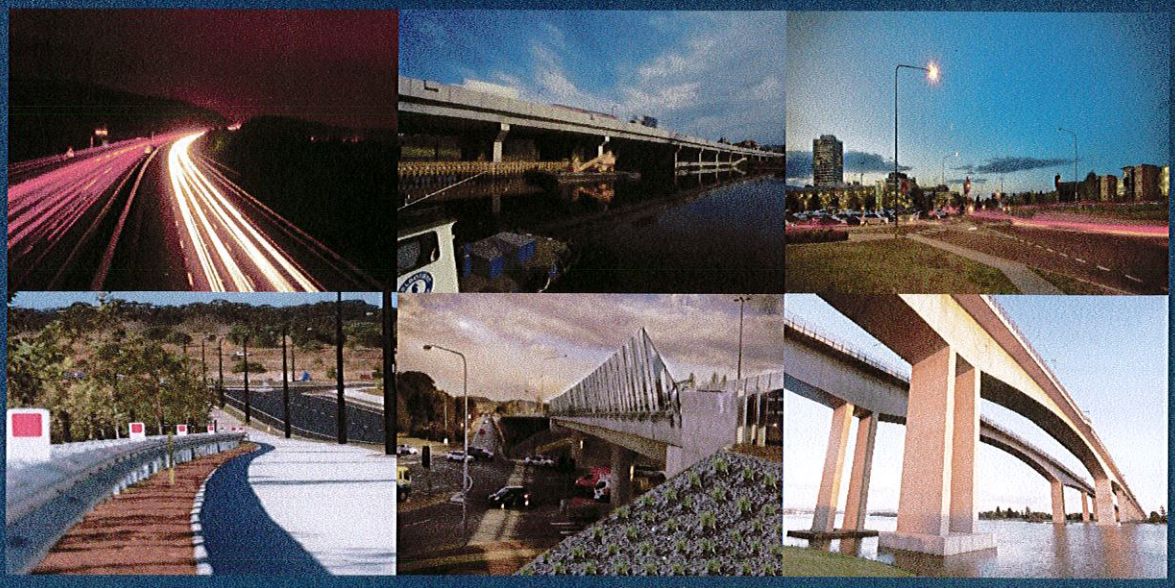
AT 6 to Council Rpt

BROWN



Traffic Report

472 - 486 and 504 - 520 Pacific Highway, St Leonards

LEIGHTON PROPERTIES

Charter Hall

Prepared for Leighton Properties and Charter Hall

November 2013

B12377/X13318

Transport & Roads Division

Smart Consulting

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2013

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1 Introduction

1.1 Background and Current Site Development

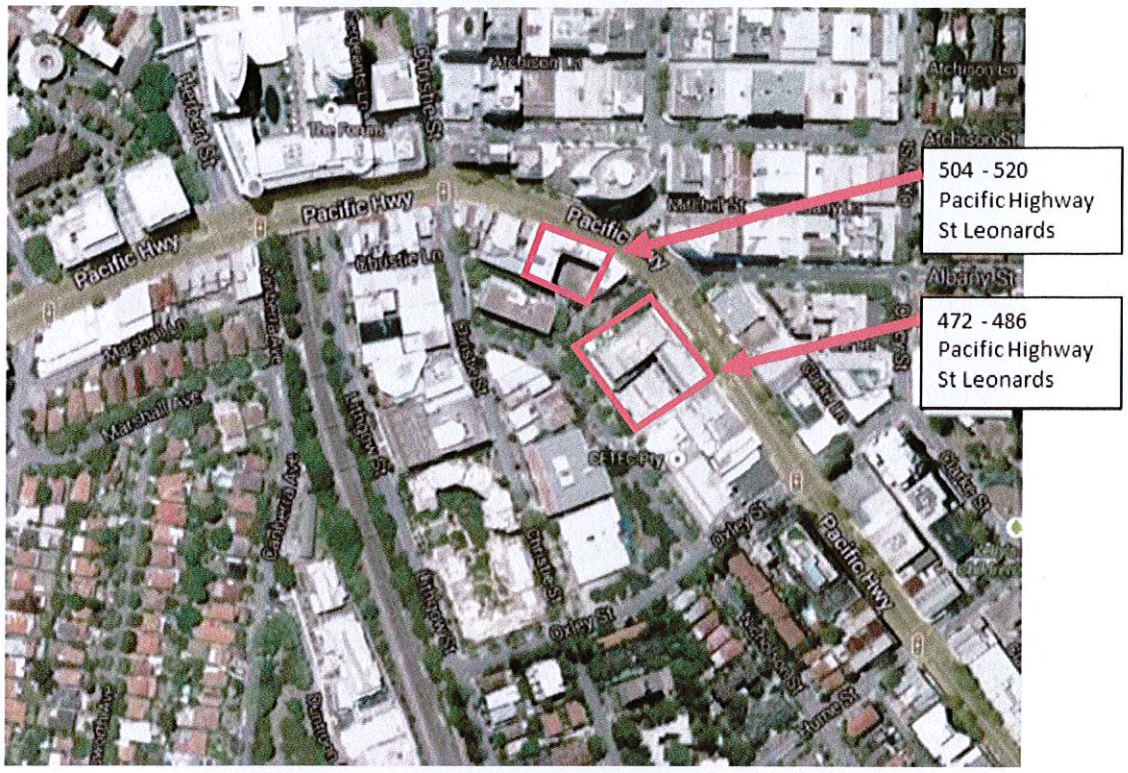
St Leonards built form is undergoing redevelopment as developers are taking advantage of the development opportunities associated with the strategic planning of St Leonards as a Specialised Precinct, as identified in the NSW Government's Metropolitan Strategy for Sydney. The advantages of this area's accessibility to public transport makes this area prime for development. This redevelopment is occurring on existing sites used for commercial and services industry purposes to mixed use residential developments, which also transform the area in terms of built form and connectivity. This Traffic Report supports the Planning Proposal to rezone no. 472-486 and no. 504-520 Pacific Highway, St Leonards (subject sites) to a mixed land use zone providing a commentary on the traffic impacts of a mixed use development on these sites.

The subject sites are located on the southern side of the Pacific Highway (as shown in Figure 1) and are highly accessible by public transport, being within 400 metres walking distance from St Leonards station and are favourable for redevelopment for mixed use purposes to take advantage of this accessibility. This Traffic Report assesses the traffic impacts associated with the rezoning of the subject sites to a mixed land use zone on the basis of an indicative mixed use development that may result from the rezoning.

1.2 Proposed Development

The indicative mixed use development for no. 472-486, Pacific Highway includes a total GFA of 49,860m^2 consisting of a 3,750m^2 commercial/retail component on the ground floor, 520 residential apartments above and car parking spaces in the form of a basement car park to be accessed via Nicholson Street. The indicative development for no. 504-520 Pacific Highway includes a total GFA of 32,545m^2 consisting of a 2,350m^2 commercial/retail component on the ground floor, 390 residential apartments above and car parking spaces in the form of a basement car park to be accessed via Nicholson Street.

Figure 1: Site Location



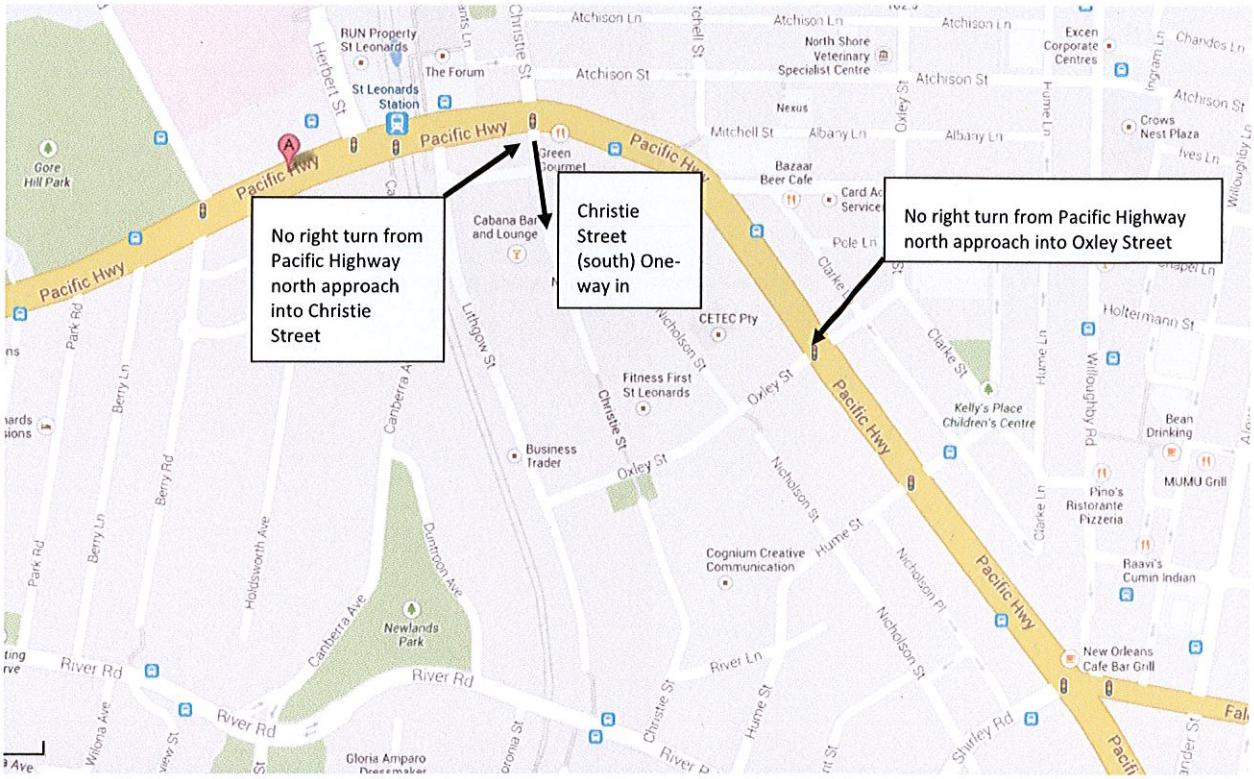
2 Existing Situation

2.1 Site Access

Due to the nature of the Pacific Highway and its limited access functionality the development site is presented with limited access and egress options for vehicular movements. Figure 2 below illustrates the potential means of access and egress to the site.

From Figure 2 it is clear that it is likely that the primary method of access and egress will be via Oxley Street and then Nicholson Street. The assessment has therefore been based on the assumption of all vehicular traffic associated with the proposed development accessing the site via Oxley Street and Nicholson Street.

Figure 2: Site Access Constraints



2.2 Traffic Data

Traffic count data for the purposes of the analyses was sourced from two previous studies, namely the *St Leonards South Strategy, Paramics Base Model – AM Peak, Calibration and Validation Report* and *St Leonards South Strategy, Paramics Base Model – PM Peak, Calibration and Validation Report* for this section of the Pacific Highway (Source: Lane Cove Council, 2013). Figures 3 and 4 below provide a summary of the existing peak hour traffic volumes at the intersection of the Pacific Highway / Oxley Street.

Figure 3: AM Peak Hour Traffic Volumes – Pacific Highway / Oxley Street

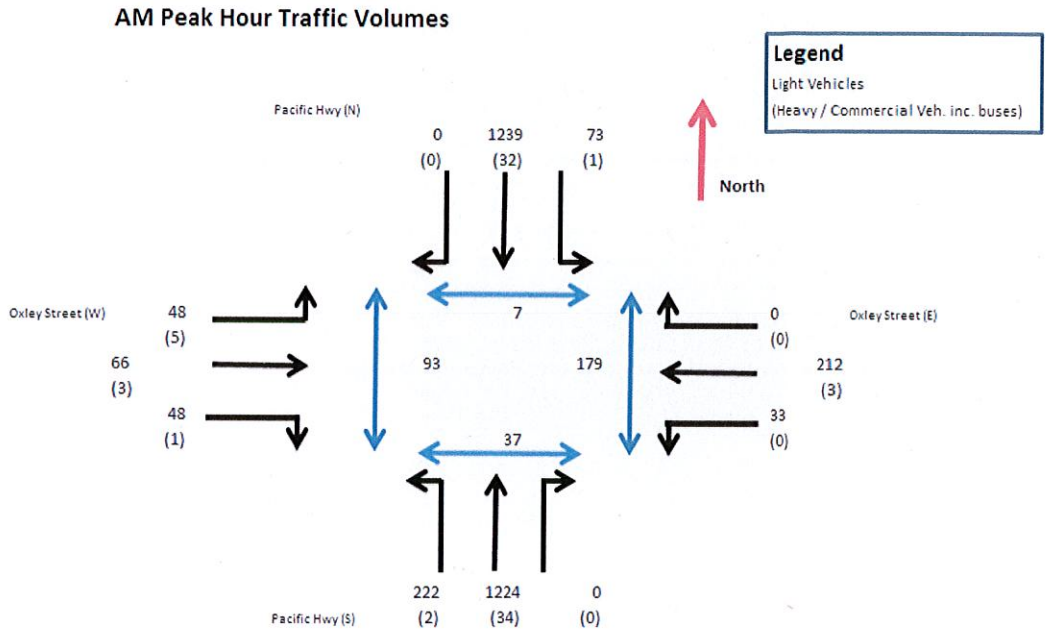
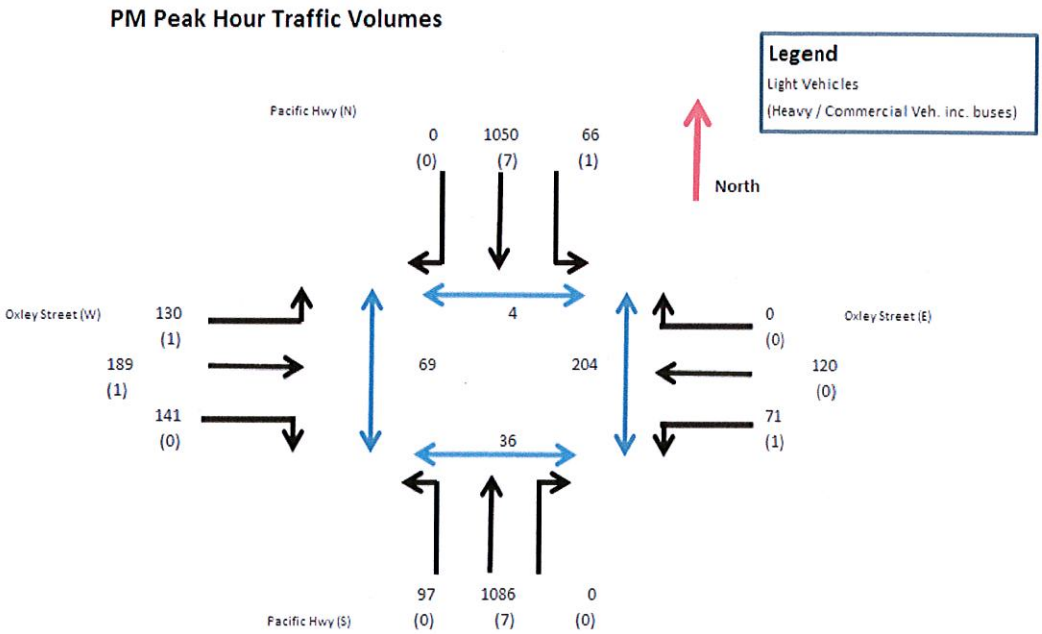


Figure 4: PM Peak Hour Traffic Volumes – Pacific Highway / Oxley Street



In addition to traffic count data Traffic Signal datasets were also required for the purposes of conducting the analyses. These datasets were acquired from Roads and Maritime Services (RMS) for the signalised intersection of the Pacific Highway / Oxley Street. The outcome from a review of this dataset is as follows:

- AM Peak Hour Period – two phase, total cycle time 138s, with a split of 115 seconds for Phase A (Pacific Highway) and 23 seconds for Phase B (Oxley Street)
- PM Peak Hour Period - two phase, total cycle time 132s, with a split of 109 seconds for Phase A (Pacific Highway) and 23 seconds for Phase B (Oxley Street)

The above values were used as the basis for undertaking the assessment of the Pacific Highway / Oxley Street intersection both with and without the development. Section 3 of this report provides more details in relation to the outcomes from this assessment.

3 Traffic Network Assessment

3.1 Traffic Generation

The estimated peak hour traffic demand associated with the proposed residential component of the development site is estimated to be:

- 175 vehicles from the development and 44 into the development in the AM peak hour period
- 44 vehicles from the development and 175 vehicles into the development in the PM peak hour period

The estimated traffic demand has been based on the use of a demand rate of 0.24 vehicle trips per dwelling unit (*RTA Guide to Traffic Generating Developments*, Section 3.3.3 High density residential flat building, for a metropolitan regional (CBD) centre). The total number of units is understood to be 520 units for 472 – 486 Pacific Highway and 390 units for 508 Pacific Highway.

For the site there is also a proportion of commercial development that will be provided on the ground floor level. This will be allocated as 3,750m^2 at 472 – 486 Pacific Highway and 2,350m^2 at 504 Pacific Highway. The *RTA Guide to Traffic Generating Developments*, Section 3.5 Office and Commercial indicates a vehicle trip generation rate of 2 peak hour trips per 100m^2 GFA for the evening peak periods. For this site this translates into about 122 vehicles during the evening peak period leaving the development site. The same rate has also been adopted for the morning peak period when it is expected these trips will be accessing the site. It is considered that the above rates are very conservative. This is because of the developments proximity to a high quality public transport system including a rail station nearby at St Leonards and the frequent on-road bus routes along the Pacific Highway.

3.2 Oxley Street Assessment

Given the nature of the Pacific Highway at this location, and in particular because of its relatively tight alignment and constrained intersection characteristics (usually consisting of right turn bans from the north and south along the Pacific Highway), there are limited opportunities to access the precinct located on the western side of the Pacific Highway, including to and from the proposed development. The access that will likely be impacted by the most significant proportion, if not all of the development traffic, will be the intersection of Oxley Street / Pacific Highway. Indeed it is envisaged that the intersection of Oxley Street with the Pacific Highway will likely be the primary point of access and egress to the arterial road network.

Due to the limited access arrangements all traffic flow to and from the development has been assumed to be via Oxley Street. It has also been assumed that all vehicle movements are destined to travel inbound towards the Sydney CBD and not north along the Pacific Highway.

The Oxley Street / Pacific Highway intersection has been assessed utilising the SIDRA intersection software. Inputs into this assessment have been traffic counts (2012 data) and also traffic signal data sourced from RMS for the site (data collected on 9 October 2013); see Section 2.2 above. This assessment has assumed all traffic associated with the development will negotiate this intersection and as such is a "worst case" scenario. There may be opportunities to distribute the traffic load across other intersections either as left turn movements in or left turn movements out or at other intersections such as Greenwich Road / Pacific Highway (located north of the proposed development site). The results from the intersection assessment for Oxley Street / Pacific Highway are presented below in Table 1.

Table 1: Intersection Analysis for the Pacific Highway / Oxley Street intersection with and without the development

Intersection and peak hour period	Intersection Level of Service (LOS)	Worst Degree of Saturation (Dos)	Worst Average Delay (seconds)	Worst 95% queue length (m)
Oxley Street / Pacific Highway – AM Peak, *without development*	B	0.55	68s	170m
Oxley Street / Pacific Highway – PM Peak, *without development*	C	0.59	42s	184m
Oxley Street / Pacific Highway – AM Peak, *with development*	C	0.70	56s	256m
Oxley Street / Pacific Highway – PM Peak, *with development*	C	0.78	51s	276m

From the assessment it can be noted that the proposed development will impact on the performance of the intersection as it may contribute an additional total of about 330 vehicles per hour through the intersection during the peak periods. This represents about a 9% increase in traffic volume through the intersection.

The Level of Service is expected to remain at a LOS "C" and the intersection will perform within its practical degree of saturation (limit at 0.90). However, it is important to note that this increase in traffic volume is considered to be very conservative and may not take full advantage of the very close proximity of a high quality public transport network as is available within St Leonards. It is expected the trip rate utilised in the assessment would likely be less in practice. The above assessment is therefore considered to be a "worst case" in terms of the impact on the performance of the intersection. Also do note that detailed traffic signal assessments would be required at later stages in the development assessment process with the objective of minimising the delays to the Pacific Highway and balancing the delay across the side streets. Also note that over this length of the Pacific Highway there is the added complexity of the location of Transit Lanes (T3) during the inbound direction in the morning peak hour and in the outbound direction during the evening peak period. This complex corridor arrangement is not well modelled alone with SIDRA and it would be recommended that a traffic micro-simulation model, or similar, be utilised to optimise the traffic signal arrangements at the intersection to take account of and minimise any impacts associated with the proposed development.

3.3 Nicholson Street Assessment

Nicholson Street provides a local access function and within a road hierarchy would be considered to be a local road. Local roads of this nature typically carry up to 2,000vpd. In this instance it is understood no traffic count data is available for Nicholson Street. However, based on the relatively high density of development that exists over its length, including its connection to Christie Street and the one-way nature of Christie Street, it is very likely that the traffic volume along Nicholson Street may be of the order of at least 2,000 – 3,000vpd. During the peak periods the total two-way volume may likely be of the order of about 300vph. The proposed development, assuming the very conservative standard trip generation rates, may double the volume on the local access road (330vph in peak periods, total two-way). Given these demands the existing intersection arrangement of Nicholson Street / Oxley Street may require a minor upgrade (linemarking / lane arrangements) to cater for the increase in demand at this location. Based on these flows it is recommended that consideration be given to the provision of a short right turn lane for right turn movements into Nicholson Street so that these movements are safely out of the through Oxley Street traffic stream and do not impede the through Oxley Street movements.

4 Conclusions and Recommendations

The primary access point for the development site to the major arterial road network is likely to be via the Oxley Street / Pacific Highway intersection. Based on the existing traffic volumes, and estimated development traffic assessment, it is not proposed to undertake any upgrade works on the Oxley Street / Pacific Highway intersection to cater for the increase in demands arising from the proposed development. Indeed, the proposed development is anticipated to have a relatively minor impact on the operations of the Pacific Highway at St Leonards.

To cater for the increase in right turn movements into Nicholson Street it is recommended that consideration be given to the provision of a short right turn lane (linemarking) for right turn movements into Nicholson Street so that these movements are safely out of the through Oxley Street traffic stream and do not impede the through Oxley Street movements.

5771013

Supplementary

Our Ref: x13318 RFI Response
Contact: Federico Ramos

BROWN

25 November 2013

Lane Cove Council
48 Longueville Rd, Lane Cove
PO Box 20
Lane Cove NSW 1595

Attention: Stephanie Bashford

Dear Stephanie,

472 - 486 & 504-520 Pacific Highway, St Leonards
Response to Council's Request for Further Information

Brown Consulting prepared a Traffic Report dated November 2013 in support of the rezoning of 472 - 486 & 504-520 Pacific Highway, St Leonards. Upon submission of the initial assessment, Council has raised several questions in relation to the report. This letter lists and attempts to address all questions raised.

1. **Supply the estimated car spaces average (although the exact bedroom mix won't be known until DA stage)**

The report submitted to Council is in support of the rezoning only. Further details will be provided in the DA stage including the parking provision assessment that is anticipated to be based on Council's DCP.

2. **clarify the controls used: The Brown report's Traffic Generation section indicates that they are based on the RMS Guide, whereas your email suggests that they used the current DCP rates.**

The Traffic Report submitted to Council estimates the anticipated trip generation based solely on the RMS Guide to Traffic Generating Developments 2002. It should be noted that the trip generation rates are dated and that more recent rates are available. Given that the older rates are higher, the trip generation estimate in the traffic report is considered to be conservative.

3. **The Traffic Manager has requested that the quantum of parking spaces should be explicitly stated in the Traffic Report as this will have a large bearing on future trip generation and impact on surrounding roads and intersections.**

The parking supply and anticipated trip generation can be inter-related but this may not necessarily always be true. For example, even if an oversupply of parking was provided in these two buildings, public transport will still provide the most convenient travel mode in and out of the city during peak periods. As such, the impact of the 'excessive' residential parking supply in the two buildings is not likely to have any significant bearing on the anticipated trip generation during peak periods.

Notwithstanding the above, further details will be provided in the DA stage including the parking provision assessment that is anticipated to be based on Council's DCP.

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ABN 30 109 434 513
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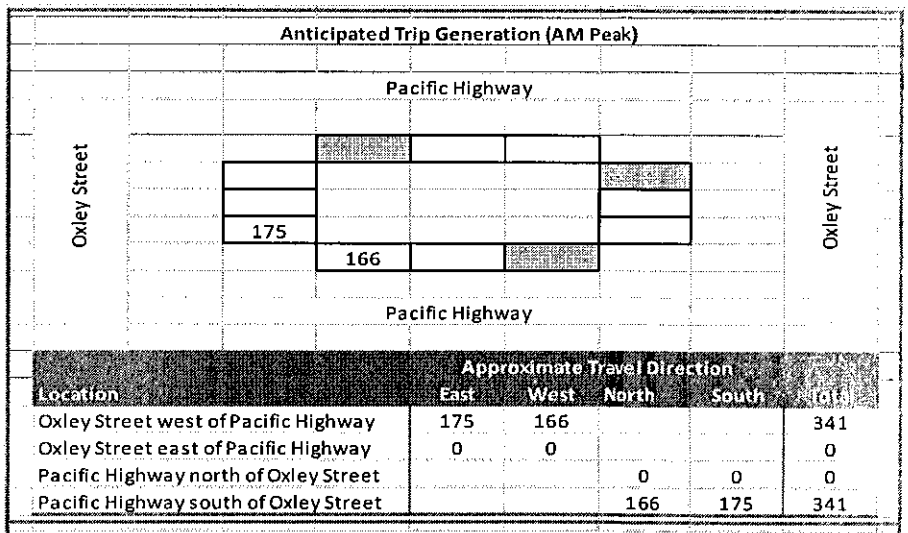
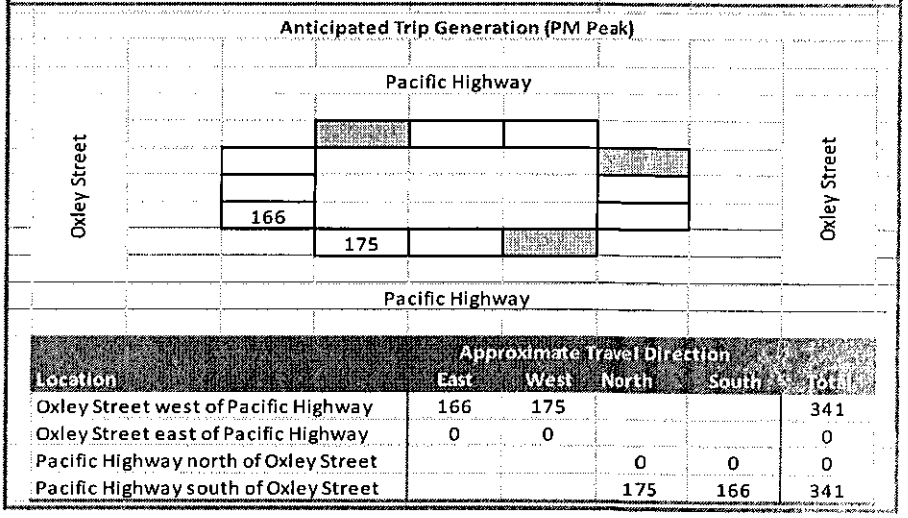
4. **The assumption that all cars will travel inbound at the site from the north (Chatswood end)**
    - **Why none from the south (North Sydney end)?**
    - **It doesn't describe whether that applies to both am and pm traffic.**
    - **If they arrived in one direction, they will leave in the opposite direction** – could that be **described please?**
    - **That those cars will all access the site via Oxley St - Mightn't they turn left** into Christie St, use **the roundabout and head south through Christie St**

The report assumes the trips to / from the site are all to / from the Sydney CBD. That means that the dominant trips will be right turns out of Oxley Street to go southbound towards the Sydney CBD during the morning peak and then in the reverse as left turns into Oxley Street from the Sydney CBD direction during the evening peak. It conservatively assumes that all traffic associated with the proposed development will travel through the Pacific Highway / Oxley Street Intersection as follows:



Location	Approximate Travel Direction				Total
	East	West	North	South	
Oxley Street west of Pacific Highway	175	166			341
Oxley Street east of Pacific Highway	0	0			0
Pacific Highway north of Oxley Street			0	0	0
Pacific Highway south of Oxley Street			166	175	341



Location	Approximate Travel Direction				Total
	East	West	North	South	
Oxley Street west of Pacific Highway	166	175			341
Oxley Street east of Pacific Highway	0	0			0
Pacific Highway north of Oxley Street			0	0	0
Pacific Highway south of Oxley Street			175	166	341

It should be noted that assuming a more even distribution such that more motorists travel to and from other directions may be more realistic. However, the results of such an analysis on other intersections with slightly increased traffic is predictable (i.e. these other intersections will continue to work well with a relatively small impact). For this reason, it is common practice to avoid a more 'realistic' trip distribution in preference of the most conservative trip distribution for the analysis. The conservative approach being an overestimation of the movement that is anticipated to be most dominant.

Please note that if a 'realistic' distribution is 75% to and from the city and 25% to and from other directions, the greatest impact is most likely to occur where 75% of traffic will travel, and very little impact will be created where 25% of the traffic will travel. The conservative approach would be to ignore the little impact for other directions and overestimate the dominant movement, thereby exaggerating the developments adverse impacts (e.g. assuming 100% to / from the city and 0% elsewhere). The intention is to demonstrate that there will not be any significant impact even when a conservative approach is undertaken. It should also be noted that generally, right turn movements tend to be the worst performing movement at any intersection. As such, the conservative approach adopted also includes overestimating the traffic generation at the worst performing movement.

5. **No observations on the current pressure around 5pm on cars queuing in Oxley St to head home?**

The report provides a table outlining the intersection's overall performance during the morning and evening peak period, with and without the development. The results of the Sidra Analysis have been attached in order to provide further details in terms of the performance of each movement at the intersection. (refer to Attachment A).

6. **It says that there may be opportunities to distribute the traffic load across other intersections such as Greenwich Rd. To arrive at the site, this would mean a complex route along River Rd, up probably Hume St on the North Sydney side, back along the Highway and left into Oxley. To leave the site no distribution of cars heading either up the Highway or west via Greenwich Rd?**

It is acknowledged that residents may find 'rat-runs' to avoid congestion, particularly when they become familiar with the area. However, first it is necessary to establish that an intersections (or a particular movement) will underperform in terms of queue lengths, delay times, etc, thereby establishing the demand for motorists to find alternative routes in order to avoid lengthy queue lengths and reduce travel times. That is the approach undertaken in the traffic report and it is an assessment of the worst case scenario.

From a traffic engineering perspective 'rat running' is the observation of motorists distributing trips more evenly throughout the local road network such that queue lengths and delay times are evenly distributed rather than being loaded onto one intersection or movement. In other words, 'rat runners' allow the local road network to perform more efficiently as a whole.

7. **No Journey to Work estimates of the directions of any of these many movements?**

It is highly anticipated that interrogating JTW data will most likely confirm that the approach undertaken in the analysis is conservative and therefore not required.

8. **Why no mention of Berry Rd? This an intersection of concern to the local residents.**

Based on a quick map assessment there is no reason to suspect that the proposed development will have any significant impact on Berry Road.

9. **What about an estimate of the current car movements using the site (it could be based on the current commercial floor space, which the applicants would know). Commercial cars would mostly be arriving in the morning, in contrast with the future residential pattern of leaving for work.**

In terms of adopting a trip distribution, the existing trip distribution or JTW data may provide sufficient data to allow for a more 'realistic' trip distribution. Nevertheless, a conservative approach, as adopted, is more appropriate.

Additional Comments

In addition to all of the above, the adopted trip generation is considered to be conservative in light of the new trip generation rates published by RMS in August 2013 and that it appears that the existing trip generation was not subtracted from the final volumes. This further adds to the conservative nature of the assessment and further indicates that the proposed rezoning should be supported in terms of traffic impact.

I trust that this letter addresses Council's concerns. Should you wish to discuss any matter further, please do not hesitate to contact me on 8808 5000.

Regards

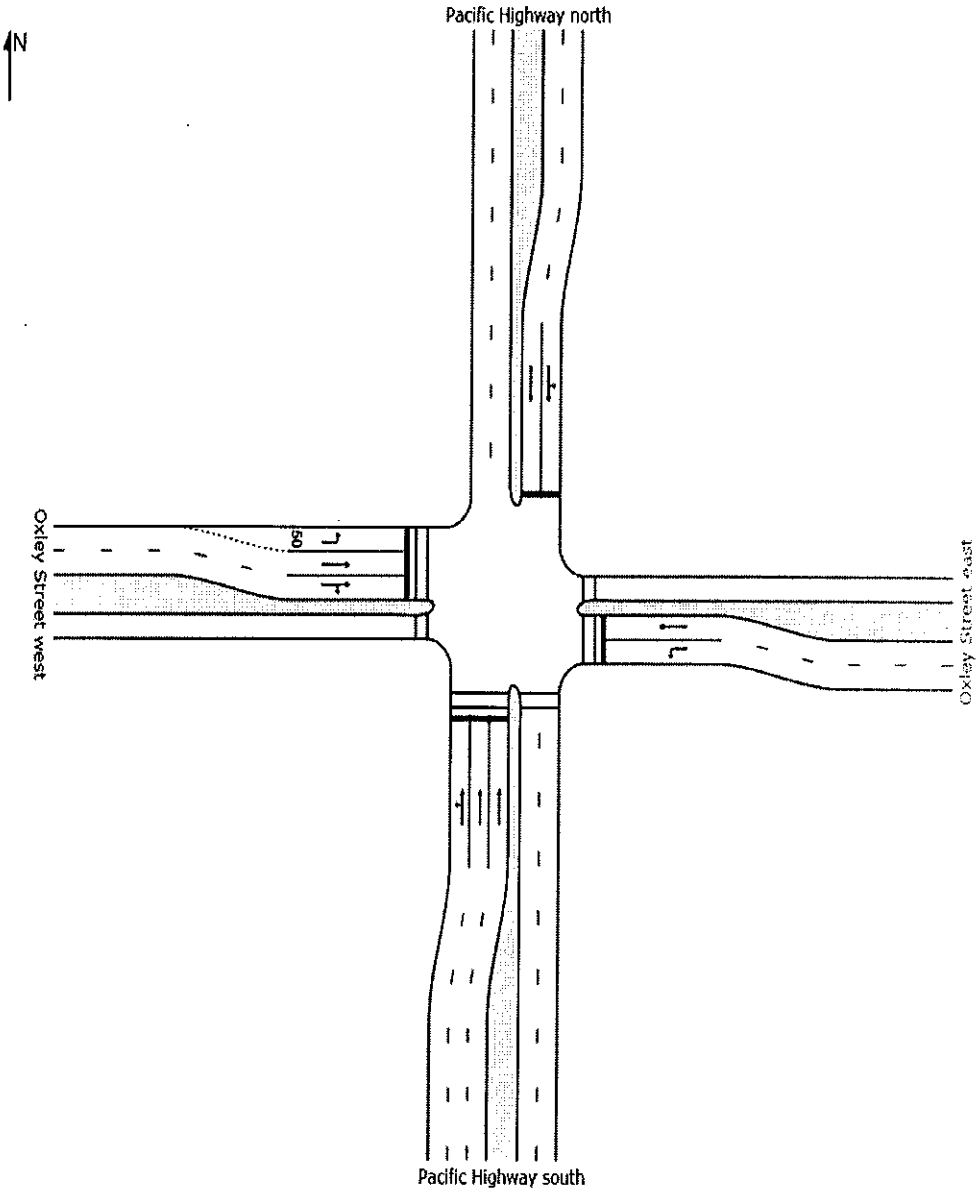
Brown Consulting (NSW) Pty Ltd

Federico Ramos
Traffic Engineer

SITE LAYOUT

Site: Oxley St

Oxley St and Pacific Highway



MOVEMENT SUMMARY

Site: Oxley St

Oxley St and Pacific Highway
Signals - Fixed Time Cycle Time = 138 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: Pacific Highway south											
1	L2	236	0.9	0.198	19.9	LOS B	6.3	44.4	0.43	0.77	39.7
2	T1	1324	2.7	0.497	10.3	LOS B	20.2	144.9	0.50	0.46	45.1
Approach		1560	2.4	0.497	11.7	LOS B	20.2	144.9	0.49	0.51	44.2
East: Oxley Street east											
4	L2	35	0.0	0.096	57.0	LOS E	1.9	13.4	0.85	0.74	23.3
5	T1	226	1.4	0.539	51.7	LOS D	13.6	96.1	0.94	0.79	24.4
Approach		261	1.2	0.539	52.4	LOS D	13.6	96.1	0.93	0.78	24.2
North: Pacific Highway north											
7	L2	78	1.4	0.545	13.7	LOS B	23.7	169.4	0.57	0.58	42.2
8	T1	1338	2.5	0.545	12.2	LOS B	23.7	169.4	0.55	0.53	43.4
Approach		1416	2.5	0.545	12.2	LOS B	23.7	169.4	0.55	0.53	43.4
West: Oxley Street west											
10	L2	56	9.4	0.147	58.8	LOS E	3.0	22.9	0.85	0.77	24.3
11	T1	73	4.3	0.469	56.2	LOS E	5.5	39.6	0.90	0.70	23.6
12	R2	52	2.0	0.469	67.8	LOS E	5.5	39.6	0.97	0.78	21.3
Approach		180	5.3	0.469	60.4	LOS E	5.5	39.6	0.90	0.74	23.1
All Vehicles		3417	2.5	0.545	17.6	LOS B	23.7	169.4	0.57	0.55	39.5

Level of Service (LOS) Method: Delay (HCM 2000).
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	41	54.9	LOS E	0.1	0.1	0.89	0.89
P2	East Full Crossing	188	9.5	LOS A	0.3	0.3	0.37	0.37
P4	West Full Crossing	98	10.6	LOS B	0.2	0.2	0.39	0.39
All Pedestrians		327	15.5	LOS B			0.44	0.44

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.

MOVEMENT SUMMARY

Site: Oxley St

Oxley St and Pacific Highway
Signals - Fixed Time Cycle Time = 138 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: Pacific Highway south											
1	L2	411	0.5	0.450	32.3	LOS C	17.7	124.6	0.70	0.82	31.7
2	T1	1324	2.7	0.636	23.2	LOS C	30.5	218.7	0.75	0.69	35.0
Approach		1735	2.2	0.636	25.4	LOS C	30.5	218.7	0.74	0.72	34.2
East: Oxley Street east											
4	L2	35	0.0	0.054	39.7	LOS D	1.5	10.7	0.69	0.73	28.6
5	T1	226	1.4	0.317	33.0	LOS C	10.7	76.0	0.76	0.64	30.3
Approach		261	1.2	0.317	33.9	LOS C	10.7	76.0	0.75	0.65	30.1
North: Pacific Highway north											
7	L2	78	1.4	0.702	35.2	LOS D	34.4	245.9	0.82	0.77	32.6
8	T1	1338	2.5	0.702	25.7	LOS C	35.8	255.8	0.81	0.75	33.5
Approach		1416	2.5	0.702	26.2	LOS C	35.8	255.8	0.81	0.75	33.4
West: Oxley Street west											
10	L2	56	9.4	0.087	38.1	LOS D	2.4	18.2	0.68	0.73	29.2
11	T1	73	4.3	0.104	30.1	LOS C	3.1	22.8	0.69	0.54	31.7
12	R2	236	0.4	0.694	56.5	LOS E	14.5	101.9	0.95	0.86	23.5
Approach		364	2.6	0.694	48.4	LOS D	14.5	101.9	0.86	0.78	25.6
All Vehicles		3776	2.3	0.702	28.5	LOS C	35.8	255.8	0.78	0.73	32.5

Level of Service (LOS) Method: Delay (HCM 2000).
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	41	37.8	LOS D	0.1	0.1	0.74	0.74
P2	East Full Crossing	188	18.9	LOS B	0.4	0.4	0.53	0.53
P4	West Full Crossing	98	20.5	LOS C	0.2	0.2	0.55	0.55
All Pedestrians		327	21.8	LOS C			0.56	0.56

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.

MOVEMENT SUMMARY

Site: Oxley St

Oxley St and Pacific Highway
Signals - Fixed Time Cycle Time = 132 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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pacific Highway south											
1	L2	102	0.0	0.583	22.1	LOS C	25.8	181.4	0.71	0.70	36.3
2	T1	1151	0.6	0.583	20.9	LOS C	26.2	184.3	0.71	0.67	36.8
Approach		1253	0.6	0.583	21.0	LOS C	26.2	184.3	0.71	0.67	36.8
East: Oxley Street east											
4	L2	75	0.0	0.124	41.4	LOS D	3.3	23.3	0.74	0.76	28.0
5	T1	126	0.0	0.186	31.8	LOS C	5.6	39.1	0.74	0.60	30.8
Approach		201	0.0	0.186	35.3	LOS D	5.6	39.1	0.74	0.66	29.7
North: Pacific Highway north											
7	L2	71	1.5	0.377	22.8	LOS C	14.0	98.6	0.65	0.65	36.1
8	T1	1113	0.7	0.377	18.5	LOS B	14.4	101.4	0.61	0.56	38.6
Approach		1183	0.7	0.377	18.8	LOS B	14.4	101.4	0.61	0.57	38.4
West: Oxley Street west											
10	L2	138	0.8	0.214	41.6	LOS D	6.2	43.5	0.74	0.79	28.8
11	T1	200	0.5	0.589	40.0	LOS D	14.6	102.4	0.82	0.72	28.4
12	R2	148	0.0	0.589	46.0	LOS D	14.6	102.4	0.89	0.82	26.5
Approach		486	0.4	0.589	42.3	LOS D	14.6	102.4	0.82	0.77	27.9
All Vehicles		3123	0.6	0.589	24.4	LOS C	26.2	184.3	0.69	0.64	35.1

Level of Service (LOS) Method: Delay (HCM 2000).
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	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	38	38.7	LOS D	0.1	0.1	0.77	0.77
P2	East Full Crossing	215	17.2	LOS B	0.4	0.4	0.51	0.51
P4	West Full Crossing	73	18.6	LOS B	0.1	0.1	0.53	0.53
All Pedestrians		325	20.0	LOS B			0.55	0.55

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.

MOVEMENT SUMMARY

Site: Oxley St

Oxley St and Pacific Highway
Signals - Fixed Time Cycle Time = 132 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: Pacific Highway south											
1	L2	286	0.0	0.788	39.5	LOS D	37.2	261.5	0.91	0.86	29.8
2	T1	1151	0.6	0.788	30.5	LOS C	39.3	276.7	0.91	0.84	30.8
Approach		1437	0.5	0.788	32.3	LOS C	39.3	276.7	0.91	0.84	30.6
East: Oxley Street east											
4	L2	75	0.0	0.100	34.2	LOS C	2.9	20.6	0.66	0.75	30.9
5	T1	126	0.0	0.153	24.7	LOS C	4.9	34.4	0.65	0.53	34.4
Approach		201	0.0	0.153	28.2	LOS C	4.9	34.4	0.65	0.61	33.0
North: Pacific Highway north											
7	L2	71	1.5	0.438	36.1	LOS D	15.9	112.4	0.75	0.70	32.0
8	T1	1113	0.7	0.438	24.7	LOS C	17.1	120.3	0.71	0.64	34.2
Approach		1183	0.7	0.438	25.3	LOS C	17.1	120.3	0.72	0.64	34.0
West: Oxley Street west											
10	L2	138	0.8	0.176	33.2	LOS C	5.4	38.3	0.66	0.77	31.3
11	T1	200	0.5	0.789	30.9	LOS C	23.8	166.4	0.76	0.66	30.5
12	R2	323	0.0	0.789	50.7	LOS D	23.8	166.4	0.95	0.90	25.2
Approach		661	0.3	0.789	41.1	LOS D	23.8	166.4	0.83	0.80	27.8
All Vehicles		3482	0.5	0.789	31.4	LOS C	39.3	276.7	0.81	0.75	31.2

Level of Service (LOS) Method: Delay (HCM 2000).
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	38	31.4	LOS D	0.1	0.1	0.69	0.69
P2	East Full Crossing	215	22.7	LOS C	0.5	0.5	0.59	0.59
P4	West Full Crossing	73	24.3	LOS C	0.2	0.2	0.61	0.61
All Pedestrians		325	24.1	LOS C			0.60	0.60

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.