



45 Victor Street, Chatswood
Planning Proposal

transportation planning, design and delivery

45 Victor Street, Chatswood

Planning Proposal

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1. Introduction

1.1 Background

As GTA Consultants understands it, a planning proposal is to be lodged with Willoughby City Council for land currently occupied by Chatswood Post Office at 45 Victor Street, Chatswood. The planning proposal seeks to amend the following planning controls applying to the site:

- retain the B3 Commercial Core zone but add 'shop top housing' as an additional permitted use on the site under Schedule 1 of the LEP
- increase the maximum height limit from 12metres up to RL235 (approximately 42 levels plus plant room space)
- turn off the floor space ratio (FSR) control for the site.

Australia Post commissioned GTA Consultants to complete a transport impact overview considering the planning proposal and indicative site layout.

1.2 Purpose of this Report

This report sets out an assessment of the anticipated transport implications of the planning proposal, 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 planning proposal
- vi suitability of the proposed access arrangements for the site
- vii the transport impact of the planning proposal and indicative site layout on the surrounding road network.

1.3 References

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

- several inspections of the site and its surrounds
- Willoughby City Council Development Control Plan (DCP) 2006
- Willoughby City Council Local Environmental Plan (LEP) 2012
- Willoughby Bike Plan, prepared by PBAI Australia, September 2006
- relevant Australian Standards including, AS 2890.1:2004, AS 2890.2:2002 and AS 2890.6:2009
- traffic and car parking surveys undertaken by GTA Consultants as referenced in the context of this report
- indicative layout plans for the planning proposal issued by Australia Post, Drawing Number SK05
- other documents and data as referenced in this report.

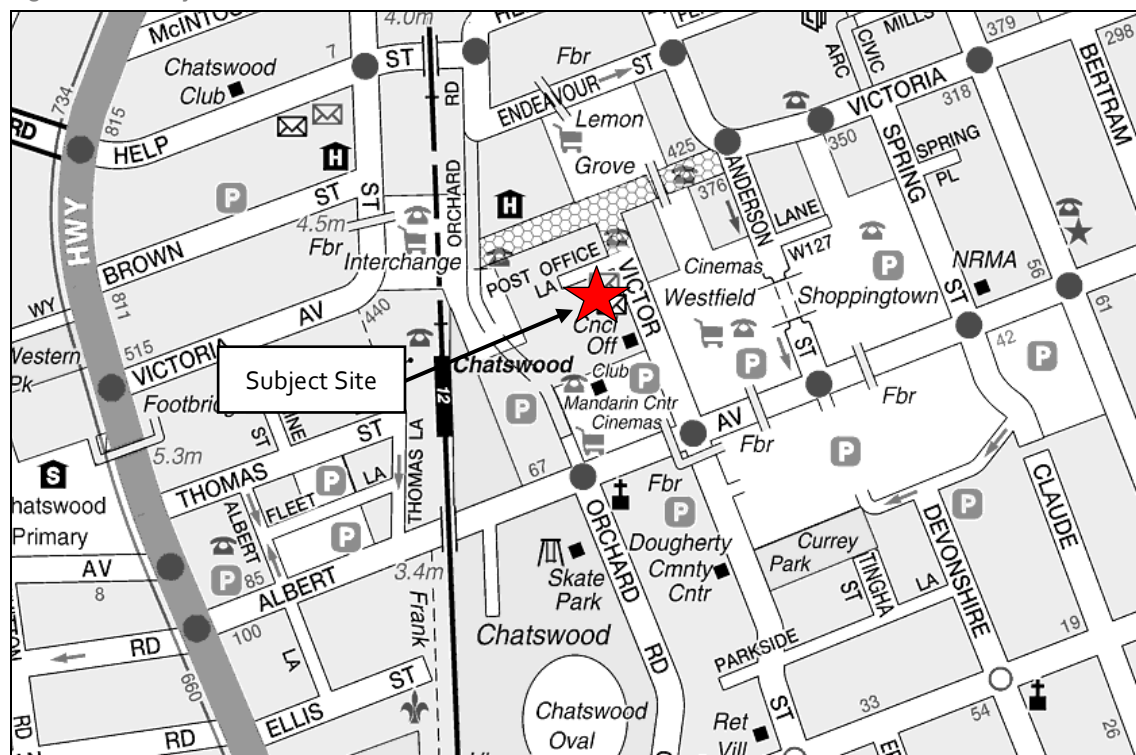
2. Existing Conditions

The subject site is located at 45 Victor Street, Chatswood. The site of approximately 980m² has a frontage of 26.8m to Victor Street and 36.6m to Post Office Lane and is currently occupied by Chatswood Post Office. Under Willoughby City Council LEP 2012 the site is classified 'B3 Commercial Core'.

The site is located within Chatswood CBD with surrounding properties including predominantly retail, commercial and high density residential uses. The pedestrian-only section of Victoria Avenue is located north of the site with Westfield Chatswood and The Mandarin Centre also located on Victor Street within in close proximity to the site. A number of residential properties are located on Victor Street, the largest of which is The Sebel Residence accommodating approximately 200 residential and serviced apartments. Willoughby City Council is also located within this building, south of the site.

The location of the subject site and its surrounding environs is shown in Figure 2.1.

Figure 2.1: Subject Site and Its Environs



Basemap source: UBD

2.1 Road Network

2.1.1 Adjoining Roads

Victor Street

Victor Street is a local road and in the vicinity of the site is aligned in a north-south direction. It is a two-way, no-through road with a 9 metre wide carriageway, set within a 13 metre wide road reserve (approx), configured with one lane in each direction. Traffic calming measures are located along the

length of Victor Street and include speed cushions. Kerbside parking is permitted on the western side of Victor Street, subject to time restrictions.

Victor Street is shown in Figure 2.2 and Figure 2.3 and carries approximately 4,000 vehicles per day¹.

Figure 2.2: Victor Street (looking south)



Figure 2.3: Victor Street (looking north)



Post Office Lane

Post Office Lane is a local road and in the vicinity of the site is aligned in an east-west direction. It is a two-way, no-through road with a 6 metre wide carriageway, set within an 8 metre wide road reserve (approx). Kerbside parking is permitted, subject to time restrictions, on the northern side of Post Office Lane.

Post Office Lane is shown in Figure 2.4.

Albert Avenue

Albert Avenue a local road and in the vicinity of the site is aligned in an east-west direction. It is a two-way road with a 15 metre wide carriageway, set within a 21 metre wide road reserve (approx), configured with two lanes in each direction. Kerbside parking is not permitted on Albert Avenue in the vicinity of the site.

Albert Avenue is shown in Figure 2.5 and carries approximately 12,000 vehicles per day¹.

Figure 2.4: Post Office Lane (looking west)



Figure 2.5: Albert Avenue (looking east)



¹ Based on the peak hour traffic counts undertaken by GTA August 2013 and assuming a peak-to-daily ratio of 10%.

2.1.2 Surrounding Intersections

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

- Victor Street/ Post Office Lane (unsignalised)
- Victor Street/ Albert Avenue (signalised).

2.2 Traffic Volumes

GTA Consultants undertook peak hour traffic movement counts on at the intersection of Victor Street and Albert Avenue on Thursday 15 August 2013 and Saturday 17 August 2013. The Thursday and Saturday peak hour traffic volumes are summarised in Figure 2.6 to Figure 2.8, with full results contained in Appendix A.

Figure 2.6: Existing Thursday AM Peak Hour Traffic Volumes

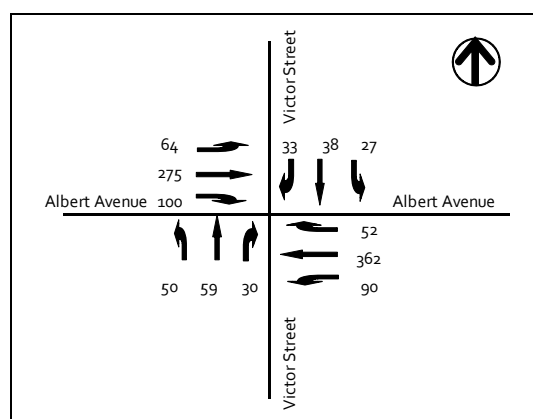


Figure 2.7: Existing Thursday PM Peak Hour Traffic Volumes

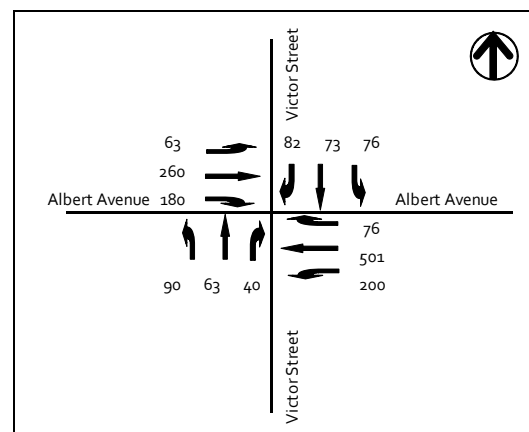
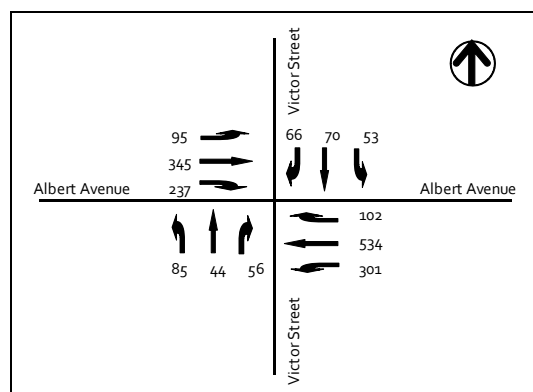


Figure 2.8: Existing Saturday Peak Hour Traffic Volumes



2.3 Intersection Operation

The operation of the key intersections within the study area have been assessed using SIDRA INTERSECTION², a computer based modelling package which calculates intersection performance.

The commonly used measure of intersection performance, as defined by the RMS, 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.

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

Table 2.2: Existing Operating Conditions (2013 Traffic Volumes)

Intersection	Peak	Leg	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)
Victor Street/ Albert Avenue	AM	Victor Street (South)	0.24	32	22	C
		Albert Avenue (East)	0.21	10	30	A
		Victor Street (North)	0.16	32	16	C
		Albert Avenue (West)	0.39	11	22	A
		Overall	0.39	15	30	B
	PM	Victor Street (South)	0.33	34	27	C
		Albert Avenue (East)	0.32	11	51	A
		Victor Street (North)	0.40	35	38	C
		Albert Avenue (West)	0.80	18	46	B
		Overall	0.80	19	51	B
	Sat	Victor Street (South)	0.33	35	26	C
		Albert Avenue (East)	0.39	12	64	A
		Victor Street (North)	0.32	34	31	C
		Albert Avenue (West)	1.00	15	46	B
		Overall	1.00	17	64	B

On the basis of the above assessment, the signalised intersection of Victor Street and Albert Avenue currently operates satisfactorily with minimal queues and delays on all approaches. It is noted that there is generally some congestion in the local area on Saturday's, largely as a result of queuing associated with the Pacific Highway to the west.

The right turn from Albert Avenue into Victor Street experiences some delay and queuing (beyond the length of the turn bay) however this approach still operates at a LOS B with a maximum queue of less than 50m.

GTA Consultants also observed the existing traffic generation of the Post Office during the AM and PM peak periods. A maximum of 7 vehicles accessed the site during the PM peak hour, comprising 5 Post Office employees exiting the site and 2 service vehicles. As such, the existing site traffic generation is thought to be less than 10 vehicles per hour.

2.4 Parking

GTA Consultants compiled an inventory of publicly available on-street parking along Victor Street and Post Office Lane. The inventory identified a total of six on-street car parking spaces, including three ¼P spaces, two disabled spaces and one '5 min' space, together with two motorcycle spaces.

Parking demand sample surveys were undertaken by GTA Consultants during the weekday AM and PM peak periods and indicate that the majority of Victor Street parking spaces are typically occupied, with little to no vacancies.

It is also noted that the site is located in close proximity to three publicly available off-street car parks as summarised in Table 2.3.

Table 2.3: Public Off-Street Parking Summary

Location	Distance to Site	Number of spaces (approx.)
Mandarin Centre	50m	300
Westfield Chatswood	200m	2,800
Chatswood Chase	550m	2,550
Total		5,650

The on-site car park is currently accessed via a 6m wide two-way access driveway from Post Office Lane along the northern boundary of the site, with vehicles also able to exit the site directly to Victor Street. This on-site parking area has capacity for five vehicles (reserved for Post Office staff), as well as a loading area for one service vehicle.

2.5 Public Transport

The subject site is well served by public transport services with Chatswood Transport Interchange located approximately 120m west of the site. Chatswood is considered a major node in the CityRail network having undergone a major redevelopment in recent years and is well served by the Northern, North Shore and Western Lines. The rail journey time between Chatswood and Town Hall is 23 minutes. Chatswood Interchange also functions as one of the main bus interchanges in the northern suburbs of Sydney.

A review of the rail and bus services available in the vicinity of the site are summarised in Table 2.4 and Table 2.5 with further details of bus services contained in Appendix C.

Table 2.4: Chatswood Interchange Rail Services

Route	Route Description	Frequency On/Off peak
Northern Line	Hornsby or Epping to the City	15 mins peak/ 20-30 mins off peak
North Shore Line	Berowra to Parramatta via City	3-5 mins peak/ 5-10 mins off peak
Western Line	Emu Plains or Richmond to Chatswood	3-5 mins peak/ 5-10 mins off peak

Table 2.5: Chatswood Interchange Bus Services

Route #	Route Description	Frequency On/Off peak
136/137	Chatswood to Manly, Dee Why & Mona Vale	15 mins peak/ 30 mins off peak
143/144	Chatswood to Manly	15 mins peak/ 15-20 mins off peak
200	Chatswood to Bondi Junction	15 mins, peak only
255/256	Chatswood to Chatswood West	30 mins, peak only
257/258	Chatswood to Balmoral/ Lane Cove Industrial	30 mins peak and off peak
267	Chatswood to Crows Nest	30 mins peak and off peak
273	Chatswood to City - Wynyard via Willoughby and North Sydney	10 mins peak/ 20-30 mins off peak
277/278/279	Chatswood to Castle Cove/ Killarney Heights/ Frenchs Forest	Hourly peak and off peak/ 20 mins peak only/ 3 services daily
280/281/283	Chatswood to Warringah Mall/ Davidson/ Belrose	15-30 mins peak/ hourly off peak
284	Chatswood to Duffys Forest via Frenchs Forest and Terrey Hills	10-30 mins peak/ hourly off-peak
533/534	Chatswood to Sydney Olympic Park via Mowbray Rd and Ryde	40 mins peak and off peak
536	Gladesville via Lane Cove and Hunters Hill	40 mins peak and off peak
545/550	Chatswood to Parramatta	15 mins peak and off peak
558	Chatswood to Lindfield	Hourly peak and off peak
565	Chatswood to Macquarie University via UTS Kuring-gai, Lindfield and West Lindfield	Hourly off peak
M40	Chatswood to Bondi Junction	10 mins peak/ 15 mins off peak
N90	Hornsby to Town Hall via Chatswood	30 mins, night only

The site is also located within close proximity to taxi services with the nearest designated taxi rank located on Victoria Avenue, 150m west of the site.

2.6 Pedestrian Infrastructure

Pedestrian paths are located as follows:

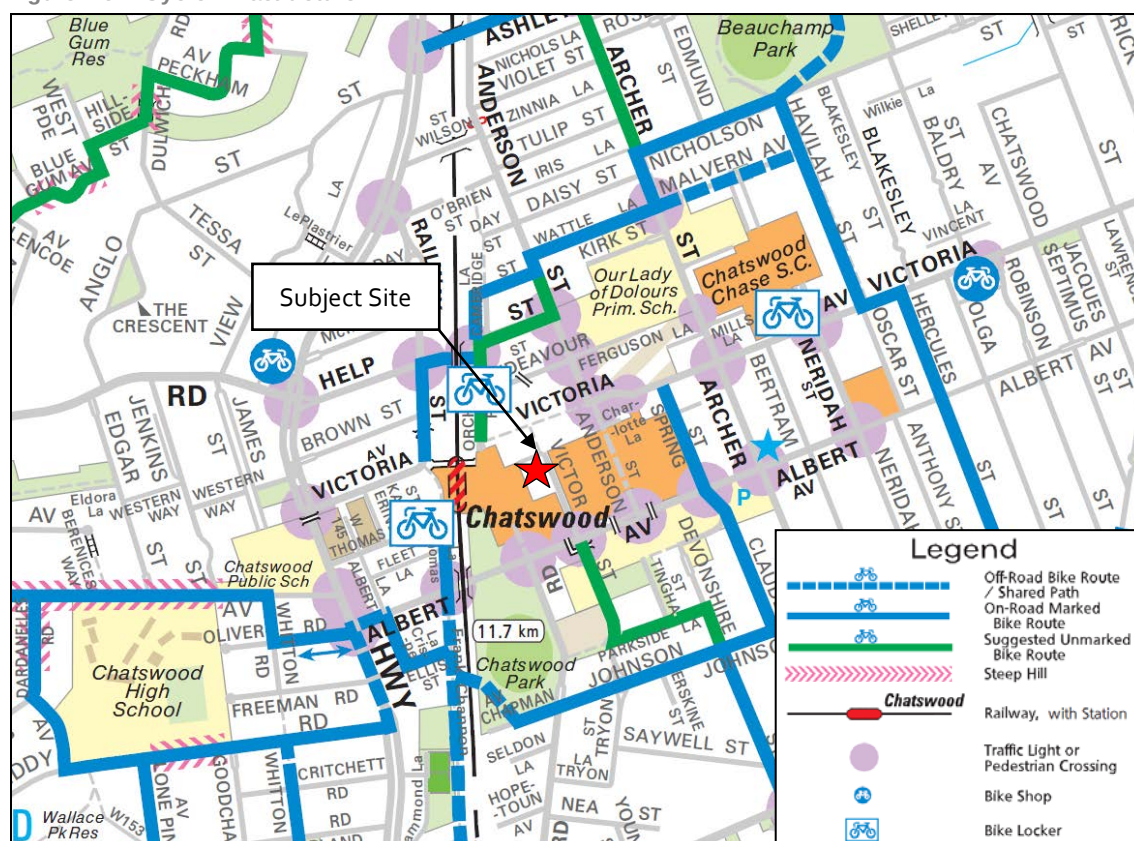
- Victor Street (both sides) – 3-4.5m wide path providing access to the pedestrianised section of Victoria Avenue, Westfield and Chatswood Interchange
- Post Office Lane (southern side) – 1.5m wide path
- Albert Avenue (both sides) – 2-3m wide path.

Safe crossing points in vicinity of the site include pedestrian crossings on all legs of the Victor Street/ Albert Avenue intersection. Generally, Chatswood CBD has well established pedestrian facilities with Victoria Avenue providing a mall at the northern end of Victor Street that provides convenient and safe access to/ from Chatswood Interchange and beyond.

2.7 Cycle Infrastructure

The subject site is located close to several established cycle routes. An extract of the Northern Sydney Cycling Map showing cycling infrastructure surrounding the subject site is shown in Figure 2.9.

Figure 2.9: Cycle Infrastructure



Source: Northern Sydney Cycling Map

End-of-trip facilities are available in close proximity to the site as follows:

- 4 cycle racks in Victor Street pedestrian area – 10m from site. (see Figure 2.10)
- 2 cycle racks on Victor Street – 50m from site (see Figure 2.11)
- 2 cycle racks on Albert Avenue – 70m from site

- cycle lockers at Chatswood Interchange – 120m from site.

The majority of these facilities are conveniently located and the high pedestrian activity offers good passive surveillance.

Figure 2.10: Victor Street Pedestrian Area Cycle Racks



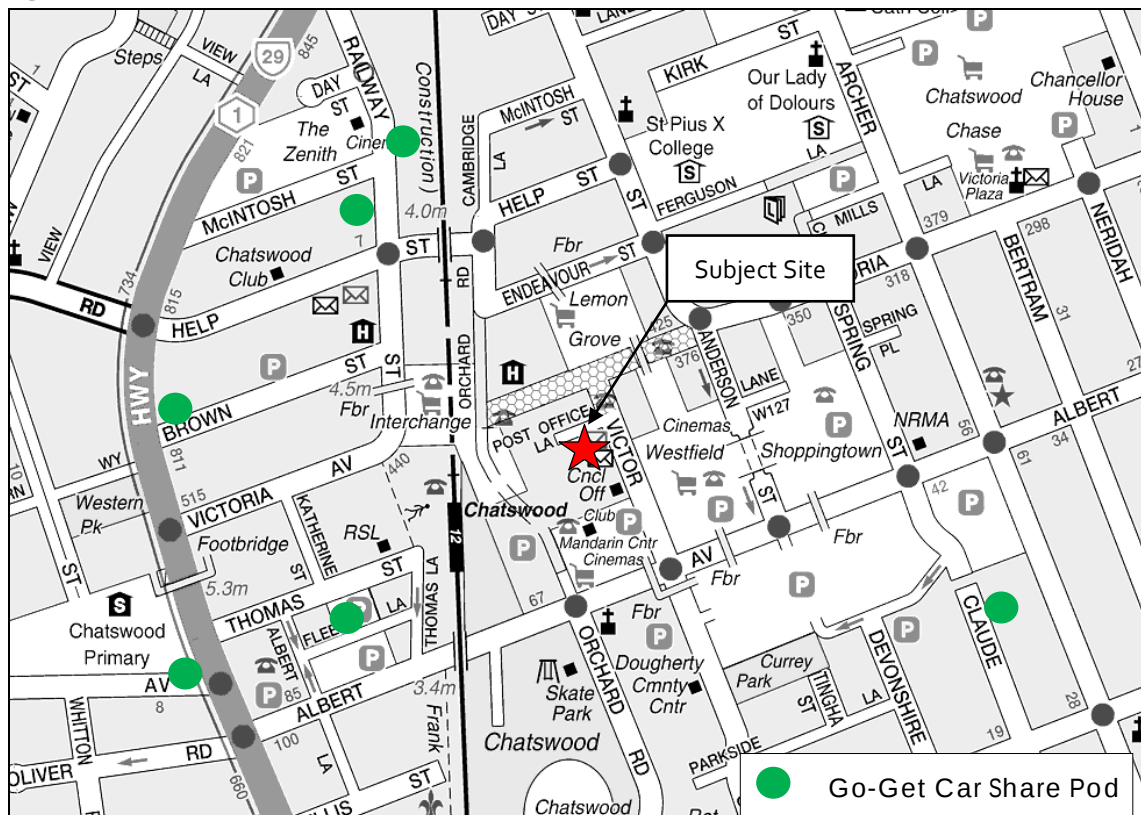
Figure 2.11: Victor Street Cycle Racks



2.8 Local Car Sharing Initiatives

Several Go-Get car sharing pods are located in the vicinity of the site as shown Figure 2.12.

Figure 2.12: Go-Get Car Share Locations



Basemap source: UBD

3. Planning Proposal

3.1 Land Uses

The planning proposal intends to amend the following planning controls applying to the site:

- retain the B3 Commercial Core zone but add 'shop top housing' as an additional permitted use on the site under Schedule 1 of the LEP
- increase the maximum height limit from 12 metres up to RL235 (approximately 42 levels plus plant room space)
- turn off the floor space ratio (FSR) control for the site.

The amended planning controls are being sought in order to construct a mixed use development incorporating commercial and residential uses to RL235 (approximately 42 levels plus plant). The planning proposal includes residential apartments set above a number of commercial levels with ground floor retail.

The indicative development schedule is summarised in Table 3.1.

Table 3.1: Planning Proposal Schedule (Indicative Only)

Use	Type	No./Size	Mix
Residential	Studio	90	30%
	1 bedroom	45	15%
	1 bedroom plus study	45	15%
	2 bedroom	72	24%
	3 bedroom	48	16%
	Subtotal	300	100%
Commercial	Retail	210sq.m	-
	Commercial (lower floors)	1,856sq.m	-
	Subtotal	2,066sq.m	-

It is noted that the existing Australia Post store that occupies the current retail floor area will be relocated to another site within Chatswood CBD.

3.2 Vehicle Access

It is proposed to provide two crossovers to the site from Post Office Lane, as follows:

- Loading Area: 20m west of Victor Street
- Car Park Access: 32m west of Victor Street.

The suitability of the proposed access arrangements is discussed in Section 4 of this report.

3.3 Car Parking

The planning proposal has an indicative maximum on-site car parking supply of 195 car parking spaces.

The suitability of the car parking provision and layout is discussed in Section 4 of this report.

3.4 Pedestrian Facilities

Pedestrian access to the residential and commercial uses would be via a lobby area along Victor Street frontage, with pedestrian access to the ground floor retail tenancy via Victor Street and/ or Post Office Lane.

The suitability of these pedestrian facilities is discussed in Section 5 of this report.

3.5 Bicycle Facilities

As this is a planning proposal the indicative layout plans do not contain details of bicycle facilities. Bicycle facilities will be covered in more detail during the Development Application stage.

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

3.6 Loading Areas

A ground floor loading area (with a turntable), is proposed to be accessed via Post Office Lane. The loading area would be capable of accommodating one service vehicle (up to an 8.8m medium rigid truck) at a time.

The suitability of these loading arrangements is discussed in Section 6 of this report.

4. Parking Assessment

4.1 Car Parking Requirements

The car parking requirements for different development types are set out in Willoughby DCP 2006. A review of the car parking rates and the floor area schedule results in a DCP parking requirement for the planning proposal as summarised in Table 4.1.

Table 4.1: DCP 2006 Car Parking Requirements

Description	DCP Parking Rate	No. of Dwellings/ NLA (m ²)	DCP Parking Requirement
Residential Flats within Railway Precincts	0.5 space/studio	90	44 spaces
	1 space/1 bedroom	90	90 spaces
	1 space/2 bedroom	72	72 spaces
	1 spaces/3 bedroom	48	48 spaces
	Subtotal	300	254 spaces
	1 space/4 dwellings (visitor parking)	300	75 spaces
Subtotal			329 spaces
Commercial Premises in Chatswood	1 space/200m ² (retail)	210	1 space
	1 space/200m ² (floors 1-4)	1,856	9 spaces
Total			339 spaces

Note: where the parking spaces required is not a whole number, DCP 2006 states that the number of spaces required is to be rounded down to the nearest whole number.

Table 4.1 indicates that the planning proposal is theoretically required to provide up to 339 car parking spaces. It is noted that the DCP 2006 parking rates are neither minimum nor maximum rates and any departure from these rates requires justification.

4.2 Council Decision Criteria Assessment

DCP 2006 contains a list of criteria against which development applications are assessed when considering any departures from the DCP car parking rates, and detailed as follows:

- the size and nature of the development, amount of additional floor area relative to the existing floor area and the parking demand generated
- whether a Green Travel Plan has been provided
- encouraging less use of motor vehicles, especially those developments close to railway stations and major public transport routes
- availability and accessibility of other public parking
- accessibility of public transport and the probable transport mode of users
- proximity to bicycle routes
- existing and likely future traffic volumes on the surrounding road network and the nature of this network
- the environmental implications of providing parking with particular regard to vegetation and landscape impacts
- results of a parking survey submitted to Council to justify demand for the proposed use
- the impact of not providing the parking.

The abovementioned decision guidelines relevant to the planning proposal have been considered and discussed below.

4.2.1 Green Travel Plan

Green Travel Plans have also proven to be a successful way of changing travel behaviour for a number of employers throughout Australia and overseas. A Green Travel Plan is a way in which a development is able to manage the transport needs of staff and visitors. 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.

4.2.2 Reduction in Motor Vehicle Usage

Encouraging the use of public transport and walking and cycling as modes of transport is central to reducing motor vehicle usage. The site is easily accessible by public transport and is within the Chatswood CBD. There are some existing and proposed on/off-road cycle lanes along the nearby major roads that can service the site. End of trip cycle facilities would be provided.

The proposed development is a prime opportunity to promote this vision by encouraging the use of public transport, cycling, and walking and not encouraging an abundance of car parking within this area, and in turn an over use of motor vehicles.

4.2.3 Car Parking Availability

In addition, and as discussed in Section 2, the site is located within close proximity to three off-street public car parks; Westfield Chatswood, The Mandarin Centre and Chatswood Chase. These car parks have a capacity in excess of 5,500 car spaces all within an easy walking distance of the site. These car parks have the potential to accommodate additional visitor parking associated with the future site uses, with The Mandarin Centre also open to at least 12:30am every day.

It is worth noting that ease and availability of public parking is something that is generally not expected in a CBD environment. Visitors to Chatswood are therefore encouraged to seek alternative modes of travel based on a general expectation that on-site parking is not readily available, albeit with knowledge of the surrounding public car parks. Education and information about the services of the other modes is also provided through the use of a Green Travel Plan.

4.2.4 Public Transport Availability

The site is located within 120m, or 3 minutes walk of Chatswood Interchange which provides access to high frequency bus and train services. As such, the provision of reduced on-site car parking will encourage residents, staff and visitors to use public transport instead of private motor vehicles. This is in-line with the overall objectives of DCP 2006 to “encourage the use of public transport in areas close to transport nodes”³.

This level of public transport accessibility will support a zero level of car ownership on the subject land.

³ Willoughby City Council DCP 2006, p. C32

4.2.5 Impacts of not Providing Parking

It is noted that as a result of not providing on-site car parking for residents, they will be required to use alternate transport modes such as public transport, cycling and walking. The surrounding on-street car parking facilities in the vicinity of the site are time restricted and as such, residents of the development will not be able to utilise these spaces for long-term parking.

4.3 Other Considerations

4.3.1 ABS Data (Car ownership Rates)

In order to assess the likely car ownership of the future residents or more specifically the recognition of zero car ownership, reference is made to the 2006 and 2011 Census undertaken by the Australian Bureau of Statistics (ABS). The Census collected data on the car ownership levels associated with a variety of dwelling types and in this instance GTA have reviewed the data to provide a summary of existing car ownership levels of studio, 1 and 2 bedroom apartments (for developments of four or more storeys) in Chatswood and Chatswood West (Postcode: 2067).

The recorded "zero" car ownership rates for studio, one, two and three bedroom apartments within the three areas described above are illustrated in Figure 4.1.

Figure 4.1: Percentage of Zero Car Ownership in Chatswood and Chatswood West (Postcode: 2067)

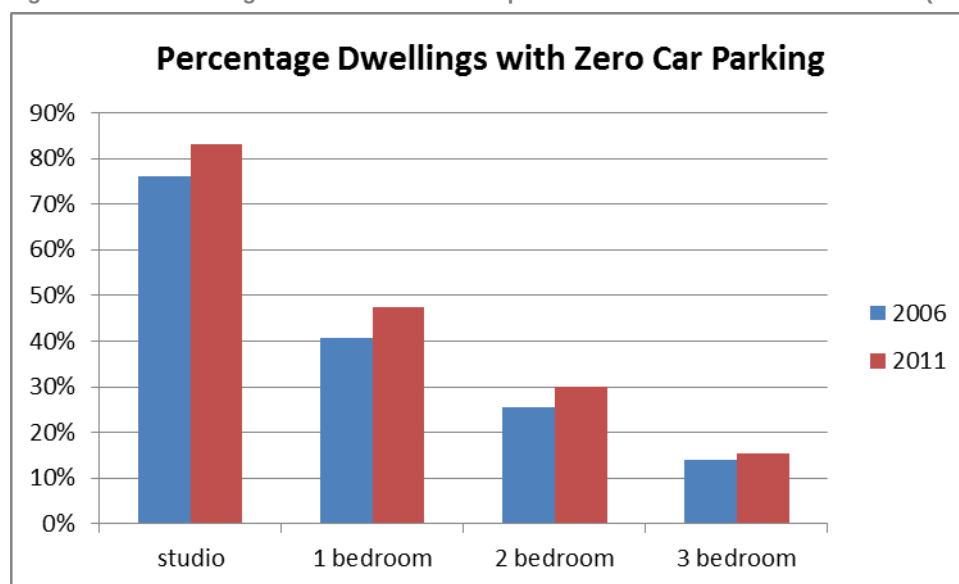


Figure 4.1 indicates that there are a substantial number of households which do not own a car in the studio, one and two bedroom classifications and to a lesser extent three bedroom household classifications. Indeed there is currently some 83% (79 of 95 dwellings), 47% (416 of 876) and 30% (490 of 1,634) studio, one and two bedroom households within the suburbs of Chatswood and Chatswood West that do not exhibit any level of car ownership (2011 census). The data also indicates that the proportion of households in the study area that do not own a car has consistently increased across all dwelling types since the 2006 census (745 to 1,091).

The study area subject to this review exhibits higher levels of “zero” ownership against than the Metropolitan Sydney average. This outcome is most likely influenced by Chatswood’s proximity to public transport and the high density nature of the Chatswood CBD and surrounds.

4.3.2 RMS Guidance

Reference to the RMS ‘*Guide to Traffic Generating Developments*’ (2002) indicates the following resident car parking rates for high density residential uses in Metropolitan Regional (CBD) Centres:

- 0.4 spaces per 1 bedroom unit.
- 0.7 spaces per 2 bedroom unit.
- 1.20 spaces per 3 bedroom unit.

Application of these rates to the proposed development yield indicates a resident car parking provision of 180 spaces.

4.4 Adequacy of Parking Supply

4.4.1 Overall

A comparison of the DCP parking requirement and the indicative on-site car parking supply is summarised in Table 4.2.

Table 4.2: On-Site Car Parking Comparison

Use	DCP 2006 Parking Requirement	Indicative Maximum Parking Supply
Residential (resident)	254	185
Residential (visitor)	75	0
Commercial (including Retail)	10	10
Total	339	195

Table 4.2 indicates a car parking shortfall of approximately 144 spaces between the DCP parking requirement of 339 spaces and the proposed parking provision of 195 spaces.

4.4.2 Residential (Residents)

It is proposed to provide a maximum resident car parking provision (185 spaces) is generally in accordance with the RMS rates summarised above. The proposed provision of less than one space per studio, one and two bedroom apartments (i.e. some apartments not being allocated a space) is consistent with the ABS data presented above which indicates that 83% of studio, 47% of one bedroom and 30% of two bedroom apartment residents do not own a car. Furthermore the data indicates that the number of residents not owning a car has increased since the 2006 census. As such, the proposed development will cater for an emerging social demographic which does not require ownership of a private motor vehicle. Accordingly, the development will deliver an increase and variety in available housing stock located in Chatswood. This product, by virtue of its reduced infrastructure delivery cost, appeals more pointedly to an affordable housing subset, which in its own right draws many parallels with numerous other policy guidelines. The availability of multiple nearby car sharing pods will further cater for the occasional vehicle needs of these residents.

The provision of car parking for the three bedroom apartments (1.2 spaces per dwellings) exceeds the DCP parking requirement (1 space per dwelling).

4.4.3 Residential (Visitors)

Setting aside likely demands of residents, it can be conservatively expected that residential visitors will generate some level of car parking. However, it is anticipated that the majority of visitors will utilise public transport services operating out of Chatswood Interchange. Given that it is intended that the proposed residential dwellings be geared towards households that do not own a car, it is most likely that a high proportion of visitors to these occupants will exhibit similar characteristics. Furthermore, visitors to Chatswood CBD generally do not expect car parking to be provided at the “front door” of all uses.

Notwithstanding, it is anticipated that any visitor car parking demands could be accommodated within the surrounding pool of on and off-street car parking facilities, noting the provision of 5,500 off-street car parking spaces within walking distance of the site.

4.4.4 Commercial

The planning proposal includes the provision of 10 parking spaces consistent with the DCP requirements for the non-residential uses.

It is noted that the existing Australia Post store will be relocated to another site within Chatswood CBD. As a result the existing on-street customer car parking demands associated with the Australia Post store will no longer be generated in the immediate vicinity of the site.

4.4.5 Summary

The indicative plans include a total of 195 car parking spaces and is therefore not in strict compliance with DCP 2006. As discussed above, the proposed residential car parking provisions, as well as the visitor parking, do not meet the DCP requirement. This provision is, however considered appropriate given the site’s location with convenient access to high frequency public transport, car share facilities and off-street parking facilities, together with on-site parking being in accordance with Willoughby City Council’s objective to reduce traffic generation in Chatswood CBD and promote the use of public transport. As such, the indicative maximum provision of 195 car parking spaces is considered to be appropriate.

4.5 Motorcycle Parking

DCP 2006 requires motorcycle parking to be provided at the rate of one space per 25 car parking spaces. Given the car parking requirements outlined above, the planning proposal is required to provide eight motorcycle parking spaces on-site. However, due to the proximity to regular public transport services operating out of Chatswood Interchange, it is proposed to provide one on-site motorcycle space.

4.6 Bicycle Parking

DCP 2006 contains a guide to bicycle parking facilities for different types of developments as summarised in Table 4.3.

Table 4.3: DCP 2006 Bicycle Parking Guide

Description	Suggested Parking Rate		No. of Dwellings/ NLA (m ²)	Suggested Parking Provision	
	Bicycle Lockers	Bicycle Rails		Bicycle Lockers	Bicycle Rails
Residential	1 per 10 units	1 per 12 units	300 dwellings	30	25
Commercial	1 per 600m ²	1 per 2,500m ²	2,066m ²	3	1
Total				33	26

Based on the above, DCP 2006 suggests that the planning proposal incorporate 30 bicycle lockers for residents. It is proposed to provide a combined area for visitors and employees of 23 spaces as they will have different demands for the spaces and utilise them at varying times of the day.

The 33 bicycle lockers could be accommodated as bicycle racks within a secure cage facility to improve space efficiency and usage.

4.7 Car Parking Layout Review

The car park layout and site access provisions should be designed in accordance with the requirements of the Willoughby City Council's DCP 2006 and the Australian Standard for Off Street Car Parking (AS2890.1:2004 and AS2890.6:2009).

5. Sustainable Transport Infrastructure

This chapter discusses potential for further measures that could encourage alternative means of travel to the private car and encourage the use of more environmentally sustainable forms of travel.

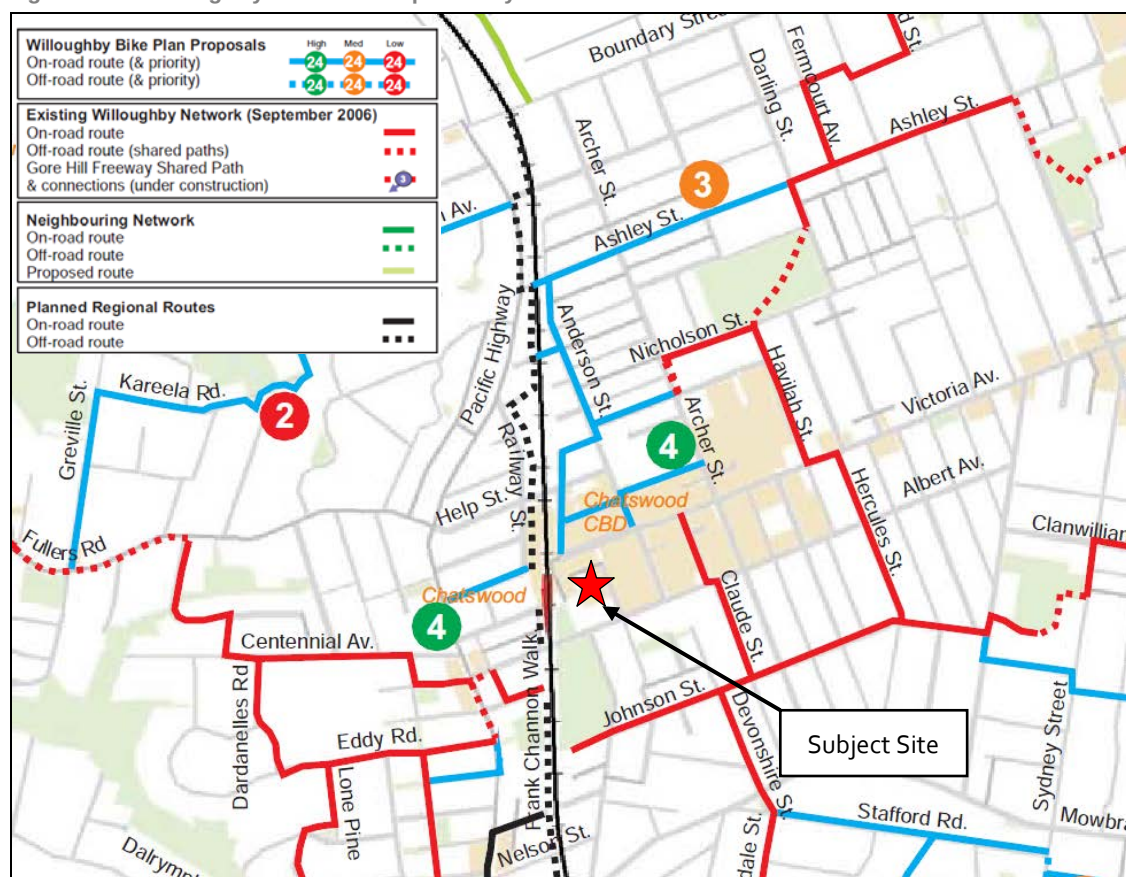
5.1 Cycle Network

Willoughby Bike Plan (2006) identified and prioritised 27 proposed cycle routes to be implemented in Willoughby LGA including the following two on-road routes in Chatswood CBD:

- Anderson Street and Ashley Street Bike Route (Route 3, medium priority)
- Chatswood CBD Access Bike Routes (Route 4, high priority).

These proposed cycle routes will improve cycling accessibility in and around Chatswood CBD and are shown in Figure 5.1.

Figure 5.1: Willoughby Bike Plan Proposed Cycle Routes



Source: Willoughby Bike Plan (2006)

5.2 Bicycle End of Trip Facilities

DCP 2006 contains general requirements for bicycle parking as follows:

- i enable wheels and frame to be locked to the device without damaging the bicycle
- ii be placed in public view and well lit for security purposes
- iii be in a convenient and accessible location outside pedestrian and vehicular movement paths
- iv be protected from the weather.

DCP 2006 requires that the design of bicycle parking facilities be in accordance with AS2890.3. It is anticipated that shower and change facilities will be provided within individual commercial tenancies.

Bicycle lockers are intended for use by residents and therefore should be included within the secure areas of the building noting that where security devices are provided for resident car parking, these are acceptable and can replace bike lockers. Bicycle rails are intended for use by visitors/ employees and as such need to be located in publicly accessible areas within close proximity to the site.

5.3 Pedestrian Network

The site is well connected to the existing pedestrian network with pedestrian paths provided on both sides of the roads in the immediate vicinity of the site. The site is located adjacent to Victoria Avenue pedestrian mall, an area of high pedestrian activity which provides access to key destinations within Chatswood CBD such as Chatswood Transport Interchange.

5.4 Public Transport

As discussed previously, the site is easily accessible by public transport with Chatswood Interchange located 120m west. The proximity to public transport will increase the use of public transport by residents and employees and discourage the use of private motor vehicles.

6. Loading Facilities

6.1 Loading Requirements

The loading requirements for different development types are contained in DCP 2006, noting that residential developments in excess of 12 apartments are to provide for removalist trucks to park, load and unload on-site.

6.2 Loading Arrangements

A loading area is possible on the ground level with access provided via a proposed crossover to Post Office Lane. The loading dock, including the provision of a turntable, would be designed to cater for vehicles up to 8.8m service vehicles and allow them to enter and exit in a forward direction.

7. Traffic Impact Assessment

7.1 Traffic Generation

7.1.1 Design Rates

Traffic generation estimates for the planning proposal have been sourced from the RMS *Guide to Traffic Generating Developments* (2002). Estimates of peak hour and daily traffic volumes resulting from the proposal are set out in Table 7.1.

Table 7.1: Estimated Traffic Generation

Land Use	Peak Hour Traffic Generation Rates	Peak Hour Traffic Generation Estimates (vehicles)
Residential (185 car spaces)	0.24 vehicle movements/ space	44 vehicle movements/ hour
Commercial (10 spaces)	1 vehicle movement/ space	10 vehicle movements/ hour
Total		54 vehicle movements/ hour

Table 7.1 indicates the site could generate up to 54 vehicle movements during a typical weekday peak hour. Given the existing traffic generation of the site, the planning proposal can be expected to generate approximately 49 additional vehicle movements⁴ during a typical weekday peak hour.

Whilst not assessed, traffic associated with the existing on-street car parking demand for the Australia Post store will no longer be attracted to the immediate surrounds and would likely result in a further reduction in traffic accessing Victor Street.

The above traffic generation rates are based on the maximum proposed number of residential car spaces (185 spaces) while adopting the RMS Guide generation rates for a Metropolitan Regional (CBD) location, in combination with 10 commercial spaces.

The RMS Technical Direction, published in May 2013, has been released to update the traffic generation rates as detailed in the *Guide to Traffic Generating Developments* (RMS, 2002). High density residential flat dwellings return an average weekday AM and PM peak hour generation rate of 0.19 and 0.15 vehicle movements per apartment respectively. This equates to 0.15 and 0.12 vehicle movements per car space. Application of these rates results in a peak hour traffic generation as follows:

- 45-57 vehicle movements based on the number of apartments
- 22-28 vehicle movements based on the number of car spaces (assuming 185 spaces).

Clearly the RMS Technical Direction is also reflective of current generation rates for such developments in Metropolitan Regional (CBD) locations. The traffic generation rates adopted for this assessment are an appropriate balance of the above estimates.

⁴ Based on an existing traffic generation of 5 peak hour vehicle movements to/from the site.

7.2 Distribution and Assignment

In order to present a conservative assessment, GTA Consultants has assessed the traffic generation rates as per the RMS Guide. The directional distribution and assignment of traffic generated by the planning proposal 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 likely distribution of employee's residences in relation to the site
- vi configuration of access points to the site.

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

- Albert Avenue (east) – 40%
- Victor Street (south) – 20%
- Albert Avenue (west) – 40%.

In addition, the directional split of traffic (i.e. the ratio between the inbound and outbound traffic movements) has been assumed to be a commercial inbound and residential outbound in the morning peak period and a corresponding reversal in the evening peak with an even split on a Saturday.

This results in a directional split during the respective peak periods as shown in Table 7.2.

Table 7.2: Increase in Traffic Generation

Peak Period	Land Use	Inbound	Outbound
Thu AM	Residential	20% (9 vehicles)	80% (35 vehicles)
	Commercial	80% (4 vehicles)	20% (1 vehicles)
	Total	13 vehicles	36 vehicles
Thu PM	Residential	80% (35 vehicles)	20% (9 vehicles)
	Commercial	20% (1 vehicles)	80% (4 vehicles)
	Total	36 vehicles	13 vehicles
Sat Midday	Residential	50% (22 vehicles)	50% (22 vehicles)
	Commercial	50% (3 vehicles)	50% (2 vehicles)
	Total	25 vehicles	24 vehicles

Based on the above, Figure 7.1 to Figure 7.3 have been prepared to show the estimated marginal increase in turning movements in the vicinity of the site assuming planning approvals.

Figure 7.1: Existing Thursday AM Peak Hour Traffic Volumes plus Development Traffic

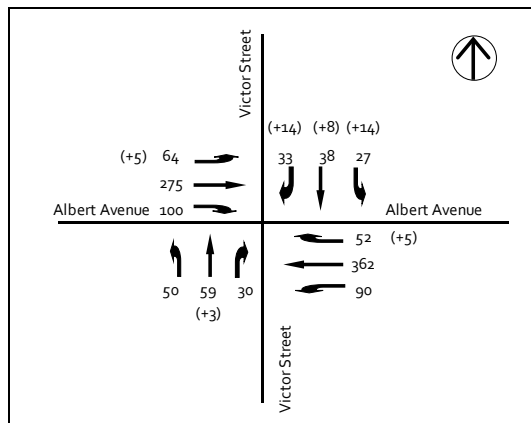


Figure 7.2: Existing Thursday PM Peak Hour Traffic Volumes plus Development Traffic

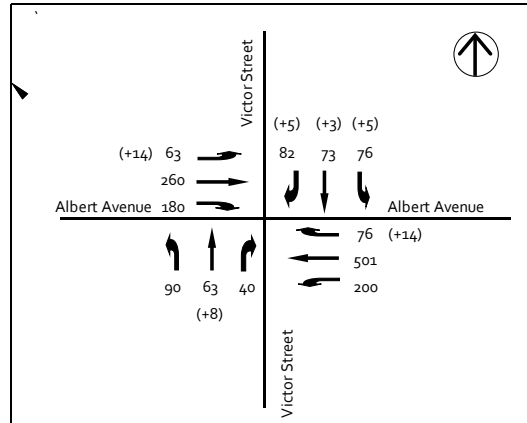
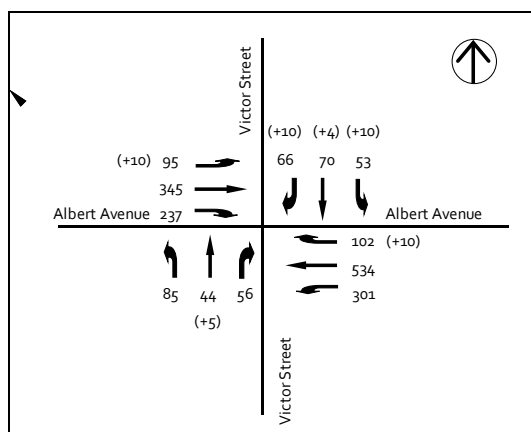


Figure 7.3: Existing Saturday Midday Peak Hour Traffic Volumes plus Development Traffic



7.3 Traffic Impact

An assessment of the impacts that future traffic would have on the surrounding road network can be made by comparing intersection performance prior to and following full site development assuming planning approvals.

The impact of this additional traffic on the intersections in the vicinity of the site has been assessed using SIDRA INTERSECTION. Table 7.3 presents a summary of the anticipated future operation of the intersections following the development of the site under the proposed planning controls with full results included in Appendix B.

Table 7.3: Future Operating Conditions

Intersection	Peak	Leg	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)
Victor Street/ Albert Avenue	Week day AM	Victor Street (South)	0.26	32	23	C
		Albert Avenue (East)	0.21	10	30	A
		Victor Street (North)	0.23	33	21	C
		Albert Avenue (West)	0.39	11	22	A
		Overall	0.39	15	30	B
	Week day PM	Victor Street (South)	0.36	34	30	C
		Albert Avenue (East)	0.32	11	51	A
		Victor Street (North)	0.44	36	40	C
		Albert Avenue (West)	0.80	18	46	B
		Overall	0.80	19	51	B
	Sat Lunch	Victor Street (South)	0.36	35	28	C
		Albert Avenue (East)	0.39	12	64	A
		Victor Street (North)	0.38	35	35	C
		Albert Avenue (West)	1.00	15	46	B
		Overall	1.00	18	64	B

Against existing traffic volumes in the vicinity of the site, the additional traffic generated by the planning proposal could not be expected to compromise the safety or function of the surrounding road network. Overall, the intersection would continue to operate at the same levels of service when compared with existing conditions.

On the basis of the above assessment, it is clear that the development of the site would have a negligible impact on the operation of the intersection of Victor Street and Albert Avenue with the intersection remaining at LOS B, which is described as a 'good' level of service.

8. Conclusion

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

- i A planning proposal is to be lodged with Willoughby City Council for the land currently occupied by Chatswood Post Office at 45 Victor Street, Chatswood. The planning proposal seeks to retain the B3 Commercial Core zone but add 'shop top housing' as a permissible use under Schedule 1 of Willoughby LEP 2012 consistent with surrounding sites.
- ii The amended planning controls are being sought with a view to provision for a mixed use development to RL 235 (approximately 42 levels plus plant) containing 300 residential apartments above 1,856sq.m commercial land uses and a 210sq.m ground floor retail tenancy.
- iii The planning proposal includes an indicative maximum on-site car parking provision of 195 car parking spaces.
- iv The indicative proposal generates a DCP parking requirement of 339 car parking spaces.
- v Given the proximity to Chatswood Transport Interchange and surrounding off-street parking facilities, reduced residential visitor parking provision is appropriate.
- vi Given that Australia Post will be relocating to another site in Chatswood CBD, traffic volumes and parking demand will no longer be attracted to the immediate surrounds and would likely result in a further reduction in traffic accessing Victor Street.
- vii The proposed car parking supply is below the DCP 2006 requirement and is considered to be appropriate having regard to several data sources, including ABS car ownership data, RMS Technical Direction and The Guide especially given the CBD location and proximity to high frequency public transport services.
- viii Based on the RMS Guide, the site would be expected to generate in the order of 54 vehicle movements (including 49 additional movements) during a typical weekday and weekend peak hour.
- ix SIDRA INTERSECTION analysis indicates that there is adequate capacity in the surrounding road network to cater for the traffic generated by the planning proposal, with the intersection of Victor Street and Albert Avenue operating satisfactorily into the future.

Appendix A

Survey Results

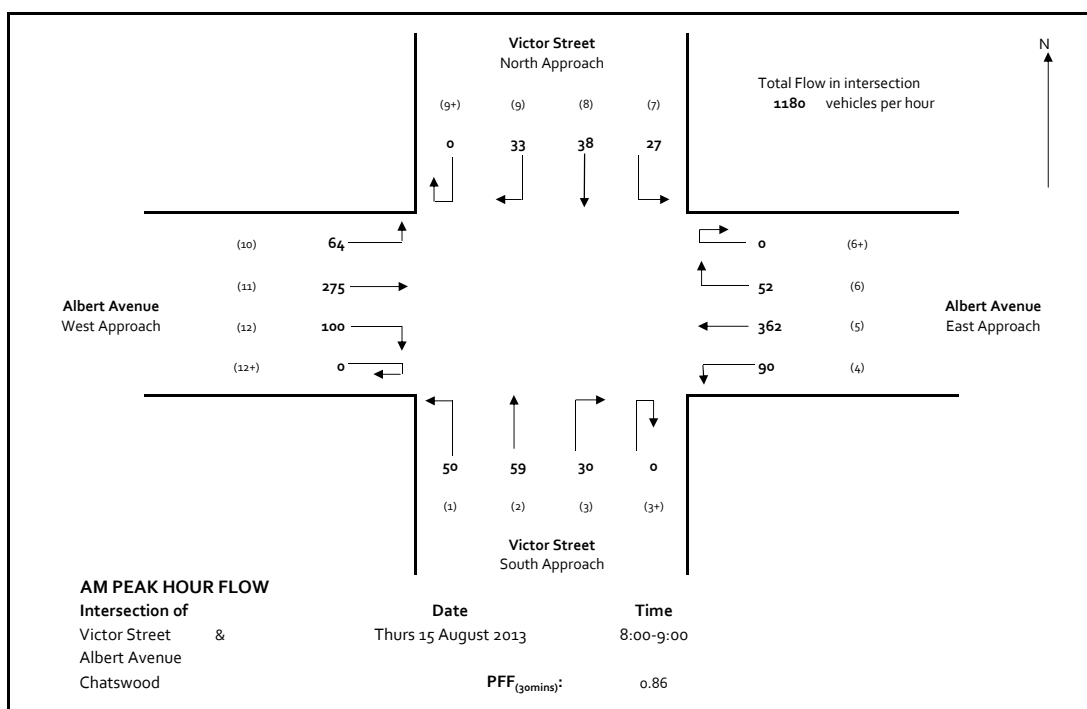
TURNING MOVEMENT SURVEY

Victor Street Albert Avenue Chatswood

Date: Thurs 15 August 2013

15 minute Data																
Time	Movement															
	Victor Street South Approach				Albert Avenue East Approach				Victor Street North Approach				Albert Avenue West Approach			
	Left 1	Through 2	Right 3	U Turn 3+	Left 4	Through 5	Right 6	U Turn 6+	Left 7	Through 8	Right 9	U Turn 9+	Left 10	Through 11	Right 12	U Turn 12+
6:00-6:15																
6:15-6:30																
6:30-6:45																
6:45-7:00																
7:00-7:15	3	1	2	0	4	24	3	0	1	1	3	0	3	20	4	0
7:15-7:30	5	8	6	0	9	65	7	0	4	5	7	0	14	65	16	0
7:30-7:45	2	4	5	0	8	73	10	0	10	9	6	0	8	53	20	0
7:45-8:00	7	4	8	0	9	68	8	0	4	5	5	0	14	51	9	0
8:00-8:15	3	12	5	0	18	85	12	0	7	8	10	0	12	60	17	0
8:15-8:30	10	15	9	0	20	75	13	0	5	4	5	0	11	55	19	0
8:30-8:45	19	19	5	0	26	118	18	0	10	12	11	0	27	79	35	0
8:45-9:00	18	13	11	0	26	84	9	0	5	14	7	0	14	81	29	0
9:00-9:15																
9:15-9:30																
9:30-9:45																
9:45-10:00																
Total	67	76	51	0	120	592	80	0	46	58	54	0	103	464	149	0

Hourly flows																
Time	Movement															
	Victor Street South Approach				Albert Avenue East Approach				Victor Street North Approach				Albert Avenue West Approach			
	Left 1	Through 2	Right 3	U Turn 3+	Left 4	Through 5	Right 6	U Turn 6+	Left 7	Through 8	Right 9	U Turn 9+	Left 10	Through 11	Right 12	U Turn 12+
6:00-7:00																
6:15-7:15																
6:30-7:30																
6:45-7:45																
7:00-8:00	17	17	21	0	30	230	28	0	19	20	21	0	39	189	49	0
7:15-8:15	17	28	24	0	44	291	37	0	25	27	28	0	48	229	62	0
7:30-8:30	22	35	27	0	55	301	43	0	26	26	26	0	45	219	65	0
7:45-8:45	39	50	27	0	73	346	51	0	26	29	31	0	64	245	80	0
8:00-9:00	50	59	30	0	90	362	52	0	27	38	33	0	64	275	100	0
8:15-9:15																
8:30-9:30																
8:45-9:45																
9:00-10:00																
Peak Hour	50	59	30	0	90	362	52	0	27	38	33	0	64	275	100	0



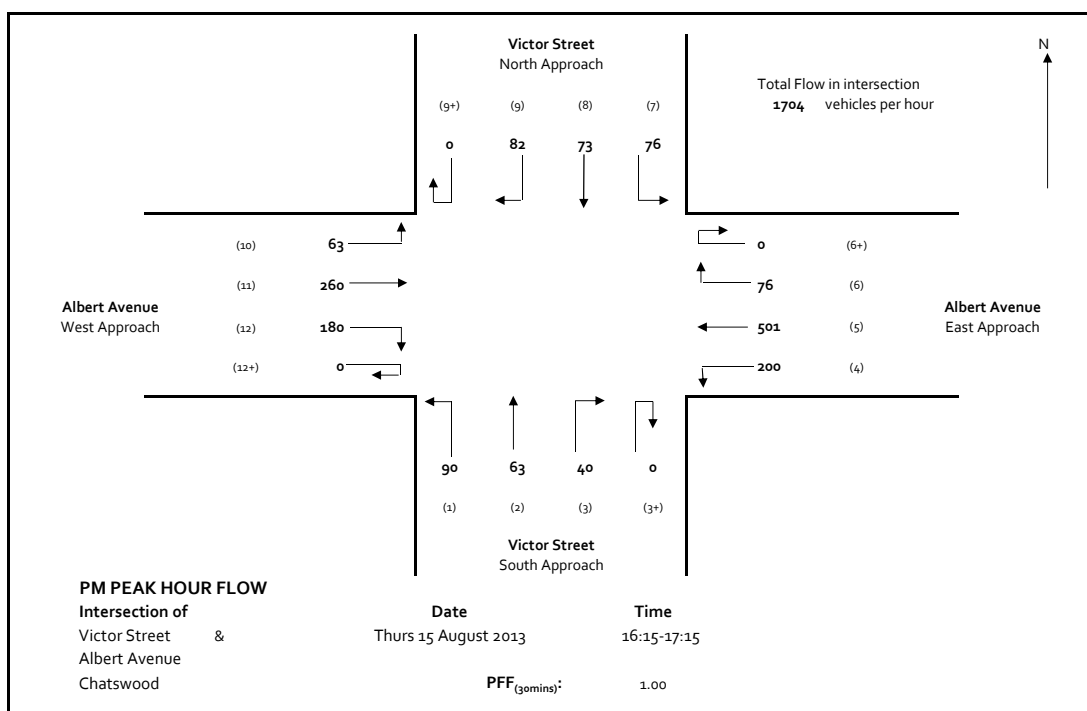
TURNING MOVEMENT SURVEY

Victor Street Albert Avenue Chatswood

Date: Thurs 15 August 2013

15 minute Data																	
Time	Movement																Total
	Victor Street South Approach				Albert Avenue East Approach				Victor Street North Approach				Albert Avenue West Approach				
	Left	Through	Right	U Turn	Left	Through	Right	U Turn	Left	Through	Right	U Turn	Left	Through	Right	U Turn	
	1	2	3	3+	4	5	6	6+	7	8	9	9+	10	11	12	12+	
15:00-15:15																	
15:15-15:30																	
15:30-15:45																	
15:45-16:00																	
16:00-16:15	18	38	12	0	42	108	22	0	15	24	20	0	10	46	45	0	400
16:15-16:30	21	26	10	0	47	122	22	0	12	23	22	0	11	55	56	0	427
16:30-16:45	33	24	13	0	46	132	15	0	18	18	26	0	10	54	38	0	427
16:45-17:00	19	7	9	0	49	121	18	0	18	15	15	0	17	64	40	0	392
17:00-17:15	17	6	8	0	58	126	21	0	28	17	19	0	25	87	46	0	458
17:15-17:30	33	14	8	0	43	130	16	0	22	21	13	0	19	40	41	0	400
17:30-17:45	21	8	12	0	37	124	19	0	22	10	12	0	20	62	52	0	399
17:45-18:00	19	10	9	0	35	128	32	0	12	12	18	0	17	81	42	0	415
18:00-18:15																	
18:15-18:30																	
18:30-18:45																	
18:45-19:00																	
Total	181	133	81	0	357	991	165	0	147	140	145	0	129	489	360	0	3318

Hourly flows																	
Time	Movement																Total
	Victor Street South Approach				Albert Avenue East Approach				Victor Street North Approach				Albert Avenue West Approach				
	Left 1	Through 2	Right 3	U Turn 3+	Left 4	Through 5	Right 6	U Turn 6+	Left 7	Through 8	Right 9	U Turn 9+	Left 10	Through 11	Right 12	U Turn 12+	
15:00-16:00																	
15:15-16:15																	
15:30-16:30																	
15:45-16:45																	
16:00-17:00	91	95	44	0	184	483	77	0	63	80	83	0	48	219	179	0	1646
16:15-17:15	90	63	40	0	200	501	76	0	76	73	82	0	63	260	180	0	1704
16:30-17:30	102	51	38	0	196	509	70	0	86	71	73	0	71	245	165	0	1677
16:45-17:45	90	35	37	0	187	501	74	0	90	63	59	0	81	253	179	0	1649
17:00-18:00	90	38	37	0	173	508	88	0	84	60	62	0	81	270	181	0	1672
17:15-18:15																	
17:30-18:30																	
17:45-18:45																	
18:00-19:00																	
Peak Hour	90	63	40	0	200	501	76	0	76	73	82	0	63	260	180	0	1704



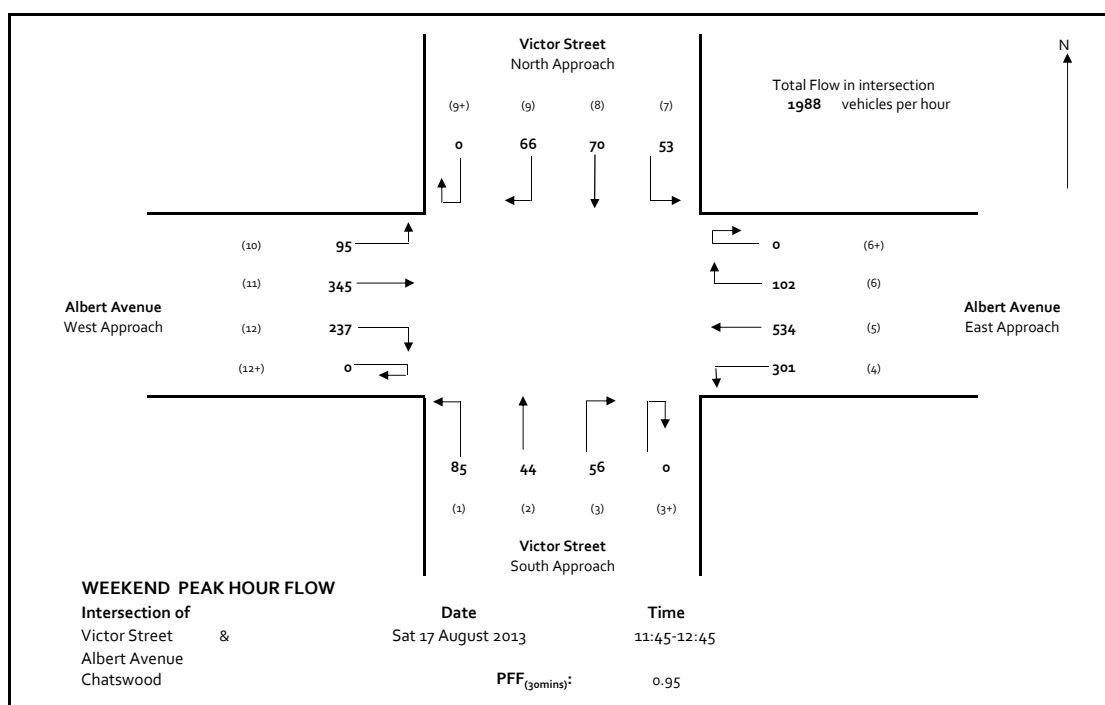
TURNING MOVEMENT SURVEY

Intersection of Victor Street & Albert Avenue, Chatswood

Date: Sat 17 August 2013

15 minute Data																
Time	Movement															
	Victor Street South Approach				Albert Avenue East Approach				Victor Street North Approach				Albert Avenue West Approach			
	Left 1	Through 2	Right 3	U Turn 3+	Left 4	Through 5	Right 6	U Turn 6+	Left 7	Through 8	Right 9	U Turn 9+	Left 10	Through 11	Right 12	U Turn 12+
10:00-10:15																
10:15-10:30																
10:30-10:45																
10:45-11:00																
11:00-11:15	16	7	5	0	59	114	25	0	10	10	9	0	21	71	53	0
11:15-11:30	23	12	12	0	65	118	31	0	15	13	11	0	25	75	69	0
11:30-11:45	18	11	7	0	59	97	23	0	8	9	6	0	19	76	65	0
11:45-12:00	29	6	25	0	65	106	33	0	9	14	13	0	28	106	58	0
12:00-12:15	22	12	9	0	83	162	33	0	17	18	18	0	21	81	73	0
12:15-12:30	15	13	5	0	69	119	22	0	14	15	15	0	17	64	42	0
12:30-12:45	19	13	17	0	84	147	14	0	13	23	20	0	29	94	64	0
12:45-13:00	24	12	13	0	80	115	25	0	16	20	19	0	23	86	55	0
13:00-13:15																
13:15-13:30																
13:30-13:45																
13:45-14:00																
Total	166	86	93		564	978	206		102	122	111		183	653	479	

Hourly flows																
Time	Movement															
	Victor Street South Approach				Albert Avenue East Approach				Victor Street North Approach				Albert Avenue West Approach			
	Left 1	Through 2	Right 3	U Turn 3+	Left 4	Through 5	Right 6	U Turn 6+	Left 7	Through 8	Right 9	U Turn 9+	Left 10	Through 11	Right 12	U Turn 12+
10:00-11:00																
10:15-11:15																
10:30-11:30																
10:45-11:45																
11:00-12:00	86	36	49	0	248	435	112	0	42	46	39	0	93	328	245	0
11:15-12:15	92	41	53	0	272	483	120	0	49	54	48	0	93	338	265	0
11:30-12:30	84	42	46	0	276	484	111	0	48	56	52	0	85	327	238	0
11:45-12:45	85	44	56	0	301	534	102	0	53	70	66	0	95	345	237	0
12:00-1:00	80	50	44	0	316	543	94	0	60	76	72	0	90	325	234	0
12:15-1:15																
12:30-13:30																
13:45-13:45																
13:00-14:00																
Peak Hour	85	44	56	0	301	534	102	0	53	70	66	0	95	345	237	0



Appendix B

SIDRA INTERSECTION Results

Appendix B

MOVEMENT SUMMARY

Site: Existing AM

Victor Street - Albert Avenue

Existing

AM Peak Hour

Signals - Fixed Time Cycle Time = 80 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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Victor Street (S)											
1	L	53	5.0	0.124	34.5	LOS C	1.6	11.9	0.82	0.74	30.8
2	T	62	5.0	0.244	27.2	LOS B	3.0	22.1	0.85	0.67	32.1
3	R	32	5.0	0.244	35.5	LOS C	3.0	22.1	0.85	0.80	31.4
Approach		146	5.0	0.244	31.6	LOS C	3.0	22.1	0.84	0.73	31.5
East: Albert Avenue (E)											
4	L	95	5.0	0.208	15.7	LOS B	4.0	29.5	0.47	0.86	43.0
5	T	381	5.0	0.208	7.3	LOS A	4.1	30.1	0.47	0.40	47.7
6	R	55	5.0	0.102	16.6	LOS B	1.0	7.0	0.47	0.72	41.3
Approach		531	5.0	0.208	9.8	LOS A	4.1	30.1	0.47	0.52	46.1
North: Victor Street (N)											
7	L	28	5.0	0.156	34.7	LOS C	2.1	15.6	0.83	0.79	31.6
8	T	40	5.0	0.156	26.4	LOS B	2.1	15.6	0.83	0.64	32.4
9	R	35	5.0	0.156	35.6	LOS C	1.1	8.1	0.83	0.73	30.4
Approach		103	5.0	0.156	31.8	LOS C	2.1	15.6	0.83	0.71	31.5
West: Albert Avenue (W)											
10	L	67	5.0	0.156	15.4	LOS B	2.9	21.3	0.45	0.86	43.2
11	T	289	5.0	0.156	7.1	LOS A	3.0	21.7	0.45	0.38	48.1
12	R	105	5.0	0.392	17.6	LOS B	2.0	14.8	0.51	0.74	40.5
Approach		462	5.0	0.392	10.7	LOS A	3.0	21.7	0.47	0.53	45.4
All Vehicles		1242	5.0	0.392	14.5	LOS B	4.1	30.1	0.54	0.56	42.0

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.

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	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	10.5	LOS B	0.1	0.1	0.51	0.51
P3	Across E approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
P5	Across N approach	53	9.0	LOS A	0.1	0.1	0.48	0.48
P7	Across W approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		212	22.0	LOS C			0.71	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Existing PM

Victor Street - Albert Avenue

Existing

PM Peak Hour

Signals - Fixed Time Cycle Time = 80 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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Victor Street (S)											
1	L	95	5.0	0.222	35.3	LOS C	3.0	22.1	0.84	0.77	30.5
2	T	66	5.0	0.331	29.7	LOS C	3.7	27.1	0.89	0.71	30.8
3	R	42	5.0	0.331	38.0	LOS C	3.7	27.1	0.89	0.80	30.3
Approach		203	5.0	0.331	34.0	LOS C	3.7	27.1	0.87	0.76	30.6
East: Albert Avenue (E)											
4	L	211	5.0	0.324	16.4	LOS B	6.8	49.7	0.52	0.83	42.2
5	T	527	5.0	0.324	8.0	LOS A	7.0	51.1	0.52	0.45	46.8
6	R	80	5.0	0.149	16.8	LOS B	1.4	10.4	0.48	0.73	41.2
Approach		818	5.0	0.324	11.0	LOS A	7.0	51.1	0.51	0.58	45.0
North: Victor Street (N)											
7	L	80	5.0	0.359	36.3	LOS C	5.2	38.1	0.88	0.81	30.8
8	T	77	5.0	0.359	28.0	LOS B	5.2	38.1	0.88	0.71	31.4
9	R	86	5.0	0.405	39.9	LOS C	3.0	22.2	0.91	0.77	28.7
Approach		243	5.0	0.405	35.0	LOS C	5.2	38.1	0.89	0.77	30.2
West: Albert Avenue (W)											
10	L	66	5.0	0.148	15.4	LOS B	2.8	20.2	0.45	0.85	43.2
11	T	274	5.0	0.148	7.0	LOS A	2.8	20.6	0.45	0.38	48.2
12	R	189	5.0	0.801	34.4	LOS C	6.3	45.7	0.71	0.92	30.9
Approach		529	5.0	0.801	17.9	LOS B	6.3	45.7	0.55	0.63	39.7
All Vehicles		1794	5.0	0.801	18.9	LOS B	7.0	51.1	0.61	0.64	38.8

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	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	10.5	LOS B	0.1	0.1	0.51	0.51
P3	Across E approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
P5	Across N approach	53	9.0	LOS A	0.1	0.1	0.48	0.48
P7	Across W approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		212	22.0	LOS C			0.71	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Existing Sat

Victor Street - Albert Avenue

Existing

Sat Midday Peak Hour

Signals - Fixed Time Cycle Time = 80 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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Victor Street (S)											
1	L	89	5.0	0.210	35.2	LOS C	2.9	20.8	0.84	0.77	30.5
2	T	46	5.0	0.332	29.8	LOS C	3.6	26.3	0.89	0.71	30.5
3	R	59	5.0	0.332	38.0	LOS C	3.6	26.3	0.89	0.80	30.0
Approach		195	5.0	0.332	34.8	LOS C	3.6	26.3	0.87	0.76	30.4
East: Albert Avenue (E)											
4	L	317	5.0	0.387	16.8	LOS B	8.5	62.0	0.54	0.82	41.6
5	T	562	5.0	0.387	8.4	LOS A	8.8	64.4	0.54	0.48	46.3
6	R	107	5.0	0.213	17.7	LOS B	2.1	15.1	0.52	0.75	40.5
Approach		986	5.0	0.387	12.1	LOS A	8.8	64.4	0.54	0.62	44.0
North: Victor Street (N)											
7	L	56	5.0	0.295	35.8	LOS C	4.2	30.9	0.86	0.81	31.1
8	T	74	5.0	0.295	27.5	LOS B	4.2	30.9	0.86	0.69	31.8
9	R	69	5.0	0.321	38.4	LOS C	2.4	17.3	0.88	0.76	29.2
Approach		199	5.0	0.321	33.6	LOS C	4.2	30.9	0.87	0.75	30.7
West: Albert Avenue (W)											
10	L	100	5.0	0.216	15.7	LOS B	4.2	30.8	0.48	0.86	43.0
11	T	393	5.0	0.216	7.4	LOS A	4.3	31.3	0.48	0.40	47.5
12	R	220	5.0	1.000 ³	28.4	LOS B	6.3	45.7	0.95	0.85	33.8
Approach		713	5.0	1.000	15.0	LOS B	6.3	45.7	0.62	0.61	41.7
All Vehicles		2093	5.0	1.000	17.3	LOS B	8.8	64.4	0.63	0.64	39.9

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.

³ x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	10.5	LOS B	0.1	0.1	0.51	0.51
P3	Across E approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
P5	Across N approach	53	9.0	LOS A	0.1	0.1	0.48	0.48
P7	Across W approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		212	22.0	LOS C			0.71	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Post-Development AM

Victor Street - Albert Avenue

Post-Development

AM Peak Hour

Signals - Fixed Time Cycle Time = 80 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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Victor Street (S)											
1	L	53	5.0	0.124	34.5	LOS C	1.6	11.9	0.82	0.74	30.8
2	T	65	5.0	0.258	28.2	LOS B	3.2	23.3	0.86	0.68	31.7
3	R	32	5.0	0.258	36.4	LOS C	3.2	23.3	0.86	0.80	31.1
Approach		149	5.0	0.258	32.1	LOS C	3.2	23.3	0.85	0.73	31.2
East: Albert Avenue (E)											
4	L	95	5.0	0.208	15.7	LOS B	4.0	29.5	0.47	0.86	43.0
5	T	381	5.0	0.208	7.3	LOS A	4.1	30.1	0.47	0.40	47.7
6	R	60	5.0	0.113	16.6	LOS B	1.1	7.7	0.47	0.73	41.3
Approach		536	5.0	0.208	9.8	LOS A	4.1	30.1	0.47	0.52	46.0
North: Victor Street (N)											
7	L	43	5.0	0.209	35.2	LOS C	2.9	21.3	0.84	0.79	31.3
8	T	48	5.0	0.209	26.8	LOS B	2.9	21.3	0.84	0.66	32.1
9	R	49	5.0	0.226	37.8	LOS C	1.7	12.0	0.86	0.74	29.5
Approach		141	5.0	0.226	33.2	LOS C	2.9	21.3	0.85	0.73	30.9
West: Albert Avenue (W)											
10	L	73	5.0	0.158	15.4	LOS B	3.0	21.6	0.46	0.85	43.2
11	T	289	5.0	0.158	7.1	LOS A	3.0	22.1	0.46	0.38	48.1
12	R	105	5.0	0.392	17.6	LOS B	2.0	14.8	0.51	0.74	40.5
Approach		467	5.0	0.392	10.8	LOS A	3.0	22.1	0.47	0.53	45.4
All Vehicles		1294	5.0	0.392	15.3	LOS B	4.1	30.1	0.56	0.57	41.4

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	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	10.5	LOS B	0.1	0.1	0.51	0.51
P3	Across E approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
P5	Across N approach	53	9.0	LOS A	0.1	0.1	0.48	0.48
P7	Across W approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		212	22.0	LOS C			0.71	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Post-Development PM

Victor Street - Albert Avenue

Post-Development

PM Peak Hour

Signals - Fixed Time Cycle Time = 80 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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Victor Street (S)											
1	L	95	5.0	0.222	35.3	LOS C	3.0	22.1	0.84	0.77	30.5
2	T	75	5.0	0.361	30.8	LOS C	4.1	29.7	0.91	0.72	30.4
3	R	42	5.0	0.361	39.0	LOS C	4.1	29.7	0.91	0.81	29.9
Approach		212	5.0	0.361	34.4	LOS C	4.1	29.7	0.88	0.76	30.3
East: Albert Avenue (E)											
4	L	211	5.0	0.324	16.4	LOS B	6.8	49.7	0.52	0.83	42.2
5	T	527	5.0	0.324	8.0	LOS A	7.0	51.1	0.52	0.45	46.8
6	R	95	5.0	0.177	16.9	LOS B	1.7	12.6	0.49	0.74	41.1
Approach		833	5.0	0.324	11.1	LOS A	7.0	51.1	0.51	0.58	44.9
North: Victor Street (N)											
7	L	85	5.0	0.379	36.5	LOS C	5.5	40.4	0.88	0.82	30.7
8	T	80	5.0	0.379	28.1	LOS B	5.5	40.4	0.88	0.72	31.3
9	R	92	5.0	0.438	41.2	LOS C	3.3	24.1	0.92	0.78	28.2
Approach		257	5.0	0.438	35.6	LOS C	5.5	40.4	0.90	0.77	29.9
West: Albert Avenue (W)											
10	L	81	5.0	0.155	15.4	LOS B	2.9	21.1	0.45	0.84	43.1
11	T	274	5.0	0.155	7.1	LOS A	3.0	21.6	0.45	0.38	48.1
12	R	189	5.0	0.801	34.4	LOS C	6.3	45.7	0.71	0.92	30.9
Approach		544	5.0	0.801	17.8	LOS B	6.3	45.7	0.54	0.64	39.7
All Vehicles		1845	5.0	0.801	19.2	LOS B	7.0	51.1	0.62	0.64	38.6

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	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	10.5	LOS B	0.1	0.1	0.51	0.51
P3	Across E approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
P5	Across N approach	53	9.0	LOS A	0.1	0.1	0.48	0.48
P7	Across W approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		212	22.0	LOS C			0.71	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Post-Development Sat

Victor Street - Albert Avenue

Post-Development

Sat Midday Peak Hour

Signals - Fixed Time Cycle Time = 80 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	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Victor Street (S)											
1	L	89	5.0	0.210	35.2	LOS C	2.9	20.8	0.84	0.77	30.5
2	T	52	5.0	0.358	30.8	LOS C	3.9	28.2	0.90	0.72	30.1
3	R	59	5.0	0.358	39.1	LOS C	3.9	28.2	0.90	0.80	29.7
Approach		200	5.0	0.358	35.2	LOS C	3.9	28.2	0.88	0.76	30.1
East: Albert Avenue (E)											
4	L	317	5.0	0.387	16.8	LOS B	8.5	62.0	0.54	0.82	41.6
5	T	562	5.0	0.387	8.4	LOS A	8.8	64.4	0.54	0.48	46.3
6	R	118	5.0	0.236	17.8	LOS B	2.3	16.8	0.52	0.75	40.4
Approach		997	5.0	0.387	12.2	LOS A	8.8	64.4	0.54	0.62	44.0
North: Victor Street (N)											
7	L	66	5.0	0.329	36.1	LOS C	4.8	34.7	0.87	0.81	31.0
8	T	78	5.0	0.329	27.7	LOS B	4.8	34.7	0.87	0.70	31.6
9	R	80	5.0	0.376	39.8	LOS C	2.8	20.5	0.90	0.77	28.7
Approach		224	5.0	0.376	34.5	LOS C	4.8	34.7	0.88	0.76	30.3
West: Albert Avenue (W)											
10	L	111	5.0	0.221	15.8	LOS B	4.3	31.5	0.48	0.85	42.9
11	T	393	5.0	0.221	7.4	LOS A	4.4	32.1	0.48	0.41	47.4
12	R	220	5.0	1.000 ³	28.4	LOS B	6.3	45.7	0.95	0.85	33.8
Approach		723	5.0	1.000	15.1	LOS B	6.3	45.7	0.62	0.61	41.6
All Vehicles		2144	5.0	1.000	17.6	LOS B	8.8	64.4	0.64	0.64	39.7

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.

³ x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	10.5	LOS B	0.1	0.1	0.51	0.51
P3	Across E approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
P5	Across N approach	53	9.0	LOS A	0.1	0.1	0.48	0.48
P7	Across W approach	53	34.2	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		212	22.0	LOS C			0.71	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

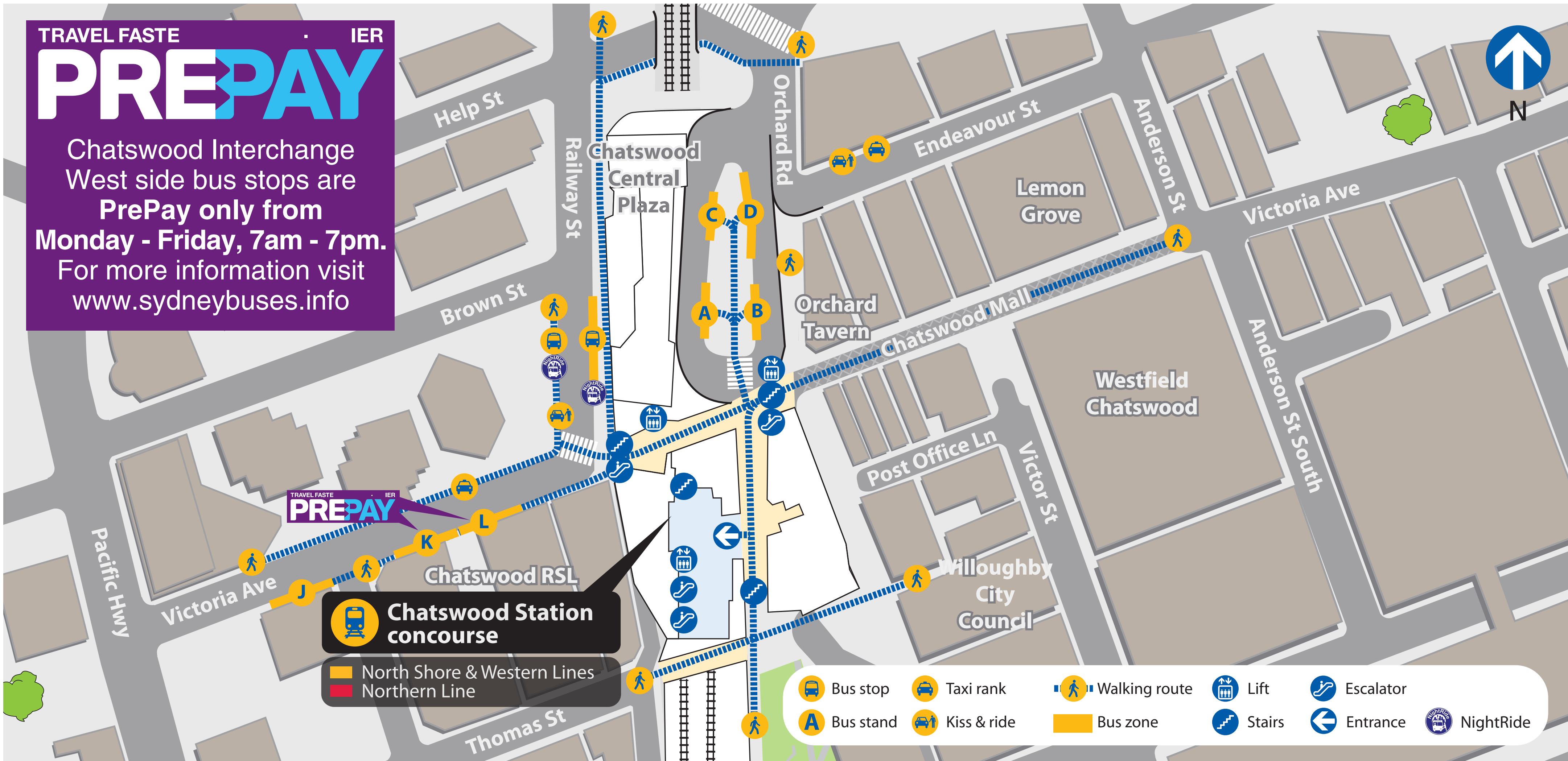
Appendix C

Chatswood Bus Network Map



Chatswood Transport Interchange

Local area map

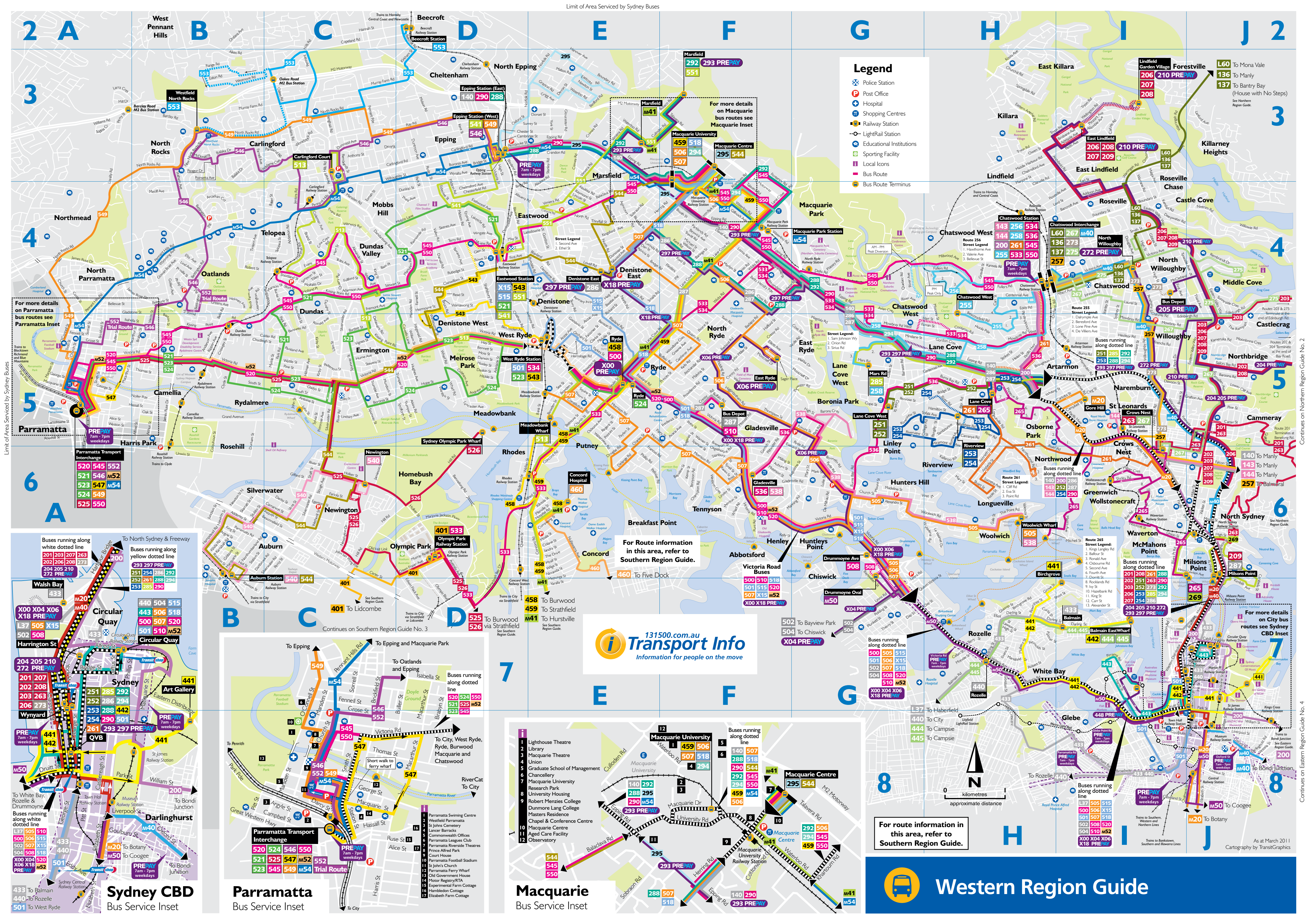


Bus route list

Stand	Bus route number	Going to	Operated by
Stand A	277	Castle Cove	Forest Coach Lines
	278	Killarney Heights via Forestville	Forest Coach Lines
	279	Frenchs Forest via Forestville (Limited Service)	Forest Coach Lines
	280	Warringah Mall via Frenchs Forest & Allambie Heights	Forest Coach Lines
	281	Davidson via Frenchs Forest	Forest Coach Lines
	282	Davidson/Belrose via Frenchs Forest	Forest Coach Lines
	283	Belrose via Frenchs Forest	Forest Coach Lines
Stand B	m40PREPAY	Metrobus to Bondi Junction via City (PrePay only)	Sydney Buses
	257	Balmoral via Willoughby & North Sydney	Sydney Buses
	267	Crows Nest via Willoughby & North Sydney	Sydney Buses
	273	City - Wynyard via Willoughby & North Sydney	Sydney Buses
Stand C	Set down only		
Stand D	136	Manly via Frenchs Forest, Dee Why & Harbord	Sydney Buses
	137	House With No Steps (Infrequent service)	Sydney Buses
	L60	Mona Vale via Dee Why (Limited Stops)	Sydney Buses
	275	Castlecrag via Middle Cove	Sydney Buses
Stand J PREPAY	255	Chatswood West (Colwell Cres)	Sydney Buses
	258	Lane Cove West (Mars Rd) (Infrequent service)	Sydney Buses
	261	City - QVB via Lane Cove, Longueville & Northwood	Sydney Buses
	533	Sydney Olympic Park via Mowbray Rd & Ryde	Sydney Buses
	534	Ryde/West Ryde via Mowbray Rd	Sydney Buses
	536	Gladesville via Lane Cove & Hunters Hill	Sydney Buses
Stand K PREPAY	143	Manly via Neutral Bay & Balgowlah	Sydney Buses
	144	Manly via RNS Hospital, Neutral Bay & Balgowlah	Sydney Buses
	258	Lane Cove West (Mars Rd) (Infrequent service)	Sydney Buses
	261	City - QVB via Lane Cove, Longueville & Northwood	Sydney Buses
	200	Bondi Junction via North Sydney & Kings Cross (Limited Stops)	Sydney Buses
Stand L PREPAY	256	Chatswood West (Hawthorne Ave)	Sydney Buses
	545	Parramatta via Macquarie Centre, Eastwood & Dundas Valley	Sydney Buses
	550	Parramatta via Macquarie Centre, Eastwood & Kissing Point Rd	Sydney Buses
Bus stop Railway St West	558	Lindfield via Roseville & East Lindfield	Transdev TSL
	565	Macquarie University via UTS Kuring-gai & West Lindfield	Transdev TSL
	N90	Hornsby via Gordon	NightRide
Bus stop Railway St East	N90	City - Town Hall via North Sydney	NightRide

Suburb/location route list

To suburb/location	Take	To suburb/location	Take	To suburb/location	Take
Allambie Heights	280	Frenchs Forest East	279	Olympic Park	533
Artarmon	144, 200, Train	Gladesville	536	Ourimbah	Train
Asquith	Train	Glenrose	281, 282, 283	Paddington	40
Auburn	Train	Gordon	Train	Parramatta	545, 550, Train
Balgowlah	143, 144	Gore Hill	200	Pendle Hill	Train
Balmoral	257	Gosford	Train	Pennant Hills	Train
Bantry Bay	137	Granville	Train	Penrith	Train
Beacon Hill	136	Greenwich	261	Point Clare	Train
Beecroft	Train	Harbord	136	Pymble	Train
Belrose	282, 283, 284	Harris Park	Train	Quakers Hill	Train
Berowra	Train	Hawkesbury River	Train	Queenscliff	136
Blacktown	Train	Hornsby	Train	Redfern	Train
Bondi Junction	40, 200	Hunters Hill	536	Rhodes	533, Train
Boronia Park	536	Killara	Train	Richmond	Train
Burwood	Train	Killarney Heights	278	Riverstone	Train
Cammeray	267	Kings Cross	200	Royal North Shore	144
Castle Cove	277	Kingswood	Train	Hospital	
Central	Train	Koolewong	Train	Rooty Hill	Train
Chatswood West (Colwell Cr)	255	Lane Cove	200, 261, 536	Roseville	565, 558, Train
Chatswood West (Hawthorne Ave)	256	Lane Cove Industrial	258	Rushcutters Bay	200
Cheltenham	Train	Lane Cove West	536	Ryde	533, 534
Clarendon	Train	Lidcombe	Train	Schofields	Train
Clyde	Train	Lindfield	558, 565, Train	Seven Hills	Train
Collaroy	L60	Lisarow	Train	St Leonards	143, 144, 200, Train
Concord West	Train	Longueville	261	St Marys	Train
Cowan	Train	Manly	136, 143, 144	Strathfield	Train
Cremorne	143, 144, 257	Macquarie Centre	545, 550	Tascott	Train
Crows Nest	143, 144, 200, 257, 261, 267, 273	Macquarie Park	545, 550, Train	Telopea	550
		Macquarie University	545, 550, 565	Terrey Hills	284
				Thornleigh	Train
Darlinghurst	40	Marayong	Train	Toongabbie	Train
Davidson	281, 282	Meadowbank	Train	Town Hall	40, 261, Train
Dee Why	L60, 136	Milsons Point	Train	Tuggerah	Train
Denistone	Train	Mona Vale	L60	Turramurra	Train
Doonside	Train	Mosman	257	UTS Kuring-gai	565
Duffys Forest	284	Mount Colah	Train	Vineyard	Train
Dundas Valley	545	Mount Druitt	Train	Wahroonga	Train
East Chatswood	L60, 136	Mount Kuring-gai	Train	Waitara	Train
East Lindfield	558	Mulgrave	Train	Warrawee	Train
East Richmond	Train	Museum	40	Warringah Mall	280
East Roseville	136, 278, 279, 280, 281, 282, 283, 284	Narara	Train	Waverton	Train
		Naremburn	40, 257, 273	Wentworthville	Train
		Narrabeen	L60	Werrington	Train
		Narraweena	L60, 136	West Lindfield	565
		Neutral Bay	143, 144, 257	West Ryde	Train
East Sydney	200	Niagara Park	Train	Westmead	Train
Eastwood	545, 550, Train	Normanhurst	Train	Willoughby	40, 257, 267, 273
Edgecliff	200	North Curl Curl	136	Windsor	Train
Emu Plains	Train	North Ryde	533, 534, Train	Wollstonecraft	Train
Epping	Train	North Strathfield	Train	Wondabyne	Train
Forestville	136, 278, 279, 280, 281, 282, 283, 284	North Sydney	273, 200, 261, Train	Woy Woy	Train
		North Willoughby	40, L60, 136, 257, 273	Wynyard	40, 273, Train
		Northbridge	267	Wyong	Train
		Northwood	261		



Legend

- Police Station
- Post Office
- Hospital
- Shopping Centres
- Railway Station
- LightRail Station
- Educational Institutions
- Sporting Facility
- Local Icons
- Bus Route
- Bus Route Terminus

For more details on Parramatta bus routes see Parramatta Inset

For route information in this area, refer to Southern Region Guide.

For route information in this area, refer to Southern Region Guide.

Sydney CBD
Bus Service Inset

Parramatta
Bus Service Inset

Macquarie
Bus Service Inset

Western Region Guide

As at March 2011
Cartography by TransInfoGraphics

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