Turramurra Village

Transport Impact Assessment

Prepared for:

Rebel Property Group

31 May 2024

PROJECT INFORMATION

Project Name:	Turramurra Village
Client:	Rebel Property Group
Project Number:	2080
Prepared By:	JMT Consulting

DOCUMENT HISTORY

Document Title	Revision	Date issued	Author
Turramurra Village TIA	Draft	02.03.21	[redacted]
Turramurra Village TIA	Draft #2	15.10.21	[redacted]
Turramurra Village TIA	Issue	29.11.21	[redacted]
Turramurra Village TIA	Rev A (response to Council feedback)	22.02.22	[redacted]
Turramurra Village TIA	Rev B	02.11.23	[redacted]
Turramurra Village TIA	Rev C	22.01.24	[redacted]
Turramurra Village TIA	Rev D	31.05.24	[redacted]

J Milston Transport Consulting Pty Ltd

ABN: 32635830054
ACN: 635830054

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1 Introduction

1.1 Background

JMT Consulting was engaged by Rebel Property Group to prepare a transport impact assessment to support a Planning Proposal for the Turramurra Village site ('the site'). The planning proposal seeks approval for an increase in height and floor space ratio (FSR) to the site which may support an FSR of approximately 3.0:1.

1.2 Site location

The site is located on the corner of the Pacific Highway and Kissing Point Road in the suburb of Turramurra within the Ku-Ring-Gai Local Government Area (LGA). It comprises of approximately 12 individual lots across a total site area of 8,459.7m^2. Turramurra railway station is located approximately 200m north of the site, with pedestrian access across the Pacific Highway provided via a signalised pedestrian crossing at Kissing Point Road.

The location of the site is shown in Figure 1 below.

Figure 1 Site location

1.3 Existing site uses

The existing site contains approximately 12 individual lots comprising largely of retail and commercial uses with associated car parking. There is approximately 2,700m^2 of retail and commercial uses on the existing site.

1.4 Report purpose

The purpose of this report is to describe the traffic, transport and parking implications of the Planning Proposal. The report details the following:

- Existing transport conditions, including:
    - Surrounding road network
    - Vehicle site access
    - Car parking
    - Loading and servicing arrangements
    - Public transport provision
- Proposed vehicle site access arrangements
- Additional traffic movements likely to be generated by the proposal and their associated impact on the surrounding road network
- Parking demands arising from the proposal and ability of the site to accommodate these demands
- Proposed vehicle loading and servicing arrangements
- Proposed enhancements to the pedestrian network supporting the site
- Bicycle parking to be provided as part of future site development

2 Existing Transport Conditions

2.1 Existing travel behaviour

Travel behaviours for residents and employees within the area surrounding the site[1] been analysed using 2016 Journey to Work Census data. The data demonstrates a strong proportion of people travelling from Turramurra to work use public transport, accounting for 36% of all trips in the case of residents travelling to work. This reflects the strong availability and accessibility of public transport in this area. Private vehicle is the dominant mode of transport for people travelling to Turramurra for work, which is likely representative of the good availability of parking in the area. These existing travel behaviours are summarised in Table 1 below.

Table 1 Existing travel behaviours

Mode of travel*	Proportion of trips	
	Residents travelling to work from Turramurra	*Employees travelling into Turramurra for work*
Car driver	59%	70%
Car passenger	1%	5%
Bus	1%	1%
Train	36%	13%
Walk	2%	9%
Other	1%	2%
Total	**100%**	**100%**

** Excludes people working from home or not going to work on the date of the Census*

Further analysis of travel behaviours has been undertaken to consider where workers in the area originate from as well as where residents in the area travel to work. This analysis is presented in the figures below and indicates:

- The majority of workers in the area reside in the upper north shore around Turramurra and Hornsby – demonstrating most of the trips to the site could be within viable walking and cycling distance; and
- Residents in the area typically work in the Sydney CBD or major employment centres north of Sydney Harbour such as Macquarie Park, Chatswood, St Leonards and North Sydney. All these centres are well served via the T1 north shore rail line from Turramurra Station.

[1] Turramurra SA2

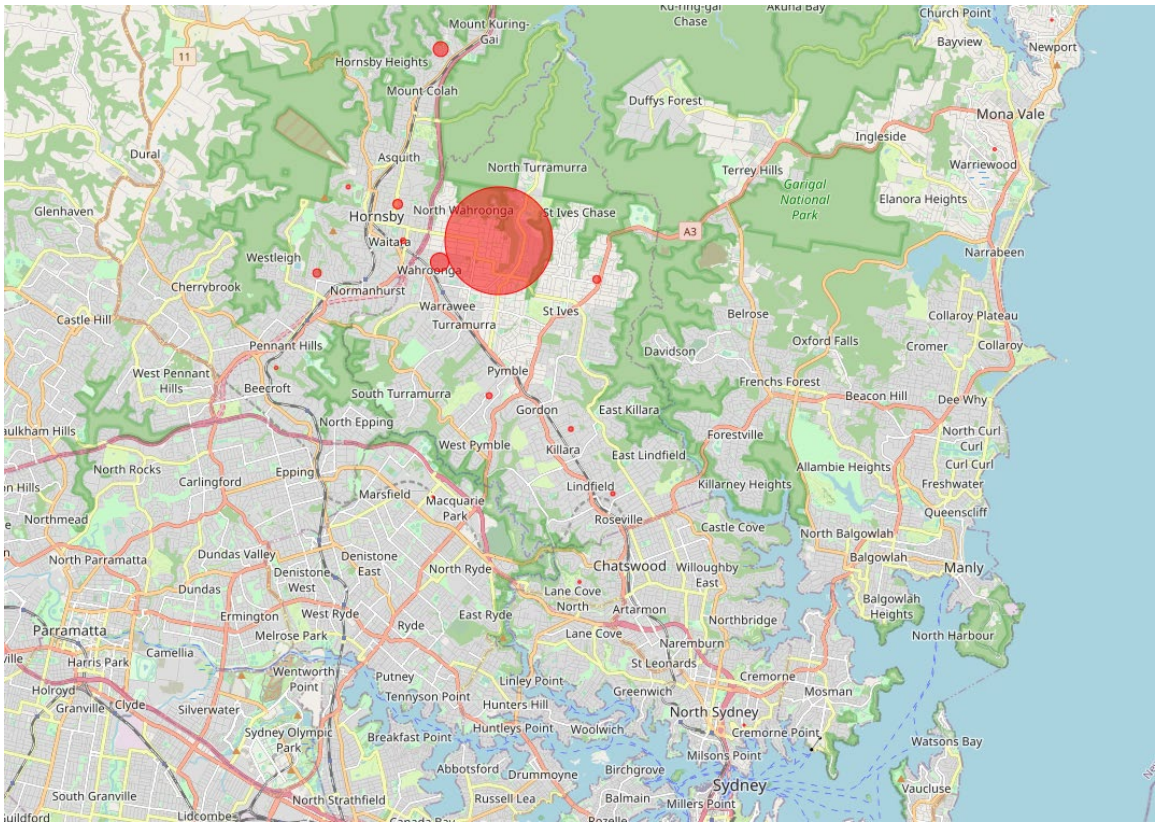

Figure 2 Home location of people working in Turramurra

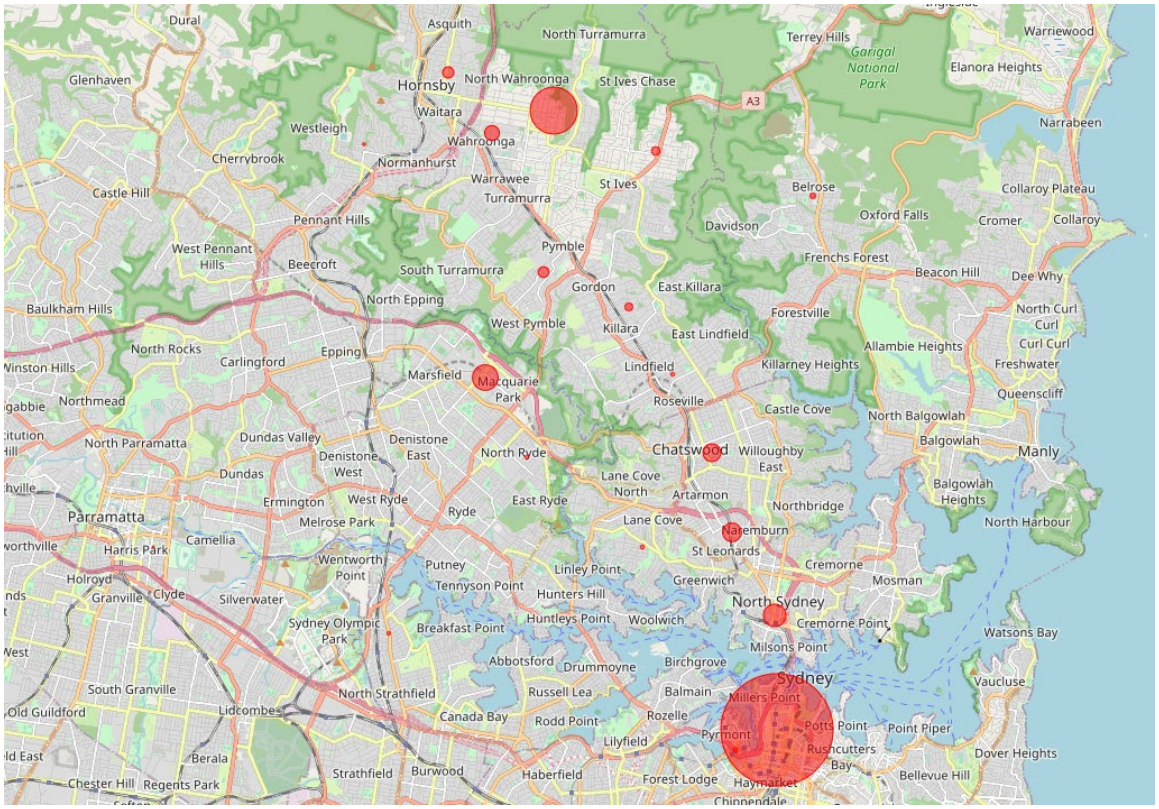

Figure 3 Employment location of residents of Turramurra

With respect to the likely origin of retail customers and visitors to the commercial uses, Location IQ has identified a 3km trade catchment for the site as indicated in Figure 4 below. This trade catchment captures suburbs immediately surrounding the site including St Ives, Pymble, Warrawee and Wahroonga. At the time of the 2016 Census there were 43,360 persons in the main trade area. The main trade area population is projected to grow to 49,560 over the period to 2036.

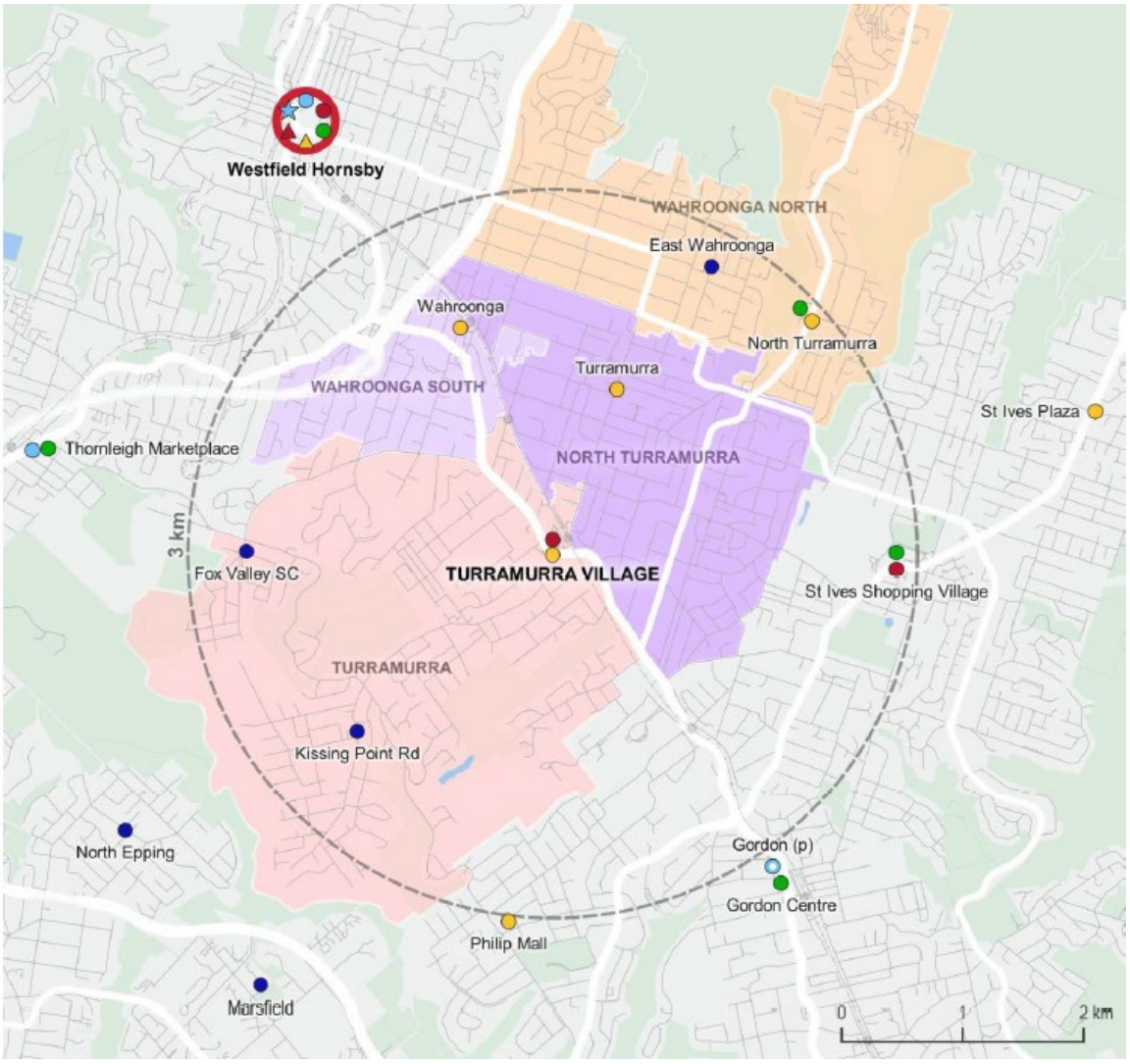

Figure 4 Turramurra Village trade catchment

Source: Location IQ

2.2 Road network

To manage the extensive network of roads for which councils are responsible under the Roads Act 1993, Transport for NSW (TfNSW) in partnership with local government established an administrative framework of *State, Regional,* and *Local Road* categories. State Roads are managed and financed by TfNSW and Regional and Local Roads are managed and financed by councils.

Regional Roads perform an intermediate function between the main arterial network of State Roads and council controlled Local Roads. Due to their network significance TfNSW provides financial assistance to councils for the management of their Regional Roads. Key State and Regional roads which provide access to the site are illustrated in Figure 5. This demonstrates the site is very well connected to the surrounding road network, with the Pacific Highway acting as the primary access to the site. Pacific Highway is classified State road which serves as a major north-south arterial link, providing connectivity between the Warringah Freeway and M1 Pacific Motorway. Both Kissing Point Road and Rohini Street are regional roads that provides a connection to Turramurra Plaza for customers arriving from the south and north of the Pacific Highway respectively.

Figure 5 Road network serving the site

2.3 Site access

Currently two vehicle access points are provided to the site as shown in Figure 6. The primary vehicle site access is located off Kissing Point Road through an access driveway, approximately 85m south of the intersection with the Pacific Highway. 'Keep Clear' line-marking is in place at this access point which allows for efficient access and egress of vehicles to the site (Figure 7). A secondary access point to the site is also provided via Duff Street.

Figure 6 Site access overview

Figure 7 Kissing Point Road site access

2.4 Access to local services

The site is well serviced by a range of local services within a 400m radius (five minute walk) as indicated in Figure 8 below. This includes Turramurra train station, schools, retail, open space and cultural/community facilities. The easily accessible nature of these local services will assist in reducing car dependency for future residents and visitors.

Figure 8 Access to local services

Source: DKO

2.5 Public transport

The site is located just over 200m or less than a five minute walk away from the Turramurra railway station. Heavy rail services from Turramurra station provide operate frequently along the T1 North Shore, Northern, and Western Line. During peak hours, T1 trains travel from Turramurra to the Sydney CBD, northern and western suburbs arrive at the station approximately every three minutes. This offers a strong level of public transport accessibility for site users.

A number of bus services also operate near the site, including many that terminate at the bus interchange adjacent to Turramurra station near Rohini Street. These bus services include:

- 571: Turramurra to South Turramurra
- 572: Turramurra to Macquarie University
- 573: Turramurra to Sydney Adventist Hospital
- 575: Hornsby to Macquarie University via Turramurra

The 571 and 572 bus services stop on Kissing Point Road immediately adjacent to the site.

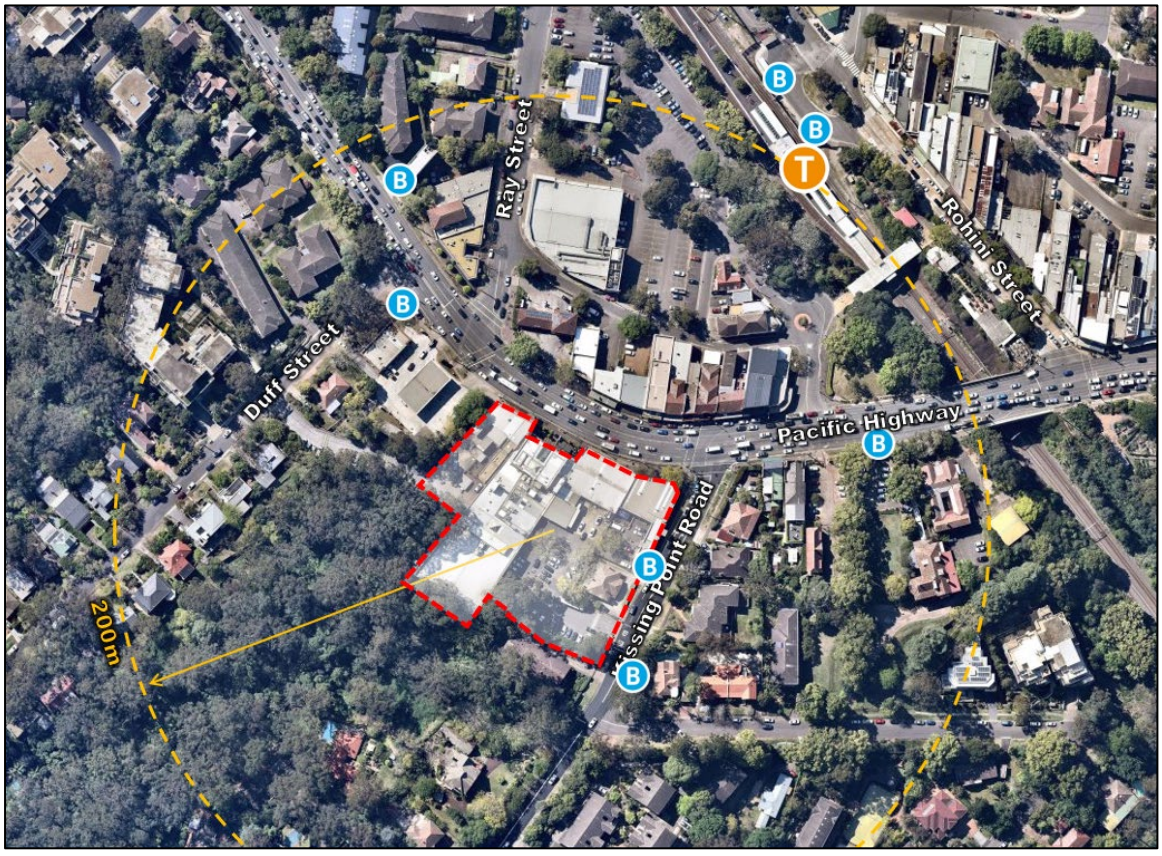

Figure 9 Public transport availability near the site

A key indicator of the level of public transport accessibility a site contains is the number of locations accessible within a 30 minute public transport catchment. A key objective of the Greater Sydney Commission's Greater Sydney Region Plan is to deliver a 30-minute city where jobs, services and quality public transport spaces are in easy reach of residences.

As illustrated in Figure 10 a number of key employment centres across Sydney can be reached within 30 minutes public transport travel time of the site, including Chatswood, Macquarie Park, St Leonards and the North Sydney CBD. The highly accessible nature of the site reduces the need for residents to own cars and rely on public transport as a means of accessing their place of work.

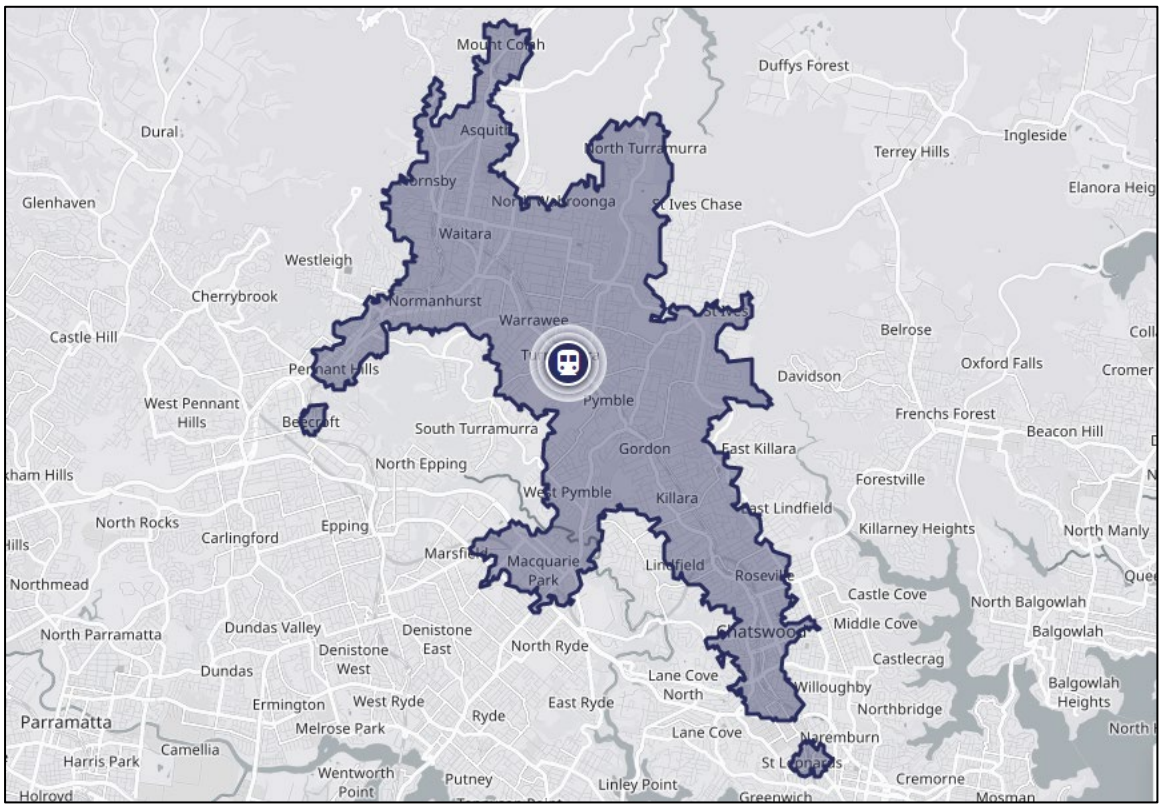

Figure 10 30 minute public transport catchment

Source: https://www.mapnificent.net/sydney

Barrier counts for Turramurra Station, obtained from Transport for NSW indicate that station entry and exits steadily increased between 2016 and February 2020 during the morning and afternoon peak periods. The significant reduction in travel resulting from the COVID-19 pandemic saw a decline in demand at the station in 2020.

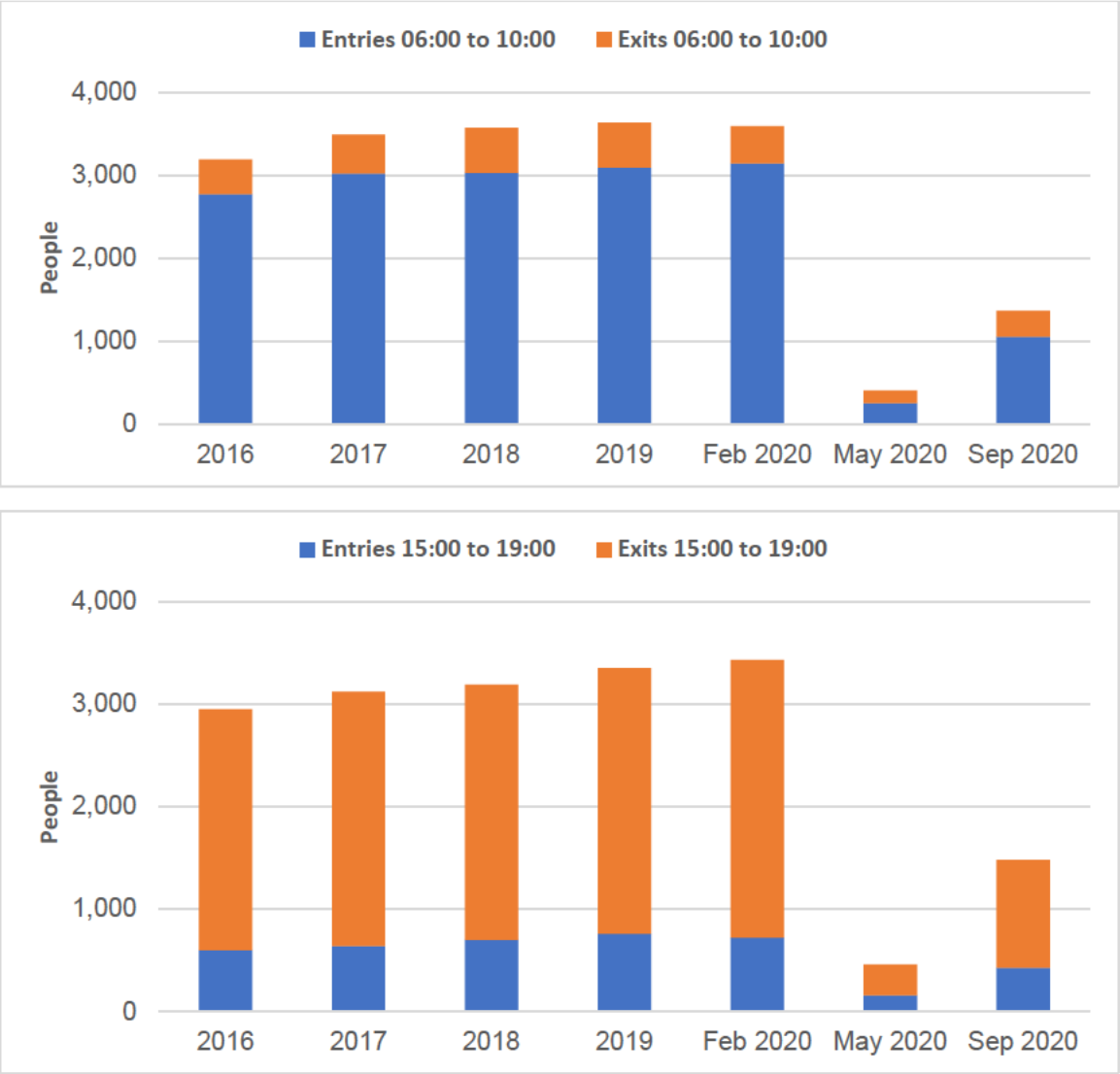

Figure 11 Barrier counts at Turramurra Station

Source: TfNSW Transport Performance and Analytics Train Station Entries and Exits Dataset

2.6 Car parking

There are approximately 100 car parking spaces provided on the site, of which 30 are located within the Council owned lands. Car parking is provided both at surface level and in an undercroft area below the existing building. Car parking is restricted to two hours in length between 8.30am and 6pm on weekdays and 8.30am and 12.30pm on Saturdays so as to promote high turnover of spaces and discourage use by commuters.

Figure 12 Existing on-site car parking

2.7 Traffic volumes

Traffic count data was collected at a number of intersections in the vicinity of the site to inform the traffic assessment undertaken in support of the Planning Proposal. The counts were undertaken two days in December 2020, those being:

- Thursday 10 December 2020
- Saturday 12 December 2020

For the weekdays the counts were undertaken to capture the morning and afternoon peak periods, those being 7am-9am and 4.30pm-6.30pm. The traffic counts were undertaken at five intersections as illustrated in Figure 13 and summarised below:

- Pacific Highway / Rohini Street
- Pacific Highway / Kissing Point Road
- Kissing Point Road / site access driveway
- Duff Street / site access driveway

The traffic surveys identified the peak hours to be as follows:

- Weekday AM peak hour – 7.15am – 8.15am
- Weekday PM peak hour – 4.45pm – 5.45pm
- Saturday peak hour – 11.15am – 12.15pm

Existing peak hour traffic volumes for each location surveyed are summarised in Figure 14 on the following page. It can be seen that the site already generates a significant amount of traffic, with over 300 vehicles recorded entering or exiting the site via Kissing Point Road during both the weekday PM and Saturday peak hours. A further 150 vehicles enter and exit the site via Duff Street during these same time periods. The traffic data also demonstrates the tidal nature of vehicle flows on the Pacific Highway, with approximately 50% more traffic travelling in the citybound direction during the morning peak hour compared to the outbound direction. This trend is then reversed during the afternoon peak hour.

Figure 13 Intersection count locations

Figure 14 Existing traffic volumes

2.8 Pedestrian and cycling network

There is a well established network of pedestrian facilities in the vicinity of the site, with paved footpaths provided on both sides of all adjacent roads. Pedestrian crossings are provided at a number of intersections across the Pacific Highway including at Kissing Point Road adjacent to the site as shown in Figure 15 below.

Figure 15 Existing pedestrian facilities

Although no formal cycle routes are available in proximity to the site, there are a number of planned cycleways as documented in the Ku-Ring-Gai Council bike plan (2012). An extract from the bike plan indicating existing and proposed future cycleways is shown in Figure 16, indicating that Kissing Point Road adjacent to the site has been identified as a future on-road cycleway to connect with Turramurra Station.

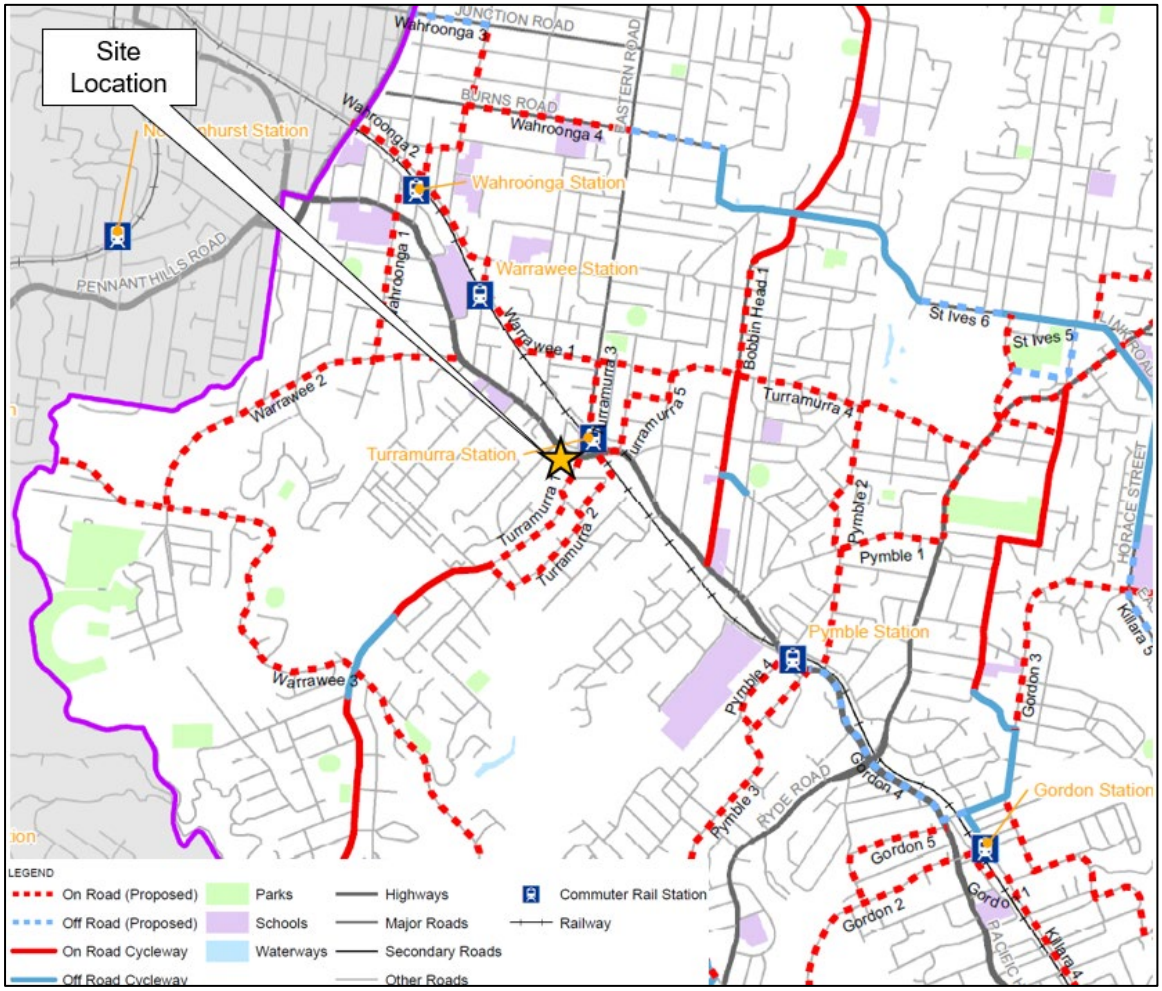

Figure 16 Ku-Ring-Gai planned bicycle routes

Source: GHD

3 Planning Proposal

3.1 Vehicle site access

Under the indicative architecture concept vehicle access to the site would be provided off a new road (Stonex Drive) at the southern end of the site as shown in Figure 17. This access point has been selected to minimise conflicts with pedestrians and general traffic as well as ensuring no direct vehicle access into the site is provided along the key traffic routes of the Pacific Highway and Kissing Point Road. Given the fall of the site from east to west the current scheme envisages a vehicle access point at the south-western end of the site.

The vehicle access would be via a single driveway, facilitating independent two-way traffic movements and allowing access into the basement of the site from which the loading dock and car park can be accessed. This aligns with best practice so that vehicle entry points to a site are to be rationalised to minimise streetscape impact – with one entry area into and existing a site.

The vehicle access will be designed in accordance with the design requirements set out in the relevant Australian Standard, namely AS2890.1:2004 and AS2890.2:2018. This will be detailed further as part of a future Development Application for the site.

Figure 17 Proposed vehicle site access

3.2 Vehicle circulation and road network access

Key features of the Planning Proposal with respect to vehicle circulation and road network access include:

- Creation of Stonex Drive – a new two-way public street which provides an east-west connection between Kissing Point Road and Duff Street. This new street, allowing for two-way traffic as well as on-street parking, is consistent with that shown in Council's DCP and public domain plan for the Turramurra town centre. Stonex Drive would connect to Kissing Point Road at the current site driveway, allowing for the retention of the existing 'keep clear' road line-marking which allows the efficient entry and exit of vehicles from the site.
- In conjunction with the creation of Stonex Drive, removal of the existing driveway crossover points into the site on Kissing Point Road and Duff Street. Instead these driveways would be converted to standard T-Junction intersections at the eastern and western ends of Stonex Drive respectively.
- Enhancements to traffic capacity along Kissing Point Road to facilitate the redevelopment of the site, including:
    - Extension of existing southbound right turn bay into the site along Kissing Point Road from approximately 25m up to 60m
    - Provision of a dedicated left turn bay from Kissing Point Road onto the Pacific Highway as well as two dedicated right turn lanes.

These enhancements to Kissing Point Road are possible through the dedication of land within the site and will be further detailed and refined at a later stage of the planning process following discussions with Transport for NSW and Ku-Ring-Gai Council. The potential future arrangements are indicatively shown in Figure 18 on the following page.

In addition to the above measures a key component of the proposal is the dedication of land for the future widening of the Pacific Highway in the vicinity of the site. Through discussions with Council and Transport for NSW all built form will be set back beyond the current site boundary and SP2 road widening zone to allow for a future upgrade of the Pacific Highway by Transport for NSW. This upgrade will facilitate the removal of the existing peak period tidal flow arrangements and result in a significantly improved traffic outcome for Turramurra and the wider precinct. Delivery of this road widening would only be possible through the development of the subject site given the limited potential for wide-scale redevelopment for properties on the northern side of the Pacific Highway.

Figure 18 Potential Kissing Point Road traffic enhancements

3.3 Car park design

As part of the indicative architecture concept developed for the Planning Proposal a basement car park has been designed to facilitate the future development. The car park and associated elements such as car parking space dimensions, circulation aisles and ramp would be designed in accordance with the relevant Australian Standard for car parking facilities, namely AS2890.1: 2004 and AS2890.6:2009.

The final design of the car park will be carried out at the Development Application stage of the project.

3.4 Loading dock

The indicative architecture concept includes an on-site loading dock which can accommodate up to three service vehicles parked at any one time. A single loading area would be provided that is shared between the residential, retail and commercial uses on the site. The loading dock is located on the first basement level near the main entrance ramp as indicated in Figure 19. Further design refinements will be required to the loading dock layout which will take place at the time of the preparation of the Development Application – this is standard practice given the early stage of the project.

Figure 19 Loading dock location

In addition to the truck loading dock, a further 2-3 parking spaces (all 2.7m wide) can allocated for the purpose of smaller deliveries, courier vehicles and long stay vehicles (e.g. tradies) within the basement car parking. The intention is for service vehicles classed as 'small vehicles' – i.e. B99, vans, utes. All of these vehicle types have a headheight of 2.2m or below and is consistent with the guidance provided in the TfNSW Last Mile Toolkit. The spaces will be used by tradespeople, contractors and for deliveries to smaller tenancies. There is no need to locate these spaces in the main loading dock area given the type of vehicles anticipated.

The loading dock is located in the basement of the building and has been designed to minimise impacts to the surrounding street network and public domain, including:

- All vehicles are to enter and exit the site in a forwards direction
- All unloading is to occur on-site and not in public streets
- Floor space at ground level is to be maximised, with supporting functions such as car parking and loading located in basement levels

The final design of the loading dock will be carried out at the Development Application stage of the project. The loading dock is to be designed in accordance with the requirements outlined in the relevant Australian Standard (AS2890.2, 2018).

During the Development Application stage of the project a preliminary loading plan of management would be prepared to ensure that the loading area is utilised efficiently between the different site uses.

3.5 Parking

3.5.1 Car parking

The potential on-site car parking for the development, based on the development yields envisaged under the indicative architecture concept, is summarised in Table 2. The adopted car parking rates comply with those outlined in the Ku-Ring-Gai Council local centres Development Control Plan (DCP).

Approximately 400 car parking spaces are envisaged, which includes maintaining the existing 30 Council car parking spaces as part of the development. The final car parking requirements for the site will be confirmed at the Development Application (DA) stage of the project. Given the mix of complementary uses on the site there may be opportunities to reduce the overall quantum of parking below the generic DCP parking rates.

Table 2 Potential on-site car parking

Land Use	Type	No. of units / GFA	Parking rate	No. of spaces
Residential	1 bed	57	0.6 / unit	34
	2 bed	92	0.9 / unit	83
	3 bed	32	1.0 / unit	32
	Sub-Total	***181***		***149***
	Visitor		1 / 6 units	30
Commercial		1,652	1 / 45m^2 GFA	37
Retail		5,538	1 / 33m^2 GFA	168
Public car parking (dedicated to Council)				30
Total				**414**

3.5.2 Motorcycle parking

The Ku-Ring-Gai local centres DCP requires that motorcycle parking be provided at a rate of one space per 50 residential apartments. It is proposed to comply with this requirement, with the final number of motorcycle parking spaces to be confirmed at the Development Application (DA) stage once the design is finalised. Based on the indicative architecture concept prepared for the Planning Proposal, approximately 4 motorcycle parking spaces would be provided.

3.5.3 Car share

As per the Ku-Ring-Gai local centres DCP a minimum of one car share space will be provided. Given the mix of uses on the site as well as it's proximity to public transport there may be opportunities to provide additional car share spaces as part of the future development, subject to market interest from car share operators. This will be detailed during later stages of planning for the site.

3.5.4 Bicycle parking

The Ku-Ring-Gai local centres DCP outlines minimum bicycle parking requirements for new developments. Table 3 below summarises the potential bicycle parking provision based on the indicative architecture concept prepared for the Planning Proposal. This will be confirmed at the DA stage of the development.

Table 3 Potential bicycle parking requirements

Land Use	No. of units / GFA	User type	Bicycle parking rate	
			Rate	Number
Residential	181	Residents	1 / 5 units	36
		Visitors	1 / 10 units	18
Commercial / Retail	7,015	Staff	1 / 600m^2	12
		Visitors	1 / 450m^2	3
Total				**69**

3.6 Adaptable basement design

The potential for the proposed basement car park to be fully or partially adapted for different users in the future should be considered during the subsequent design phases of the Turramurra Village project. The reference design prepared for the Planning Proposal indicates 3.1m floor to floor heights which would provide the ability to convert car parking to certain commercial uses in future if desired. The ability to provide greater floor to floor heights to provide the flexibility to accommodate a wider range of uses will be considered in detailed during the Development Application phase of the project.

4 Transport Assessment

4.1 Travel demand analysis

Recent surveys undertaken by the TfNSW of high density residential and mixed use developments indicates a person trip generation rate of approximately 0.60 trips / dwelling. The equivalent trip generation rate for commercial/retail uses was found to be 2.26 trips per 100m^2 GFA in the AM peak hour and 1.73 trips per 100m^2 GFA in the PM peak hour. Applying these rates to the yields possible under the planning proposal results in the following total development trips:

Table 4 Development trip generation

Use	Yield	Quantum	Trip rate (per unit / 100m^2)		Number of trips	
			AM peak hour	PM peak hour	AM peak hour	PM peak hour
Residential	181	units	0.60	0.60	107	107
Retail/Commercial	7,190	m^2 GFA	2.26	1.73	158	121
Total trips					***265***	***228***

Based on the existing travel behaviours of residents and employees of Turramurra, existing and future public transport services, as well as the proposed parking rates for the different uses forecast mode shares have been developed. These mode shares, along with the forecast trip generation noted in Table 4, have been used to estimate the number of trips by mode to and from the site. This is summarised in the table below.

Table 5 Trip generation by mode

Travel mode	*Residential trips*			*Retail/Commercial trips*			*Total*	
	Mode share	AM peak hour	PM peak hour	Mode share	AM peak hour	PM peak hour	AM peak hour	PM peak hour
Car driver	33%	35	35	60%	95	73	130	108
Car passenger	2%	2	2	6%	9	7	12	9
Bus	7%	7	7	3%	5	4	12	11
Train	49%	52	52	18%	28	22	81	74
Walk	8%	9	9	11%	17	13	26	22
Other	1%	1	1	2%	3	2	4	3
Total	***100%***	***107***	***107***	***100%***	***158***	***121***	***265***	***228***

4.2 Public transport demands

The travel demand analysis undertaken in Section 4.1 indicates that the proposal may generate approximately 81 train trips and 12 bus trips during the morning peak hour.

Of the rail demand approximately 65 trips are estimated to be travelling south towards the Sydney CBD during the morning peak hour. Therefore based on the current 9 train services between 8am-9am, the estimated additional train loading traveling to towards the Sydney CBD during the morning peak hour is approximately eight additional passengers per each service. Due to the COVID-19 pandemic it was not possible to accurately monitor demand for existing train services at Turramurra Station. Previous observations undertaken by WSP at Lindfield Station to support the Lindfield Village Hub Planning Proposal indicated that there is spare capacity on rail services travelling towards the Sydney CBD during the morning peak hour. In this context the eight additional passengers per service generated by the proposal (equivalent to only one passenger per carriage) could be accommodated on the rail network. Following the completion of the Sydney Metro City & Southwest project (expected 2024) additional capacity will be released on the T1 line given passengers from the north-west will no longer have to transfer at Chatswood to travel to the CBD.

Approximately four additional passengers per service are forecast to be travelling into Turramurra Station during the morning peak hour. As previously indicated in Section 2.5 the travel demand into Turramurra during the morning peak hour is minimal when compared to the outbound demand.

Therefore it can be concluded that the existing public transport network has the capacity to accommodate this level of additional demand generated by the development. Discussions with Transport for NSW regarding measures to further promote public transport use will be held at a later stage of the planning process.

4.3 Pedestrians

The Planning Proposal will include significant enhancements to the pedestrian environment in the vicinity of the site, with measures including:

- Widening of existing footpaths on Kissing Point Road and the Pacific Highway adjacent to the site
- Public pedestrian through site link to provide a connection between the Pacific Highway and Stonex Drive through the middle of the site
- Retain and upgrade Stonex Lane as a pedestrian lane including a new 8m wide pedestrian arcade linking Pacific Highway and Stonex Drive.
- Footpaths along both sides of Stonex Drive to provide a pedestrian connection between Duff Street and Kissing Point Road

Figure 20 Pedestrian measures

4.4 Cycling

4.4.1 Bicycle parking

As part of the future development of the site bicycle parking spaces will be provided for staff, residents and visitors. Based on the indicative architecture concept approximately 69 bicycle parking spaces would be provided, as well as complementary end of trip facilities such as showers and lockers for commercial and retail staff. This provision will be confirmed at the DA stage of the project.

4.4.2 Bicycle routes

The proposal will facilitate the creation of a shared pathway on the western side of Kissing Point Road (north of Stonex Drive) – aligning with the intentions of Council's bike plan. Stonex Drive, to be designed as a low speed cyclist friendly street environment, will also provide improved permeability for cyclists

An initiative that the site will benefit from is the completion of the network of strategic cycleway corridors for the Eastern Harbour City. As shown in Figure 20, the site would be located in the vicinity of a future cycling corridor connecting Hornsby with Gordon. The planned local bicycle networks identified in Council's Contributions Plan fronting the site along Kissing Point Road and new Stonex Drive will benefit with greater connection into this principal network.

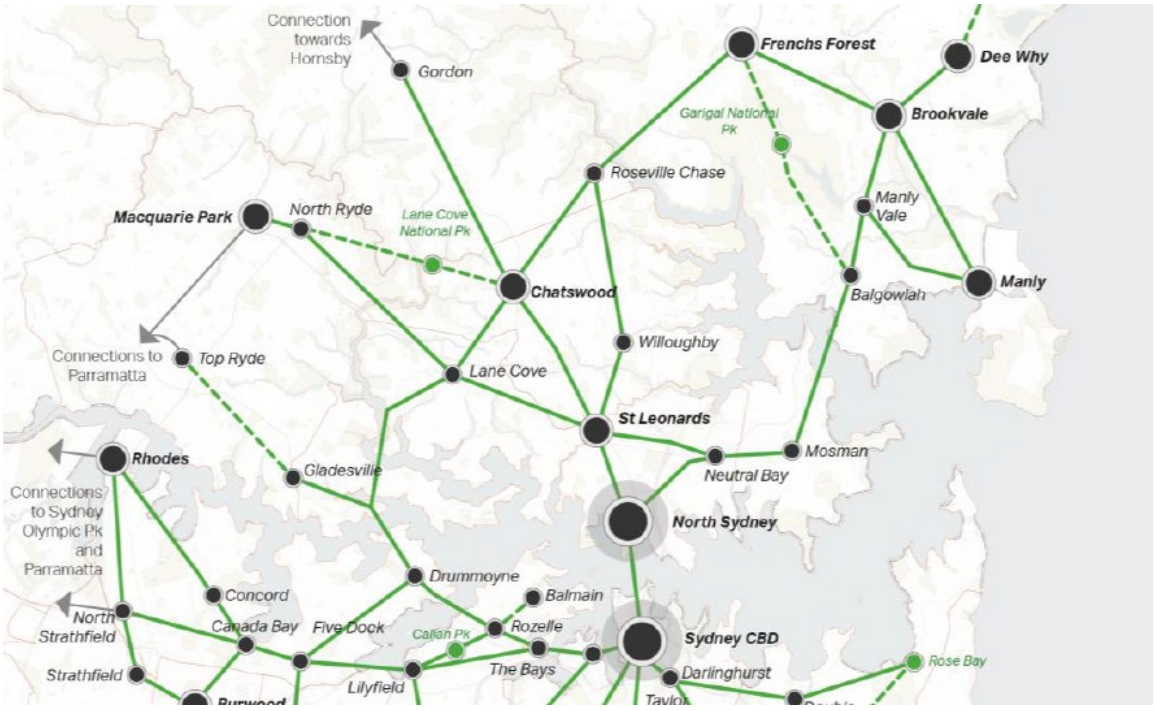

Figure 21 Strategic Cycleway Corridor network map

Source: Transport for NSW

4.5 Alignment with Turramurra public domain plan

The Ku-ring-gai Town Centres Public Domain Plan 2010 (KPDP 2010) was adopted on 23 November 2010. Its purpose is to guide the design of streets and public spaces within and around the town centres of Ku-ring-gai LGA. Part 2B of the KPDP 2010 relates to Turramurra Town Centre.

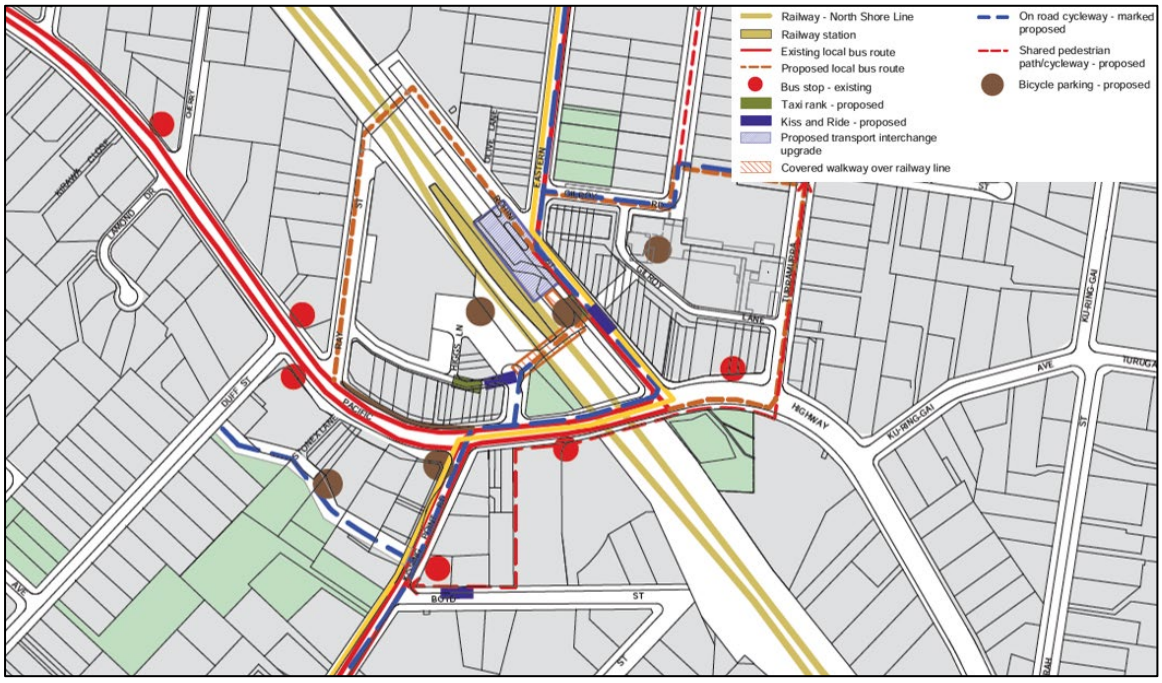

Figure 22 Turramurra public domain plan (integrated transport)

Source: Ku-Ring-Gai Council

The proposal aligns with the strategies identified in the public domain plan by incorporating the following key elements:

- Provision of a new public park and roadway (Stonex Drive) to act as the catalyst for a new pedestrian pathway through Granny Springs reserve
- New through site link between Stonex Drive and the Pacific Highway to improve site permeability
- Footpath widening along both Kissing Point Road and the Pacific Highway
- Provision of a shared pedestrian/cyclist pathway on the western side of Kissing Point Road as well as a cyclist friendly environment along Stonex Drive
- Bicycle parking facilities to be provided on Stonex Drive and the Pacific Highway
- Interface to the Pacific Highway will consist of a high quality streetscape with street tree planting, high quality paving, lighting, and street furniture.
- The proposal make provision for road widening at the Pacific Highway and Kissing Point Road intersection with a dedicated left turn lane

4.6 Green travel plan

This report includes a preliminary Green Travel Plan (GTP) identifying some key items that could be included in a more detailed plan to be completed in the DA stage of planning.

4.6.1 Background

A Green Travel Plan (GTP) is a package of measures put in place by the development occupants to try and encourage more sustainable travel. It is a means for a development to demonstrate a commitment and take a pro-active step towards improving the environmental sustainability of its activities.

More generally, the principles of a GTP are applied to all people travelling to and from a site. Government authorities are placing increasing emphasis on the need to reduce the number and lengths of motorised journeys and in doing so encourage greater use of alternative means of travel with less negative environmental impacts than the car.

4.6.2 Objectives

The main objectives of the GTP are to reduce the need to travel and promotion of sustainable means of transport. The more specific objectives include:

- High mode share for public transport, cycling and walking to work journeys;
- Ensuring adequate facilities are provided at the site to enable the tenants and visitors of the development to commute by sustainable transport modes;
- Reduce the number of car journeys associated with business travel;
- Facilitate the sustainable and safe travel of occupants; and
- Raise awareness of sustainable transport amongst residents of the development.

4.6.3 Potential measures

A suite of potential measures is described in Table 6 to be implemented as part of the GTP, which can be developed further as the proposal progresses towards a Development Application.

Table 6 List of potential GTP measures

Action	Responsibility
Cycling	
Provide sufficient cycle parking to meet needs, which is easily accessible and secure	Developer
Provide adequate cycle parking facilities for visitors	Developer
Ensure cycle parking is clearly visible or provide signage to direct people to cycle bays	Building manager
Produce a map showing cycle routes and bike stands in the area	Building manager
Walking	
Produce a map showing safe walking routes to and from the site with times, distances to local facilities, such as shops and bus stops	Building manager
Public Transport	
Develop a map showing public transport routes in the area	Building manager
Put up a noticeboard with leaflets and maps showing the main public transport routes to and from the site	Building manager
Carshare / Carpooling	
Put a poster on the noticeboard where residents would register their interest in carpooling by indicating their work location	Building manager
Develop a map showing car-share spots in the area	Building manager
General actions	
Promotion including: • An events calendar. Best in conjunction with statewide events such as National Bike Week and Bike2Work Day, National Walk to Work Day. • Display boards in prominent locations to show public transport maps and timetables.	Building manager

4.6.4 Monitoring and review

In order for the GTP to be effective, it must be reviewed on a regular basis. It is important to ensure that the GTP is meeting its objectives and having the intended impact on car use and transport choices. The GTP should be reviewed periodically by undertaking resident and other users of the building travel surveys. It is recommended that the mode shares are first reviewed at least 18 months after occupation, to allow activity levels to settle at the site.

5 Traffic Impact Assessment

5.1 Traffic generation

The traffic generated by the site has been calculated based on the development yields associated with the indicative architecture concept prepared for the Planning Proposal. The traffic generation forecasts take into consideration:

- Traffic generation from the high density residential and commercial uses, based on traffic generation rates noted for similar sites with good public transport access as outlined in the TfNSW *Guide to Traffic Generating Developments* document (TDT 2013/04a). Following the receipt of a Gateway Determination for the site and prior to the public exhibition of the proposal a survey of a comparable mixed use development in the Ku-Ring-Gai LGA can be undertaken to confirm the suitability of the adopted traffic generation rate for residential uses.
- Surveys undertaken by Transport for NSW at a number of retail centres in NSW for the retail uses. The floor area for each shopping centre has been plotted against the surveyed traffic generation rate, and a regression analysis undertaken to establish the relationship between floor area and traffic generation. This is illustrated in Figure 22 below.

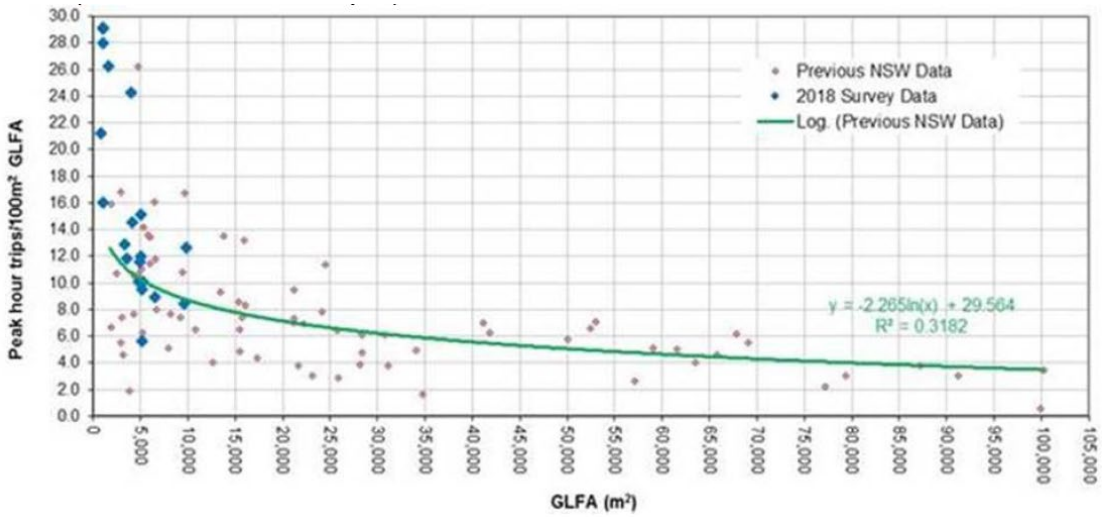

Figure 23 Relationship between retail floor area and traffic generation

Source: Transport for NSW

- Existing traffic generation from the site based on the traffic counts undertaken in December 2020.

A breakdown of the traffic generation calculations are shown in Table 7 on the following page.

Table 7 Forecast traffic generation

Use	Number	Unit	Traffic Generation Rate (per unit or per 100m² GFA)			Forecast Traffic Generation								
						Into Site	Out of Site	Total	Into Site	Out of Site	Total	Into Site	Out of Site	Total
			AM peak hour	*PM peak hour*	*Sat peak hour*	*AM peak hour*			*PM peak hour*			*Sat peak hour*		
Future Residential	181	Units	0.19	0.15	0.19	7	27	34	21	5	27	17	17	34
Future Commercial	1,652	m² GFA	1.60	1.20	0	19	5	24	4	14	18	0	0	0
Future retail	5,538	m² GFA	0.05	0.10	0.11	118	118	237	237	237	473	260	260	520
Sub-Total						144	150	295	262	256	518	277	277	554
Existing site traffic generation						82	110	192	151	151	302	151	172	323
Net traffic generation						**62**	**40**	**103**	**111**	**105**	**216**	**126**	**105**	**231**

5.2 Traffic distribution

Based on the existing traffic movements into the site, as recorded in the traffic surveys undertaken in December 2020, the traffic distribution from the future site development has been forecast and is shown in Figure 23 below. This considers vehicle access via the following routes:

- Kissing Point Road (south): 30% of arrivals
- Pacific Highway (east): 20% of arrivals
- Pacific Highway (west): 25% of arrivals
- Rohini Street: 10% of arrivals
- Duff Street: 15% of arrivals

Figure 24 Forecast traffic distribution

5.3 Historical traffic growth

The Annual Average Daily traffic (AADT) data from the nearest Transport for NSW counting station 53003, which operates on the Pacific Highway adajcent to the site, was extracted from TfNSW's traffic volume viewer to appreciate the pattern of traffic changes along the Pacific Highway corridor within the study area. As can be seen in Figure 24 below, traffic flows on the Pacific Highway have remained largely static over the 14 year period since 2009. There was a significant reduction in 2020 and 2021 however this would primarily be due to the COVID-19 pandemic. It could be expected however that, with the increasing popularity of working from home, traffic flows on the Pacific Highway would not reach their pre-pandemic levels for some time. Importantly the data analysis indicates that traffic flows on the Pacific Highway have not increased significantly in the last decade (even prior to COVID) and therefore no future traffic growth rate has been assumed as part of the traffic modelling undertaken for this study.

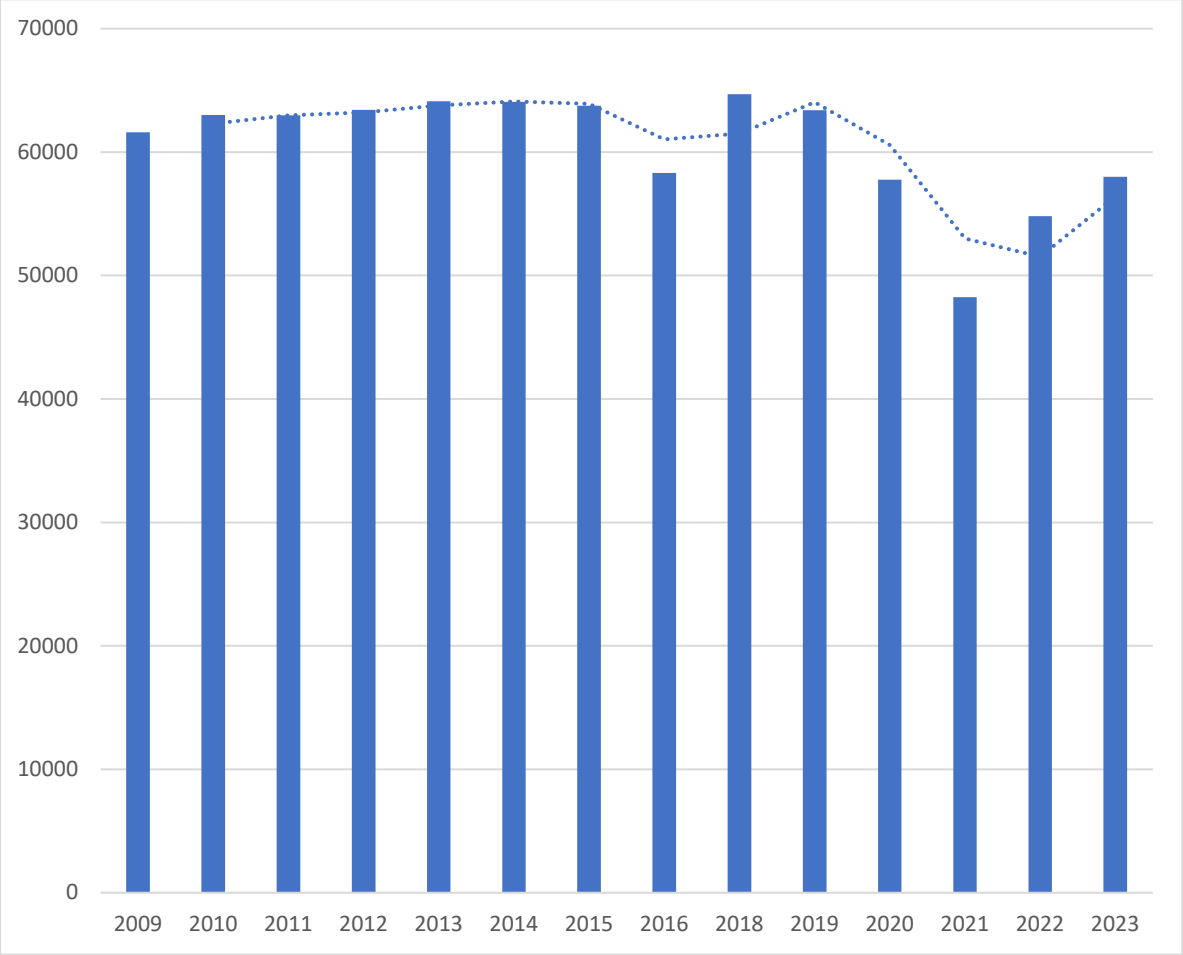

Figure 25 Historical traffic flows – Pacific Highway at Turramurra

5.4 Road network impacts

5.4.1 Methodology

Based on the traffic counts collected in December 2020 and forecast traffic generation an assessment of the performance of the road network has been undertaken. A SIDRA network model, which takes into consideration queueing impacts from upstream and downstream intersections, has been developed for the following locations:

- Pacific Highway / Rohini Street
- Pacific Highway / Kissing Point Road
- Pacific Highway / Ray Street
- Kissing Point Road / Stonex Drive

5.4.2 Performance criteria

The performance of intersections in an urban environment is measured in terms of its Level of Service (LoS). Level of service ranges from A (very good) to F (over capacity with significant delays). This is described in the *RTA Guide to Traffic Generating Developments* as summarised in Table 8. In peak hours at intersections controlled by traffic signals on key regional and arterial routes, a LoS D is generally acceptable.

Table 8 Intersection level of service

Level of Service	Average Vehicle Delay (seconds)	Traffic Signals and Roundabouts	Priority Intersections ('Stop' and "Give Way')
A	< 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	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity. At signals, incidents will cause excessive delay. Roundabouts require other control mode	At capacity, requires other control mode
F	> 71	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing;

Another common measure of intersection performance is the degree of saturation (DOS), which provides an overall measure of the capability of the intersection to accommodate additional traffic. A DOS of 1.0 indicates that an intersection is operating at capacity.

5.4.3 Future development traffic flows

The traffic modelling has incorporated forecast traffic movements from a previous version of the Planning Proposal which sought a density of approximately 4.0:1 which is greater than that proposed under the current proposal. Therefore the outcomes of the modelling represent a worst case scenario given the projected traffic flows associated with the current proposal are significantly reduced compared to the former proposal. This is summarised in the table below.

Table 9 Traffic movements comparison

Scenario	Forecast Increase in Traffic Movements		% reduction in traffic flows
	Former proposal	Current Proposal	
AM Peak Hour	175	103	-42%
PM Peak Hour	301	216	-28%
Sat Peak Hour	297	231	-22%

5.4.4 Road network performance

The operation of the future road network has been modelling using SIDRA Network, with the following scenarios considered:

- Scenario 1: Existing performance based on December 2020 traffic data
- Scenario 2: Existing traffic flows (December 2020) plus those associated with the Planning Proposal

As a worst case scenario, the traffic modelling has considered the future road network operation on a Thursday afternoon and Saturday lunchtime. This was based on the findings of the traffic generation analysis (see Section 5.1) which indicated the site would generate the greatest level of traffic during these time periods as opposed to the AM peak hour. The results of the intersection analysis assessing the future performance of the road network is provided in Table 10 with detailed modelling outputs provided in Appendix A. Key findings from the assessment are as follows:

- All intersections retain an acceptable level of service following the introduction of the development, taking into consideration existing traffic flows already generated by the site.
- Retention of the existing ‘keep clear’ line-marking ensures that the future Kissing Point Road / Stonex Drive intersection performs well during peak hours of the day.
- No vehicle queueing is forecast to extend beyond the right turn bay into the site from Kissing Point Road which would impact the flow of traffic on the Pacific Highway.

As previously noted a key component of the proposal is the dedication of land for the future widening of the Pacific Highway in the vicinity of the site. This land dedication will enable future road widening works to be undertaken by Transport for NSW – facilitating the removal of the existing peak period tidal flow arrangements on the Pacific Highway and resulting in a significantly improved traffic outcome for Turramurra and the wider precinct. Although the project will enable this road widening to occur it has not been relied upon in the traffic modelling undertaken to support this assessment.

Table 10 Future road network performance

Peak Hour	Intersection	Scenario 1: Existing performance			Scenario 2: Existing + development		
		AVD (sec)	LOS	DOS	AVD (sec)	LOS	DOS
Weekday PM Peak Hour	Pacific Highway / Kissing Point Road	19	B	0.70	20	B	0.71
	Kissing Point Road / Stonex Drive	3	A	0.20	5	4	0.25
	Pacific Highway / Ray Street	28	B	0.91	29	C	0.92
	Pacific Highway / Rohini Street	27	B	0.91	32	C	0.93
Saturday Peak Hour	Pacific Highway / Kissing Point Road	18	B	0.87	22	B	0.90
	Kissing Point Road / Stonex Drive	3	A	0.21	4	A	0.24
	Pacific Highway / Ray Street	48	D	0.95	53	D	0.97
	Pacific Highway / Rohini Street	17	B	0.71	19	B	0.73

6 Summary

This transport impact assessment report has been prepared by JMT Consulting on behalf of Rebel Property Group for the Turramurra Village site. The planning proposal seeks approval for an increase in height and floor space ratio (FSR) to the site to allow a mix of uses including residential, retail and commercial.

Key findings of the assessment are as follows:

- Under the indicative architecture concept vehicle access would be provided off a new road (Stonex Drive) at the southern end of the site.
- The Planning Proposal involves a number of enhancements to the existing road network supporting the site including:
    - Creation of Stonex Drive – a new two-way public street which provides an east-west connection between Kissing Point Road and Duff Street
    - Enhancements to traffic capacity along Kissing Point Road including extension of the right turn bay into the site as well as a dedicated left turn bay from Kissing Point Road onto the Pacific Highway
- The indicative architecture concept contemplates approximately 550 off-street parking bays which is consistent with the current Ku-Ring-Gai Council DCP parking controls.
- The proposal would retain a minimum of 30 public car parking spaces on the site dedicated to Council.
- A key component of the proposal is the dedication of land for the future widening of the Pacific Highway by Transport for NSW – facilitating the removal of the existing peak period tidal flow arrangements. This will result in a significantly improved traffic outcome for Turramurra and the wider precinct.
- The site is located in close proximity to various public transport facilities, including Turramurra train station and nearby bus stops.
- Detailed traffic modelling indicates that future development contemplated under the Planning Proposal will not detrimentally impact the operation of the surrounding road network. All intersections in the vicinity of the site are forecast to retain their level of service when compared to current conditions.
- Secure bicycle parking would be provided as a component of any future proposed development, in line with rates specified in the Ku-Ring-Gai Council DCP.
- Travel demand management measures have also been suggested to improve the mode share of public transport and active transport. These items should be considered further at detailed design stage.

In the above context, the traffic and transport impacts arising from the proposal are considered acceptable.

Appendix A: Traffic Modelling Outputs

MOVEMENT SUMMARY

Site: 101 [Pac Hwy / Ray Street (Site Folder: Sat Future)]

Network: N101 [Saturday Future (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Pacific Highway (E)														
5	T1	2072	5.0	2072	5.0	0.878	27.4	LOS B	14.4	105.0	0.81	0.84	0.88	34.5
6	R2	94	5.0	94	5.0	* 0.878	51.3	LOS D	14.4	105.0	0.96	1.09	1.04	26.2
Approach		2165	5.0	2165	5.0	0.878	28.5	LOS B	14.4	105.0	0.82	0.85	0.88	34.0
North: Ray Street (N)														
7	L2	103	5.0	103	5.0	0.424	66.5	LOS E	4.0	29.5	0.96	0.78	0.96	19.1
9	R2	113	5.0	113	5.0	0.463	66.9	LOS E	4.4	32.4	0.97	0.79	0.97	28.3
Approach		216	5.0	216	5.0	0.463	66.7	LOS E	4.4	32.4	0.97	0.79	0.97	24.5
West: Pacific Highway (W)														
10	L2	125	5.0	125	5.0	* 0.967	78.0	LOS F	42.0	306.6	1.00	1.13	1.29	26.9
11	T1	2295	5.0	2295	5.0	0.967	72.9	LOS F	43.3	315.8	1.00	1.14	1.28	17.8
Approach		2420	5.0	2420	5.0	0.967	73.2	LOS F	43.3	315.8	1.00	1.14	1.28	18.4
All Vehicles		4801	5.0	4801	5.0	0.967	52.7	LOS D	43.3	315.8	0.92	0.99	1.09	24.0

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Pacific Highway (E)											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	234.9	221.8	0.94
North: Ray Street (N)											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.8	215.2	0.94
All Pedestrians		105	64.3	LOS F	0.2	0.2	0.96	0.96	232.3	218.5	0.94

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: 101 [Kissing Point Road / Pac Hwy (Site Folder: PM Future)]

Network: N101 [PM Future (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Kissing Point Road (S)														
1	L2	113	3.5	113	3.5	0.194	41.7	LOS C	3.4	24.4	0.76	0.75	0.76	7.3
3	R2	333	1.2	333	1.2	* 0.711	69.8	LOS E	7.4	52.3	1.00	0.84	1.06	4.7
Approach		446	1.8	446	1.8	0.711	62.7	LOS E	7.4	52.3	0.94	0.82	0.99	5.2
East: Pacific Highway (E)														
4	L2	249	3.2	249	3.2	0.178	6.5	LOS A	0.5	3.7	0.05	0.59	0.05	35.4
5	T1	2425	1.9	2425	1.9	* 0.708	16.6	LOS B	19.7	140.0	0.63	0.58	0.63	21.7
Approach		2674	2.1	2674	2.1	0.708	15.6	LOS B	19.7	140.0	0.58	0.58	0.58	22.5
West: Pacific Highway (W)														
11	T1	1697	1.8	1697	1.8	0.614	9.0	LOS A	14.8	105.0	0.59	0.54	0.59	26.8
12	R2	178	2.2	178	2.2	* 0.682	68.8	LOS E	7.3	52.0	1.00	0.83	1.03	5.9
Approach		1875	1.8	1875	1.8	0.682	14.7	LOS B	14.8	105.0	0.63	0.57	0.63	19.9
All Vehicles		4995	1.9	4995	1.9	0.711	19.5	LOS B	19.7	140.0	0.63	0.60	0.63	17.9

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Kissing Point Road (S)											
P1	Full	50	64.3	LOS F	0.2	0.2	0.96	0.96	229.8	215.2	0.94
West: Pacific Highway (W)											
P4	Full	50	66.2	LOS F	0.2	0.2	0.97	0.97	236.8	221.8	0.94
All Pedestrians		100	65.2	LOS F	0.2	0.2	0.97	0.97	233.3	218.5	0.94

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: 101 [Kissing Point Road / Stonex Dr (Site Folder: PM Future)]

Network: N101 [PM Future (Network Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Kissing Point Road (S)														
1	L2	104	0.0	104	0.0	0.214	5.6	LOS A	0.0	0.0	0.00	0.15	0.00	48.1
2	T1	302	2.6	302	2.6	0.214	0.1	LOS A	0.0	0.0	0.00	0.15	0.00	57.2
Approach		406	2.0	406	2.0	0.214	1.5	NA	0.0	0.0	0.00	0.15	0.00	54.3
North: Kissing Point Road (N)														
8	T1	285	4.2	285	4.2	0.152	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
9	R2	141	0.0	141	0.0	0.117	6.7	LOS A	0.2	1.3	0.40	0.64	0.40	32.6
Approach		426	2.8	426	2.8	0.152	2.2	NA	0.2	1.3	0.13	0.21	0.13	53.9
West: Stonex Drive														
10	L2	144	0.0	144	0.0	0.137	9.5	LOS A	0.2	1.6	0.41	0.89	0.41	25.5
12	R2	97	0.0	97	0.0	0.246	16.3	LOS B	0.4	2.8	0.70	1.02	0.77	40.5
Approach		241	0.0	241	0.0	0.246	12.2	LOS A	0.4	2.8	0.53	0.94	0.55	36.1
All Vehicles		1073	1.9	1073	1.9	0.246	4.2	NA	0.4	2.8	0.17	0.35	0.18	50.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Pac Hwy / Rohini Street (Site Folder: PM Future)]

Network: N101 [PM Future (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Pacific Highway (East)														
5	T1	2482	5.0	2482	5.0	*0.927	38.1	LOS C	34.7	253.2	0.84	0.93	1.01	26.9
6	R2	68	2.0	68	2.0	0.743	83.0	LOS F	3.1	21.8	1.00	0.84	1.20	25.1
Approach		2550	4.9	2550	4.9	0.927	39.3	LOS C	34.7	253.2	0.84	0.93	1.02	26.8
North: Rohini Street (North)														
7	L2	74	2.0	74	2.0	0.333	67.4	LOS E	2.9	20.6	0.96	0.77	0.96	28.1
9	R2	202	2.0	202	2.0	*0.909	86.5	LOS F	9.7	69.2	1.00	0.97	1.37	15.8
Approach		276	2.0	276	2.0	0.909	81.4	LOS F	9.7	69.2	0.99	0.92	1.26	19.4
West: Pacific Highway (West)														
10	L2	171	2.0	171	2.0	0.763	19.9	LOS B	19.3	140.0	0.70	0.69	0.70	41.9
11	T1	1842	5.0	1842	5.0	0.763	14.9	LOS B	19.3	140.0	0.73	0.70	0.73	43.2
Approach		2013	4.7	2013	4.7	0.763	15.3	LOS B	19.3	140.0	0.73	0.70	0.73	43.1
All Vehicles		4839	4.7	4839	4.7	0.927	31.7	LOS C	34.7	253.2	0.81	0.83	0.91	31.6

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Pacific Highway (East)											
P2	Full	50	64.3	LOS F	0.2	0.2	0.96	0.96	234.9	221.8	0.94
North: Rohini Street (North)											
P3	Full	50	64.3	LOS F	0.2	0.2	0.96	0.96	229.8	215.2	0.94
All Pedestrians		100	64.3	LOS F	0.2	0.2	0.96	0.96	232.3	218.5	0.94

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: 101 [Pac Hwy / Ray Street (Site Folder: PM Future)]

Network: N101 [PM Future (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Pacific Highway (E)														
5	T1	2542	5.0	2542	5.0	*0.920	33.2	LOS C	14.4	105.0	0.90	0.94	1.01	31.7
6	R2	89	5.0	89	5.0	0.497	82.4	LOS F	4.7	34.6	1.00	0.90	1.00	18.4
Approach		2632	5.0	2632	5.0	0.920	34.9	LOS C	14.4	105.0	0.90	0.94	1.01	31.0
North: Ray Street (N)														
7	L2	106	5.0	106	5.0	0.437	66.6	LOS E	4.2	30.4	0.96	0.79	0.96	19.0
9	R2	139	5.0	139	5.0	*0.571	68.0	LOS E	5.6	40.7	0.99	0.80	0.99	27.9
Approach		245	5.0	245	5.0	0.571	67.4	LOS E	5.6	40.7	0.98	0.80	0.98	24.7
West: Pacific Highway (W)														
10	L2	139	5.0	139	5.0	0.810	23.2	LOS B	30.1	219.6	0.79	0.75	0.79	45.1
11	T1	1907	5.0	1907	5.0	0.810	17.5	LOS B	30.3	221.2	0.79	0.75	0.79	38.1
Approach		2046	5.0	2046	5.0	0.810	17.8	LOS B	30.3	221.2	0.79	0.75	0.79	38.9
All Vehicles		4923	5.0	4923	5.0	0.920	29.4	LOS C	30.3	221.2	0.86	0.85	0.92	33.0

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Pacific Highway (E)											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	234.9	221.8	0.94
North: Ray Street (N)											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.8	215.2	0.94
All Pedestrians		105	64.3	LOS F	0.2	0.2	0.96	0.96	232.3	218.5	0.94

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: 101 [Kissing Point Road / Pac Hwy (Site Folder: Sat Future)]

Network: N101 [Saturday Future (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Kissing Point Road (S)														
1	L2	152	2.1	152	2.1	0.297	47.7	LOS D	5.0	35.3	0.83	0.78	0.83	6.5
3	R2	344	0.6	344	0.6	*0.896	84.6	LOS F	9.0	63.1	1.00	0.96	1.37	3.8
Approach		496	1.1	496	1.1	0.896	73.3	LOS F	9.0	63.1	0.95	0.91	1.20	4.4
East: Pacific Highway (E)														
4	L2	239	1.3	239	1.3	0.164	7.3	LOS A	1.0	7.0	0.11	0.61	0.11	33.7
5	T1	2119	1.3	2119	1.3	*0.903	22.4	LOS B	19.8	140.0	0.75	0.74	0.80	17.7
Approach		2358	1.3	2358	1.3	0.903	20.9	LOS B	19.8	140.0	0.69	0.73	0.73	18.6
West: Pacific Highway (W)														
11	T1	2196	1.9	2196	1.9	0.511	9.0	LOS A	14.8	105.0	0.62	0.57	0.62	26.9
12	R2	202	1.0	202	1.0	*0.710	58.4	LOS E	6.4	44.9	0.94	0.97	0.98	6.7
Approach		2398	1.8	2398	1.8	0.710	13.1	LOS A	14.8	105.0	0.64	0.60	0.65	21.4
All Vehicles		5252	1.5	5252	1.5	0.903	22.3	LOS B	19.8	140.0	0.69	0.69	0.73	16.0

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Kissing Point Road (S)											
P1	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.8	215.2	0.94
West: Pacific Highway (W)											
P4	Full	53	66.2	LOS F	0.2	0.2	0.97	0.97	236.8	221.8	0.94
All Pedestrians		105	65.2	LOS F	0.2	0.2	0.97	0.97	233.3	218.5	0.94

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: 101 [Kissing Point Road / Site Access (Site Folder: Sat Future)]

Network: N101 [Saturday Future (Network Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Kissing Point Road (S)														
1	L2	112	0.0	112	0.0	0.225	5.6	LOS A	0.0	0.0	0.00	0.15	0.00	48.1
2	T1	319	1.7	319	1.7	0.225	0.1	LOS A	0.0	0.0	0.00	0.15	0.00	57.2
Approach		431	1.2	431	1.2	0.225	1.5	NA	0.0	0.0	0.00	0.15	0.00	54.2
North: Kissing Point Road (N)														
8	T1	284	1.9	284	1.9	0.148	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
9	R2	160	0.0	160	0.0	0.136	6.9	LOS A	0.2	1.5	0.41	0.66	0.41	32.3
Approach		444	1.2	444	1.2	0.148	2.5	NA	0.2	1.5	0.15	0.24	0.15	53.1
West: RoadName														
10	L2	184	0.0	184	0.0	0.178	9.6	LOS A	0.3	2.1	0.43	0.90	0.43	25.3
12	R2	92	0.0	92	0.0	0.243	16.8	LOS B	0.4	2.7	0.71	1.02	0.78	40.1
Approach		276	0.0	276	0.0	0.243	12.0	LOS A	0.4	2.7	0.52	0.94	0.55	34.8
All Vehicles		1151	0.9	1151	0.9	0.243	4.4	NA	0.4	2.7	0.18	0.37	0.19	49.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Pac Hwy / Rohini Street (Site Folder: Sat Future)]

Network: N101 [Saturday Future (Network Folder: General)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Pacific Highway (East)														
5	T1	2030	5.0	2030	5.0	*0.730	9.9	LOS A	23.3	170.3	0.59	0.55	0.59	45.4
6	R2	65	2.0	65	2.0	0.621	79.7	LOS F	2.8	20.2	1.00	0.79	1.07	25.8
Approach		2095	4.9	2095	4.9	0.730	12.1	LOS A	23.3	170.3	0.60	0.56	0.61	43.5
North: Rohini Street (North)														
7	L2	85	2.0	85	2.0	0.283	61.2	LOS E	3.1	22.4	0.92	0.77	0.92	29.5
9	R2	213	2.0	213	2.0	*0.708	67.0	LOS E	3.5	25.0	1.00	0.85	1.04	19.0
Approach		298	2.0	298	2.0	0.708	65.4	LOS E	3.5	25.0	0.98	0.82	1.00	22.5
West: Pacific Highway (West)														
10	L2	175	2.0	175	2.0	0.655	20.4	LOS B	19.1	139.0	0.64	0.63	0.64	41.4
11	T1	2233	5.0	2233	5.0	0.655	18.0	LOS B	19.2	140.0	0.74	0.69	0.74	40.9
Approach		2408	4.8	2408	4.8	0.655	18.2	LOS B	19.2	140.0	0.73	0.69	0.73	41.0
All Vehicles		4801	4.7	4801	4.7	0.730	18.5	LOS B	23.3	170.3	0.69	0.64	0.69	39.6

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Pacific Highway (East)											
P2	Full	50	64.3	LOS F	0.2	0.2	0.96	0.96	234.9	221.8	0.94
North: Rohini Street (North)											
P3	Full	50	64.3	LOS F	0.2	0.2	0.96	0.96	229.8	215.2	0.94
All Pedestrians		100	64.3	LOS F	0.2	0.2	0.96	0.96	232.3	218.5	0.94

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.