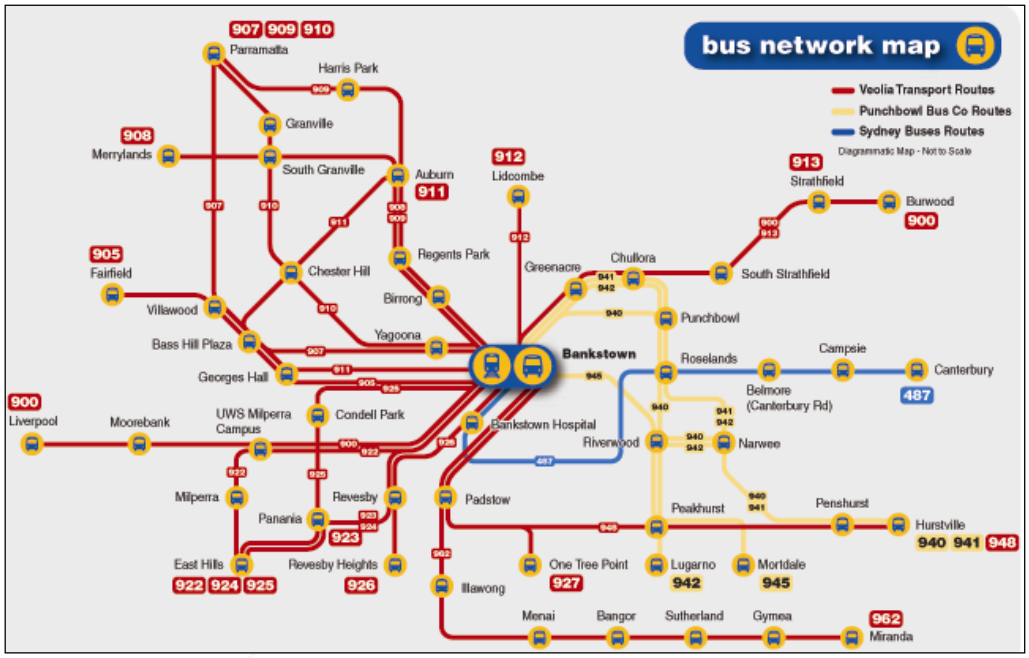

Figure 11: Bus Services from Bankstown CBD

Figure 12: Train Services from Bankstown CBD

2.8 Conclusions on the Existing Conditions

The proposed development is located in an area where there are a reasonable number of vacant car spaces on a weekday on Restwell Street and Leonard Street.

The four surveyed intersections performs well with sufficient spare capacity to accommodate additional traffic.

The site has excellent access to public transport.

3. PROPOSED RESIDENTIAL DEVELOPMENT

The landuses for the proposed residential development are as follows in the following:

- Twenty-five one-bedroom apartments
- One hundred and ten two-bedroom apartments
- Twenty-one three-bedroom apartment
- A total of one hundred and fifty six residential apartments

Vehicle access and egress is via Leonard Street.

The parking is provided at two basement levels:

- Twenty-one residential visitor car spaces
  - One disabled car space
- One hundred and eight nine residential tenant car spaces
  - five car spaces for adaptable units
- fifty two bicycle car spaces

A full scaled plan of the proposed development is provided as part of the Development Application. Scaled measurements should use these plans.

4. CAR PARKING CONSIDERATIONS

4.1 Bankstown City Council Planning Scheme

The car parking requirements for residential developments are presented in *Council's Development Control Plan* with the car parking rates as follows as it applies to the proposed development:

Apartments

- 1 car spaces for two bedroom apartments
- 1 .2car spaces for two bedroom apartments
- 1.5 car spaces for three-bedroom apartments
- 1 visitor car space per five apartments

Table 4 summarises the car parking requirements for the apartments.

The proposed development complies with Council's car parking requirements.

	Apartments	Number	Car parking rate per unit	Car Spaces Required	Car Spaces Provided
Stanrdard Apartments	1 Bedroom	25	1	25	189
	2 Bedroom	110	1.2	132	
	3 Bedroom	21	1.5	31.5	
	Visitor		0.2	31.2	31
			Total	220	220

Table 4: Summary of Car Parking Requirements and Provision

4.2 Adequacy of Car Parking Provision

The proposed development complies with the residential and visitor and commercial car parking provision.

There is sufficient car spaces provided on site to minimise parking overspill into public areas.

Should visitor car parking demand exceed 31 car spaces in rare circumstances, there are vacant car spaces available on Restwell Street and on Leonard Street.

5. VEHICLE TRAFFIC IMPACT CONSIDERATIONS

5.1 Traffic Generation

The RTA Guide to Traffic Generating Developments Updated Traffic Surveys August 2013 provides average weekday AM and PM peak hour trip generation rates for residential apartments located in areas of excellent public transport (near a train station with a bus services) as follows:

- 0.15 trips per car space for the AM peak hour
- 0.12 trips per car space for the PM peak hour

Table 6 summarises the trip generation for the proposed and existing to obtain the net trip generation. It is assumed that the retail is not active in the weekday AM peak hour. Overall the proposed development is a modest trip generator.

Table 7 presents the trip distribution.

Proposed AM residential				
Apartments	Number	Trip rate per carspace	Car Spaces	Trips
1 Bedroom	25	0.15	221	33.15
2 Bedroom	110			
3 Bedroom	21			
Proposed PM residential				
Apartments	Number	Trip rate per carspac	Car Spaces	Trips
1 Bedroom	25	0.12	221	26.52
2 Bedroom	110			
3 Bedroom	21			

Table 6: Summary of Trip Generation for the Proposed Development and Existing for Weekday Hours

Proposed AM Peakhour			
	Origin	Destination	Total
Residential	30	3	33
Proposed PM Peakhour			
	Origin	**Destination**	**Total**
Residential	3	23	26

Table 7: Weekday Trip Distribution for the Proposed Development Distribution

5.2 Traffic Volumes

The additional development trips are assigned onto the local traffic network. The following figures present the existing 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.

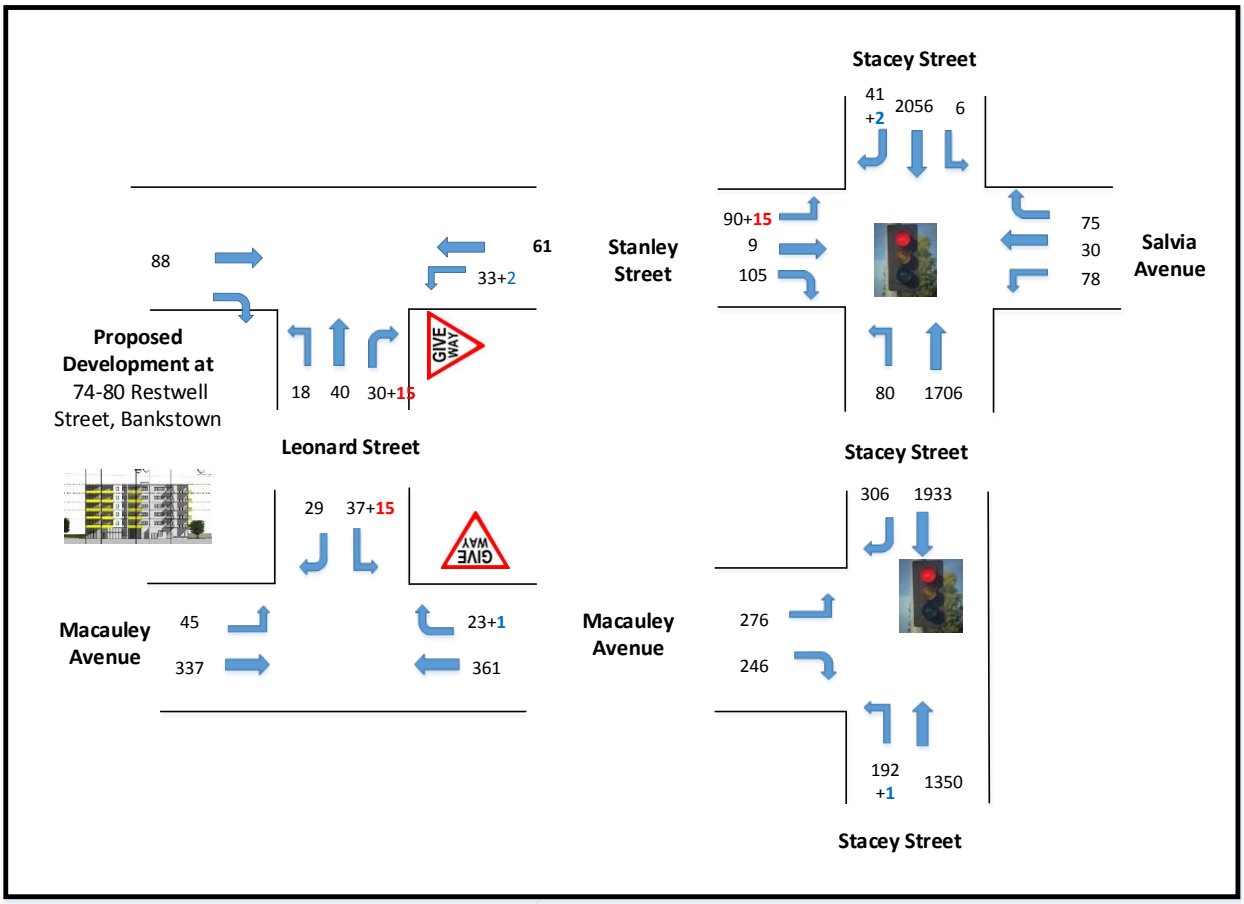

Figure 13: Weekday AM Peak Hour Traffic Volumes (Development Origin Trips in Red and Destination Trips in Blue)

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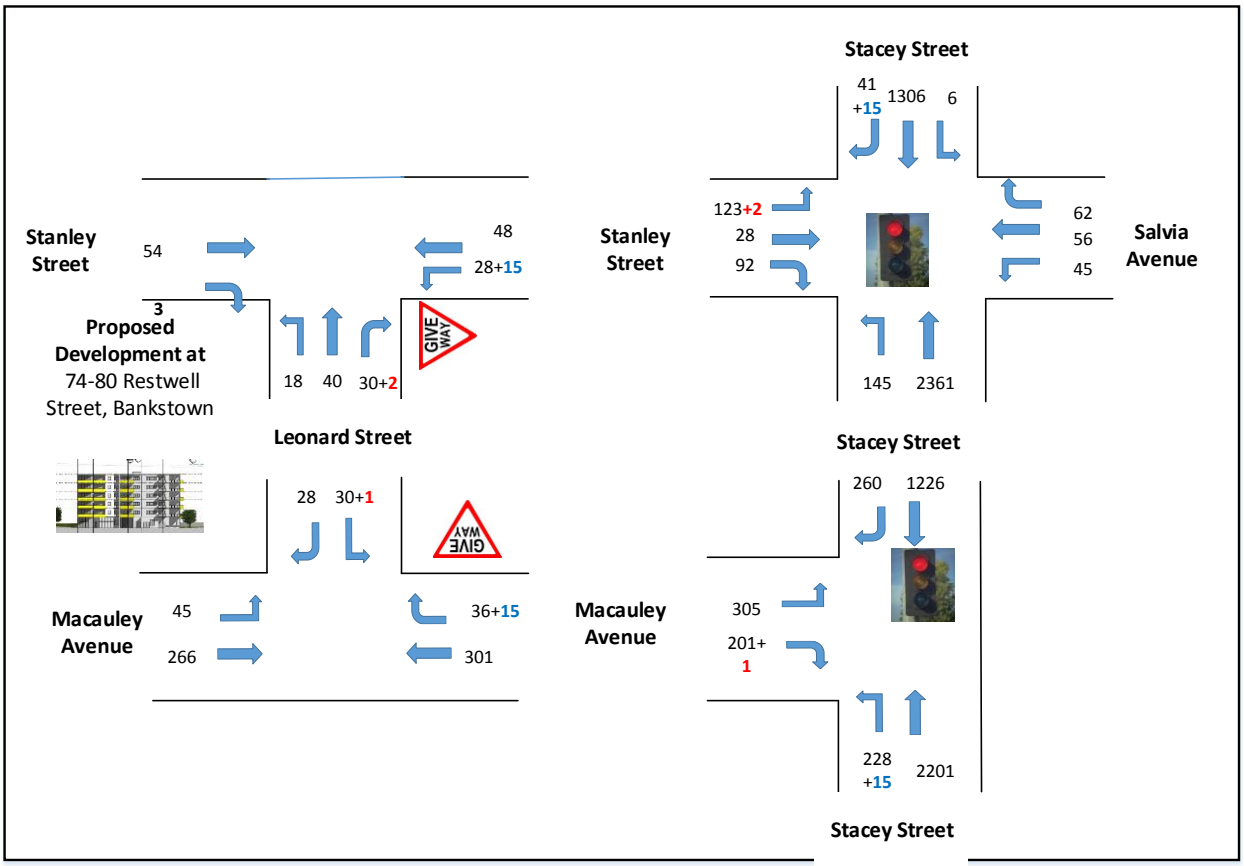

Figure 14: Weekday PM Peak Hour Traffic Volumes (Development Origin Trips in Red and Destination Trips in Blue)

5.3 Intersection Assessment

An intersection assessment has been undertaken for the four nearby intersection.

The results of the intersection analysis are as follows for the AM and PM peak hours:

Signalised intersection of Stacey Street with Stanley Street and Salvia Avenue

- The overall intersection is a LoS B for both peak hours
- The additional trips does not change the LoS of the overall intersection

Signalised intersection of Stacey Street with Macauley Avenue

- The overall intersection is a LoS B for both peak hours
- The additional trips does not change the LoS of the overall intersection

Priority intersection of Macauley Avenue with Leonard Street

- All turn movements have a LoS A or B for both peak hours
- The additional trips does not change the LoS of any turn movement

Priority intersection of Stanley Street with Leonard Street

- All turn movements have a LoS A or B for both peak hours
- The additional trips does not change the LoS of any turn movement

The full Sidra results with the development traffic are presented in Appendix B. The existing conditions are presented in Appendix A.

6. CONCLUSIONS

Based on the considerations presented in this report, it is considered that:

Parking

- The proposed development complies with Council's car parking requirements

Traffic

- The proposed development is a moderate trip generator for the weekday AM and PM peak hours.
- The additional trips from the proposed development can be accommodated at the adjacent intersection and road network without noticeably affecting intersection performance, delays or queues.
- There are no traffic engineering reasons why a planning consent for the proposed residential development at 74-80 Restwell Street and 1-9 Leonard Street, in Bankstown, should be refused.

APPENDIX A

SIDRA Intersection Results for Existing Traffic Conditions

Movement Performance - Vehicles											
Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Stacey Street South											
1	L2	80	0.0	0.084	16.1	LOS B	1.6	11.0	0.54	0.69	46.4
2	T1	1706	0.0	0.884	29.4	LOS C	38.3	268.2	0.94	1.01	40.5
Approach		1786	0.0	0.884	28.8	LOS C	38.3	268.2	0.92	1.00	40.7
East: Salvia Street											
4	L2	78	0.0	0.306	35.6	LOS C	3.7	26.2	0.90	0.75	33.8
5	T1	30	0.0	0.306	31.0	LOS C	3.7	26.2	0.90	0.75	34.1
6	R2	70	0.0	0.285	37.7	LOS C	2.5	17.6	0.92	0.75	33.0
Approach		178	0.0	0.306	35.6	LOS C	3.7	26.2	0.91	0.75	33.5
North: Stacey Street North											
7	L2	6	0.0	0.005	10.3	LOS A	0.1	0.5	0.35	0.61	50.1
8	T1	2056	0.0	0.806	11.6	LOS A	30.4	213.1	0.78	0.74	50.4
9	R2	41	0.0	0.294	46.0	LOS D	1.6	11.4	0.98	0.73	33.8
Approach		2103	0.0	0.806	12.3	LOS A	30.4	213.1	0.78	0.74	49.9
West: Stanley Street											
10	L2	90	0.0	0.144	24.5	LOS B	2.5	17.2	0.73	0.72	37.2
11	T1	9	0.0	0.498	34.7	LOS C	4.3	30.0	0.96	0.79	32.6
12	R2	105	0.0	0.498	39.3	LOS C	4.3	30.0	0.96	0.79	32.5
Approach		204	0.0	0.498	32.6	LOS C	4.3	30.0	0.86	0.76	34.4
All Vehicles		4271	0.0	0.884	21.1	LOS B	38.3	268.2	0.85	0.85	43.9

Table A1: Existing Weekday Signalised Intersection Performance of Stacey Street with Stanley Street with Salvia Avenue for the AM Peak Hour

Movement Performance - Vehicles											
Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Fairford Road											
1	L2	192	0.0	0.248	17.9	LOS B	3.7	25.9	0.69	0.75	45.4
2	T1	1315	0.0	0.809	21.0	LOS B	19.5	136.4	0.94	0.93	50.0
Approach		1507	0.0	0.809	20.6	LOS B	19.5	136.4	0.91	0.91	49.4
North: Stacey Street north											
8	T1	1933	0.0	0.522	6.5	LOS A	10.4	72.5	0.59	0.53	62.3
9	R2	306	0.0	0.706	36.6	LOS C	4.8	33.7	1.00	0.87	37.3
Approach		2239	0.0	0.706	10.6	LOS A	10.4	72.5	0.65	0.57	57.1
West: Macauley Avenue											
10	L2	276	0.0	0.446	31.2	LOS C	3.8	26.9	0.94	0.78	40.9
12	R2	247	0.4	0.795	36.4	LOS C	8.0	55.7	1.00	0.95	38.4
Approach		523	0.2	0.795	33.6	LOS C	8.0	55.7	0.97	0.86	39.7
All Vehicles		4269	0.0	0.809	17.0	LOS B	19.5	136.4	0.78	0.73	51.5

Table A2: Existing Weekday Signalised Intersection Performance of Stacey Street with Macauley Avenue for the AM Peak Hour

Movement Performance - Vehicles											
Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Macauley Avenue east											
5	T1	361	0.0	0.104	0.8	LOS A	0.8	5.3	0.20	0.04	58.6
6	R2	23	0.0	0.104	7.2	LOS A	0.8	5.3	0.45	0.08	51.2
Approach		384	0.0	0.104	1.2	NA	0.8	5.3	0.21	0.04	58.1
North: Leonard Street											
7	L2	27	0.0	0.095	8.7	LOS A	0.3	2.4	0.39	0.63	44.3
9	R2	29	0.0	0.095	8.7	LOS A	0.3	2.4	0.39	0.63	44.1
Approach		56	0.0	0.095	8.7	LOS A	0.3	2.4	0.39	0.63	44.2
West: Macauley Avenue east											
10	L2	45	0.0	0.099	5.3	LOS A	0.0	0.0	0.00	0.14	55.2
11	T1	337	0.0	0.099	0.0	LOS A	0.0	0.0	0.00	0.06	58.9
Approach		382	0.0	0.099	0.6	NA	0.0	0.0	0.00	0.07	58.5
All Vehicles		822	0.0	0.104	1.4	NA	0.8	5.3	0.13	0.09	57.0

Table A3: Existing Weekday Priority Intersection Performance of Macauley Avenue with Leonard Street for the AM Peak Hour

Movement Performance - Vehicles											
Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Leonard Street											
1	L2	18	0.0	0.038	4.7	LOS A	0.1	0.9	0.17	0.53	46.3
3	R2	30	0.0	0.038	5.1	LOS A	0.1	0.9	0.17	0.53	45.8
Approach		48	0.0	0.038	5.0	LOS A	0.1	0.9	0.17	0.53	46.0
East: Stanley St east											
4	L2	33	0.0	0.049	4.6	LOS A	0.0	0.0	0.00	0.19	48.5
5	T1	61	0.0	0.049	0.0	LOS A	0.0	0.0	0.00	0.19	48.9
Approach		94	0.0	0.049	1.6	NA	0.0	0.0	0.00	0.19	48.8
West: Stanley Street west											
11	T1	88	0.0	0.046	0.0	LOS A	0.0	0.0	0.01	0.01	49.9
12	R2	1	0.0	0.046	4.8	LOS A	0.0	0.0	0.01	0.01	49.0
Approach		89	0.0	0.046	0.1	NA	0.0	0.0	0.01	0.01	49.9
All Vehicles		231	0.0	0.049	1.7	NA	0.1	0.9	0.04	0.19	48.6

Table A4: Existing Weekday Priority Intersection Performance of Stanley Street with Leonard Street for the AM Peak Hour

Movement Performance - Vehicles											
Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Stacey Street South											
1	L2	145	0.0	0.113	13.5	LOS A	3.4	23.9	0.35	0.67	48.0
2	T1	2361	0.0	0.923	27.9	LOS B	83.2	582.4	0.86	0.86	41.1

Approach		2506	0.0	0.923	27.1	LOS B	83.2	582.4	0.83	0.85	41.5
East: Salvia Street											
4	L2	45	0.0	0.407	68.7	LOS E	7.2	50.4	0.96	0.77	26.2
5	T1	56	0.0	0.407	64.2	LOS E	7.2	50.4	0.96	0.77	26.3
6	R2	62	0.0	0.407	75.6	LOS F	7.2	50.4	0.98	0.76	24.6
Approach		163	0.0	0.407	69.8	LOS E	7.2	50.4	0.97	0.77	25.6
North: Stacey Street North											
7	L2	6	0.0	0.004	9.5	LOS A	0.1	0.7	0.24	0.60	50.7
8	T1	1306	0.0	0.433	6.1	LOS A	15.8	110.7	0.37	0.34	54.6
9	R2	41	0.0	0.552	87.4	LOS F	3.2	22.2	1.00	0.75	24.5
Approach		1353	0.0	0.552	8.5	LOS A	15.8	110.7	0.39	0.35	52.6
West: Stanley Street											
10	L2	123	0.0	0.292	56.1	LOS D	7.4	52.0	0.87	0.77	28.1
11	T1	28	0.0	0.729	74.6	LOS F	9.0	63.3	1.00	0.87	24.2
12	R2	92	0.0	0.729	79.2	LOS F	9.0	63.3	1.00	0.87	24.1
Approach		243	0.0	0.729	67.0	LOS E	9.0	63.3	0.94	0.82	26.0
All Vehicles		4265	0.0	0.923	25.1	LOS B	83.2	582.4	0.70	0.69	41.8

Table A5: Existing Weekday Signalised Intersection Performance of Stacey Street with Stanley Street with Salvia Avenue for the PM Peak Hour

Movement Performance - Vehicles											
Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Fairford Road											
1	L2	228	0.0	0.196	14.7	LOS B	5.1	35.7	0.45	0.70	47.3
2	T1	2201	0.0	0.900	28.4	LOS B	58.8	411.8	0.93	0.95	45.5
Approach		2429	0.0	0.900	27.1	LOS B	58.8	411.8	0.89	0.93	45.6
North: Stacey Street north											
8	T1	1226	0.0	0.274	4.1	LOS A	6.4	44.8	0.32	0.28	65.0
9	R2	260	0.0	0.856	68.6	LOS E	7.8	54.8	1.00	0.98	28.1
Approach		1486	0.0	0.856	15.4	LOS B	7.8	54.8	0.44	0.41	52.9
West: Macauley Avenue											
10	L2	305	0.0	0.645	57.0	LOS E	8.1	56.9	1.00	0.82	31.8
12	R2	202	0.5	0.850	64.8	LOS E	11.9	83.5	1.00	0.95	29.6
Approach		507	0.2	0.850	60.1	LOS E	11.9	83.5	1.00	0.87	30.9
All Vehicles		4422	0.0	0.900	26.9	LOS B	58.8	411.8	0.75	0.75	45.2

Table A6: Existing Weekday Signalised Intersection Performance of Stacey Street with Macauley Avenue for the PM Peak Hour

Movement Performance - Vehicles											
Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed

		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Macauley Avenue east											
5	T1	301	0.0	0.094	0.6	LOS A	0.6	4.2	0.16	0.06	58.4
6	R2	36	0.0	0.094	6.7	LOS A	0.6	4.2	0.40	0.15	50.6
Approach		337	0.0	0.094	1.2	NA	0.6	4.2	0.18	0.07	57.5
North: Leonard Street											
7	L2	30	0.0	0.083	7.5	LOS A	0.3	2.1	0.30	0.59	44.9
9	R2	28	0.0	0.083	7.5	LOS A	0.3	2.1	0.30	0.59	44.7
Approach		58	0.0	0.083	7.5	LOS A	0.3	2.1	0.30	0.59	44.8
West: Macauley Avenue east											
10	L2	45	0.0	0.080	5.3	LOS A	0.0	0.0	0.00	0.17	54.5
11	T1	266	0.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.07	58.7
Approach		311	0.0	0.080	0.8	NA	0.0	0.0	0.00	0.08	58.1
All Vehicles		706	0.0	0.094	1.5	NA	0.6	4.2	0.11	0.12	56.4

Table A7: Existing Weekday Priority Intersection Performance of Macauley Avenue with Leonard Street for the PM Peak Hour

Movement Performance - Vehicles											
Mov ID	ODMov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Leonard Street											
1	L2	23	0.0	0.029	4.7	LOS A	0.1	0.7	0.13	0.52	46.3
3	R2	17	0.0	0.029	4.9	LOS A	0.1	0.7	0.13	0.52	45.9
Approach		40	0.0	0.029	4.8	LOS A	0.1	0.7	0.13	0.52	46.1
East: Stanley St east											
4	L2	28	0.0	0.040	4.6	LOS A	0.0	0.0	0.00	0.20	48.4
5	T1	48	0.0	0.040	0.0	LOS A	0.0	0.0	0.00	0.20	48.9
Approach		76	0.0	0.040	1.7	NA	0.0	0.0	0.00	0.20	48.7
West: Stanley Street west											
11	T1	54	0.0	0.030	0.0	LOS A	0.0	0.1	0.02	0.03	49.8
12	R2	3	0.0	0.030	4.8	LOS A	0.0	0.1	0.02	0.03	48.8

Approach	57	0.0	0.030	0.3	NA	0.0	0.1	0.02	0.03	49.7
All Vehicles	173	0.0	0.040	1.9	NA	0.1	0.7	0.04	0.22	48.4

Table A8: Existing Weekday Priority Intersection Performance of Stanley Street with Leonard Street for the PM Peak Hour

APPENDIX B

SIDRA Intersection Results for Existing and Residential Development Traffic Conditions

Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Stacey Street South											
1	L2	80	0.0	0.084	16.1	LOS B	1.6	11.0	0.54	0.69	46.4
2	T1	1706	0.0	0.885	29.4	LOS C	38.3	268.2	0.94	1.01	40.5
Approach		1786	0.0	0.885	28.8	LOS C	38.3	268.2	0.92	1.00	40.7
East: Salvia Street											
4	L2	78	0.0	0.306	35.6	LOS C	3.7	26.2	0.90	0.75	33.8
5	T1	30	0.0	0.306	31.0	LOS C	3.7	26.2	0.90	0.75	34.1
6	R2	70	0.0	0.296	38.6	LOS C	2.5	17.8	0.93	0.75	32.7
Approach		178	0.0	0.306	36.0	LOS C	3.7	26.2	0.91	0.75	33.4
North: Stacey Street North											
7	L2	6	0.0	0.005	10.3	LOS A	0.1	0.5	0.35	0.61	50.1
8	T1	2056	0.0	0.806	11.6	LOS A	30.4	213.1	0.78	0.74	50.4
9	R2	41	0.0	0.294	46.0	LOS D	1.6	11.4	0.98	0.73	33.8
Approach		2103	0.0	0.806	12.3	LOS A	30.4	213.1	0.78	0.74	49.9
West: Stanley Street											
10	L2	105	0.0	0.168	24.7	LOS B	2.9	20.2	0.74	0.73	37.1
11	T1	9	0.0	0.498	34.7	LOS C	4.3	30.0	0.96	0.79	32.6
12	R2	105	0.0	0.498	39.3	LOS C	4.3	30.0	0.96	0.79	32.5
Approach		219	0.0	0.498	32.1	LOS C	4.3	30.0	0.85	0.76	34.5
All Vehicles		4286	0.0	0.885	21.2	LOS B	38.3	268.2	0.85	0.85	43.9

Table B1: Existing Weekday Signalised Intersection Performance of Stacey Street with Stanley Street with Salvia Avenue for the AM Peak Hour with residential apartment traffic

Movement Performance - Vehicles											
Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Fairford Road											
1	L2	193	0.0	0.249	17.9	LOS B	3.7	26.0	0.69	0.75	45.4
2	T1	1315	0.0	0.809	21.0	LOS B	19.5	136.4	0.94	0.93	50.0
Approach		1508	0.0	0.809	20.6	LOS B	19.5	136.4	0.91	0.91	49.4
North: Stacey Street north											
8	T1	1933	0.0	0.522	6.5	LOS A	10.4	72.5	0.59	0.53	62.3
9	R2	306	0.0	0.706	36.6	LOS C	4.8	33.7	1.00	0.87	37.3
Approach		2239	0.0	0.706	10.6	LOS A	10.4	72.5	0.65	0.57	57.1
West: Macauley Avenue											
10	L2	276	0.0	0.446	31.2	LOS C	3.8	26.9	0.94	0.78	40.9
12	R2	247	0.4	0.795	36.4	LOS C	8.0	55.7	1.00	0.95	38.4
Approach		523	0.2	0.795	33.6	LOS C	8.0	55.7	0.97	0.86	39.7
All Vehicles		4270	0.0	0.809	17.0	LOS B	19.5	136.4	0.78	0.73	51.5

Table B2: Existing Weekday Signalised Intersection Performance of Stacey Street with Macauley Avenue for the AM Peak Hour with residential apartment traffic

Movement Performance – Vehicles											
Mov ID	ODMov	Demand Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Macauley Avenue east											
5	T1	361	0.0	0.105	0.2	LOS A	0.3	1.8	0.07	0.04	59.1
6	R2	24	0.0	0.105	7.2	LOS A	0.3	1.8	0.15	0.08	52.2
Approach		385	0.0	0.105	0.6	NA	0.3	1.8	0.07	0.04	58.6
North: Leonard Street											
7	L2	52	0.0	0.117	5.1	LOS A	0.4	3.0	0.34	0.59	44.8
9	R2	29	0.0	0.117	12.4	LOS A	0.4	3.0	0.34	0.59	44.6
Approach		81	0.0	0.117	7.7	LOS A	0.4	3.0	0.34	0.59	44.8
West: Macauley Avenue west											
10	L2	45	0.0	0.099	5.3	LOS A	0.0	0.0	0.00	0.14	55.2
11	T1	337	0.0	0.099	0.0	LOS A	0.0	0.0	0.00	0.06	58.9
Approach		382	0.0	0.099	0.6	NA	0.0	0.0	0.00	0.07	58.5
All Vehicles		848	0.0	0.117	1.3	NA	0.4	3.0	0.06	0.10	56.9

Table B3: Existing Weekday Priority Intersection Performance of Macauley Avenue with Leonard Street for the AM Peak Hour with residential apartment traffic

Movement Performance - Vehicles											
Mov ID	ODMov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Leonard Street											
1	L2	18	0.0	0.052	4.7	LOS A	0.2	1.2	0.18	0.54	46.2
3	R2	45	0.0	0.052	5.1	LOS A	0.2	1.2	0.18	0.54	45.8
Approach		63	0.0	0.052	5.0	LOS A	0.2	1.2	0.18	0.54	45.9
East: Stanley St east											
4	L2	35	0.0	0.050	4.6	LOS A	0.0	0.0	0.00	0.20	48.4
5	T1	61	0.0	0.050	0.0	LOS A	0.0	0.0	0.00	0.20	48.9
Approach		96	0.0	0.050	1.7	NA	0.0	0.0	0.00	0.20	48.7
West: Stanley Street west											
11	T1	88	0.0	0.046	0.0	LOS A	0.0	0.0	0.01	0.01	49.9
12	R2	1	0.0	0.046	4.8	LOS A	0.0	0.0	0.01	0.01	49.0
Approach		89	0.0	0.046	0.1	NA	0.0	0.0	0.01	0.01	49.9
All Vehicles		248	0.0	0.052	1.9	NA	0.2	1.2	0.05	0.22	48.4

Table B4: Existing Weekday Priority Intersection Performance of Stanley Street with Leonard Street for the AM Peak Hour with residential apartment traffic

Movement Performance - Vehicles											
Mov ID	ODMov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Stacey Street South											
1	L2	145	0.0	0.113	13.5	LOS A	3.4	23.9	0.35	0.67	48.0
2	T1	2361	0.0	0.923	27.9	LOS B	83.2	582.4	0.86	0.86	41.1
Approach		2506	0.0	0.923	27.1	LOS B	83.2	582.4	0.83	0.85	41.5
East: Salvia Street											
4	L2	45	0.0	0.409	68.8	LOS E	7.2	50.5	0.96	0.77	26.1
5	T1	56	0.0	0.409	64.2	LOS E	7.2	50.5	0.96	0.77	26.3
6	R2	62	0.0	0.409	75.7	LOS F	7.2	50.5	0.98	0.76	24.6
Approach		163	0.0	0.409	69.8	LOS E	7.2	50.5	0.97	0.77	25.6
North: Stacey Street North											
7	L2	6	0.0	0.004	9.5	LOS A	0.1	0.7	0.24	0.60	50.7
8	T1	1306	0.0	0.433	6.1	LOS A	15.8	110.7	0.37	0.34	54.6
9	R2	41	0.0	0.552	87.4	LOS F	3.2	22.2	1.00	0.75	24.5
Approach		1353	0.0	0.552	8.5	LOS A	15.8	110.7	0.39	0.35	52.6
West: Stanley Street											
10	L2	125	0.0	0.297	56.2	LOS D	7.6	52.9	0.87	0.78	28.1
11	T1	28	0.0	0.729	74.6	LOS F	9.0	63.3	1.00	0.87	24.2
12	R2	92	0.0	0.729	79.2	LOS F	9.0	63.3	1.00	0.87	24.1
Approach		245	0.0	0.729	66.9	LOS E	9.0	63.3	0.94	0.82	26.0
All Vehicles		4267	0.0	0.923	25.1	LOS B	83.2	582.4	0.70	0.69	41.8

Table B5: Existing Weekday Signalised Intersection Performance of Stacey Street with Stanley Street with Salvia Avenue for the PM Peak Hour with residential apartment traffic

Movement Performance - Vehicles											
Mov ID	ODMov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Fairford Road											
1	L2	243	0.0	0.209	14.8	LOS B	5.5	38.4	0.46	0.70	47.2
2	T1	2201	0.0	0.900	28.4	LOS B	58.8	411.8	0.93	0.95	45.5
Approach		2444	0.0	0.900	27.0	LOS B	58.8	411.8	0.89	0.93	45.7
North: Stacey Street north											
8	T1	1226	0.0	0.274	4.1	LOS A	6.4	44.8	0.32	0.28	65.0
9	R2	260	0.0	0.856	68.6	LOS E	7.8	54.8	1.00	0.98	28.1
Approach		1486	0.0	0.856	15.4	LOS B	7.8	54.8	0.44	0.41	52.9
West: Macauley Avenue											
10	L2	305	0.0	0.645	57.0	LOS E	8.1	56.9	1.00	0.82	31.8
12	R2	203	0.5	0.855	65.1	LOS E	12.0	84.3	1.00	0.96	29.5
Approach		508	0.2	0.855	60.2	LOS E	12.0	84.3	1.00	0.88	30.8
All Vehicles		4438	0.0	0.900	26.9	LOS B	58.8	411.8	0.75	0.75	45.2

Table B6: Existing Weekday Signalised Intersection Performance of Stacey Street with Macauley Avenue for the PM Peak Hour with residential apartment traffic

Movement Performance – Vehicles											
Mov ID	ODMov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Maucaley Avenue east											
5	T1	301	0.0	0.102	0.5	LOS A	0.4	2.9	0.10	0.08	58.4
6	R2	51	0.0	0.102	6.6	LOS A	0.4	2.9	0.28	0.24	50.2
Approach		352	0.0	0.102	1.3	NA	0.4	2.9	0.12	0.10	57.1
North: Leonard Street											
7	L2	31	0.0	0.085	5.0	LOS A	0.3	2.2	0.30	0.59	44.9
9	R2	28	0.0	0.085	10.6	LOS A	0.3	2.2	0.30	0.59	44.7
Approach		59	0.0	0.085	7.6	LOS A	0.3	2.2	0.30	0.59	44.8
West: Maucaley Avenue west											
10	L2	45	0.0	0.080	5.3	LOS A	0.0	0.0	0.00	0.17	54.5
11	T1	266	0.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.07	58.7
Approach		311	0.0	0.080	0.8	NA	0.0	0.0	0.00	0.08	58.1
All Vehicles		722	0.0	0.102	1.6	NA	0.4	2.9	0.08	0.13	56.2

Table B7: Existing Weekday Priority Intersection Performance of Macauley Avenue with Leonard Street for the PM Peak Hour with residential apartment traffic

Movement Performance - Vehicles											
Mov ID	ODMov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Leonard Street											

1	L2	23	0.0	0.029	4.7	LOS A	0.1	0.7	0.13	0.52	46.3
3	R2	17	0.0	0.029	5.0	LOS A	0.1	0.7	0.13	0.52	45.9
Approach		40	0.0	0.029	4.8	LOS A	0.1	0.7	0.13	0.52	46.2
East: Stanley St east											
4	L2	43	0.0	0.048	4.6	LOS A	0.0	0.0	0.00	0.26	48.1
5	T1	48	0.0	0.048	0.0	LOS A	0.0	0.0	0.00	0.26	48.6
Approach		91	0.0	0.048	2.2	NA	0.0	0.0	0.00	0.26	48.3
West: Stanley Street west											
11	T1	54	0.0	0.030	0.0	LOS A	0.0	0.1	0.02	0.03	49.8
12	R2	3	0.0	0.030	4.8	LOS A	0.0	0.1	0.02	0.03	48.8
Approach		57	0.0	0.030	0.3	NA	0.0	0.1	0.02	0.03	49.7
All Vehicles		188	0.0	0.048	2.1	NA	0.1	0.7	0.03	0.24	48.3

Table B8: Existing Weekday Priority Intersection Performance of Stanley Street with Leonard Street for the PM Peak Hour with residential apartment traffic

ML
Traffic Engineers

CARPARK, RAMP CERTIFICATION OF PROPOSED RESIDENTIAL DEVELOPMENT

74-80 Restwell Street and 1-9 Leonard Street in Bankstown

Prepared for: Le Chateau Developments Pty Ltd

N1414120N (Version 1a)

May 2015

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1. INTRODUCTION

ML Traffic Engineering was commissioned by Le Chateau Developments Pty Ltd to prepare a car park certification of proposed residential development at 74-80 Restwell Street and 1-9 Leonard Street in Bankstown.

Vehicle access and egress to the two basement levels is via Leonard Street

Reference is made to AS2890.1, and AS2890.6 and Council's Development Control Plan for compliance.

2. DRIVEWAY AND RAMPS

The details of the driveway/ramp from Restwell Street to the upper basement are as follows

- The ramp is 6.4 metres wide kerb to kerb
- The gradients are as follows from the perspective of the inbound moment for descriptive purposes only
    - 5 percent for 6 metres
    - 16.7 percent for 19.2 metres
    - 11.7 percent for 2.3 metres on the inside edge.
    - 4 percent for 6.24 metres on the outside edge

The inside radius is 4 metres and the outside radius is 11.8 metres.

The details of the ramp from the upper basement to the lower basement are as follows

- The ramp is 6.4 metres wide kerb to kerb
- The gradients are as follows from the perspective of the inbound moment for descriptive purposes only
    - 5 percent for 6 metres
    - 16.7 percent for 19.2 metres
    - 11.7 percent for 2.3 metres on the inside edge.
    - 4 percent for 6.24 metres on the outside edge

3. CAR SPACES

The details of the car parking areas are as follows:

Upper Basement

- The car parking aisle is a minimum 6.2 metres wide
- Ninety degree car spaces are 2.5 metres wide with a length of 5.4 metres
    - Car spaces adjacent to walls have a further 300mm width in general
- The disabled car spaces are 2.4 metres wide with a length of 5.4 metres with a share zone of the same length and with a width of 2.5 metres
- Blind aisle extensions are provided
- Column setback and lengths comply

Lower Basement

- The car parking aisle is a minimum 6.2 metres wide
- Ninety degree car spaces are 2.5 metres wide with a length of 5.4 metres
    - Car spaces adjacent to walls have a further 300mm width in general
- The disabled car spaces are 2.4 metres wide with a length of 5.4 metres with a share zone of the same length and with a width of 2.5 metres
- Blind aisle extensions are provided
- Column setback and lengths comply

4. SIGHT DISTANCE

The car driver's vehicle sight distance requirement to enter the external road is stated in Figure 3.2 of AS2890.1.

The sight distance varies according to the speed of the external road. Leonard Street has a default speed limit of 50km/hr.

The minimum vehicle sight distance required is 45 metres. Site measurements showed that the minimum sight distance looking left or right is met without permanent obstructions for all four driveway.

The pedestrian sight distance is met as well with the implementation of convex safety mirrors.

ML
Traffic Engineers

5. CONCLUSIONS AND RECOMMENDATIONS

The car parking area and driveway is compliant with Australian Standards and Council's DCP.