Chandos Street and Atchison Street, St Leonards

Planning Proposal

Transport Impact Assessment

transportation planning, design and delivery

1451511000 05/08/14

GTAconsultants

Chandos Street and Atchison Street, St Leonards

Planning Proposal

Transport Impact Assessment

Issue: B 05/08/14

Client: Auswin TWT Development Pty Ltd
Reference: 14S1511000
GTA Consultants Office: NSW

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
A	07/07/14	Final	Rebekah Giana	Andrew Farran	Jason Rudd	Brett Maynard
B	05/08/14	Final	Rebekah Giana	Andrew Farran	Jason Rudd	

GTAconsultants
MELBOURNE · SYDNEY · BRISBANE · CANBERRA
ADELAIDE · GOLD COAST · TOWNSVILLE
www.gta.com.au

Table of Contents

Figures

Tables

1. Introduction

1.1 Background

It is understood that a Planning Proposal is to be lodged with North Sydney Council to allow for a proposed mixed use development for land generally bound by Chandos Street to the north, Oxley Street to the east and Albany Lane to the south in St Leonards.

The land is currently zoned B4 Mixed Use. The Planning Proposal seeks to increase the permissible height limits for the site and introduce a site specific floor space ratio. An indicative development yield for the site comprises some 540 residential apartments set above lower level commercial and community land uses.

It is noted that Council is currently undertaking a review of the planning controls for the Precinct where the site is located with the view to intensification of land uses. This review is understood to be completed later this year.

Auswin TWT commissioned GTA Consultants in May 2014 to undertake a transport impact assessment of the planning proposal.

1.2 Purpose of this Report

This report sets out an assessment of the anticipated transport implications of the proposed development, including consideration of the following:

i existing traffic and parking conditions surrounding the site
ii suitability of the proposed parking in terms of supply (quantum) and layout
iii service vehicle requirements
iv pedestrian and bicycle requirements
v the traffic generating characteristics of the proposed development
vi suitability of the proposed access arrangements for the site
vii the transport impact of the development proposal on the surrounding road network.

1.3 References

In preparing this report, reference has been made to the following:

- an inspection of the site and its surrounds
- North Sydney Council Development Control Plan (DCP) 2013
- North Sydney Council Local Environment Plan (LEP) 2013
- RMS Guide to Traffic Generating Developments: Technical Direction (August 2013)
- traffic and car parking surveys undertaken by GTA Consultants as referenced in the context of this report
- other documents and data as referenced in this report.

2. Existing Conditions

2.1 Site Location

The subject site is made up a number of properties located at 75-89 Chandos Street, 23-35 and 58-62 Atchison Street in St Leonards. The overall site of approximately 5,244sq.m has frontages of 55m to Chandos Street, 55m and 30m to Atchison Lane, 30m and 60m to Atchison Street, 60m to Albany Lane and 38m and 35m to Oxley Street.

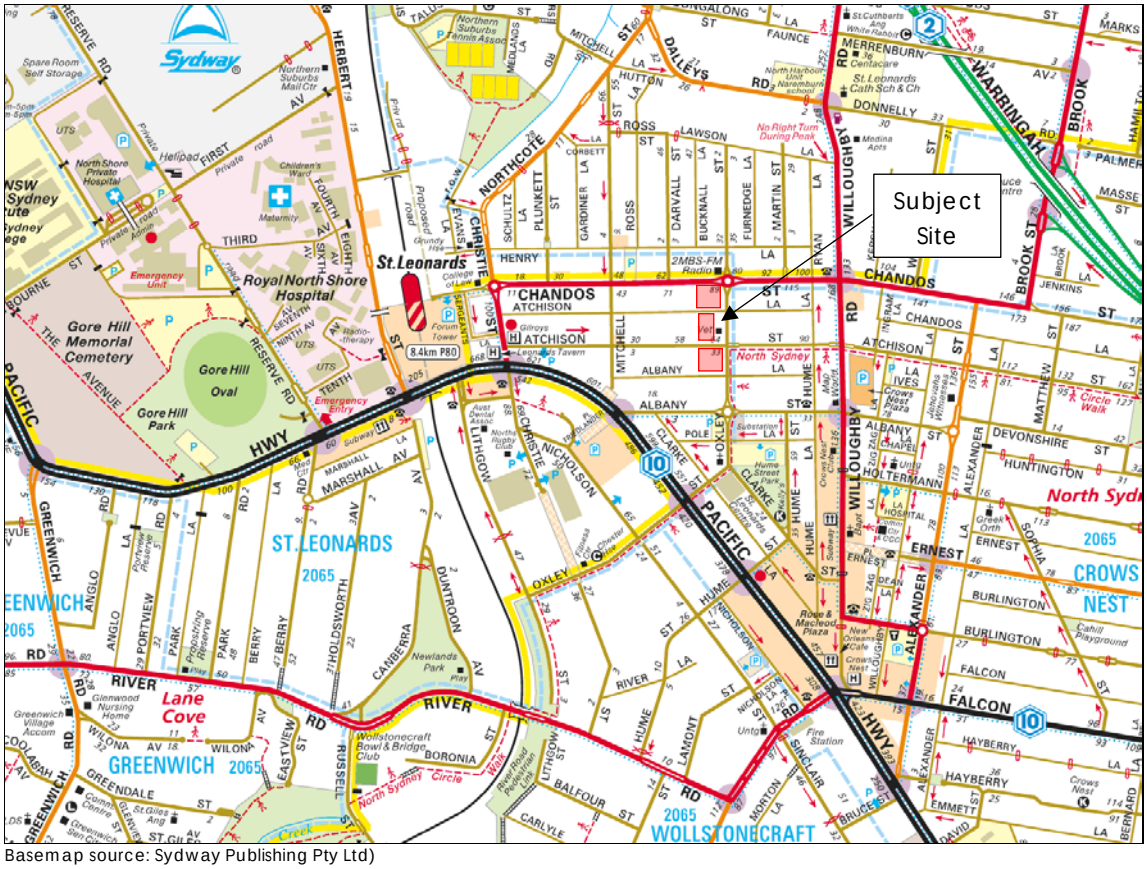
It is noted that the subject site does not include the existing vet building located on Oxley Street.

The site currently has a land use classification as B4 Mixed Use under the North Sydney Council Local Environment Plan (LEP) 2013and is occupied by a number of commercial tenancies.

The site is located within the St Leonards Town Centre and surrounding properties predominantly include commercial, retail and high density residential uses. Low density residential dwellings are located to the north and east of the site. St Leonards Railway Station is located to the west of the site. The Crows Nest commercial centre is located approximately 500m southeast of the site.

The location of the subject site and its surrounding environs is shown in Figure 2.1, whilst an aerial photo of the subject site is shown in Figure 2.2.

Figure 2.1: Subject Site and Its Environs



Basemap source: Sydway Publishing Pty Ltd)

Figure 2.2: Aerial Photo of Subject Site

Basemap source: NearMap aerial photography, used under licence

2.2 Road Network

2.2.1 Adjoining Roads

Chandos Street

Chandos Street is classified as a RMS State Road. In the vicinity of the site it is aligned in an east-west direction. It is a two-way road configured with a two lane, 12.5 metre wide carriageway set within a 20 metre road reserve (approx.). Kerbside ticketed parking is permitted on both sides of the road subject to time restrictions in most areas.

Chandos Street is shown in Figure 2.3 and carries approximately 10,000 vehicles per day1.

Atchison Street

Atchison Street functions as a local road and in the vicinity of the site is aligned in an east-west direction. It is a two-way road configured with a two lane, 12.8 metre wide carriageway, set within a 20.1 metre wide road reserve (approx.). Kerbside parking is permitted on both sides of the road and varies between ticketed and non-ticketed parking subject to time restrictions in most areas.

Atchison Street is shown in Figure 2.4 and carries approximately 1,500 vehicles per day1.

1 Based on the peak hour traffic counts undertaken by GTA in May 2014 and assuming a peak-to-daily ratio of 10%.

Figure 2.3: Chandos Street (facing west)

Figure 2.4: Atchison Street (facing west)

Oxley Street

Oxley Street functions as a local road and in the vicinity of the site is aligned in a north-south direction. It is a two-way road configured with a two lane, 9.1 metre wide carriageway, set within a 20.2 metre wide road reserve (approx.). Kerbside parking is permitted on both sides of the road including abutting the site where 2 hour ticketed parking is provided. The provision of on-street parking on both sides of the carriageway affectively restricts Oxley Street to one shared traffic lane.

Oxley Street is shown in Figure 2.5 and carries approximately 6,500 vehicles per day[1].

Atchison Lane

Atchison Lane functions as a laneway providing rear vehicle access to properties with another frontage and in the vicinity of the site is aligned in an east-west direction. It is a two-way lane configured with 4.8 metre wide carriageway, set within a 6 metre wide road reserve (approx.). A small amount of restricted parking is permitted between Oxley Street and Hume Lane, no parking is permitted abutting the site.

Atchison Lane is shown in Figure 2.6 and carries approximately 900 vehicles per day[1].

Figure 2.5: Oxley Street (facing north)

Figure 2.6: Atchison Lane (facing east)

Albany Lane

Albany Lane functions as a laneway providing rear vehicle access to properties with another frontage and in the vicinity of the site is aligned in an east-west direction. It is a two-way lane configured with a 4.8 metre wide carriageway, set within a 6.4 metre wide road reserve (approx.). Kerbside parking is not permitted on Albany Lane.

Albany Lane is shown in Figure 2.7 and carries approximately 750 vehicles per day[1].

Figure 2.7: Albany Lane (facing west)

2.2.2 Surrounding Intersections

The following intersections currently exist in the vicinity of the site:

- Oxley Street/Chandos Street (roundabout)
- Oxley Street/Atchison Lane (unsignalised)
- Oxley Street/Atchison Street (unsignalised)
- Oxley Street/Albany Lane (unsignalised)
- Oxley Street/Albany Street (roundabout)
- Oxley Street/Pacific Highway (signalised)
- Pacific Highway/Albany Street (signalised)
- Pacific Highway/Christie Street (signalised).

2.3 Traffic Volumes

GTA Consultants have undertaken traffic counts of the intersections identified above on various dates (21 June 2012, 29 May 2014 and 11 June 2014).

The AM and PM peak hour traffic volumes are summarised in Appendix A.

2.4 Intersection Operation

The operation of the key intersections within the study area have been assessed using SIDRA INTERSECTION 5[2], a computer based modelling package which calculates intersection performance.

[2] Program used under license from Akcelik & Associates Pty Ltd.

The commonly used measure of intersection performance, as defined by the RTA, is vehicle delay. SIDRA INTERSECTION determines the average delay that vehicles encounter and provides a measure of the level of service.

Table 2.1 shows the criteria that SIDRA INTERSECTION adopts in assessing the level of service.

Table 2.1: SIDRA INTERSECTION Level of Service Criteria

Level of Service (LOS)	Average Delay per vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Sign
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Near capacity	Near capacity, accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Greater than 70	Extra capacity required	Extreme delay, major treatment required

Table 2.2 presents a summary of the existing operation of the intersection, with full results presented in Appendix B of this report.

Table 2.2: Existing Operating Conditions

Intersection	Peak	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)
Oxley Street/ Chandos Street	AM	0.55	8	36	A
	PM	0.59	9	40	A
Oxley Street/ Atchison Lane	AM	0.16	3	8	-
	PM	0.19	3	10	-
Oxley Street/ Atchison Street	AM	0.18	5	8	-
	PM	0.24	5	11	-
Oxley Street/ Albany Lane	AM	0.19	3	11	-
	PM	0.21	3	13	-
Oxley Street/ Albany Street	AM	0.64	10	47	A
	PM	0.71	12	63	A
Oxley Street/ Pacific Highway	AM	0.70	10	87	A
	PM	0.61	21	136	B
Pacific Highway/ Albany Street	AM	0.78	22	212	B
	PM	0.79	20	139	B
Pacific Highway/ Christie Street	AM	0.68	10	105	A
	PM	0.54	8	76	A

On the basis of the above assessment, it is clear that the intersections along the Pacific Highway currently experience some queuing and delays during both the AM and PM peak periods. The intersections along Oxley Street currently operate well with minimal queues and delays during peak periods.

It is noted that SIDRA INTERSECTION modelling does not fully take into account the linking of signalised intersections along the Pacific Highway corridor and that the actual delays and queue lengths along the corridor during peak periods maybe higher than those modelled above. In this

regard, Paramics modelling previously undertaken on behalf of Lane Cove Council indicates that significant congestion occurs along the Pacific Highway through the St Leonards area.

2.5 Car Parking

Sample parking demand surveys were undertaken by GTA at 9:00am, 4:00pm and 6:00pm on Wednesday 11 June 2014 on the streets surrounding the site. The results of the car parking surveys are summarised in Table 2.3.

Table 2.3: Parking Supply and Demand [1]

Parking Restriction (at time of survey)	9:00am		4:00pm		6:00pm	
	Supply	Demand	Supply	Demand	Supply	Demand
Unrestricted	41	41	41	39	213	158
1-2 hour	168	129	148	103	4	2
Less than 1 hour	5	5	5	3	0	0

[1] The car parking supply varies throughout the day.

Table 2.3 indicates that the public on-street parking demand on the streets surrounding the site is relatively high with a peak demand of 82% at 9:00am amounting to 39 vacancies. The majority of the existing car parking demand was observed to be associated with surrounding commercial properties. Full results of the car parking surveys are shown in Appendix C.

2.6 Public Transport

The site is located approximately 5 minutes walking distance from St Leonards Railway Station. St Leonards Station is serviced regularly by the T1-North Shore and Northern Line and Western Lines. These train services link St Leonards directly with key locations including Chatswood, North Sydney, Sydney CBD, Hornsby and Parramatta. Train services operate in each direction approximately every 2 minutes during peak times.

A number of frequent bus services are available within a five minute walking distance of the site on the Pacific Highway and Willoughby Road. These buses provide services to northern suburbs including Manly, Chatswood, North Sydney, North Ryde and Lane Cove.

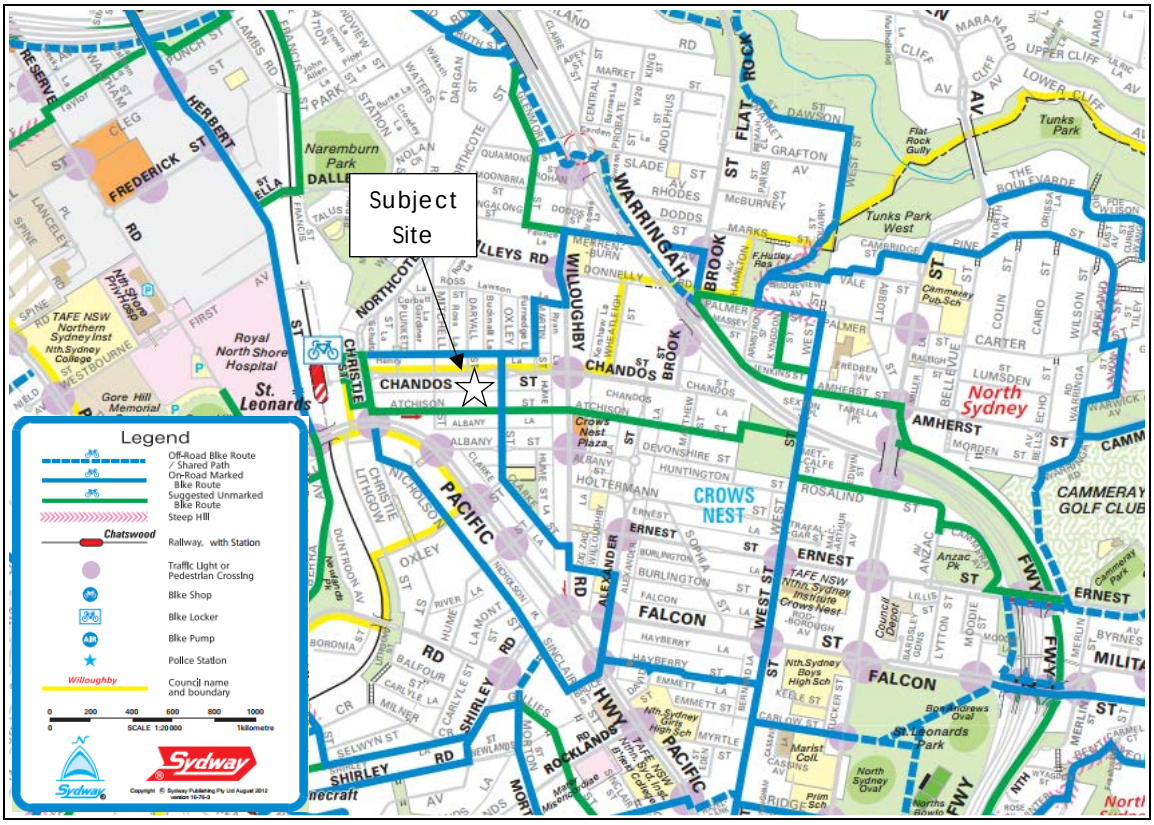
2.7 Pedestrian and Cycle Infrastructure

Pedestrian paths are located on all major roads within the immediate road network. The majority of the intersections surrounding the site are not signalised but provide pedestrian refuge islands to assist with crossing the road. Signalised pedestrian crossings are provided at each of the following intersections:

- Chandos Street/Willoughby Road
- Albany Street/Pacific Highway
- Albany Street/Willoughby Road

A large bicycle network is present throughout the North Sydney Council local government area. A marked bicycle route is located on Atchison Street and provides a direct connection to St Leonards Railway Station. North Sydney's Cycling Map (2012) provided in Figure 2.8 shows the site is also located close to a number of other on road bicycle routes.

Figure 2.8: Cycling Infrastructure



Source: North Sydney Cycling Map (2012)

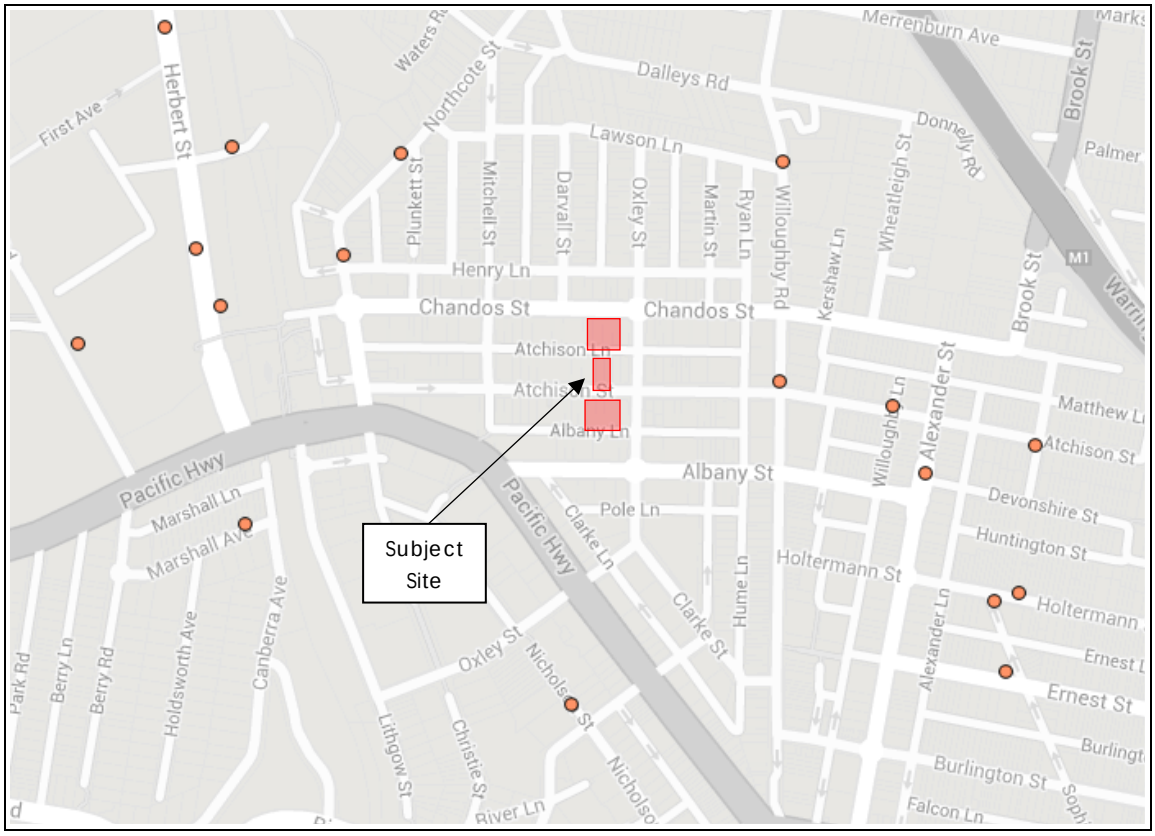
2.8 Local Car Sharing Initiatives

The following GoGet car share facilities are located less than a 5 minute walk from the site:

- Atchison Street, near Willoughby Road: 2 minute walk
- Willoughby Road, near Lawson Lane: 3 minute walk
- Christie Street, near Henry Lane: 4 minute walk
- Atchison Street, near Willoughby Lane: 4 minute walk
- Northcote Street, near Plunkett Street: 4 minute walk

Another 15 GoGet car share pods are located within a 10 minute walk of the site and are shown in Figure 2.9.

Figure 2.9: GoGet Car Share Locations



Source: City of Sydney, accessed 11 June 2014

3. Transport Policy and Strategic Context

3.1 Preamble

St Leonards is located 6km north of the Sydney CBD and 2.5km from North Sydney. There are currently good public transport links between St Leonards and surrounding centres including the Sydney CBD, North Sydney, Chatswood, Macquarie Park and Parramatta.

As detailed below there are a number of existing state and local government strategies (as well as strategies currently being prepared) that earmark St Leonards for future development and land use intensification. These strategies are supported principally by proposed capacity improvements to the existing heavy rail network servicing the centre.

3.2 Metropolitan Strategy

St Leonards, as defined in the Metropolitan Strategy for Sydney (draft), is identified as a Specialised Precinct and forms part of the Global Economic Corridor that links the Airport and Port Botany area with Macquarie Park. The strategy identifies the following priority for metropolitan areas:

"enable housing intensification throughout the subregion, particularly around established and new centres, key corridors and along the Airport and East Hills Line, Inner West Line, Eastern Suburbs and Illawarra Lines, North Shore Line, Bankstown Line and the Northern Line."

The following specific principles are identified for the St Leonards Specialised Precinct:

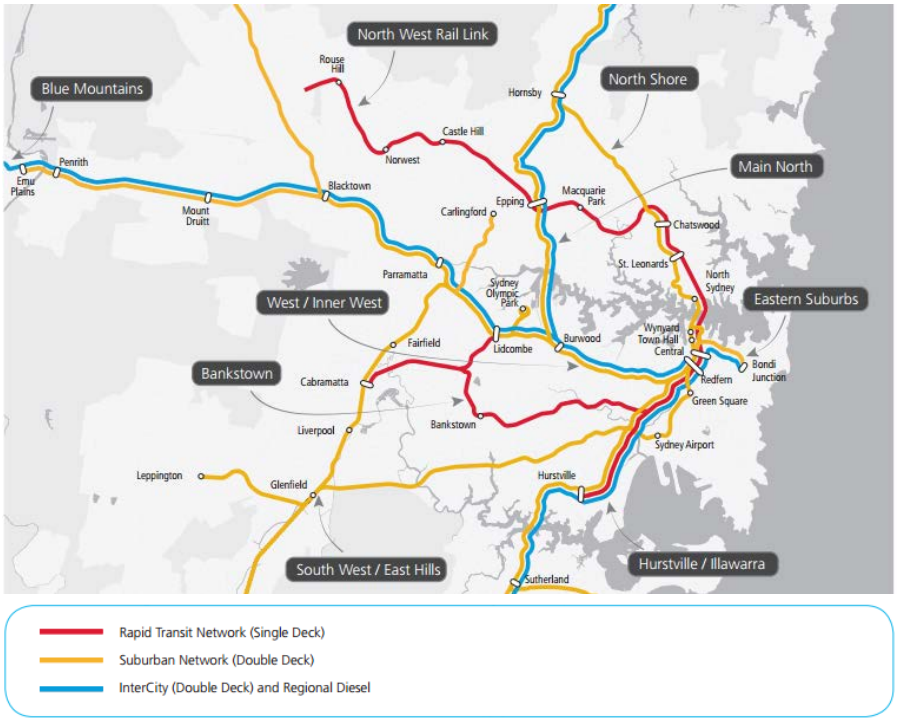
- *"support office-based hub and health and education facilities at Royal North Shore Hospital, Royal North Shore Private Hospital, Mater Misericordiae Hospital, Northern Sydney TAFE and the emerging technology cluster at Gore Hill*
- *protect industrial lands for urban services*
- *provide capacity for 8,000 additional jobs to 2031"*

The Metropolitan Strategy identifies St Leonards for significant job growth in health, education and technology. Additional housing would complement new employment and provide employees an opportunity to live where they work and in turn reducing there commuting requirements.

3.3 Transport Projects

Transport for New South Wales (TfNSW) have recently released the plan for Sydney's Rail Future, as part of the plan is the rapid transit network. The rapid transit network is a new rail line that is proposed between Rouse Hill and the CBD which includes a new railway station at St Leonards/Crows Nest and a second railway harbour crossing. This network is proposed to provide a 'turn up and go' service with single deck trains every five minutes to the CBD and Chatswood. This is in addition to the existing rail services that service the St Leonards Railway Station. The proposed future train network, including the rapid transit line is shown in Figure 3.1.

Figure 3.1: Sydney's Rail Future



Source: Sydney's Rail Future, TfNSW 2012 (accessed 17 June 2014)

3.4 North Sydney Council

3.4.1 North Sydney DCP 2013

The general transport and car parking objectives of the North Sydney DCP are provided in Section 10 of Part B (Development Controls) and have been reproduced below:

"O1 existing levels of traffic generation are contained and reduced;
O2 public transport, including walking and cycling, is the main form of travel mode;
O3 parking is adequate and managed in a way that maintains pedestrian safety and the quality of the public domain whilst minimising traffic generation;
O4 parking is limited to minimise impacts on surrounding areas;
O5 parking is accessible to all user groups;
O6 minimal impacts occur on the provision of on-street parking;
O7 ensure consideration is given to the provision of bicycle parking and facilities; and
O8 the actions of the Metropolitan Plan for Sydney 2036 are implemented. "

The objectives are supported by a number of provision items. Those relevant to the development have been reproduced and assessed against in Section 5 of this report.

3.4.2 St Leonards/Crows Nest Planning Area

Section 3 (of Part C Character Statements) of the North Sydney DCP outlines the desired future outcome for development in St Leonards/Crows Nest town centre. A number of character statements are identified and cover function, environmental criteria, quality built form, quality urban environment and efficient use of resources.

The overarching character statements relating to transport items are reproduced below:

*"**Function***

- *public transport, including walking and cycling, is the main form of access to the St Leonards Town Centre*
- *parking is adequate but is managed in a way that maintains pedestrian safety, the quality of public space and built form, and minimises traffic generation*
- *traffic is managed so that pedestrians can move within the area freely and safely and amenity is maintained*
- *the area is highly permeable for pedestrians*

Quality Urban Environment

- *traffic is managed so that pedestrians can move within the area safely and freely*
- *parking is managed to maintain pedestrian safety and the quality of traffic generation*
- *rear lanes are used for vehicle access to properties*
- *pedestrians are assisted in safely crossing barriers such as the Pacific Highway."*

Specifically regarding the St Leonards town centre, the DCP states the following:

*"**Public transport***

- *P14 Development is to take advantage of high levels of access to high frequency public train and bus services*
- *P15 Public transport, cycling and walking are the main forms of transport to the Centre*

Car accommodation

- *P21 Where a property has a frontage to a laneway, vehicular access must be provided from the laneway*
- *P22 All off-street car parking must be provided underground*
- *P23 Pick up and drop off points for public transport and taxi ranks should be located close to public spaces and activities, and main building entries*
- *P24 Short stay (ten minute) parking spaces should be located close to meeting places*
- *P25 The amount of long stay commuter parking is minimised*
- *P26 Non-residential parking is minimised."*

The transport strategy has been prepared on the basis of the above character statements.

3.4.3 St Leonards/ Crows Nest Planning Study

The St Leonards/ Crows Nest Planning Study is being prepared by North Sydney Council and identified a number of potential new strategies and initiatives to improve the centre. The study is broken into four precincts as detailed in Figure 3.2. The subject site is located in Precinct 3.

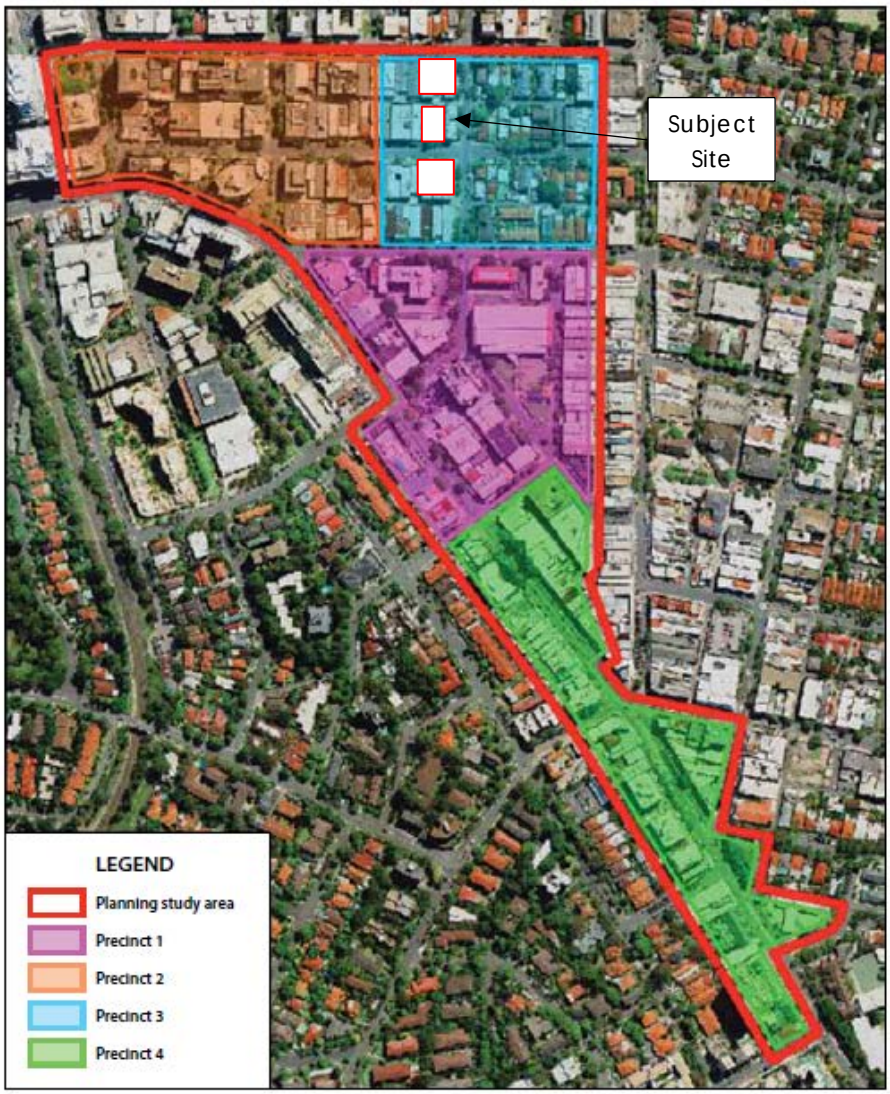
The findings for Precinct 1 are complete and have been provided within the *'St Leonards/ Crows Nest Planning Study Precinct 1 (Addendum)'* document prepared by North Sydney Council (dated October 2012). It is understood that the background reports that will inform Precincts 2 and 3 are currently being prepared following which Council will prepare the draft planning study.

The study will include information on the following (sourced from the North Sydney Council website):

- *"strategies to support businesses and creative industries;*
- *public domain, access and community infrastructure improvements; and*
- *built form principles to guide future development."*

In preparing the transport strategy for the site, reference has been made to some of the high level principles regarding site access principles, pedestrianisation and promotion of sustainable transport modes as outlined for Precinct 1. It is noted that for the most part these build on the statements provided in Section 3.4.2.

Figure 3.2: St Leonards / Crows Nest Planning Study – Precinct Overview



Source: St Leonards/ Crows Nest Planning Study Precinct 1 (Addendum), North Sydney Council, October 2012, Figure 1, Page 4

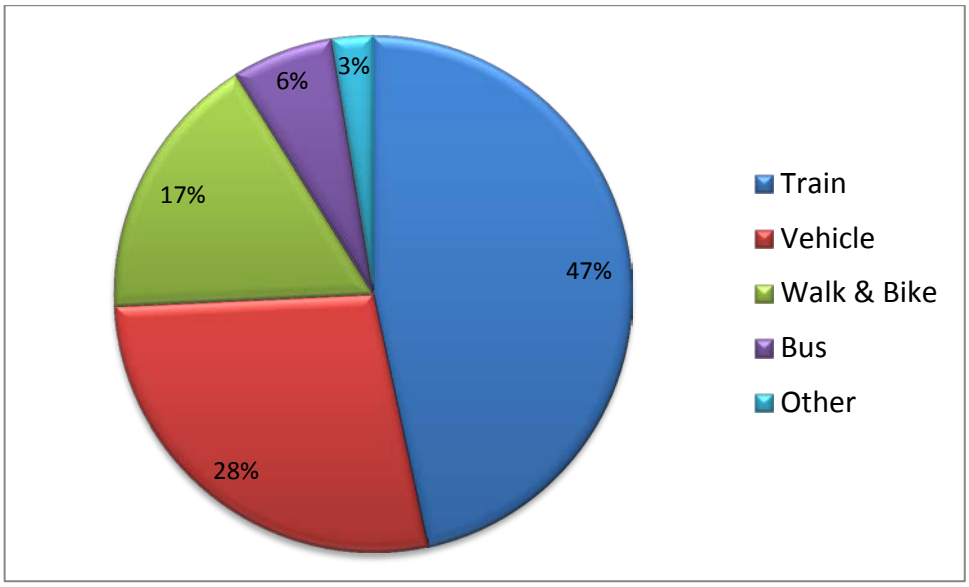
3.5 Summary

As detailed above, St Leonards is earmarked for land use intensification, as well as improved public transport linkages. The centre already has a high reliance on sustainable transport modes and a low reliance on private motor vehicle usage.

For reference the 2011 ABS Journey to Work Data is presented in Figure 3.3. The data indicates that of residents that live in St Leonards town centre, 70% currently utilise sustainable transport modes (walk, public transport) to travel to and from work, whilst only 28% use private vehicle to get to work (driver or passenger).

By comparison, the NSW average indicates that 18% of people use sustainable modes and 78% use private vehicle to get to work. This indicates that there is a propensity for existing residents to use sustainable transport modes.

Figure 3.3: St Leonards Journey to Work Mode Share [1]



[1] Vehicle includes driver and passenger.
Source: ABS Journey to Work Data 2011

Given the centre's residents' existing propensity for sustainable travel, the site presents a prime opportunity for a low private vehicle reliance development. In this regard it is proposed to develop the site as a transport oriented development that will take full advantage of the site's accessibility to sustainable travel modes.

4. Concept Proposal

4.1 Land Uses

The planning proposal includes a concept plan for the development of the site in two towers accommodating lower level commercial and community uses and 540 residential apartments set above. The indicative development is summarised in Table 4.1.

Table 4.1: Indicative Development Schedule

Use	Type	Size
Residential	1 bedroom	270 dwellings
	2 bedroom	246 dwellings
	3 bedroom	27 dwellings
	Sub-Total	**540 dwellings**
Non-Residential	Commercial/Community	3,493m^2

4.2 Vehicle Access

Two vehicle accesses are proposed at the following locations:

- Atchison Lane 55m west of Oxley Street at 75-77 Chandos Street
- Albany Lane 65m west of Oxley Street at 25 Atchison Street

These vehicle accesses will provide direct access to multi-level basement car parks. It is noted that the basement car park accessed from Atchison Lane will service the basements located at 75-77 Chandos Street and 58-62 Atchison Street including a proposed vehicle link beneath Atchison Lane.

4.3 Street Network/ Public Realm Changes

A number of potential treatments have been identified to improve the existing and future operation of the surrounding street network.

Remove Parking on Atchison Street

A linear park is proposed to connect the three sites along the eastern part of the site. In order to improve pedestrian connectivity between the parks it is proposed to narrow the carriageway on Atchison Street.

Narrowing the carriageway on Atchison Street would reduce the crossing distances for pedestrians and hence make it easier for pedestrians to cross the road. If this treatment were pursued it would result in the loss of approximately 6 on-street car parking spaces.

Remove Parking on Oxley Street

Car parking is currently provided on both sides of Oxley Street, which effectively reduces the carriageway to one traffic lane. In order to improve the existing and future midblock operation of Oxley Street on-street car parking along the sites Oxley Street frontage could be removed. This would allow uninterrupted two-way traffic flow to occur on Oxley Street between Chandos Street and Albany Lane. If this treatment were pursued it would result in the loss of approximately 7 on-street spaces.

Summary

If pursued, the identified road network improvements would result in the loss of approximately 13 on-street car parking spaces. Notwithstanding, it is noted that the above works are identified as potential works only and are not strictly required for the project to proceed.

4.4 Car Parking

The planning proposal provides an indicative on-site car parking supply of up to 427 spaces, including 403 resident spaces, 2 car share spaces and up to 22 other spaces. This includes the provision of the 13 potentially displaced car parking spaces identified above.

The suitability of the car parking provision is discussed in Section 5 of this report.

4.5 Bicycle Facilities

As this stage of the planning proposal, the indicative layout plans do not contain details of bicycle facilities. Such facilities will be detailed appropriately as part of the Development Application.

The recommended bicycle facilities are discussed in Section 5 of this report.

5. Transport Assessment

5.1 Car Parking

5.1.1 Car Parking Requirements

The car parking provision requirements for different development types are set out in North Sydney Council's DCP 2013.

A review of the car parking rates for mixed use developments and the floor area schedule results in a maximum parking requirement for the proposed development as summarised in Table 5.1 below.

Table 5.1: DCP Car Parking Requirements

Use		DCP and LEP Parking Rate (Maximum)	GFA/ Units	Maximum Parking Requirement
Residential	1 bedroom apartment	0.5 spaces per dwelling	270 dwellings	135
	2 bedroom apartment	1 space per dwelling	246 dwellings	246
	3 bedroom apartment	1 space per dwelling	27 dwellings	27
Non-residential		1 space per 400m^2	3,493m^2	9
Total				**417**

Based on the above, the proposed development is required to provide a maximum of 417 car parking spaces, with 408 allocated for use by residents.

5.1.2 Empirical Assessment of Car Parking Demand

In order to assess the likely vehicle ownership of the future residents, reference is made to the 2011 Census undertaken by the ABS. The Census collected data on the vehicle ownership levels associated with a variety of dwelling types and in this instance GTA has reviewed the data to provide a summary of existing vehicle ownership levels of 1, 2 and 3 bedroom apartments in St Leonards (in developments of 4 or more storeys).

Table 5.2 provides a summary of the anticipated car parking demand based on existing car ownership data.

Table 5.2: ABS Car Ownership Data - St Leonards (2011)

Number of Bedrooms	Average Vehicle Ownership	No. of Apartments	Resultant Parking Demand
1 bedroom	0.55 per dwelling	270 dwellings	149 spaces
2 bedrooms	0.98 per dwelling	246 dwellings	241 spaces
3 bedrooms	1.42 per dwelling	27 dwellings	38 spaces
Total		540 dwellings	428 spaces

Table 5.2 indicates that adopting the average car ownership rates, the residential component of the development could be anticipated to generate a car parking demand of 428 spaces. This level of car parking demand is generally consistent with the maximum car parking rates specified in the DCP.

5.1.3 Car Share Provisions

Section 10.2 of the North Sydney DCP notes that *"car share schemes can be designed to enhance sustainable transport modes, such as walking, cycling and public transport by filling a "mobility gap" – that is providing access to a vehicle on an "as needs" basis".*

The proposed development is being developed as a transport oriented development and as such, it is proposed to provide two on-site car share spaces. The car share spaces will service the private vehicle needs of those apartments not allocated a car parking space.

5.1.4 Impacts to On Street Parking

The number of parking spaces provided, including visitor parking, is at the upper end of the DCP requirements and as such, there is anticipated to be limited additional car parking demands generated by the site to the surrounding car parking pool.

As previously detailed, there may be an overall public benefit in removing 13 on-street car parking spaces from Atchison Street and Oxley Street. Removing the on-street car parking spaces would improve the following:

- the pedestrian environment on Atchison Street (between the linear park)
- traffic flow along Oxley Street.

It is proposed to provide the displaced on-street car parking within the publicly available on-site car parking supply.

The location and type (i.e. restriction) of on-street spaces car parking spaces lost is illustrated in Figure 5.1 and Table 5.3.

Figure 5.1: Potential On Street Car Parking Impacts

Table 5.3: On-Street Car Parking Impacts

Feature	Restriction	Number of Spaces Lost
Narrowing of Atchison Street	Loading Zone	2
	2 Hour Ticket Parking	4
Removal of Parking on Oxley Street Frontage	2 Hour Ticket Parking	7
Total		**13**

It is recommended that the 2 displaced loading zone spaces be relocated further west on Atchison Street. The displaced 2P parking spaces could then be accommodated on-site (11 plus 2 spaces required for the loading zone).

Furthermore, consideration could be had to alter some of the existing 2P on-street car parking surrounding the site to rapid stay parking (10 minutes) consistent with the recommendations of the St Leonards/Crows Nest Planning Area.

5.1.5 Adequacy of Parking Supply

The proposed car parking provision includes resident (403 spaces), car share (2 spaces), non-residential (9 spaces) and displaced on-street car parking (13 spaces).

There may be an opportunity under a commercial arrangement to accommodate car parking (11 spaces) currently provided for the existing vet building within the basement car park. This will allow the ground floor of the vet building to be redeveloped to include an active frontage that would be more consistent with the rest of the development.

The potential road network improvements, including removing the on-street car parking on the Oxley Street and Atchison Street, would improve the operation and amenity of these road links. In order to appease any potential concern from surrounding residents, it is considered appropriate to provide these displaced spaces on-site. The spaces would continue to be publicly available and would be provided as part of a pool of visitor parking.

When considering the above on-street car parking (should these treatments proceed), the overall car parking provision of 427 car parking spaces is slightly lower than the maximum car parking requirement specified by the DCP, and therefore appropriate.

5.1.6 Car Parking Layout Review

The car park layout and site access provisions should be designed in accordance with the requirements of DCP 2013 and the Australian Standard for Off Street Car Parking (AS2890.1:2004 and AS2890.6:2009).

5.2 Sustainable Transport Infrastructure

5.2.1 Bicycle End-of-Trip Facilities

The bicycle parking requirements are set out in Table B-10.4 'Minimum Bicycle Parking Rates' of the North Sydney Council DCP 2013. A summary of the rates and the recommended bicycle parking provisions are provided in Table 5.4.

Table 5.4: Bicycle Parking Requirements

Use	Size	Bicycle Parking Rate		Bicycle Parking Requirement	
		Resident / Employees	Visitors	Resident / Employees	Visitors
Residential	540 dwellings	1 per dwelling	1 per 10 dwellings	540	54
Non-residential [1]	3,493m^2	1 per 150m^2	1 per 400m^2	23	9
Total				**563**	**63**

[1] For assessment purposes the commercial car parking rates have been adopted. This could be modified when further details regarding the community facilities are confirmed.

Table 5.4 indicates that the development should provide 626 bicycle parking spaces, incorporating 563 secure resident and employee spaces and 63 publicly accessible visitor spaces.

The DCP 2013 also recommends that bicycle parking is to be secure and located on the uppermost level of a basement car park. Shower and change room facilities should be provided within a short distance of the bicycle parking area for the designated non-residential spaces (at a rate of 1 per 10 employee spaces).

5.2.2 Walking and Cycling Network

General

The site is well connected to the existing pedestrian network with pedestrian paths provided on both sides of all major roads in the immediate vicinity of the site. The site is located within the St Leonards CBD and in close proximity to the Willoughby road dining precinct. Subject to Council approval, there could be an opportunity to improve pedestrian amenity by narrowing Atchison Street. This would reduce pedestrian crossing distances and reduce vehicle speeds.

The site is well positioned within the St Leonards bicycle network with a bicycle route located to Atchison Street providing a direct connection between the site and St Leonards Railway Station.

Shared Zones

Whilst not being formally applied for at this stage, Shared Zones could be provided opposite the site on Atchison Street and Atchison Lane. The shared zones would provide a pedestrian friendly link between the various sections of the linear public park. The provision of shared zones would also be in accordance with the principles of the site being developed as a transport oriented development prioritising sustainable transport modes over private motor vehicle trips.

A shared zone is defined by the Transport for NSW (TfNSW) as:

"A Shared Zone is a road or network of roads where the road space is shared safely by vehicles and pedestrians. The maximum speed limit is always 10 km/h.
There may be no road lines, kerb or gutter in a Shared Zone to show that pedestrians and vehicles are equal. Drivers must give way to pedestrians at all times.
Vehicles can only stop in a Shared Zone if they obey the parking signs and park in marked bays, if they are provided.
Drivers travelling at a lower speed are better able to control their vehicles and safely avoid impact with other road users."

To be considered for a Shared Zone treatment, each location should comply with the TfNSW Policy and Guidelines for Shared Zones. In this regard the following key characteristics should be met:

- the traffic volume in a Shared Zone should be less than 100 vehicles per hour and less than 1,000 vehicles per day
- the current speed limit on a road earmarked to be a Shared Zone should be less than 50km/h
- a Shared Zone should be less than 400 metres in length
- the current carriageway should be a minimum of 2.8 metres in width
- the road must not be located along a bus or heavy vehicle route, except for delivery or garbage uses.

It is noted that the future traffic volumes along Atchison Street and Atchison Lane may exceed the upper traffic volume threshold however, additional treatments could be provided on these streets to discourage through vehicle trips.

5.2.3 Public Transport

The site is easily accessible by public transport with frequent bus and train services operating in the vicinity of the site. Buses frequently service stops along the Pacific Highway and Willoughby Road, both of which are within easy walking distance of the site. St Leonards Railway Station is located within a 5 minute walk of the site and provides frequent train services during peak travel times.

The proximity to such regular public transport services will aid good utilisation of such services and discourage the use of the private car consistent with the sites design as a transport oriented development.

5.2.4 Green Travel Plan

Green Travel Plans can be a successful way of changing travel behaviour for a residents and employees. A Green Travel Plan is a way in which a development is able to manage the transport needs of tenants (residents, employees and visitors alike). The aim of the plan is to reduce the environmental impact of travel to and from a given site and in association with its operation. In essence, the plan encourages more efficient use of motor vehicles as well as alternatives to single occupant car usage.

It is recommended that a Green Travel Plan be prepared for the development prior to occupation.

5.3 Loading Facilities

5.3.1 Loading Requirements

The loading requirements for developments are contained in Section 10.4 of the North Sydney Council DCP 2013. Off-street loading and unloading facilities should be provided for the commercial premises with the number and size of loading facilities to be determined by council.

For residential developments with 60 dwellings or more the DCP 2013 states that a loading area should be provided, capable of accommodating at least one heavy rigid vehicle or two medium rigid vehicles. Further details of the loading arrangements will be detailed at the DA stage.

5.3.2 Proposed Loading Arrangements

As this is a Planning Proposal, the indicative layout plans do not contain details of loading areas. Loading areas will be addressed in more detail during the Development Application stage. Any loading facility would be designed such that the design vehicle can enter and exit the site in a forward direction.

5.4 Traffic Impact Assessment

5.4.1 Traffic Generation

Residential

Traffic generation estimates for the proposed development have been sourced from the RMS Guide to Traffic Generating Developments (Technical Direction August 2013). The Technical Direction provides updated traffic generation rates for a number of uses from the original document (2002). Ten high density residential developments were surveyed as part of the update, including a site at St Leonards.

The surveyed St Leonards site was located at 13 Herbert Street. The surveyed site has the following attributes:

- Located 200m from the St Leonards Railway Station
- 70 apartments (including 31 3-bedroom apartments)
- Car park provision of 1.39 spaces per dwelling.

The surveyed site has better public transport accessibility than the subject site, a higher proportion of 3-bedroom dwellings (i.e. likely to generate more movements than 1 or 2-bedroom dwellings) and a greater per dwelling car parking provision. Taking into account each of these attributes it is considered appropriate to apply the traffic generation rates from these surveys to the subject site.

Utilising the above survey results, estimates of the residential peak hour traffic generation from the proposal are set out in Table 5.5.

Table 5.5: Estimated Residential Traffic Generation

No. of Dwellings	Design Generation Rates		Traffic Generation	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
540	0.14	0.07	76	38

Table 5.5 indicates the residential development could be expected to generate approximately 76 and 38 vehicle movements during the AM and PM peak hours, respectively.

Non-Residential

There are up to 22 non-residential car parking spaces proposed within the basement car park. For assessment purposes the following traffic generation rates have been assumed:

- AM Peak Hour: 1 movement per space (i.e. 1 vehicle arriving)
- PM Peak Hour: 2 movements per space (i.e. each space turning over)

Application of the above rates indicates that the non-residential spaces could be anticipated to generate some 31 and 62 vehicle movements during the AM and PM peak hours, respectively.

It is noted that 13 of the 31 non-residential spaces are existing on-street car parking spaces that have been relocated. Vehicles using these spaces are already included in existing traffic volumes and as such, the following assessment is considered conservative.

Summary

The following directional split of traffic (i.e. the ratio between the inbound and outbound traffic movements) has been adopted:

Residential:

- AM Peak Hour: 30% in / 70% out
- PM Peak Hour: 70% in / 30% out

Non-residential:

- AM Peak Hour: 90% in / 10% out
- PM Peak Hour: 50% in / 50% out

A summary of the peak hour traffic generation for the site is provided in Table 5.6.

Table 5.6: Traffic Generation Summary

Use	AM Peak Hour		PM Peak Hour	
	In	Out	In	Out
Residential	23	53	27	11
Non-Residential	20	2	22	22
TOTAL	**43**	**55**	**49**	**33**

Table 5.6 indicates that the proposed development is anticipated to generate some 98 and 82 vehicle movements in the AM and PM peak hours, respectively.

5.4.2 Distribution and Assignment

The directional distribution and assignment of traffic generated by the proposed development will be influenced by a number of factors, including the:

i configuration of the arterial road network in the immediate vicinity of the site
ii existing operation of intersections providing access between the local and arterial road network
iii distribution of households in the vicinity of the site
iv surrounding employment centres, retail centres and schools in relation to the site
v configuration of access points to the site.

In order to determine the distribution of traffic during the AM and PM peaks, reference has been made to the 2011 ABS Census Journey to Work data. The Census collected data of the destinations of employed residents living in St Leonards. The data shows the following directional distributions for residents who drove to work (the proportion of people employed south and east was much greater however these residents were much more likely to use public transport than to drive to work):

- west/north (e.g. Chatswood, Lane Cove, Ryde, Parramatta) 54% of trips
- south (e.g. Sydney CBD, Botany) 26% of trips
- east (e.g. North Sydney, Mosman, Warringah) 20% of trips

It has been assumed that all vehicles travelling in a west or north direction will leave the site in a western direction to the Pacific Highway (west) via Christie and Albany Streets. Vehicles travelling

to the south would use the Warringah Freeway and exit the site from an easterly direction via Chandos Street. It has been assumed that half of all vehicles travelling to the east would use the Warringah Freeway and half would use the Pacific Highway (south) via Oxley Street.

Having consideration to the above, for the purposes of estimating vehicle movements, the following directional distributions have been assumed:

Atchison Lane Access:

- Pacific Highway (west, via Christie Street) 54%
- Chandos Street (east) 36%
- Pacific Highway (south) 10%

Albany Lane Access:

- Pacific Highway (west, via Albany Street) 54%
- Chandos Street (east) 36%
- Pacific Highway (south) 10%

Based on the above, turning movement diagrams have been prepared to show the estimated marginal increase in turning movements in the vicinity of the subject property following full site development. The AM and PM peak turning increases and expected post development vehicle movements are shown in Appendix D.

A summary of the post development traffic volumes on the surrounding road network are provided in Figure 5.2.

Figure 5.2: Overview of Daily Traffic Volumes

[1] Adopting a 10% peak to daily ratio for existing and development generated traffic.

The post development daily traffic volumes presented in Figure 5.2 are reflective of each of the functions of each of the surrounding roads.

5.4.3 Traffic Impact

SIDRA INTERSECTION Assessment

The impact of the development traffic upon the surrounding intersections has been assessed using SIDRA INTERSECTION. On the basis of the turning movement estimates presented above, Table 5.7 presents a summary of the anticipated future operation of the intersections following the full development of the site.

Detailed results of this analysis are provided in Appendix E of this report. It is noted that this assessment does not take into account any changes to the background traffic volumes as a result of intensification of existing surrounding land uses.

Table 5.7: Post Development Operating Conditions

Intersection	Peak	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)
Oxley Street/ Chandos Street	AM	0.56	8	38	A
	PM	0.60	9	41	A
Oxley Street/ Atchison Lane	AM	0.18	3	9	-
	PM	0.20	3	11	-
Oxley Street/ Atchison Street	AM	0.18	5	8	-
	PM	0.24	5	11	-
Oxley Street/ Albany Lane	AM	0.20	3	11	-
	PM	0.22	4	14	-
Oxley Street/ Albany Street	AM	0.65	10	49	A
	PM	0.72	12	66	A
Oxley Street/ Pacific Highway	AM	0.70	10	87	A
	PM	0.61	21	136	B
Pacific Highway/ Albany Street	AM	0.79	23	219	B
	PM	0.79	21	147	B
Pacific Highway/ Christie Street	AM	0.69	10	110	A
	PM	0.54	8	80	A

Against existing traffic volumes in the vicinity of the site, the additional traffic generated by the proposed development could not be expected to compromise the safety or function of the surrounding road network.

Whilst not necessarily reflected in the SIDRA outputs the operation of the intersections along Oxley Street will improve as a result of removing the on-street car parking to allow simultaneous two-way flow.

As noted in Section 2, SIDRA INTERSECTION modelling does not fully take into account the linking of signalised intersections along the Pacific Highway corridor. However, the SIRDA modelling does allow us to review the impact on the intersection with and without the development traffic. In this regard the modelling shows that 95th percentile queues are anticipated to increase by 8m or less (i.e. 1 vehicle) and average delays are to stay the same for each of the impacted intersections along the Pacific Highway corridor.

Additional Traffic Through Pacific Highway Intersections

Table 5.8 provides a summary of the existing, additional and post development traffic volumes through each of the three signalised intersections to Pacific Highway.

Table 5.8: Pacific Highway Additional Traffic Volumes

Location	Peak Hour	Traffic Volumes			Proportion of Additional Traffic Through Intersection
		Existing	Additional	Post Development	
Pacific Highway / Oxley Street Intersection	AM	3,349	10	3,359	<1%
	PM	3,043	8	3,051	<1%
Pacific Highway / Albany Street Intersection	AM	3,634	20	3,654	<1%
	PM	3,325	13	3,338	<1%
Pacific Highway / Christie Street	AM	4,394	53	4,447	1%
	PM	3,877	44	3,921	1%

Table 5.8 indicates that the additional peak hour traffic through the Pacific Highway intersections is equal to or less than 1%. The level of additional peak hour traffic through each of the intersections is provided below:

- Pacific Highway / Oxley Street: 1 additional vehicle every 6 minutes
- Pacific Highway / Albany Street: 1 additional vehicle every 3 to 4 minutes
- Pacific Highway / Christie Street: 1 additional vehicle every minute

The additional traffic through each of the intersections could not be expected to have any noticeable impact on any of the surrounding intersections.

Summary

Against existing traffic volumes in the vicinity of the site, the additional traffic generated by the proposed development could not be expected to compromise the safety or function of the surrounding road network.

Subject to Council approval, there could be an opportunity to improve the existing midblock operation of Oxley Street between Chandos Street and Albany Lane by removing the existing on-street car parking.

The above traffic impact assessment does not take into account any other development traffic generation. It is anticipated that when additional traffic to the subject site is added to the network that increased queuing and delays would occur along the Pacific Highway corridor. It is likely that signal phasing imposed by RMS would favour through traffic movements at the expense of the minor roads, such as Oxley Street, Albany Street and Christie Street. This will reduce the capacity for vehicle trips to and from the site during peak periods.

The reduced capacity for vehicles to access the site will result in a combination of mode shift away from private vehicle and peak spreading (i.e. longer peak hours). A mode shift away from private vehicle usage is consistent with the site being developed as a transport oriented development, noting that many alternate and feasible transport modes are provided for future residents. The occurrence of peak spreading is not uncommon in metropolitan areas and is becoming increasingly common in areas that experience significant congestion (such as along major road corridors like the Pacific Highway).

6. Conclusion

Based on the analysis and discussions presented within this report, the following conclusions are made:

i A Planning Proposal is being lodged with North Sydney Council to increase the permissible height limits for the site and introduce a site specific floor space ratio.

ii An indicative development yield comprises approximately 540 dwellings set above 3,500m^2 of commercial/community uses.

iii Application of the maximum car parking rates contained within the North Sydney DCP indicates that the proposed development has a maximum car parking requirement of 417 spaces.

iv Subject to Council approval, there could be an opportunity to improve pedestrian amenity and traffic flow in the vicinity of the site by removing some 13 on-street car parking spaces from the site frontages.

v The proposed car parking provision of 427 spaces meets the requirements of the DCP, noting that the 13 displaced on-street spaces could be provided on-site.

vi The proposed parking layout will be designed in accordance with the dimensional requirements as set out in the North Sydney DCP and/or Australian/New Zealand Standard for Off Street Car Parking (AS/NZS2890.1:2004 and AS/NZS2890.6:2009).

vii Application of the bicycle parking rates indicates that some 626 bicycle parking spaces should be provided on-site, incorporating 563 secure resident/employee spaces and 63 publicly accessible visitor spaces.

viii The site is expected to generate up to 98 and 82 vehicle movements during the AM and PM peak hours, respectively.

ix Removing the on-street car parking on the western side of Oxley Street between Chandos Street and Albany Lane will improve the midblock and intersection operation along Oxley Street.

x Additional development within the precinct will likely lead to a mode shift away from private vehicle and/or peak spreading (i.e. longer peak hours).

xi There is adequate capacity in the surrounding road network to cater for the traffic generated by the proposed development.

Appendix A

Existing Turning Movements

Figure A1: AM Peak Hour Traffic Volumes

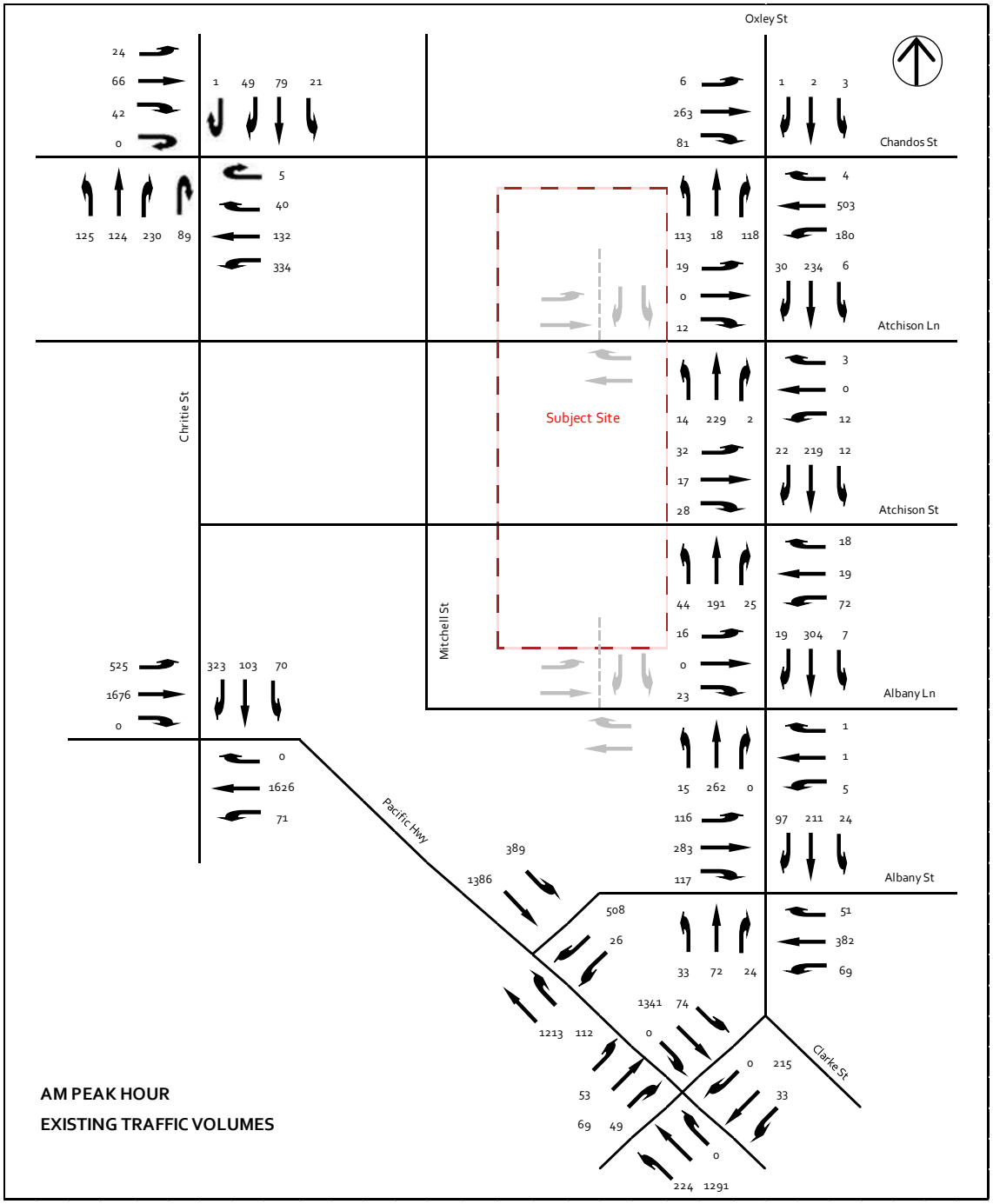
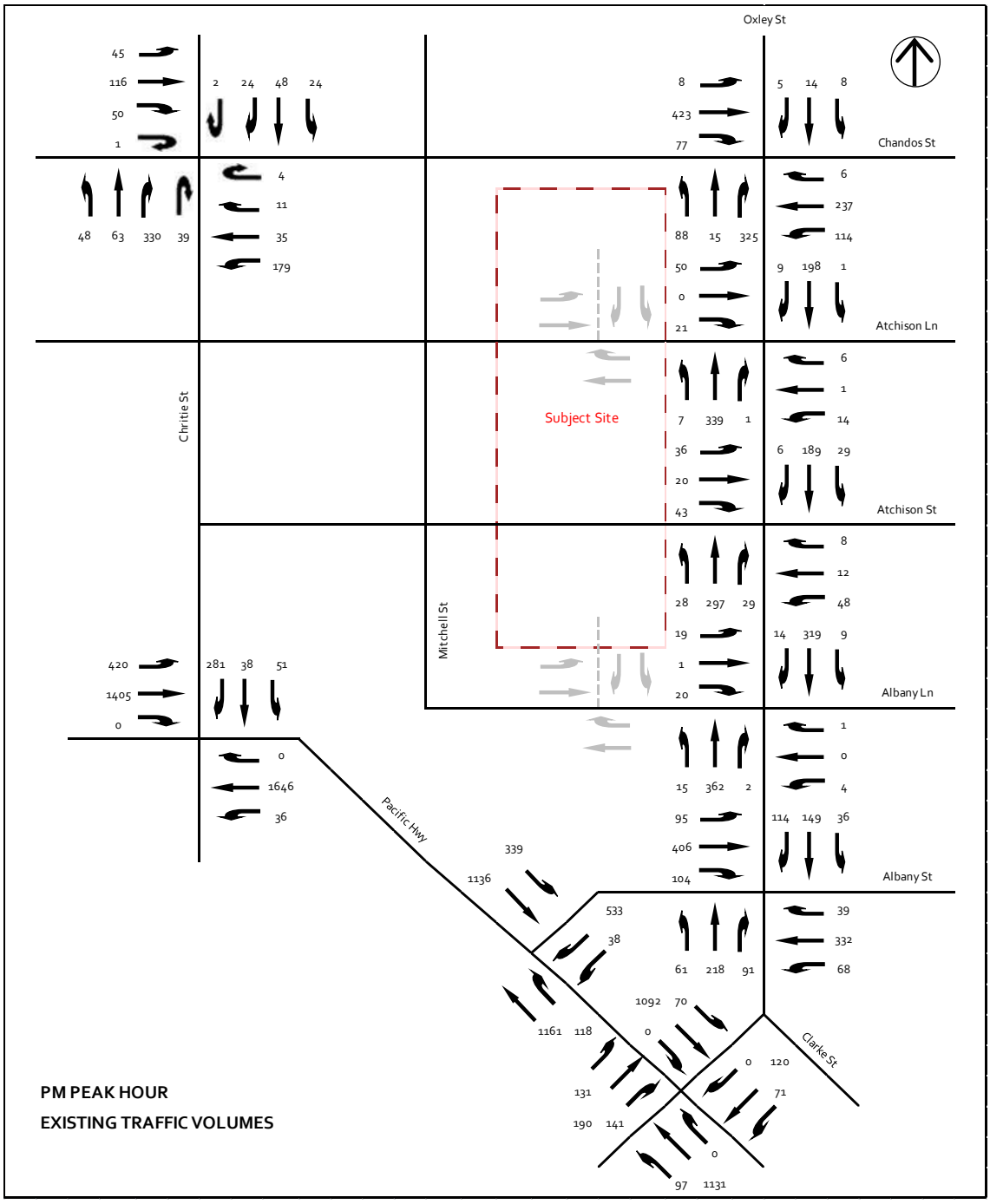


Figure A2: PM Peak Hour Traffic Volumes



Appendix B

Parking Survey Results

Road Link			Restriction			Residential Y/N	Supply	Demand			Peak Occupancy
			Type	Hour	Day			9:00am	4:00pm	6:00pm	
Clarke Lane		Oxley Street	2 hour meter	08:30-15:30; 08:30-12:30	Mon-Fri; Sat	N	10	4	0	0	40%
			No stopping	15:30-18:30	Mon-Fri	N					
Oxley Street		Hume Street	2 hour meter	08:30-18:00; 08:30-12:30	Mon-Fri; Sat	N	6	3	2	5	83%
Hume Street		Hume Lane	2 hour meter	08:30-22:00	Mon-Sun	N	4	3	2	2	75%
Hume Lane		Oxley Street	1/2 hour	08:30-18:00	Mon-Fri	N	2	2	2	2	100%
			Mail zone	18:00-20:00	Sun-Fri	N					
			1 hour	08:30-18:00	Mon Fri	Y	4	3	3	3	75%
			No restriction			Y	10	10	10	10	100%
Oxley Street		Pacific Highway	2 hour meter	08:30-18:00; 08:30-12:30	Mon-Fri; Sat	N	19	11	14	11	74%
Mitchell Street		Oxley Street	2 hour meter	08:30-18:00	Mon-Fri	N	17	14	17	16	100%
			2 hour meter disabled	08:30-18:00; 08:30-12:30	Mon-Fri; Sat	N	2	1	1	1	50%
			2 hour meter	08:30-18:00	Mon-Fri	N	4	4	4	4	100%
Oxley Street		Hume Lane	No restriction				13	13	13	13	100%
			1 hour	08:30-18:00; 08:30-12:30	Mon-Fri; Sat	Y	5	5	3	5	100%
Hume Lane		Willoighby Road	1 hour	08:30-18:00; 08:30-12:30	Mon-Fri; Sat	Y	3	3	3	3	100%
Willoughby Road		Hume Lane	Loading zone	08:30-18:00; 08:30-12:30	Mon-Fri; Sat	N	3	1	1	3	100%
Hume Lane		Oxley Street	Loading zone			N	2	2	0	2	100%
			I hour	08:30-18:00; 08:30-12:30	Mon-Fri; Sat	Y	12	12	8	6	100%
Oxley Street		Mitchell Street	Loading zone	08:30-18:00	Mon-Fri	N	2	0	0	1	50%
			2 hour meter	08:30-18:00	Mon-Fri	N	8	8	7	7	100%
			5 minute	08:30-18:00	Mon-Fri	N	3	3	1	3	100%
			2 hour meter	08:30-18:00	Mon-Fri	N	9	9	9	9	100%
			Loading zone	08:30-18:00	Mon-Fri	N	2	2	2	2	100%
Oxley Street		Hume Lane	No restriction			Y	3	3	2	1	100%
Oxley Street		Hume Lane	No parking	08:30-18:00; 08:30-12:30	Mon-Fri; Sat	N	8	0	0	0	0%
			2 hour	08:30-18:00	Mon-Fri	N	3	3	3	2	100%
Mitchell Street		Oxley Street	Loading zone	08:30-18:00	Mon-Fri	N	2	0	1	0	50%

			2 hour meter	08:30-18:00	Mon-Fri	N	2	2	2	2	100%
			Works zone	07:00-17:00; 08:30-12:30	Mon-Fri; Sat	N	3	0	0	2	67%
			2 hour meter	08:30-18:00	Mon-Fri	N	3	3	2	3	100%
			Loading zone	08:30-18:00	Mon-Fri	N	3	2	0	1	67%
			2 hour meter	08:30-18:00	Mon-Fri	N	10	9	10	8	100%
Oxley Street		Hume Lane	No restriction			Y	15	15	14	14	100%
Ryan Lane		Martin Street	1 hour ticket	08:30-18:30	Mon-Fri	N	4	0	0	0	0%
			No parking	15:30-18:30	Mon-Fri	N					
			No parking	08:30-18:30	Mon-Fri	N	3	0	0	0	0%
Martin Street		Oxley Street	2 hour ticket	08:30-15:30	Mon-Fri	N	6	1	0	0	17%
			No parking	15:30-18:30	Mon-Fri	N					
Oxley Street		Darvall Street	Loading zone	08:30-18:00	Mon-Fri	N	2	2	0	0	100%
			2 hour meter	08:30-18:00	Mon-Fri	N	7	4	3	6	86%
Darvall Street		Mitchell Street	2 hour meter	08:30-18:00	Mon-Fri	N	6	6	1	5	100%
			Loading zone			N	2	0	0	1	50%
Pole Lane		Albany Street	1 hour meter	08:30-18:00; 08:30-12:30	Mon-Fri; Sat	N	3	1	1	1	33%
Albany Street		Albany Lane	2 hour meter	08:30-18:00	Mon-Fri	N	2	2	1	1	100%
Albany Lane		Atchison Street	2 hour meter	08:30-18:00	Mon-Fri	N	4	4	0	2	100%
Atchison Street		Atchison Lane	2 hour meter	08:30-18:00	Mon-Fri	N	3	2	2	2	67%
Chandos Street		Atchison Lane	2 hour meter	08:30-18:00	Mon-Fri	N	2	2	1	2	100%
Atchison Lane		Atchison Street	2 hour meter	08:30-18:00	Mon-Fri	N	4	4	3	1	100%
Atchison Street		Albany Lane	2 hour meter	08:30-18:00	Mon-Fri	N	3	3	0	2	100%
Albany Lane		Albany Street	2 hour meter	08:30-18:00	Mon-Fri	N	3	3	1	1	100%

Appendix C

SIDRA INTERSECTION Results – Existing Conditions

MOVEMENT SUMMARY

Site: Oxley Street/Chandos Street (EX-AM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Chandos Street-Existing Weekday AM
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	119	5.0	0.339	10.1	LOS A	2.1	15.5	0.71	0.80	40.2
2	T	19	5.0	0.339	9.1	LOS A	2.1	15.5	0.71	0.77	40.4
3	R	124	5.0	0.339	12.9	LOS A	2.1	15.5	0.71	0.85	38.5
Approach		262	5.0	0.339	11.4	LOS A	2.1	15.5	0.71	0.82	39.4
East: Chandos Street - E											
4	L	189	5.0	0.548	6.9	LOS A	4.9	35.8	0.41	0.59	42.4
5	T	529	5.0	0.548	6.0	LOS A	4.9	35.8	0.41	0.50	42.6
6	R	4	5.0	0.548	9.7	LOS A	4.9	35.8	0.41	0.72	40.9
Approach		723	5.0	0.548	6.2	LOS A	4.9	35.8	0.41	0.53	42.5
North: Oxley Street - N											
7	L	3	5.0	0.008	8.7	LOS A	0.0	0.3	0.56	0.60	41.4
8	T	2	5.0	0.008	7.8	LOS A	0.0	0.3	0.56	0.54	41.8
9	R	1	5.0	0.008	11.5	LOS A	0.0	0.3	0.56	0.69	39.6
Approach		6	5.0	0.008	8.9	LOS A	0.0	0.3	0.56	0.60	41.2
West: Chandos Street - W											
10	L	6	5.0	0.323	7.2	LOS A	2.2	16.0	0.43	0.62	42.3
11	T	277	5.0	0.323	6.2	LOS A	2.2	16.0	0.43	0.54	42.5
12	R	85	5.0	0.323	10.0	LOS A	2.2	16.0	0.43	0.74	40.8
Approach		368	5.0	0.323	7.1	LOS A	2.2	16.0	0.43	0.59	42.1
All Vehicles		1360	5.0	0.548	7.5	LOS A	4.9	35.8	0.47	0.60	41.8

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Chandos Street (EX-PM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Chandos Street-Existing Weekday PM
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	93	5.0	0.443	8.2	LOS A	3.1	22.4	0.58	0.68	41.4
2	T	16	5.0	0.443	7.3	LOS A	3.1	22.4	0.58	0.62	41.4
3	R	342	5.0	0.443	11.0	LOS A	3.1	22.4	0.58	0.74	39.8
Approach		451	5.0	0.443	10.3	LOS A	3.1	22.4	0.58	0.72	40.2
East: Chandos Street - E											
4	L	120	5.0	0.306	6.8	LOS A	2.1	15.0	0.34	0.60	42.5
5	T	249	5.0	0.306	5.8	LOS A	2.1	15.0	0.34	0.50	42.9
6	R	6	5.0	0.306	9.6	LOS A	2.1	15.0	0.34	0.74	40.9
Approach		376	5.0	0.306	6.2	LOS A	2.1	15.0	0.34	0.54	42.7
North: Oxley Street - N											
7	L	8	5.0	0.053	12.5	LOS A	0.3	2.3	0.79	0.77	38.7
8	T	15	5.0	0.053	11.5	LOS A	0.3	2.3	0.79	0.74	38.9
9	R	5	5.0	0.053	15.3	LOS B	0.3	2.3	0.79	0.82	37.2
Approach		28	5.0	0.053	12.5	LOS A	0.3	2.3	0.79	0.77	38.5
West: Chandos Street - W											
10	L	8	5.0	0.594	10.6	LOS A	5.5	39.9	0.77	0.85	40.3
11	T	445	5.0	0.594	9.6	LOS A	5.5	39.9	0.77	0.82	40.5
12	R	81	5.0	0.594	13.4	LOS A	5.5	39.9	0.77	0.90	38.7
Approach		535	5.0	0.594	10.2	LOS A	5.5	39.9	0.77	0.83	40.2
All Vehicles		1389	5.0	0.594	9.2	LOS A	5.5	39.9	0.59	0.72	40.8

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Atchison Lane (EX-AM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Atchison Lane-Existing Weekday AM
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	15	5.0	0.138	7.7	LOS A	1.0	7.2	0.43	0.51	43.0
2	T	241	5.0	0.138	1.2	LOS A	1.0	7.2	0.43	0.00	44.9
3	R	2	5.0	0.138	8.1	LOS A	1.0	7.2	0.43	0.87	43.0
Approach		258	5.0	0.138	1.6	NA	1.0	7.2	0.43	0.04	44.8
East: Atchison Lane - E											
4	L	13	5.0	0.025	9.1	LOS A	0.1	0.6	0.41	0.61	41.1
5	T	1	5.0	0.025	7.7	LOS A	0.1	0.6	0.41	0.62	41.8
6	R	3	5.0	0.025	9.5	LOS A	0.1	0.6	0.41	0.76	40.9
Approach		17	5.0	0.025	9.1	LOS A	0.1	0.6	0.41	0.64	41.1
North: Oxley Street - N											
7	L	6	5.0	0.162	7.8	LOS A	1.1	8.2	0.42	0.49	42.9
8	T	246	5.0	0.162	1.3	LOS A	1.1	8.2	0.42	0.00	44.8
9	R	32	5.0	0.162	8.2	LOS A	1.1	8.2	0.42	0.86	42.9
Approach		284	5.0	0.162	2.2	NA	1.1	8.2	0.42	0.11	44.6
West: Atchison Lane - W											
10	L	20	5.0	0.057	10.1	LOS A	0.2	1.5	0.45	0.63	40.2
11	T	1	5.0	0.057	8.7	LOS A	0.2	1.5	0.45	0.67	40.9
12	R	13	5.0	0.057	10.5	LOS A	0.2	1.5	0.45	0.79	40.1
Approach		34	5.0	0.057	10.2	LOS A	0.2	1.5	0.45	0.69	40.2
All Vehicles		593	5.0	0.162	2.6	NA	1.1	8.2	0.43	0.12	44.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Atchison Lane (EX-PM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Atchison Lane-Existing Weekday PM
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	7	5.0	0.194	7.6	LOS A	1.4	10.3	0.40	0.55	43.1
2	T	357	5.0	0.194	1.0	LOS A	1.4	10.3	0.40	0.00	45.3
3	R	1	5.0	0.194	7.8	LOS A	1.4	10.3	0.40	0.88	43.0
Approach		365	5.0	0.194	1.2	NA	1.4	10.3	0.40	0.01	45.2
East: Atchison Lane - E											
4	L	15	5.0	0.037	10.1	LOS A	0.1	1.0	0.42	0.60	40.3
5	T	1	5.0	0.037	8.7	LOS A	0.1	1.0	0.42	0.65	41.0
6	R	6	5.0	0.037	10.4	LOS A	0.1	1.0	0.42	0.79	40.1
Approach		22	5.0	0.037	10.1	LOS A	0.1	1.0	0.42	0.65	40.3
North: Oxley Street - N											
7	L	1	5.0	0.121	8.3	LOS A	0.9	6.7	0.50	0.45	43.0
8	T	208	5.0	0.121	1.9	LOS A	0.9	6.7	0.50	0.00	44.2
9	R	9	5.0	0.121	8.8	LOS A	0.9	6.7	0.50	0.90	42.9
Approach		219	5.0	0.121	2.2	NA	0.9	6.7	0.50	0.04	44.1
West: Atchison Lane - W											
10	L	53	5.0	0.133	10.7	LOS A	0.5	3.5	0.52	0.72	39.8
11	T	1	5.0	0.133	9.3	LOS A	0.5	3.5	0.52	0.75	40.4
12	R	22	5.0	0.133	11.1	LOS A	0.5	3.5	0.52	0.85	39.7
Approach		76	5.0	0.133	10.8	LOS A	0.5	3.5	0.52	0.76	39.7
All Vehicles		682	5.0	0.194	2.9	NA	1.4	10.3	0.45	0.13	44.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Atchison Street (EX-AM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Atchison Street-Existing Weekday AM
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	46	5.0	0.156	7.7	LOS A	1.1	7.7	0.44	0.45	42.7
2	T	201	5.0	0.156	1.2	LOS A	1.1	7.7	0.44	0.00	44.5
3	R	26	5.0	0.156	8.1	LOS A	1.1	7.7	0.44	0.81	42.7
Approach		274	5.0	0.156	3.0	NA	1.1	7.7	0.44	0.15	44.0
East: Atchison Street - E											
4	L	76	5.0	0.176	9.9	LOS A	0.7	5.0	0.46	0.66	40.5
5	T	20	5.0	0.176	8.6	LOS A	0.7	5.0	0.46	0.72	41.2
6	R	19	5.0	0.176	10.3	LOS A	0.7	5.0	0.46	0.83	40.3
Approach		115	5.0	0.176	9.7	LOS A	0.7	5.0	0.46	0.70	40.6
North: Oxley Street - N											
7	L	13	5.0	0.150	7.7	LOS A	1.0	7.5	0.42	0.50	42.9
8	T	231	5.0	0.150	1.2	LOS A	1.0	7.5	0.42	0.00	44.9
9	R	23	5.0	0.150	8.1	LOS A	1.0	7.5	0.42	0.85	42.9
Approach		266	5.0	0.150	2.1	NA	1.0	7.5	0.42	0.10	44.6
West: Atchison Street - W											
10	L	34	5.0	0.160	11.7	LOS A	0.6	4.4	0.51	0.66	39.1
11	T	18	5.0	0.160	10.4	LOS A	0.6	4.4	0.51	0.74	39.7
12	R	29	5.0	0.160	12.1	LOS A	0.6	4.4	0.51	0.85	39.0
Approach		81	5.0	0.160	11.5	LOS A	0.6	4.4	0.51	0.75	39.2
All Vehicles		736	5.0	0.176	4.7	NA	1.1	7.7	0.44	0.28	43.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Atchison Street (EX-PM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Atchison Street-Existing Weekday PM
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	29	5.0	0.209	7.7	LOS A	1.5	11.0	0.43	0.48	42.8
2	T	313	5.0	0.209	1.2	LOS A	1.5	11.0	0.43	0.00	44.7
3	R	31	5.0	0.209	8.1	LOS A	1.5	11.0	0.43	0.84	42.8
Approach		373	5.0	0.209	2.3	NA	1.5	11.0	0.43	0.11	44.4
East: Atchison Street - E											
4	L	51	5.0	0.110	9.8	LOS A	0.4	3.0	0.42	0.64	40.6
5	T	13	5.0	0.110	8.5	LOS A	0.4	3.0	0.42	0.70	41.3
6	R	8	5.0	0.110	10.1	LOS A	0.4	3.0	0.42	0.82	40.4
Approach		72	5.0	0.110	9.6	LOS A	0.4	3.0	0.42	0.67	40.7
North: Oxley Street - N											
7	L	31	5.0	0.129	8.3	LOS A	1.0	7.1	0.52	0.41	42.8
8	T	199	5.0	0.129	1.8	LOS A	1.0	7.1	0.52	0.00	43.8
9	R	6	5.0	0.129	8.6	LOS A	1.0	7.1	0.52	0.86	42.8
Approach		236	5.0	0.129	2.8	NA	1.0	7.1	0.52	0.08	43.7
West: Atchison Street - W											
10	L	38	5.0	0.235	13.4	LOS A	0.9	6.7	0.60	0.76	37.8
11	T	21	5.0	0.235	12.1	LOS A	0.9	6.7	0.60	0.80	38.4
12	R	45	5.0	0.235	13.8	LOS A	0.9	6.7	0.60	0.88	37.8
Approach		104	5.0	0.235	13.3	LOS A	0.9	6.7	0.60	0.82	37.9
All Vehicles		784	5.0	0.235	4.6	NA	1.5	11.0	0.48	0.24	42.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Albany Lane (EX-AM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Albany Lane-Existing Weekday AM
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	16	5.0	0.156	8.2	LOS A	1.2	8.9	0.50	0.45	43.0
2	T	276	5.0	0.156	1.7	LOS A	1.2	8.9	0.50	0.00	44.1
3	R	1	5.0	0.156	8.5	LOS A	1.2	8.9	0.50	0.89	43.0
Approach		293	5.0	0.156	2.1	NA	1.2	8.9	0.50	0.03	44.1
East: Albany Lane - E											
4	L	5	5.0	0.012	10.0	LOS A	0.0	0.3	0.48	0.62	40.3
5	T	1	5.0	0.012	8.7	LOS A	0.0	0.3	0.48	0.64	41.0
6	R	1	5.0	0.012	10.3	LOS A	0.0	0.3	0.48	0.76	40.2
Approach		7	5.0	0.012	9.9	LOS A	0.0	0.3	0.48	0.64	40.4
North: Oxley Street - N											
7	L	7	5.0	0.192	8.1	LOS A	1.5	10.7	0.48	0.46	42.9
8	T	320	5.0	0.192	1.6	LOS A	1.5	10.7	0.48	0.00	44.4
9	R	20	5.0	0.192	8.5	LOS A	1.5	10.7	0.48	0.88	43.0
Approach		347	5.0	0.192	2.1	NA	1.5	10.7	0.48	0.06	44.2
West: Albany Lane - W											
10	L	17	5.0	0.096	12.7	LOS A	0.3	2.5	0.55	0.67	38.3
11	T	1	5.0	0.096	11.3	LOS A	0.3	2.5	0.55	0.76	38.8
12	R	24	5.0	0.096	13.0	LOS A	0.3	2.5	0.55	0.85	38.2
Approach		42	5.0	0.096	12.8	LOS A	0.3	2.5	0.55	0.78	38.2
All Vehicles		689	5.0	0.192	2.8	NA	1.5	10.7	0.49	0.10	43.7

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Albany Lane (EX-PM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Albany Lane-Existing Weekday PM
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	16	5.0	0.213	8.5	LOS A	1.8	13.1	0.55	0.41	43.0
2	T	381	5.0	0.213	2.0	LOS A	1.8	13.1	0.55	0.00	43.7
3	R	2	5.0	0.213	8.9	LOS A	1.8	13.1	0.55	0.91	42.9
Approach		399	5.0	0.213	2.3	NA	1.8	13.1	0.55	0.02	43.7
East: Albany Lane - E											
4	L	4	5.0	0.013	11.4	LOS A	0.0	0.3	0.52	0.63	39.3
5	T	1	5.0	0.013	10.0	LOS A	0.0	0.3	0.52	0.68	39.9
6	R	1	5.0	0.013	11.6	LOS A	0.0	0.3	0.52	0.79	39.2
Approach		6	5.0	0.013	11.2	LOS A	0.0	0.3	0.52	0.67	39.4
North: Oxley Street - N											
7	L	9	5.0	0.199	8.9	LOS A	1.7	12.4	0.57	0.38	42.7
8	T	336	5.0	0.199	2.4	LOS A	1.7	12.4	0.57	0.00	43.4
9	R	15	5.0	0.199	9.3	LOS A	1.7	12.4	0.57	0.92	42.6
Approach		360	5.0	0.199	2.8	NA	1.7	12.4	0.57	0.05	43.4
West: Albany Lane - W											
10	L	20	5.0	0.109	14.1	LOS A	0.4	2.8	0.60	0.74	37.3
11	T	1	5.0	0.109	12.7	LOS A	0.4	2.8	0.60	0.79	37.8
12	R	21	5.0	0.109	14.5	LOS A	0.4	2.8	0.60	0.87	37.2
Approach		42	5.0	0.109	14.3	LOS A	0.4	2.8	0.60	0.81	37.2
All Vehicles		807	5.0	0.213	3.2	NA	1.8	13.1	0.56	0.08	43.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Albany Street (EX-AM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Albany Street-Existing Weekday AM
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	35	5.0	0.189	9.8	LOS A	1.1	8.3	0.70	0.78	40.7
2	T	76	5.0	0.189	8.8	LOS A	1.1	8.3	0.70	0.74	41.0
3	R	25	5.0	0.189	12.6	LOS A	1.1	8.3	0.70	0.84	39.0
Approach		136	5.0	0.189	9.8	LOS A	1.1	8.3	0.70	0.77	40.5
East: Albany Street - E											
4	L	73	5.0	0.639	12.6	LOS A	6.4	47.1	0.84	0.96	38.8
5	T	402	5.0	0.639	11.6	LOS A	6.4	47.1	0.84	0.94	38.9
6	R	54	5.0	0.639	15.4	LOS B	6.4	47.1	0.84	1.00	37.3
Approach		528	5.0	0.639	12.1	LOS A	6.4	47.1	0.84	0.95	38.7
North: Oxley Street - N											
7	L	25	5.0	0.420	9.6	LOS A	2.8	20.4	0.71	0.80	40.9
8	T	222	5.0	0.420	8.7	LOS A	2.8	20.4	0.71	0.76	41.1
9	R	102	5.0	0.420	12.4	LOS A	2.8	20.4	0.71	0.86	39.2
Approach		349	5.0	0.420	9.8	LOS A	2.8	20.4	0.71	0.79	40.5
West: Albany Street - W											
10	L	122	5.0	0.465	7.4	LOS A	3.5	25.8	0.48	0.62	42.0
11	T	298	5.0	0.465	6.4	LOS A	3.5	25.8	0.48	0.55	42.2
12	R	123	5.0	0.465	10.2	LOS A	3.5	25.8	0.48	0.73	40.6
Approach		543	5.0	0.465	7.5	LOS A	3.5	25.8	0.48	0.61	41.8
All Vehicles		1557	5.0	0.639	9.8	LOS A	6.4	47.1	0.67	0.78	40.3

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Oxley Street/Albany Street (EX-PM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Albany Street-Existing Weekday PM
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	64	5.0	0.505	11.3	LOS A	4.0	29.2	0.80	0.90	39.6
2	T	229	5.0	0.505	10.3	LOS A	4.0	29.2	0.80	0.87	39.8
3	R	96	5.0	0.505	14.1	LOS A	4.0	29.2	0.80	0.94	38.1
Approach		389	5.0	0.505	11.4	LOS A	4.0	29.2	0.80	0.89	39.3
East: Albany Street - E											
4	L	72	5.0	0.533	10.1	LOS A	4.4	31.8	0.75	0.83	40.6
5	T	349	5.0	0.533	9.1	LOS A	4.4	31.8	0.75	0.80	40.9
6	R	41	5.0	0.533	12.9	LOS A	4.4	31.8	0.75	0.89	39.0
Approach		462	5.0	0.533	9.6	LOS A	4.4	31.8	0.75	0.81	40.7
North: Oxley Street - N											
7	L	38	5.0	0.481	12.4	LOS A	3.8	27.7	0.86	0.96	38.6
8	T	157	5.0	0.481	11.5	LOS A	3.8	27.7	0.86	0.94	38.8
9	R	120	5.0	0.481	15.2	LOS B	3.8	27.7	0.86	0.98	37.2
Approach		315	5.0	0.481	13.0	LOS A	3.8	27.7	0.86	0.96	38.2
West: Albany Street - W											
10	L	100	5.0	0.710	12.6	LOS A	8.6	62.6	0.88	0.95	38.7
11	T	427	5.0	0.710	11.6	LOS A	8.6	62.6	0.88	0.93	38.9
12	R	109	5.0	0.710	15.4	LOS B	8.6	62.6	0.88	0.97	37.3
Approach		637	5.0	0.710	12.4	LOS A	8.6	62.6	0.88	0.94	38.6
All Vehicles		1803	5.0	0.710	11.6	LOS A	8.6	62.6	0.83	0.90	39.2

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Pacific Highway (EX-AM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Pacific Highway-Existing Weekday AM
Signals - Fixed Time Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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 - S											
1	L	236	5.0	0.697	23.1	LOS B	1.9	13.8	0.66	0.78	35.6
2	T	1359	5.0	0.526	3.2	LOS A	6.7	48.7	0.19	0.17	54.2
Approach		1595	5.0	0.697	6.1	LOS A	6.7	48.7	0.26	0.26	50.5
East: Oxley Street - E											
4	L	35	5.0	0.197	47.7	LOS D	1.6	11.8	0.83	0.72	24.2
5	T	226	5.0	0.553	45.5	LOS D	11.9	87.0	0.94	0.79	23.0
Approach		261	5.0	0.553	45.8	LOS D	11.9	87.0	0.93	0.78	23.2
North: Pacific Highway - N											
7	L	78	5.0	0.231	10.0	LOS A	1.9	13.9	0.12	0.95	46.4
8	T	1412	5.0	0.463	2.9	LOS A	5.3	38.5	0.16	0.14	54.7
Approach		1489	5.0	0.463	3.3	LOS A	5.3	38.5	0.16	0.19	54.2
West: Oxley Street - W											
10	L	56	5.0	0.318	48.3	LOS D	2.6	19.3	0.85	0.74	24.0
11	T	73	5.0	0.521	50.5	LOS D	6.0	43.7	0.94	0.73	21.6
12	R	52	5.0	0.521	61.4	LOS E	6.0	43.7	0.98	0.80	21.3
Approach		180	5.0	0.521	52.9	LOS D	6.0	43.7	0.92	0.75	22.2
All Vehicles		3525	5.0	0.697	10.3	LOS A	11.9	87.0	0.30	0.29	45.1

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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	Across S approach	53	50.4	LOS E	0.2	0.2	0.92	0.92
P3	Across E approach	53	8.4	LOS A	0.1	0.1	0.38	0.38
P7	Across W approach	53	9.6	LOS A	0.1	0.1	0.40	0.40
All Pedestrians		159	22.8	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 Street/Pacific Highway (EX-PM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Pacific Highway-Existing Weekday PM
Signals - Fixed Time Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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 - S											
1	L	102	5.0	0.275	21.7	LOS B	6.0	43.6	0.44	0.87	37.3
2	T	1191	5.0	0.550	16.5	LOS B	15.8	115.3	0.55	0.49	39.7
Approach		1293	5.0	0.550	16.9	LOS B	15.8	115.3	0.54	0.52	39.5
East: Oxley Street - E											
4	L	75	5.0	0.331	31.2	LOS C	2.7	19.7	0.66	0.73	29.6
5	T	126	5.0	0.167	24.6	LOS B	4.7	34.2	0.68	0.55	30.4
Approach		201	5.0	0.331	27.0	LOS B	4.7	34.2	0.67	0.62	30.1
North: Pacific Highway - N											
7	L	74	5.0	0.467	22.7	LOS B	1.5	10.9	0.44	0.70	35.9
8	T	1149	5.0	0.609	17.6	LOS B	18.7	136.2	0.60	0.54	38.9
Approach		1223	5.0	0.609	17.9	LOS B	18.7	136.2	0.60	0.55	38.7
West: Oxley Street - W											
10	L	138	5.0	0.612	32.5	LOS C	5.2	38.2	0.69	0.76	29.1
11	T	200	5.0	0.575	31.0	LOS C	15.1	110.0	0.82	0.70	27.2
12	R	148	5.0	0.575	39.5	LOS C	15.1	110.0	0.85	0.85	27.0
Approach		486	5.0	0.612	34.1	LOS C	15.1	110.0	0.79	0.76	27.6
All Vehicles		3203	5.0	0.612	20.5	LOS B	18.7	136.2	0.61	0.58	36.2

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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	Across S approach	53	30.1	LOS D	0.1	0.1	0.71	0.71
P3	Across E approach	53	18.7	LOS B	0.1	0.1	0.56	0.56
P7	Across W approach	53	20.4	LOS C	0.1	0.1	0.58	0.58
All Pedestrians		159	23.1	LOS C			0.62	0.62

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: Pacific Highway/Albany Street (EX-AM)

14S1511000-Chandos and Atchison Street St Leonards-Pacific Highway/Albany Street-Existing Weekday AM
Signals - Fixed Time Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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 - S											
2	T	1277	5.0	0.527	5.7	LOS A	9.7	70.5	0.28	0.26	50.6
3	R	118	5.0	0.717	68.5	LOS E	7.1	51.7	1.00	0.83	20.1
Approach		1395	5.0	0.717	11.0	LOS A	9.7	70.5	0.35	0.31	45.1
East: Albany Street - E											
4	L	27	5.0	0.775	52.8	LOS D	10.9	79.3	0.89	0.88	22.9
6	R	535	5.0	0.775	54.0	LOS D	20.4	149.2	0.96	0.89	22.6
Approach		562	5.0	0.775	53.9	LOS D	20.4	149.2	0.95	0.89	22.6
North: Pacific Highway - N											
7	L	409	5.0	0.457	23.4	LOS B	11.4	82.9	0.51	0.77	35.4
8	T	1459	5.0	0.772	20.0	LOS B	29.0	212.0	0.74	0.68	37.0
Approach		1868	5.0	0.772	20.7	LOS B	29.0	212.0	0.69	0.70	36.7
All Vehicles		3825	5.0	0.775	22.1	LOS B	29.0	212.0	0.60	0.58	35.8

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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	Across S approach	53	45.9	LOS E	0.2	0.2	0.88	0.88
P3	Across E approach	53	18.7	LOS B	0.1	0.1	0.56	0.56
All Pedestrians		106	32.3	LOS D			0.72	0.72

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: Pacific Highway/Albany Street (EX-PM)

14S1511000-Chandos and Atchison Street St Leonards-Pacific Highway/Albany Street-Existing Weekday PM
Signals - Fixed Time Cycle Time = 80 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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 - S											
2	T	1222	5.0	0.563	7.2	LOS A	9.8	71.3	0.44	0.40	48.3
3	R	124	5.0	0.792	51.3	LOS D	5.3	38.6	1.00	0.89	24.0
Approach		1346	5.0	0.792	11.3	LOS A	9.8	71.3	0.49	0.44	44.4
East: Albany Street - E											
4	L	40	5.0	0.698	35.8	LOS C	9.0	65.8	0.90	0.85	27.9
6	R	561	5.0	0.698	36.3	LOS C	12.6	91.9	0.93	0.86	27.7
Approach		601	5.0	0.698	36.3	LOS C	12.6	91.9	0.93	0.86	27.7
North: Pacific Highway - N											
7	L	357	5.0	0.482	24.0	LOS B	8.6	62.7	0.65	0.79	35.1
8	T	1196	5.0	0.767	20.6	LOS B	19.0	139.0	0.84	0.77	36.4
Approach		1553	5.0	0.767	21.4	LOS B	19.0	139.0	0.79	0.78	36.1
All Vehicles		3500	5.0	0.792	20.1	LOS B	19.0	139.0	0.70	0.66	36.8

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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	Across S approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
P3	Across E approach	53	18.2	LOS B	0.1	0.1	0.68	0.68
All Pedestrians		106	26.2	LOS C			0.80	0.80

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: Pacific Highway/Christie Street (EX-AM)

14S1511000-Chandos and Atchison Street St Leonards-Pacific Highway/Christie Street-Exsting Weekday AM
Signals - Fixed Time Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Pacific Highway - E											
4	L	75	5.0	0.462	10.6	LOS A	5.2	38.2	0.17	1.04	46.1
5	T	1712	5.0	0.462	3.0	LOS A	5.3	38.5	0.17	0.15	54.6
Approach		1786	5.0	0.462	3.3	LOS A	5.3	38.5	0.17	0.19	54.2
North: Christie Street - N											
7	L	74	5.0	0.665	54.2	LOS D	14.3	104.6	0.97	0.84	22.8
8	T	108	5.0	0.665	46.9	LOS D	14.3	104.6	0.97	0.82	22.2
9	R	340	5.0	0.665	54.0	LOS D	14.3	104.6	0.97	0.84	22.7
Approach		522	5.0	0.665	52.6	LOS D	14.3	104.6	0.97	0.83	22.6
West: Pacific Highway - W											
10	L	553	5.0	0.342	7.8	LOS A	1.2	8.9	0.08	0.66	48.2
11	T	1764	5.0	0.684	3.9	LOS A	12.0	87.4	0.26	0.24	53.0
Approach		2317	5.0	0.684	4.8	LOS A	12.0	87.4	0.21	0.34	51.9
All Vehicles		4625	5.0	0.684	9.6	LOS A	14.3	104.6	0.28	0.34	45.9

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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	Across S approach	53	6.7	LOS A	0.1	0.1	0.33	0.33
P3	Across E approach	53	50.4	LOS E	0.2	0.2	0.92	0.92
P5	Across N approach	53	10.8	LOS B	0.1	0.1	0.43	0.43
All Pedestrians		159	22.6	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: Pacific Highway/Christie Street (EX-PM)

14S1511000-Chandos and Atchison Street St Leonards-Pacific Highway/Christie Street-Exsting Weekday PM
Signals - Fixed Time Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Pacific Highway - E											
4	L	38	5.0	0.268	9.4	LOS A	1.8	13.1	0.10	1.07	47.1
5	T	1733	5.0	0.536	2.2	LOS A	5.4	39.8	0.14	0.12	55.8
Approach		1771	5.0	0.536	2.4	LOS A	5.4	39.8	0.14	0.14	55.6
North: Christie Street - N											
7	L	54	5.0	0.540	54.3	LOS D	10.4	76.1	0.95	0.82	22.7
8	T	40	5.0	0.540	47.0	LOS D	10.4	76.1	0.95	0.79	22.1
9	R	296	5.0	0.540	54.1	LOS D	10.4	76.1	0.95	0.82	22.7
Approach		389	5.0	0.540	53.4	LOS D	10.4	76.1	0.95	0.81	22.6
West: Pacific Highway - W											
10	L	442	5.0	0.482	8.6	LOS A	2.7	20.1	0.10	0.76	47.6
11	T	1479	5.0	0.482	2.0	LOS A	4.4	32.5	0.13	0.12	56.1
Approach		1921	5.0	0.482	3.5	LOS A	4.4	32.5	0.12	0.26	53.9
All Vehicles		4081	5.0	0.540	7.8	LOS A	10.4	76.1	0.21	0.26	48.2

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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	Across S approach	53	6.0	LOS A	0.1	0.1	0.32	0.32
P3	Across E approach	53	52.3	LOS E	0.2	0.2	0.93	0.93
P5	Across N approach	53	10.0	LOS B	0.1	0.1	0.41	0.41
All Pedestrians		159	22.8	LOS C			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.

Appendix D

Post Development Turning Movements

Figure D1: AM Peak Hour Additional Traffic Volumes

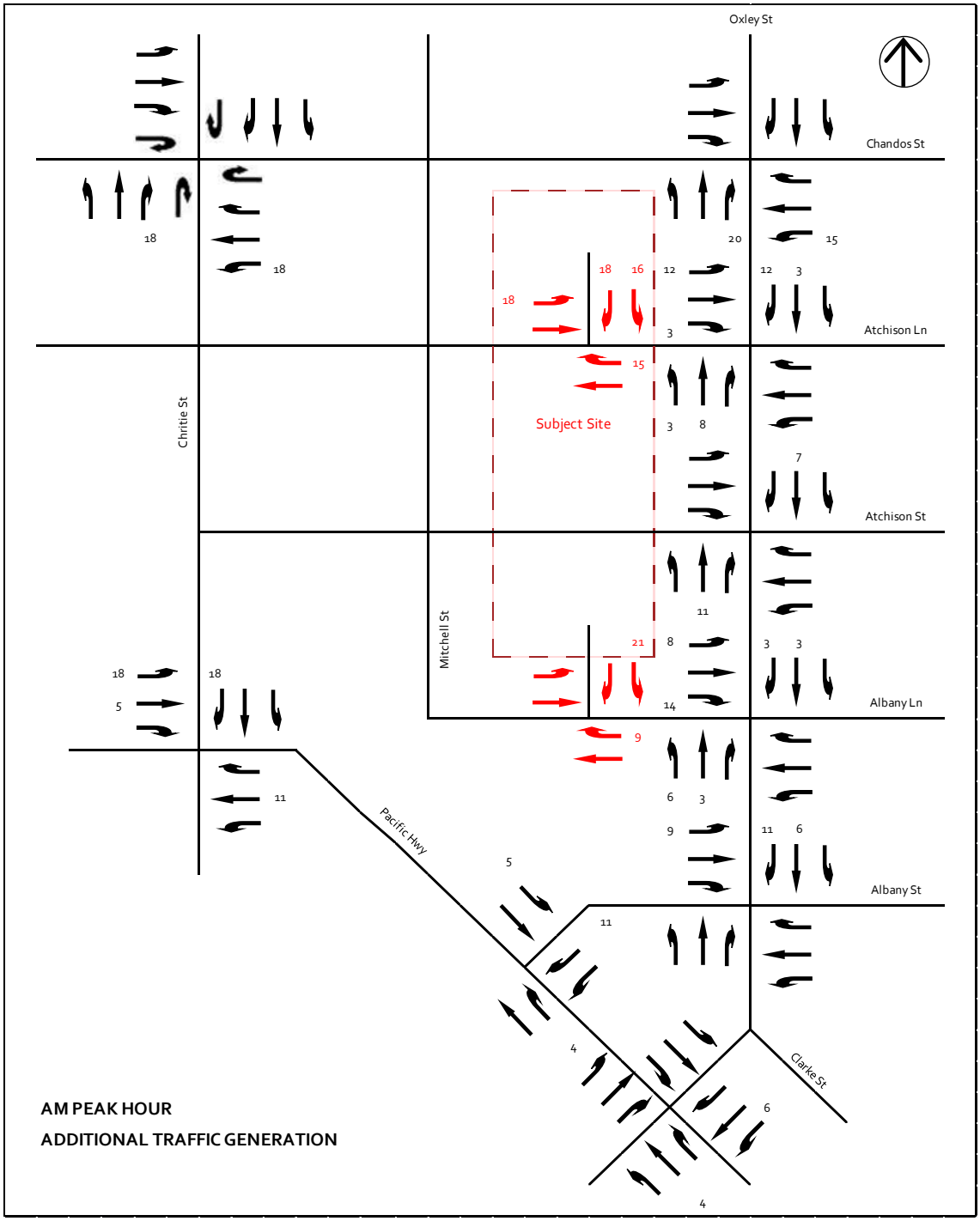


Figure D2: PM Peak Hour Additional Traffic Volumes

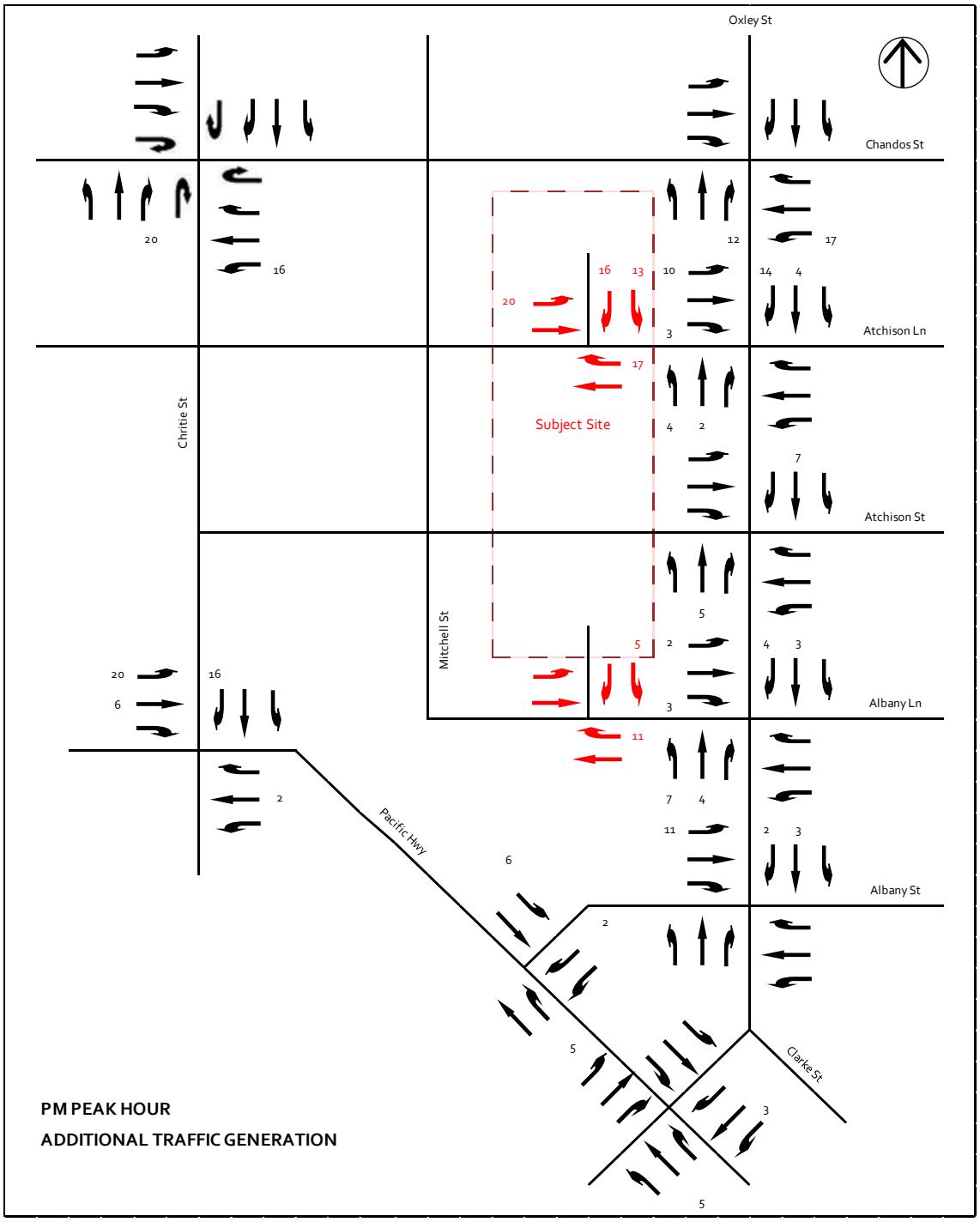


Figure D3: AM Peak Hour Post Development Traffic Volumes

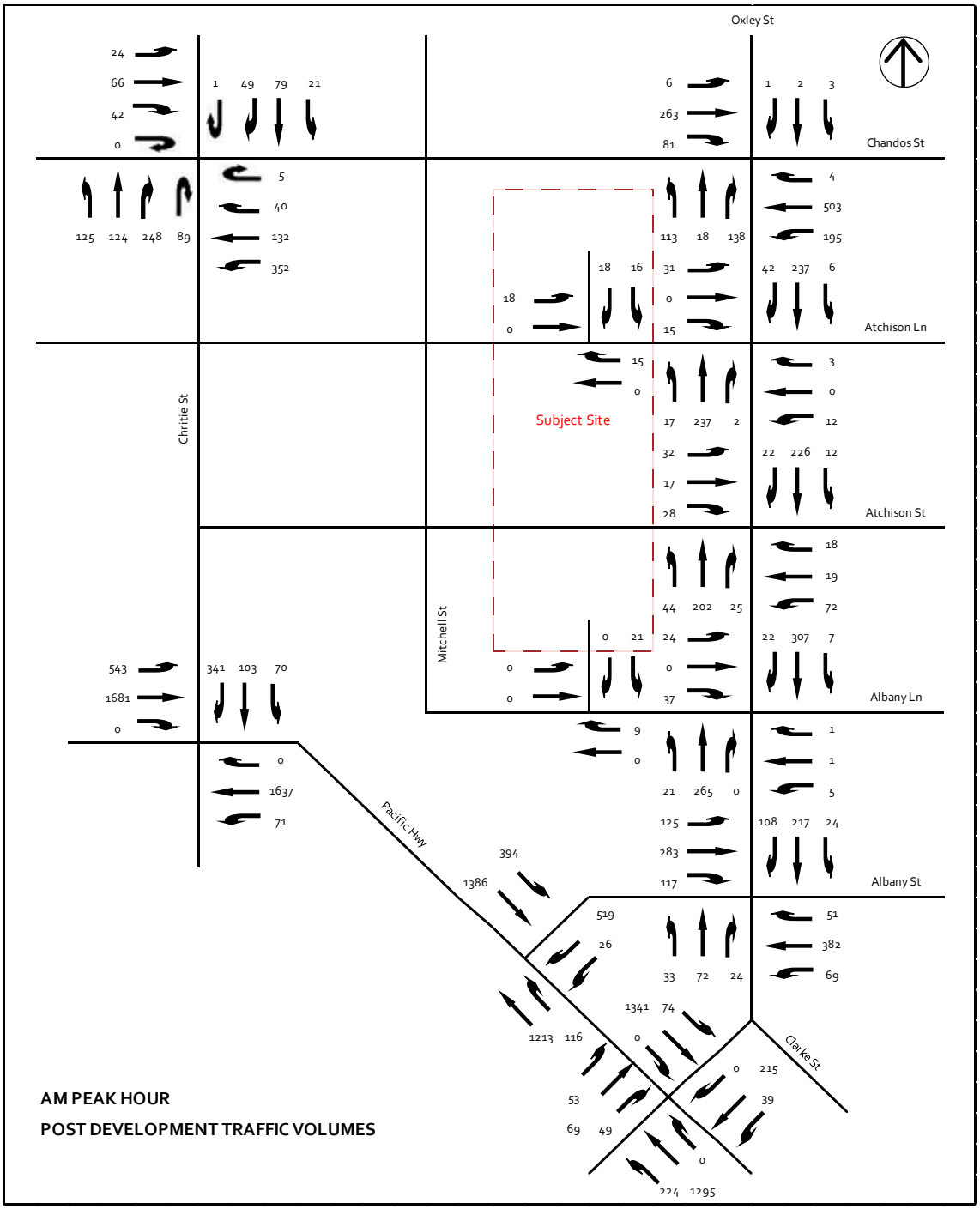
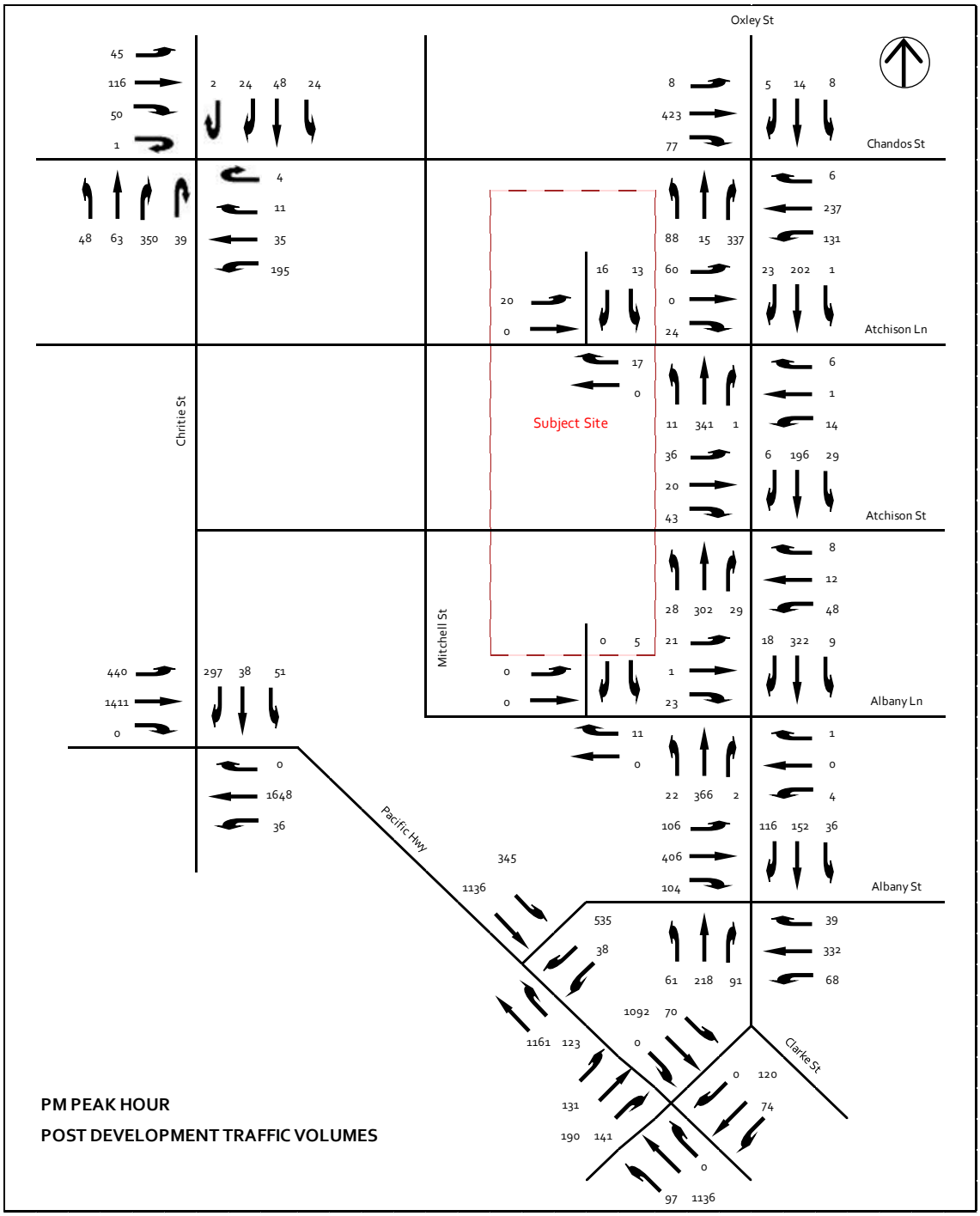


Figure D4: PM Peak Hour Post Development Traffic Volumes



Appendix E

SIDRA INTERSECTION Results – Post Development

MOVEMENT SUMMARY

Site: Oxley Street/Chandos Street (PD-AM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Chandos Street-Post Development Weekday AM
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	119	5.0	0.367	10.2	LOS A	2.3	17.1	0.72	0.81	40.1
2	T	19	5.0	0.367	9.2	LOS A	2.3	17.1	0.72	0.78	40.3
3	R	145	5.0	0.367	13.0	LOS A	2.3	17.1	0.72	0.86	38.5
Approach		283	5.0	0.367	11.6	LOS A	2.3	17.1	0.72	0.83	39.2
East: Chandos Street - E											
4	L	205	5.0	0.560	6.9	LOS A	5.1	37.5	0.42	0.59	42.3
5	T	529	5.0	0.560	6.0	LOS A	5.1	37.5	0.42	0.50	42.6
6	R	4	5.0	0.560	9.8	LOS A	5.1	37.5	0.42	0.71	40.8
Approach		739	5.0	0.560	6.3	LOS A	5.1	37.5	0.42	0.53	42.5
North: Oxley Street - N											
7	L	3	5.0	0.008	8.9	LOS A	0.0	0.3	0.57	0.61	41.3
8	T	2	5.0	0.008	7.9	LOS A	0.0	0.3	0.57	0.55	41.7
9	R	1	5.0	0.008	11.6	LOS A	0.0	0.3	0.57	0.69	39.5
Approach		6	5.0	0.008	9.0	LOS A	0.0	0.3	0.57	0.60	41.1
West: Chandos Street - W											
10	L	6	5.0	0.333	7.3	LOS A	2.3	16.5	0.46	0.63	42.2
11	T	277	5.0	0.333	6.3	LOS A	2.3	16.5	0.46	0.56	42.3
12	R	85	5.0	0.333	10.1	LOS A	2.3	16.5	0.46	0.75	40.7
Approach		368	5.0	0.333	7.2	LOS A	2.3	16.5	0.46	0.60	42.0
All Vehicles		1397	5.0	0.560	7.6	LOS A	5.1	37.5	0.49	0.61	41.6

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Chandos Street (PD-PM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Chandos Street-Post Development Weekday PM Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	93	5.0	0.455	8.3	LOS A	3.2	23.3	0.59	0.68	41.3
2	T	16	5.0	0.455	7.3	LOS A	3.2	23.3	0.59	0.63	41.4
3	R	355	5.0	0.455	11.1	LOS A	3.2	23.3	0.59	0.74	39.8
Approach		463	5.0	0.455	10.4	LOS A	3.2	23.3	0.59	0.72	40.1
East: Chandos Street - E											
4	L	138	5.0	0.319	6.8	LOS A	2.2	15.9	0.35	0.59	42.5
5	T	249	5.0	0.319	5.8	LOS A	2.2	15.9	0.35	0.50	42.9
6	R	6	5.0	0.319	9.6	LOS A	2.2	15.9	0.35	0.73	40.9
Approach		394	5.0	0.319	6.3	LOS A	2.2	15.9	0.35	0.54	42.7
North: Oxley Street - N											
7	L	8	5.0	0.054	12.7	LOS A	0.3	2.4	0.79	0.78	38.5
8	T	15	5.0	0.054	11.7	LOS A	0.3	2.4	0.79	0.75	38.7
9	R	5	5.0	0.054	15.5	LOS B	0.3	2.4	0.79	0.82	37.1
Approach		28	5.0	0.054	12.7	LOS A	0.3	2.4	0.79	0.77	38.4
West: Chandos Street - W											
10	L	8	5.0	0.603	10.9	LOS A	5.7	41.4	0.79	0.87	40.1
11	T	445	5.0	0.603	9.9	LOS A	5.7	41.4	0.79	0.84	40.3
12	R	81	5.0	0.603	13.7	LOS A	5.7	41.4	0.79	0.92	38.5
Approach		535	5.0	0.603	10.5	LOS A	5.7	41.4	0.79	0.85	40.0
All Vehicles		1420	5.0	0.603	9.3	LOS A	5.7	41.4	0.60	0.72	40.7

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Atchison Lane (PD-AM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Atchison Lane-Post Development Weekday AM Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	18	5.0	0.144	7.8	LOS A	1.0	7.6	0.44	0.50	43.0
2	T	249	5.0	0.144	1.2	LOS A	1.0	7.6	0.44	0.00	44.8
3	R	2	5.0	0.144	8.1	LOS A	1.0	7.6	0.44	0.87	43.0
Approach		269	5.0	0.144	1.7	NA	1.0	7.6	0.44	0.04	44.7
East: Atchison Lane - E											
4	L	13	5.0	0.025	9.3	LOS A	0.1	0.6	0.42	0.61	40.9
5	T	1	5.0	0.025	7.9	LOS A	0.1	0.6	0.42	0.63	41.7
6	R	3	5.0	0.025	9.7	LOS A	0.1	0.6	0.42	0.77	40.8
Approach		17	5.0	0.025	9.3	LOS A	0.1	0.6	0.42	0.64	40.9
North: Oxley Street - N											
7	L	6	5.0	0.176	7.9	LOS A	1.2	8.9	0.44	0.47	42.8
8	T	249	5.0	0.176	1.4	LOS A	1.2	8.9	0.44	0.00	44.6
9	R	44	5.0	0.176	8.3	LOS A	1.2	8.9	0.44	0.85	42.8
Approach		300	5.0	0.176	2.5	NA	1.2	8.9	0.44	0.13	44.3
West: Atchison Lane - W											
10	L	33	5.0	0.082	10.1	LOS A	0.3	2.2	0.46	0.64	40.3
11	T	1	5.0	0.082	8.7	LOS A	0.3	2.2	0.46	0.69	41.0
12	R	16	5.0	0.082	10.4	LOS A	0.3	2.2	0.46	0.82	40.1
Approach		49	5.0	0.082	10.2	LOS A	0.3	2.2	0.46	0.70	40.2
All Vehicles		636	5.0	0.176	3.0	NA	1.2	8.9	0.44	0.15	44.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Atchison Lane (PD-PM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Atchison Lane-Post Development Weekday PM Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	12	5.0	0.197	7.6	LOS A	1.4	10.5	0.41	0.54	43.1
2	T	359	5.0	0.197	1.1	LOS A	1.4	10.5	0.41	0.00	45.2
3	R	1	5.0	0.197	7.8	LOS A	1.4	10.5	0.41	0.88	43.0
Approach		372	5.0	0.197	1.3	NA	1.4	10.5	0.41	0.02	45.1
East: Atchison Lane - E											
4	L	15	5.0	0.039	10.3	LOS A	0.1	1.0	0.43	0.60	40.1
5	T	1	5.0	0.039	8.9	LOS A	0.1	1.0	0.43	0.66	40.8
6	R	6	5.0	0.039	10.7	LOS A	0.1	1.0	0.43	0.80	39.9
Approach		22	5.0	0.039	10.4	LOS A	0.1	1.0	0.43	0.66	40.1
North: Oxley Street - N											
7	L	1	5.0	0.138	8.4	LOS A	1.0	7.5	0.50	0.43	42.8
8	T	213	5.0	0.138	2.0	LOS A	1.0	7.5	0.50	0.00	44.0
9	R	24	5.0	0.138	8.9	LOS A	1.0	7.5	0.50	0.89	42.7
Approach		238	5.0	0.138	2.7	NA	1.0	7.5	0.50	0.09	43.9
West: Atchison Lane - W											
10	L	63	5.0	0.159	10.9	LOS A	0.6	4.3	0.53	0.73	39.6
11	T	1	5.0	0.159	9.5	LOS A	0.6	4.3	0.53	0.75	40.2
12	R	25	5.0	0.159	11.3	LOS A	0.6	4.3	0.53	0.85	39.5
Approach		89	5.0	0.159	11.0	LOS A	0.6	4.3	0.53	0.77	39.6
All Vehicles		721	5.0	0.197	3.2	NA	1.4	10.5	0.46	0.16	43.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Atchison Street (PD-AM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Atchison Street-Post Development Weekday AM Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	46	5.0	0.162	7.8	LOS A	1.1	8.2	0.45	0.45	42.7
2	T	213	5.0	0.162	1.2	LOS A	1.1	8.2	0.45	0.00	44.4
3	R	26	5.0	0.162	8.1	LOS A	1.1	8.2	0.45	0.82	42.7
Approach		285	5.0	0.162	2.9	NA	1.1	8.2	0.45	0.15	44.0
East: Atchison Street - E											
4	L	76	5.0	0.179	10.1	LOS A	0.7	5.1	0.47	0.67	40.3
5	T	20	5.0	0.179	8.8	LOS A	0.7	5.1	0.47	0.72	41.0
6	R	19	5.0	0.179	10.4	LOS A	0.7	5.1	0.47	0.84	40.2
Approach		115	5.0	0.179	9.9	LOS A	0.7	5.1	0.47	0.71	40.4
North: Oxley Street - N											
7	L	13	5.0	0.154	7.8	LOS A	1.1	7.8	0.43	0.49	42.9
8	T	238	5.0	0.154	1.3	LOS A	1.1	7.8	0.43	0.00	44.8
9	R	23	5.0	0.154	8.2	LOS A	1.1	7.8	0.43	0.86	42.9
Approach		274	5.0	0.154	2.2	NA	1.1	7.8	0.43	0.09	44.5
West: Atchison Street - W											
10	L	34	5.0	0.164	12.0	LOS A	0.6	4.5	0.53	0.67	38.9
11	T	18	5.0	0.164	10.7	LOS A	0.6	4.5	0.53	0.75	39.5
12	R	29	5.0	0.164	12.3	LOS A	0.6	4.5	0.53	0.85	38.8
Approach		81	5.0	0.164	11.8	LOS A	0.6	4.5	0.53	0.75	39.0
All Vehicles		755	5.0	0.179	4.7	NA	1.1	8.2	0.45	0.28	43.0

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Oxley Street/Atchison Street (PD-PM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Atchison Street-Post Development Weekday PM Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	29	5.0	0.212	7.8	LOS A	1.5	11.2	0.44	0.47	42.8
2	T	318	5.0	0.212	1.3	LOS A	1.5	11.2	0.44	0.00	44.6
3	R	31	5.0	0.212	8.1	LOS A	1.5	11.2	0.44	0.84	42.8
Approach		378	5.0	0.212	2.3	NA	1.5	11.2	0.44	0.11	44.3
East: Atchison Street - E											
4	L	51	5.0	0.112	9.9	LOS A	0.4	3.0	0.43	0.64	40.5
5	T	13	5.0	0.112	8.6	LOS A	0.4	3.0	0.43	0.70	41.2
6	R	8	5.0	0.112	10.3	LOS A	0.4	3.0	0.43	0.83	40.3
Approach		72	5.0	0.112	9.7	LOS A	0.4	3.0	0.43	0.67	40.6
North: Oxley Street - N											
7	L	31	5.0	0.133	8.3	LOS A	1.0	7.4	0.52	0.41	42.8
8	T	206	5.0	0.133	1.8	LOS A	1.0	7.4	0.52	0.00	43.8
9	R	6	5.0	0.133	8.7	LOS A	1.0	7.4	0.52	0.87	42.8
Approach		243	5.0	0.133	2.8	NA	1.0	7.4	0.52	0.07	43.6
West: Atchison Street - W											
10	L	38	5.0	0.240	13.7	LOS A	0.9	6.9	0.61	0.77	37.7
11	T	21	5.0	0.240	12.4	LOS A	0.9	6.9	0.61	0.80	38.2
12	R	45	5.0	0.240	14.0	LOS A	0.9	6.9	0.61	0.89	37.6
Approach		104	5.0	0.240	13.6	LOS A	0.9	6.9	0.61	0.83	37.7
All Vehicles		797	5.0	0.240	4.6	NA	1.5	11.2	0.49	0.24	42.8

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Oxley Street/Albany Lane (PD-AM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Albany Lane-Post Development Weekday AM Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	22	5.0	0.161	8.3	LOS A	1.3	9.3	0.51	0.43	42.9
2	T	279	5.0	0.161	1.7	LOS A	1.3	9.3	0.51	0.00	44.0
3	R	1	5.0	0.161	8.5	LOS A	1.3	9.3	0.51	0.88	43.0
Approach		302	5.0	0.161	2.2	NA	1.3	9.3	0.51	0.03	43.9
East: Albany Lane - E											
4	L	5	5.0	0.013	10.2	LOS A	0.0	0.3	0.48	0.62	40.3
5	T	1	5.0	0.013	8.8	LOS A	0.0	0.3	0.48	0.65	40.9
6	R	1	5.0	0.013	10.4	LOS A	0.0	0.3	0.48	0.77	40.1
Approach		7	5.0	0.013	10.0	LOS A	0.0	0.3	0.48	0.65	40.3
North: Oxley Street - N											
7	L	7	5.0	0.197	8.2	LOS A	1.5	11.0	0.49	0.45	42.9
8	T	323	5.0	0.197	1.6	LOS A	1.5	11.0	0.49	0.00	44.2
9	R	23	5.0	0.197	8.5	LOS A	1.5	11.0	0.49	0.88	42.9
Approach		354	5.0	0.197	2.2	NA	1.5	11.0	0.49	0.07	44.1
West: Albany Lane - W											
10	L	25	5.0	0.154	13.2	LOS A	0.6	4.1	0.57	0.70	37.9
11	T	1	5.0	0.154	11.8	LOS A	0.6	4.1	0.57	0.77	38.4
12	R	39	5.0	0.154	13.6	LOS A	0.6	4.1	0.57	0.86	37.8
Approach		65	5.0	0.154	13.4	LOS A	0.6	4.1	0.57	0.79	37.8
All Vehicles		728	5.0	0.197	3.3	NA	1.5	11.0	0.51	0.12	43.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Albany Lane (PD-PM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Albany Lane-Post Development Weekday PM Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	23	5.0	0.219	8.6	LOS A	1.9	13.7	0.56	0.40	42.9
2	T	385	5.0	0.219	2.0	LOS A	1.9	13.7	0.56	0.00	43.6
3	R	2	5.0	0.219	8.9	LOS A	1.9	13.7	0.56	0.90	42.9
Approach		411	5.0	0.219	2.4	NA	1.9	13.7	0.56	0.03	43.5
East: Albany Lane - E											
4	L	4	5.0	0.013	11.6	LOS A	0.0	0.3	0.53	0.63	39.2
5	T	1	5.0	0.013	10.2	LOS A	0.0	0.3	0.53	0.69	39.8
6	R	1	5.0	0.013	11.8	LOS A	0.0	0.3	0.53	0.80	39.1
Approach		6	5.0	0.013	11.4	LOS A	0.0	0.3	0.53	0.67	39.3
North: Oxley Street - N											
7	L	9	5.0	0.205	9.0	LOS A	1.8	12.9	0.58	0.37	42.6
8	T	339	5.0	0.205	2.5	LOS A	1.8	12.9	0.58	0.00	43.3
9	R	19	5.0	0.205	9.4	LOS A	1.8	12.9	0.58	0.92	42.5
Approach		367	5.0	0.205	3.0	NA	1.8	12.9	0.58	0.06	43.2
West: Albany Lane - W											
10	L	22	5.0	0.127	14.6	LOS B	0.4	3.2	0.62	0.76	37.0
11	T	1	5.0	0.127	13.2	LOS A	0.4	3.2	0.62	0.80	37.5
12	R	24	5.0	0.127	14.9	LOS B	0.4	3.2	0.62	0.87	36.9
Approach		47	5.0	0.127	14.7	LOS B	0.4	3.2	0.62	0.82	36.9
All Vehicles		832	5.0	0.219	3.5	NA	1.9	13.7	0.57	0.09	42.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Albany Street (PD-AM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Albany Street-Post Development Weekday AM
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	35	5.0	0.191	9.9	LOS A	1.2	8.5	0.71	0.78	40.6
2	T	76	5.0	0.191	8.9	LOS A	1.2	8.5	0.71	0.75	40.9
3	R	25	5.0	0.191	12.7	LOS A	1.2	8.5	0.71	0.84	39.0
Approach		136	5.0	0.191	9.9	LOS A	1.2	8.5	0.71	0.77	40.5
East: Albany Street - E											
4	L	73	5.0	0.652	13.2	LOS A	6.8	49.3	0.86	0.99	38.4
5	T	402	5.0	0.652	12.2	LOS A	6.8	49.3	0.86	0.97	38.5
6	R	54	5.0	0.652	16.0	LOS B	6.8	49.3	0.86	1.02	37.0
Approach		528	5.0	0.652	12.7	LOS A	6.8	49.3	0.86	0.98	38.3
North: Oxley Street - N											
7	L	25	5.0	0.442	9.7	LOS A	3.0	21.9	0.72	0.80	40.8
8	T	228	5.0	0.442	8.7	LOS A	3.0	21.9	0.72	0.77	41.1
9	R	114	5.0	0.442	12.5	LOS A	3.0	21.9	0.72	0.86	39.1
Approach		367	5.0	0.442	10.0	LOS A	3.0	21.9	0.72	0.80	40.4
West: Albany Street - W											
10	L	132	5.0	0.473	7.4	LOS A	3.6	26.5	0.49	0.62	42.0
11	T	298	5.0	0.473	6.4	LOS A	3.6	26.5	0.49	0.55	42.1
12	R	123	5.0	0.473	10.2	LOS A	3.6	26.5	0.49	0.73	40.6
Approach		553	5.0	0.473	7.5	LOS A	3.6	26.5	0.49	0.61	41.7
All Vehicles		1584	5.0	0.652	10.0	LOS A	6.8	49.3	0.68	0.79	40.1

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Oxley Street/Albany Street (PD-PM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Albany Street-Post Development Weekday PM
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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: Oxley Street - S											
1	L	64	5.0	0.507	11.3	LOS A	4.0	29.3	0.80	0.90	39.6
2	T	229	5.0	0.507	10.3	LOS A	4.0	29.3	0.80	0.87	39.8
3	R	96	5.0	0.507	14.1	LOS A	4.0	29.3	0.80	0.94	38.0
Approach		389	5.0	0.507	11.4	LOS A	4.0	29.3	0.80	0.89	39.3
East: Albany Street - E											
4	L	72	5.0	0.536	10.2	LOS A	4.4	32.3	0.76	0.84	40.6
5	T	349	5.0	0.536	9.2	LOS A	4.4	32.3	0.76	0.81	40.8
6	R	41	5.0	0.536	13.0	LOS A	4.4	32.3	0.76	0.89	38.9
Approach		462	5.0	0.536	9.7	LOS A	4.4	32.3	0.76	0.82	40.6
North: Oxley Street - N											
7	L	38	5.0	0.491	12.6	LOS A	3.9	28.7	0.87	0.96	38.5
8	T	160	5.0	0.491	11.6	LOS A	3.9	28.7	0.87	0.95	38.7
9	R	122	5.0	0.491	15.4	LOS B	3.9	28.7	0.87	0.99	37.1
Approach		320	5.0	0.491	13.2	LOS A	3.9	28.7	0.87	0.96	38.1
West: Albany Street - W											
10	L	112	5.0	0.722	12.8	LOS A	9.0	65.6	0.89	0.96	38.5
11	T	427	5.0	0.722	11.9	LOS A	9.0	65.6	0.89	0.94	38.7
12	R	109	5.0	0.722	15.7	LOS B	9.0	65.6	0.89	0.98	37.1
Approach		648	5.0	0.722	12.7	LOS A	9.0	65.6	0.89	0.95	38.4
All Vehicles		1820	5.0	0.722	11.7	LOS A	9.0	65.6	0.83	0.91	39.0

Level of Service (LOS) Method: Delay (RTA NSW).
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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: Oxley Street/Pacific Highway (PD-AM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Pacific Highway-Post Development Weekday AM
Signals - Fixed Time Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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 - S											
1	L	236	5.0	0.697	23.1	LOS B	1.9	13.8	0.66	0.78	35.6
2	T	1364	5.0	0.529	3.2	LOS A	6.7	49.1	0.19	0.17	54.2
Approach		1600	5.0	0.697	6.1	LOS A	6.7	49.1	0.26	0.26	50.5
East: Oxley Street - E											
4	L	41	5.0	0.233	47.9	LOS D	1.9	14.1	0.84	0.73	24.1
5	T	226	5.0	0.553	45.5	LOS D	11.9	87.0	0.94	0.79	23.0
Approach		267	5.0	0.553	45.9	LOS D	11.9	87.0	0.93	0.78	23.2
North: Pacific Highway - N											
7	L	78	5.0	0.231	10.0	LOS A	1.9	13.9	0.12	0.95	46.4
8	T	1412	5.0	0.463	2.9	LOS A	5.3	38.5	0.16	0.14	54.7
Approach		1489	5.0	0.463	3.3	LOS A	5.3	38.5	0.16	0.19	54.2
West: Oxley Street - W											
10	L	56	5.0	0.318	48.3	LOS D	2.6	19.3	0.85	0.74	24.0
11	T	73	5.0	0.522	50.5	LOS D	6.0	43.7	0.94	0.73	21.6
12	R	52	5.0	0.522	61.4	LOS E	6.0	43.7	0.98	0.80	21.3
Approach		180	5.0	0.522	52.9	LOS D	6.0	43.7	0.92	0.75	22.2
All Vehicles		3537	5.0	0.697	10.3	LOS A	11.9	87.0	0.30	0.29	45.1

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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	Across S approach	53	50.4	LOS E	0.2	0.2	0.92	0.92
P3	Across E approach	53	8.4	LOS A	0.1	0.1	0.38	0.38
P7	Across W approach	53	9.6	LOS A	0.1	0.1	0.40	0.40
All Pedestrians		159	22.8	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 Street/Pacific Highway (PD-PM)

14S1511000-Chandos and Atchison Street St Leonards-Oxley Street/Pacific Highway-Post Development Weekday PM
Signals - Fixed Time Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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 - S											
1	L	102	5.0	0.276	21.7	LOS B	6.0	43.9	0.44	0.87	37.3
2	T	1196	5.0	0.552	16.5	LOS B	15.9	116.1	0.55	0.49	39.7
Approach		1298	5.0	0.552	16.9	LOS B	15.9	116.1	0.54	0.52	39.5
East: Oxley Street - E											
4	L	78	5.0	0.345	31.2	LOS C	2.8	20.6	0.66	0.73	29.6
5	T	126	5.0	0.167	24.6	LOS B	4.7	34.2	0.68	0.55	30.4
Approach		204	5.0	0.345	27.1	LOS B	4.7	34.2	0.67	0.62	30.1
North: Pacific Highway - N											
7	L	74	5.0	0.467	22.7	LOS B	1.5	10.9	0.44	0.70	35.9
8	T	1149	5.0	0.609	17.6	LOS B	18.7	136.2	0.60	0.54	38.9
Approach		1223	5.0	0.609	17.9	LOS B	18.7	136.2	0.60	0.55	38.7
West: Oxley Street - W											
10	L	138	5.0	0.612	32.5	LOS C	5.2	38.2	0.69	0.76	29.1
11	T	200	5.0	0.575	31.0	LOS C	15.1	110.0	0.82	0.70	27.2
12	R	148	5.0	0.575	39.5	LOS C	15.1	110.0	0.85	0.85	27.0
Approach		486	5.0	0.612	34.1	LOS C	15.1	110.0	0.79	0.76	27.6
All Vehicles		3212	5.0	0.612	20.5	LOS B	18.7	136.2	0.61	0.58	36.2

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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	Across S approach	53	30.1	LOS D	0.1	0.1	0.71	0.71
P3	Across E approach	53	18.7	LOS B	0.1	0.1	0.56	0.56
P7	Across W approach	53	20.4	LOS C	0.1	0.1	0.58	0.58
All Pedestrians		159	23.1	LOS C			0.62	0.62

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: Pacific Highway/Albany Street (PD-AM)

14S1511000-Chandos and Atchison Street St Leonards-Pacific Highway/Albany Street-Post Development Weekday AM
Signals - Fixed Time Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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 - S											
2	T	1277	5.0	0.534	6.3	LOS A	10.4	76.0	0.31	0.28	49.9
3	R	122	5.0	0.743	69.0	LOS E	7.4	54.0	1.00	0.84	19.9
Approach		1399	5.0	0.743	11.8	LOS A	10.4	76.0	0.37	0.33	44.3
East: Albany Street - E											
4	L	27	5.0	0.772	51.8	LOS D	10.8	78.9	0.88	0.87	23.1
6	R	546	5.0	0.772	53.0	LOS D	20.9	152.2	0.95	0.88	22.8
Approach		574	5.0	0.772	53.0	LOS D	20.9	152.2	0.95	0.88	22.8
North: Pacific Highway - N											
7	L	415	5.0	0.470	24.3	LOS B	12.0	87.3	0.53	0.77	34.9
8	T	1459	5.0	0.786	21.0	LOS B	30.0	219.2	0.77	0.70	36.3
Approach		1874	5.0	0.786	21.7	LOS B	30.0	219.2	0.72	0.72	36.0
All Vehicles		3846	5.0	0.786	22.8	LOS B	30.0	219.2	0.62	0.60	35.4

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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	Across S approach	53	45.1	LOS E	0.2	0.2	0.87	0.87
P3	Across E approach	53	19.3	LOS B	0.1	0.1	0.57	0.57
All Pedestrians		106	32.2	LOS D			0.72	0.72

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: Pacific Highway/Albany Street (PD-PM)

14S1511000-Chandos and Atchison Street St Leonards-Pacific Highway/Albany Street-Post Development Weekday PM
Signals - Fixed Time Cycle Time = 80 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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 - S											
2	T	1222	5.0	0.563	7.2	LOS A	9.8	71.3	0.44	0.40	48.3
3	R	129	5.0	0.722	48.9	LOS D	5.3	38.8	1.00	0.85	24.7
Approach		1352	5.0	0.722	11.2	LOS A	9.8	71.3	0.50	0.44	44.4
East: Albany Street - E											
4	L	40	5.0	0.700	35.8	LOS C	9.1	66.1	0.90	0.85	27.8
6	R	563	5.0	0.700	36.4	LOS C	12.7	92.4	0.93	0.86	27.6
Approach		603	5.0	0.700	36.4	LOS C	12.7	92.4	0.93	0.86	27.6
North: Pacific Highway - N											
7	L	363	5.0	0.506	25.1	LOS B	9.1	66.7	0.68	0.79	34.4
8	T	1196	5.0	0.791	22.7	LOS B	20.2	147.2	0.87	0.82	35.1
Approach		1559	5.0	0.791	23.2	LOS B	20.2	147.2	0.82	0.81	35.0
All Vehicles		3514	5.0	0.791	20.9	LOS B	20.2	147.2	0.72	0.68	36.3

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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	Across S approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
P3	Across E approach	53	18.9	LOS B	0.1	0.1	0.69	0.69
All Pedestrians		106	26.6	LOS C			0.81	0.81

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: Pacific Highway/Christie Street (PD-AM)

14S1511000-Chandos and Atchison Street St Leonards-Pacific Highway/Christie Street-Post Development Weekday AM
Signals - Fixed Time Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Pacific Highway - E											
4	L	75	5.0	0.465	10.6	LOS A	5.3	38.7	0.17	1.05	46.1
5	T	1723	5.0	0.465	3.0	LOS A	5.3	38.9	0.17	0.15	54.5
Approach		1798	5.0	0.465	3.3	LOS A	5.3	38.9	0.17	0.19	54.2
North: Christie Street - N											
7	L	74	5.0	0.689	54.8	LOS D	15.0	109.6	0.98	0.85	22.7
8	T	108	5.0	0.689	47.5	LOS D	15.0	109.6	0.98	0.83	22.1
9	R	359	5.0	0.689	54.7	LOS D	15.0	109.6	0.98	0.85	22.6
Approach		541	5.0	0.689	53.3	LOS D	15.0	109.6	0.98	0.85	22.5
West: Pacific Highway - W											
10	L	572	5.0	0.354	7.8	LOS A	1.3	9.4	0.08	0.66	48.2
11	T	1769	5.0	0.686	3.9	LOS A	12.1	88.1	0.26	0.24	53.0
Approach		2341	5.0	0.686	4.8	LOS A	12.1	88.1	0.21	0.34	51.8
All Vehicles		4680	5.0	0.689	9.9	LOS A	15.0	109.6	0.28	0.34	45.7

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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	Across S approach	53	6.7	LOS A	0.1	0.1	0.33	0.33
P3	Across E approach	53	50.4	LOS E	0.2	0.2	0.92	0.92
P5	Across N approach	53	10.8	LOS B	0.1	0.1	0.43	0.43
All Pedestrians		159	22.6	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: Pacific Highway/Christie Street (PD-PM)

14S1511000-Chandos and Atchison Street St Leonards-Pacific Highway/Christie Street-Post Development Weekday PM
Signals - Fixed Time Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow 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
East: Pacific Highway - E											
4	L	38	5.0	0.272	9.7	LOS A	2.1	15.3	0.11	1.07	46.8
5	T	1735	5.0	0.543	2.7	LOS A	6.4	46.5	0.16	0.14	55.1
Approach		1773	5.0	0.543	2.8	LOS A	6.4	46.5	0.16	0.16	54.9
North: Christie Street - N											
7	L	54	5.0	0.541	53.5	LOS D	10.8	78.9	0.94	0.82	22.9
8	T	40	5.0	0.541	46.2	LOS D	10.8	78.9	0.94	0.78	22.3
9	R	313	5.0	0.541	53.3	LOS D	10.8	78.9	0.94	0.82	22.9
Approach		406	5.0	0.541	52.6	LOS D	10.8	78.9	0.94	0.82	22.8
West: Pacific Highway - W											
10	L	463	5.0	0.494	8.6	LOS A	2.9	21.1	0.10	0.76	47.5
11	T	1485	5.0	0.494	2.5	LOS A	5.3	38.7	0.15	0.13	55.4
Approach		1948	5.0	0.494	3.9	LOS A	5.3	38.7	0.14	0.28	53.4
All Vehicles		4127	5.0	0.543	8.3	LOS A	10.8	78.9	0.23	0.28	47.6

Level of Service (LOS) Method: Delay (RTA NSW).
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 used.

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	Across S approach	53	6.3	LOS A	0.1	0.1	0.33	0.33
P3	Across E approach	53	51.3	LOS E	0.2	0.2	0.93	0.93
P5	Across N approach	53	10.4	LOS B	0.1	0.1	0.42	0.42
All Pedestrians		159	22.7	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.

Melbourne

A Level 25, 55 Collins Street
PO Box 24055
MELBOURNE VIC 3000
P +613 9851 9600
F +613 9851 9610
E melbourne@gta.com.au

Canberra

A Unit 4, Level 1, Sparta Building, 55 Woolley Street
PO Box 62
DICKSON ACT 2602
P +612 6243 4826
F +612 6243 4848
E canberra@gta.com.au

Townsville

A Level 1, 25 Sturt Street
PO Box 1064
TOWNSVILLE QLD 4810
P +617 4722 2765
F +617 4722 2761
E townsville@gta.com.au

Sydney

A Level 6, 15 Help Street
CHATSWOOD NSW 2067
PO Box 5254
WEST CHATSWOOD NSW 1515
P +612 8448 1800
F +612 8448 1810
E sydney@gta.com.au

Adelaide

A Suite 4, Level 1, 136 The Parade
PO Box 3421
NORWOOD SA 5067
P +618 8334 3600
F +618 8334 3610
E adelaide@gta.com.au

Brisbane

A Level 4, 283 Elizabeth Street
BRISBANE QLD 4000
GPO Box 115
BRISBANE QLD 4001
P +617 3113 5000
F +617 3113 5010
E brisbane@gta.com.au

Gold Coast

A Level 9, Corporate Centre 2
Box 37
1 Corporate Court
BUNDALL QLD 4217
P +617 5510 4800
F +617 5510 4814
E goldcoast@gta.com.au

www.gta.com.au

GTAconsultants