GP3 – Residential Development Planning Proposal

Comprehensive Transport Impact Assessment

Prepared for:

Mirvac Homes (NSW) Pty Ltd

14 April 2022

The Transport Planning Partnership

GP3 – Residential Development Planning Proposal

Comprehensive Transport Impact Assessment

Client: Mirvac Homes (NSW) Pty Ltd

Version: 04

Date: 14 April 2022

TTPP Reference: 17285

Quality Record

Version	Date	Prepared by	Reviewed by	Approved by	Signature
Draft 01	7/4/2022	Clinton Cheung, Charbel Hanna, Doris Lee	Wayne Johnson	Wayne Johnson	-
02	11/4/2022	Clinton Cheung, Doris Lee	Wayne Johnson	Wayne Johnson	-
03	11/4/2022	Clinton Cheung, Doris Lee	Wayne Johnson	Wayne Johnson	-
04	14/4/2022	Doris Lee	Wayne Johnson	Wayne Johnson	

Table of Contents

Tables

Figures

APPENDICES

1 Introduction

1.1 Background

A Planning Proposal was lodged with Penrith City Council in May 2018 and March 2020 seeking amendment of the Penrith City Council 2010 Local Environmental Plan (LEP) to enable the extension of Glenmore Park for a mixed-use development on land located adjacent to The Northern Road, Mulgoa.

Following consultation with Transport for NSW (TfNSW) and Penrith City Council to appreciate the planning proposal requirements, this comprehensive traffic impact assessment (CTIA) has been prepared to identify the traffic and transport impacts of the subject development and to recommend a package of appropriate transport measures to help residents and workers to travel sustainably to/from the proposed development while incorporating targets for reducing private car use.

1.2 Overview of Proposed Development and Vehicular Accesses

The proposed residential development in GP3 is an extension of GP2. Access to the subject site is proposed to be via the following roads as shown in Figure 1.1:

- An entry boulevard as an extension of the western leg to the intersection of The Northern Road with Defence Establishment Orchard Hills (DEOH) Access Road
- Three access points off the north side of Chain-O-Ponds Road
- A number of local roads to be extended south from GP2 to GP3. The primary access between GP2 and GP3 would be via Darug Avenue, Gunyah Drive and Riverflat Drive.

Figure 1.1: Site Layout and Access Points

The proposed mixed-use development consists of the following land uses:

- 1,783 low density dwellings (including 81 large lots)
- 487 medium density dwellings
- 30 Fonzie flats (within medium density)
- 100 shop top dwellings
- 5,000m^2 GLFA mixed-use centre
- A primary school to accommodate up to 1,000 students and 70 staff.

A total of 2,400 dwellings are scheduled to be fully developed by year 2036, with an initial 200 low density dwellings to be developed by year 2026. The mixed-use centre is located on the south side of the proposed entry boulevard approximately 500m west of The Northern Road, and is scheduled to be operational by year 2036.

School Infrastructure NSW (SINSW) advised that a primary school is required within the subject development, and estimated the projected enrolment to be upwards of 670 students based on the proposed 2,400 dwelling yield. However, SINSW typically builds primary schools to a 1,000-student capacity. SINSW also specified a primary school with a 1,000-student capacity would generate an estimated 70 staff.

SINSW also advised that the specific catchment area for the school would be determined on delivery, however, it is likely that approximately 70% of future students would be located within GP3.

The primary school would be located on the south side of the entry boulevard on the east side of the extended Riverflat Drive.

1.3 Consultation with TfNSW and Penrith City Council

Transport for NSW (TfNSW) and Penrith City Council provided comments to the planning proposal submitted in March 2020 requesting a comprehensive study be undertaken to appreciate the traffic and transport on the internal and external road network.

The scope of work has been formulated based on discussions with authorities and finalised in the TTPP proposed study methodology letter dated 18 October 2021 in which both authorities made specific requirements on the CTIA.

The objective of the CTIA is to identify the road hierarchy impact and if any further infrastructure requirements are identified, in addition to The Northern Road upgrade, to support the planning proposal upon completion.

A detailed assessment of the internal road network is required in terms of public transport and active transport connectivity, internal intersection control and local area traffic management measures.

This comprehensive transport impact assessment has considered measures to achieve the 30-minute city target as such residents should be able to reach their nearest metropolitan and strategic centres within 30 minutes, seven days a week, by public transport. This would reduce reliance on private vehicle trips to support this target.

During the consultation phase, both TfNSW and Council agreed on the traffic generation rates to be used for the proposed residential, mixed-use centre and school. The traffic impact is to be assessed using SIDRA modelling for the agreed intersections along The Northern Road, Chain-O-Ponds Road and intersections internal to the mixed-use development.

1.4 Purpose of this Report

This report sets out our assessment of the anticipated transport implications of the Planning Proposal, including consideration of the following:

- the traffic generating characteristics of the Planning Proposal
- suitability of the proposed access arrangements
- traffic and transport impact of the development proposal on the internal and external road networks at the access points to/from the site
- any further infrastructure requirements in addition to The Northern Road upgrade, to support the Planning Proposal upon completion.

The study methodology has been customised in consultation with TfNSW and Council to address their specific requirements.

Traffic generation associated with the above development yield was assessed using Network SIDRA modelling software for the potential traffic impact on the surrounding external and internal road networks.

1.5 Reference

In preparing this report, reference has been made, but not limited to, the following:

- The Northern Road Upgrade (TfNSW)
- The Northern Road Upgrade Mersey Road to Glenmore Parkway, Environmental Impact Assessment (Jacobs, 15 May 2017 and December 2017)
- TfNSW Guide to Traffic Generating Developments, 2002
- TfNSW's Trip Generation Surveys – NSW Small Suburban Shopping Centres Analysis Report (November 2018)

- TfNSW's Trip Generation Surveys – Schools Analysis Report (August 2014)
- Penrith City Council Development Control Plan Part E7 Glenmore Park
- Future Transport 2056 (NSW Government)
- Sydney's 30-minute Centres (GTA Consultants)
- Western City District Plan (Greater Sydney Commission)
- Place-based Infrastructure Compact (PIC) program (Greater Sydney Commission)
- Austroads Guide to Road Design Part 6A
- RMS Bicycle Guidelines
- NSW Cycleway Design Toolbox.

2 Existing Transport Context

2.1 Site Location

The subject site is located on the west side of The Northern Road as highlighted in Figure 2.1. The site borders adjacent residential properties to the north, The Northern Road to the east and rural properties to the south and Penrith Landfill Depot to the west.

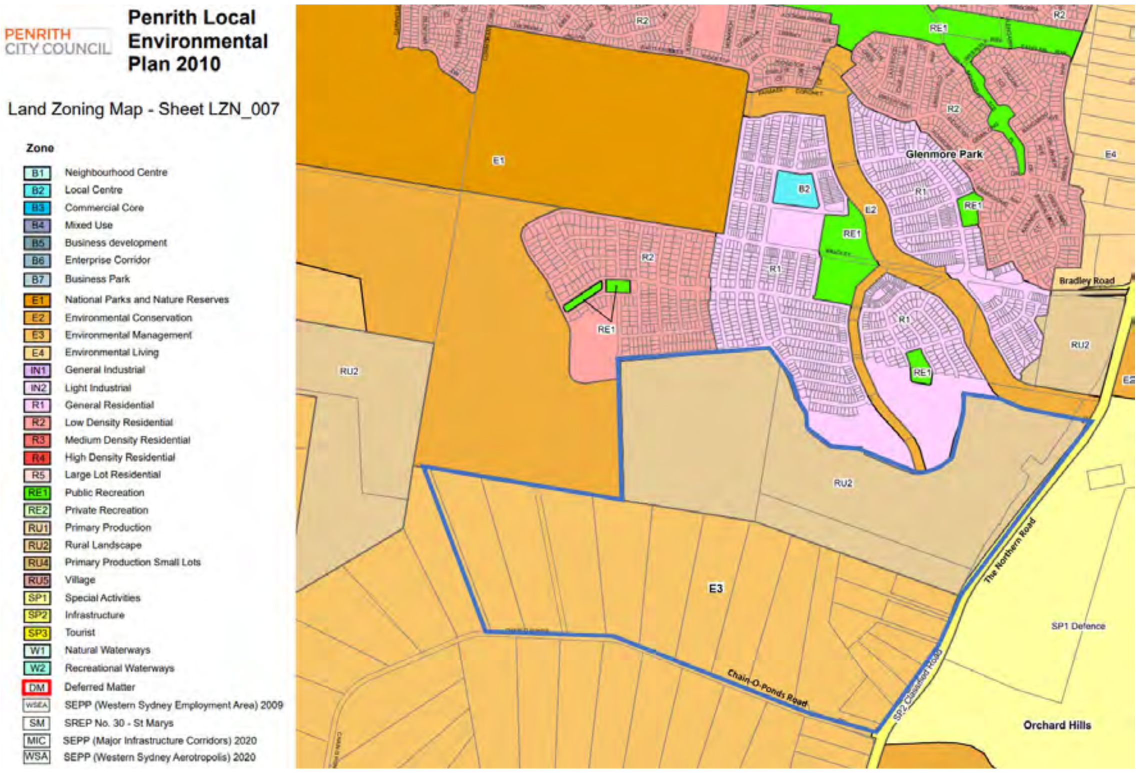
The subject site comprises the following land parcels:, , Lot 3/DP1224642, Lot 701/DP1275647, Lot 18/DP244610, Lot 19/DP244610, Lot 25/DP244610, Lot 26/DP244610, Lot 27/DP244610, Lot 28/DP244610, Lot 29/DP244610, Lot 30/DP244610, , Lot 2/DP1240361, Lot 3/DP1240361 Lot 1/DP29081, Lot 2/29081, Lot 3/DP29081, Lot 4/29081, Lot 5/DP29081, Lot 6/DP29081, Lot 1/DP1088989, Lot 8/DP29081 and Lot 1/DP795841. The subject site has a total area of approximately 205 hectares.

Figure 2.1: Site Location and its Surrounding Environs

2.2 Land Use

Figure 2.2 shows the subject site is located on land currently zoned RU2 Rural Landscape, and C3 Environmental Management under the Penrith LEP 2010.

Figure 2.2: Land Use



Source: Penrith Local Environmental Plan 2010 (last accessed on 12 January 2022)

2.3 Road Network

The Northern Road is a State Road with a north-south alignment connecting Narellan with Richmond. Approximately 36km of The Northern Road has recently been upgraded to a dual carriageway with a central median reserved for future road widening. The Northern Road generally provides three traffic lanes and a dedicated kerbside bus lane in each direction north of Bradley Street, and two traffic lanes in each direction. Bus lanes are provided at all traffic lights. Refer to Section 2.4 for further details. The Northern Road has a posted speed limit of 80km/h between Glenmore Parkway and Elizabeth Drive.

Bradley Street is a collector road under the jurisdiction of Penrith City Council. Bradley Street is a two-lane undivided road with an east-west alignment connecting Glenmore Park with The Northern Road. The signalised intersection with The Northern Road has recently been upgraded as part of The Northern Road upgrade works.

Defence Establishment Orchard Hills (DEOH) Access Road is a private road that provides access to DEOH from The Northern Road. Currently, a U-turn facility is provided on the western approach to the intersection with The Northern Road. However, this would eventually be upgraded as an entry boulevard providing access to the proposed GP3 community.

Chain-O-Ponds Road is a rural collector road under the jurisdiction of Penrith City Council. It is a two-lane undivided road that runs between The Northern Road and Kings Hill Road. Chain-O-Ponds Road has a posted speed limit of 70km/hr. The signalised intersection with The Northern Road has recently been upgraded as part of The Northern Road upgrade works.

2.4 The Northern Road Upgrade

The Australian and NSW governments have recently completed upgrading The Northern Road as part of the $4.1 billion Western Sydney Infrastructure Plan to improve safety, increase road capacity and reduce travel times and congestion. The Northern Road upgrade between The Old Northern Road, Narellan and Jamison Road, South Penrith covers about 36km and includes access to the new Nancy Bird Walton Airport at Badgerys Creek and the growth areas of South West and Western Sydney.

The upgrade was delivered in six stages as detailed in Table 2.1.

Table 2.1: The Northern Road Upgrade

Stage	Section	Completed / Open to Traffic
Stage 1	The Old Northern Road, Narellan and Peter Brock Drive, Oran Park (3.3km)	April 2018
Stage 2	Peter Brock Drive, Oran Park and Mersey Road, Bringelly (11.3km)	December 2020
Stage 3	Mersey Road, Bringelly and Eaton Road, Luddenham (5.5km)	September 2020
Stage 4	Eaton Road, Luddenham and Littlefields Road, Luddenham (4.5km)	March 2021
Stage 5	Littlefields Road, Luddenham and Glenmore Parkway, Glenmore Park (6km)	December 2021
Stage 6	Glenmore Parkway, Glenmore Park and Jamison Road, South Penrith (4km)	May 2021

Source: TfNSW The Northern Road Upgrade Project Update (December 2021)

The upgrade works generally comprised road widening, intersection improvements and road realignment along 36km of The Northern Road between Jamison Road in South Penrith and Peter Brock Drive in Oran Park as shown in Figure 2.3.

Figure 2.3: Extent of The Northern Road Upgrade

Source: TfNSW The Northern Road Upgrade Project Update (December 2021)

Notably, The Northern Road adjacent to the proposed development site between Littlefields Road to Glenmore Parkway (refer Figure 2.3) was upgraded and opened to traffic in December 2021 as part of the Stage 5 upgrade. Key features include:

- Three lanes in each direction with median and dedicated kerbside bus lanes between Bradley Street and Glenmore Parkway
- Two lanes in each direction south of Bradley Street, with a wide median allowing for widening to six lanes, when required
- Three new traffic lights at Littlefields Road, Kings Hill Road and Chain-O-Ponds Road
- Two new U-turn bays and two new roundabouts for ease of access
- Access to Defence Establishment Orchard Hills with traffic lights and a U-turn facility located on the western leg of the intersection to accommodate traffic accessing existing rural properties along The Northern Road as right turn movements across the central median will not be permitted. It is noted that the western leg is being proposed to be upgraded to provide direct access to the subject development from The Northern Road
- Upgraded intersection at Bradley Street with U-turn facility
- Bus lanes at all traffic lights
- A 3m wide off-road shared pedestrian and cyclist path.

The upgraded section between Jamison Road and Bradley Street was opened to traffic in May 2021. Key features involve:

- Three lanes in each direction with a median and dedicated kerbside bus lanes between Glenmore Parkway and Smith Street
- Upgraded interchange with the M4 Motorway including a new wider bridge to replace the existing bridge
- New traffic lights and turning lanes at nine intersections including replacing the roundabout at Glenmore Parkway
- Off-road shared pedestrian and cyclist paths on both the eastern and western sides.

The remaining road sections between Jamison Road in South Penrith and Peter Brock Drive in Oran Park were also upgraded and opened to traffic as shown in Figure 2.3.

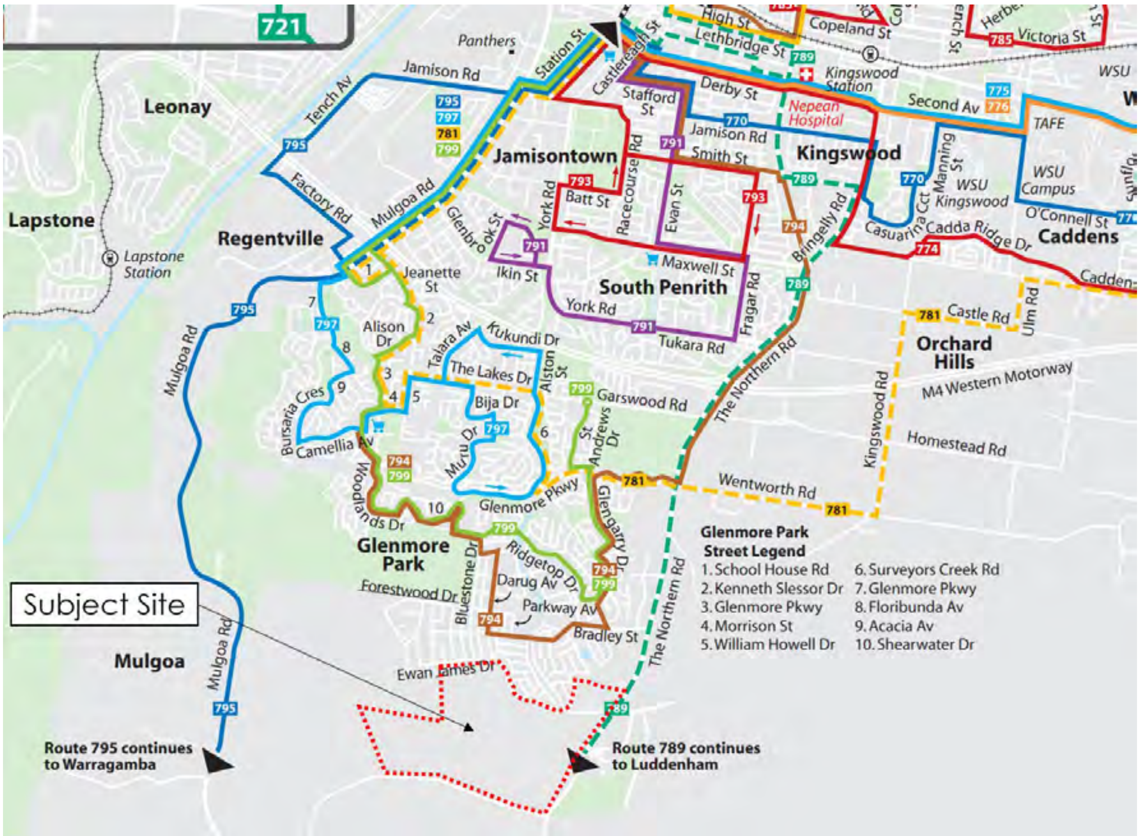
2.5 Public Transport

Public transport within close proximity of the subject site is provided exclusively by bus services.

The Northern Road within the vicinity of the site is serviced by Bus Route 789 that links Luddenham with Penrith. The nearest bus stops along The Northern Road are located adjacent to the intersections with Entry Boulevard/Defence Establishment Orchard Hills and Chain-O-Ponds Road. This bus service operates twice a day on weekdays during the peak periods. No services are provided on weekends.

Furthermore, the existing bus route 794 currently services Glenmore Park providing services between Penrith to Glenmore Park via South Penrith. This bus route is proposed to be re-routed to service the new GP3 development. Further details on the future route are discussed in Section 4.5.1.2 and Section 8.2.2.

Figure 2.4: Existing Bus Route 789 and Bus Route 794



Source: Busways (last accessed on 12 January 2022)

2.6 Pedestrian and Cyclist Facilities

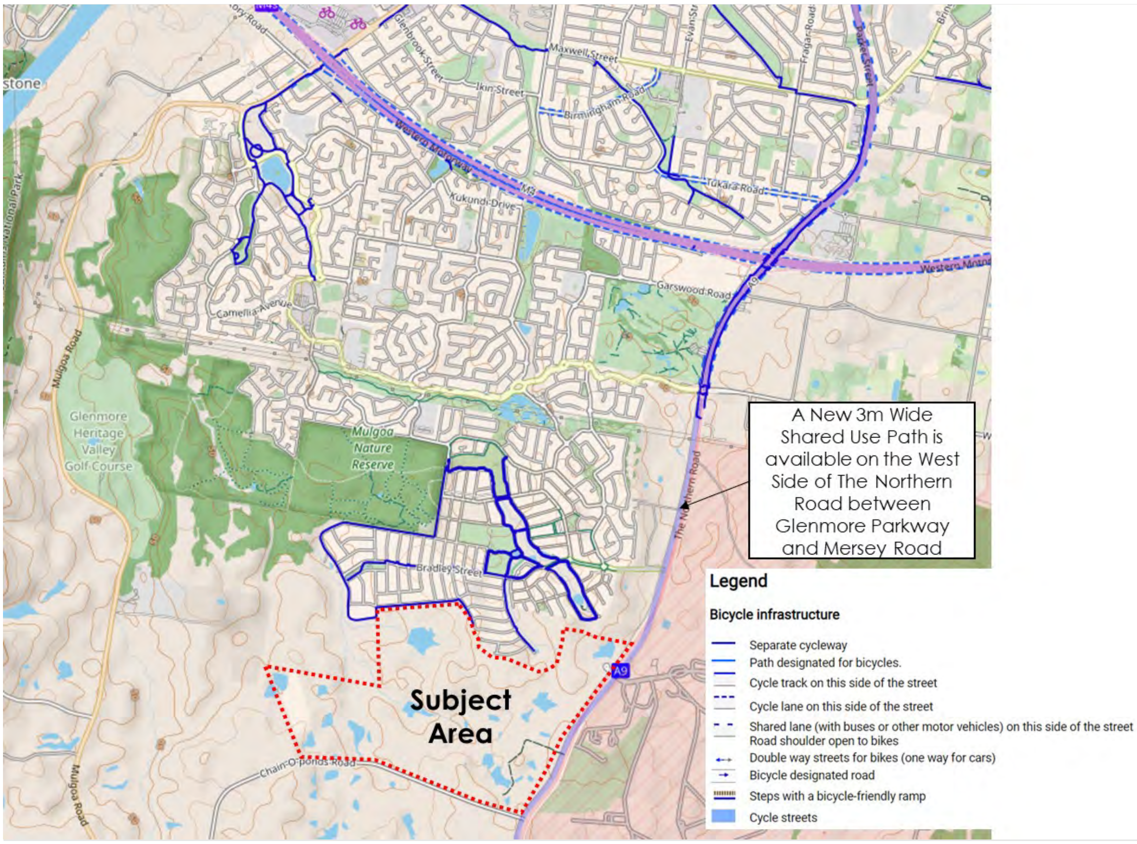
Prior to the Northern Road Upgrade there was limited pedestrian and cycling infrastructure provided along The Northern Road, Chain-O-Ponds Road and Bradley

Street. Upon completion of the upgrades, it now provides a 3m-wide off-road shared pedestrian and cyclist path along the west side of The Northern Road. Additionally, signalised pedestrian crossings are provided on all approaches of the upgraded signalised intersections for access to the bus stops located on the east side of the road.

Sealed footpaths are provided along Glenmore Parkway and Bradley Street upon entry to the existing Glenmore Park residential area.

The existing cycleway network within the area is presented in Figure 2.5, noting that a new shared use path is currently available on the west side of The Northern Road following the recent upgrade but it is not shown on the base map in Figure 2.5.

Figure 2.5: Existing Cycleway Network



Source: OpenStreetMaps (last accessed 12 January 2022)

There are a number of existing shared use paths in GP2 adjacent to the proposed GP3 development. The proposed shared use paths will connect with the existing facilities in GP2 and The Northern Road. Refer to Section 5.5 for further discussion.

2.7 Travel Mode Share

Review of the Census Method to Travel to Work (MTW) 2016 data has been undertaken to appreciate the mode of transport for GP1 and GP2. It is noted that since the subject site (GP3) is located immediately south of GP2, it is expected that the transport mode would be similar to GP1 and GP2, except that it is located further away from Penrith Train Station. Furthermore, a substantial proportion of the GP2 development was already developed and occupied in 2016 (census year).

The nearest train station (Penrith Station) is located between 3-6km north of GP1 and 2. As such, residents (specifically those which travel to work by train) within the existing Glenmore Park would require at least one other mode of transport (i.e. via bus or car) to reach Penrith Station. It is highly unlikely that residents would walk from Glenmore Park Stage 1 and 2 to Penrith Station noting the walking distance and the limited pedestrian connectivity across the M4 Motorway – the only pedestrian facilities are provided at the Mulgoa Road intersection and The Northern Road intersection.

Furthermore, the census when asking how people travel to work, provides the option for individuals to choose one or more transport modes relevant to them and their journey to work. For example, a resident who requires to be driven to the nearest bus stop to take the bus to the train station would choose three answers on the census: 'car as passenger', 'bus' and 'train'. However, it is also reasonable to assume that some may simply answer with one mode i.e. 'train' without also indicating how they arrived at the train station (via bus or car).

Based on the above, Table 2.2 provides a breakdown of the existing train mode share based on the census data. The breakdown indicates that approximately 4.6% of Glenmore Park residents simply chose 'train' without identifying other transport modes require to reach the train station. As a result, the adjusted existing mode share has been adjusted excluding the 'train-only' results.

Table 2.2: Existing Resident Travel Mode Splits

Mode of Travel		Existing Mode Share for GP1 and 2 based on Census	Adjusted Mode Share for GP1 and 2 (i.e. without Train Only as a travel mode)
Car (as driver or passenger)		87.1%	87.1%
Train	Train Only	4.6%	Not applicable – GP1 and 2 residents require a connection to Penrith Station which is located outside the walking distance
	Train-bus	1.3%	2.2%
	Train-car (driver and passenger)	4.0%	7.1%
	Train-bus-car (driver and passenger)	0.6%	1.1%
	Train-others	0.1%	0.1%
Bus only		1.0%	1.0%
Motorcycle		0.4%	0.4%

Mode of Travel	Existing Mode Share for GP1 and 2 based on Census	Adjusted Mode Share for GP1 and 2 (i.e. without Train Only as a travel mode)
Bicycle	0.2%	0.2%
Walked only	0.7%	0.7%
Total	**100%**	**100%**

[1] figures rounded to nearest per cent.

Table 2.2 indicates that a large proportion of residents living within GP1 and 2 travel via private vehicle (driver or passenger) with 87% mode share. Public transport makes up 11.5%, 0.6% travel via motorcycle and bicycle and 0.7% via walking only. The train-car connection makes up 7.1% indicating private vehicle is a major means to get to the nearest train station, as compared with the train-bus connection (2.2%).

Table 2.3 provides a breakdown of the mode share of employed people traveling to work in GP1 and GP2.

Table 2.3: Existing Employee Travel Mode Splits

Mode of Travel	Existing Mode Share for GP1 and 2 based on Census
Car (as driver or passenger)	92%
Train	1%
Bus only	0%
Motorcycle	2%
Bicycle	1%
Walked only	4%
Total	**100%**

Table 2.3 indicates that the majority of employed people travel to GP1 and 2 via private vehicle (92%), bus (0%), 2% via motorcycle and 5% via active travel means (i.e. walked only or bicycle). It is noted that based on the census data 0% of employed persons take public bus to travel to GP1 and 2. This could be due to the small / local nature of existing businesses currently operating within the local centre of Glenmore Park i.e. Glenmore Park is not considered as a major employment zone / destination. Furthermore, the local centre provides an unrestricted car park which can be utilised by employees and visitors. Unrestricted car parking is also provided within surrounding local roads which influence the use of private vehicle to travel to work. The 5% of active travel indicates that there are some local residents who travel to work via bicycle or walking.

Detailed discussion regarding proposed target mode share is provided in Section 8.1.

2.8 Travel Patterns

Review of Census 2016 data has been undertaken to appreciate the current travel patterns. For the residents travelling from GP1 and GP2 to workplace, key destinations include 32% to Penrith, 9% to Parramatta, 8% to both Mount Druitt and Sydney Inner City. The remaining residents travel to other destinations in Greater Sydney and further. The top 10 destinations which residents in GP1 and GP2 travel to for work are summarised in Table 2.4.

Table 2.4: ABS Census 2016 Travel Patterns for Residents

Statistical Area (Place of Work)	Proportion
1. Penrith	32%
2. Parramatta	9%
3. Mount Druitt	8%
4. Sydney Inner City	8%
5. Blacktown	5%
6. St Marys	4%
7. Fairfield	3%
8. Merrylands - Guildford	3%
9. Blue Mountains	3%
10. All Other Suburbs	25%
Total	**100%**

2.9 Traffic Volumes

Traffic movement count surveys and queue length surveys were undertaken at the following locations during the morning and evening peak periods (7am-9am and 4pm-6pm) on Tuesday 12 December 2021:

- The Northern Road and M4 Western Motorway interchange
- The Northern Road and Glenmore Parkway / Wentworth Road
- The Northern Road and Bradley Street
- The Northern Road and Defence Establishment Access
- The Northern Road and Chain-O-Ponds Road.

In consultation with TfNSW and Council, it was agreed that intersections that were under construction as part of The Northern Road upgrade project would be excluded from the existing base case model, given they were to be upgraded. As such there is little value in calibrating and validating these intersections, noting there would be significant changes in road configuration following the upgrade of The Northern Road.

In order to confirm whether the surveyed traffic volumes collected in December 2021 have resumed to the pre-Covid situation, TTPP has reviewed historical SCATS count data and recent traffic count survey results to quantify the traffic fluctuation, namely,

- 28 November 2019 (pre-COVID)
- 26 November 2020 (minimal COVID effects)
- 27 May 2021 (outside of COVID i.e. ease of restrictions)
- 12 December 2021 (outside of COVID i.e. ease of restrictions).

Table 2.5 shows a comparison of the total traffic volumes at The Northern Road-M4 Motorway and The Northern Road-Glenmore Parkway intersection for the weekday AM and PM peak hours in 2019, 2020 and 2021.

Table 2.5: SCATS Traffic Volume Comparison

Intersection	Source	Date	AM Peak Hour (veh)	PM Peak Hour (veh)
The Northern Road-M4 (TCS 2306 and 3669)	TfNSW SCATS data	Thursday, 28 November 2019	4,103	4,331
		Thursday, 26 November 2020	Detectors not fully operational after TCS upgrade throughout November 2020	
		Thursday, 27 May 2021	**5,674**	**5,924**
	Traffic Survey	Tuesday, 12 December 2021	5,399	5,818
The Northern Road-Glenmore Parkway (TCS 4288)	TfNSW SCATS data	Thursday, 28 November 2019	TCS installation in 2020 therefore no data for November 2019	
		Thursday, 26 November 2020	2,177	1,973
		Thursday, 27 May 2021	**3,730**	**3,849**
	Traffic Survey	Tuesday, 12 December 2021	3,618	3,705

In Table 2.5 the historical data shows that the total traffic volume was greatest in May 2021 with 5,674 vph (AM peak) and 5,924 vph (PM peak) at The Northern Road-M4 Motorway intersection and 3,730 vph (AM peak) and 3,849 vph (PM peak) at The Northern Road-Glenmore Parkway intersection.

As the highest traffic volumes occurred in May 2021, traffic volumes recorded 27 May 2021 were adopted in modelling as a conservative measure. These baseline traffic volumes were projected for years 2026 and 2036 for future year modelling for the following intersections:

- The Northern Road and Bradley Street
- The Northern Road and Defence Establishment Access
- The Northern Road and Chain-O-Ponds Road.

These intersections were modelled to assess the traffic impact of the development on the external roads, as agreed with Department of Planning and Environment (DPIE) during a meeting held on 24 March 2022.

Based on the SCATS traffic volume, the following network peak hours have been determined and adopted in this traffic assessment:

- 7:45am-8:45am
- 4:15pm-5:15pm.

3 NSW Government Strategic Future Planning Policies

3.1 Future Transport Strategy 2056

The Future Transport Strategy is the NSW governments' long-term plan to enhance transport choices for people across NSW and to set out the future direction of the transport infrastructure with a vision to make a real impact on the lives of people in NSW and to reshape the state's economic growth. Future Transport Strategy recommends the action plan for building regional as well as greater metropolitan transport network by considering all modes of transport and the use of technology to evolve transport.

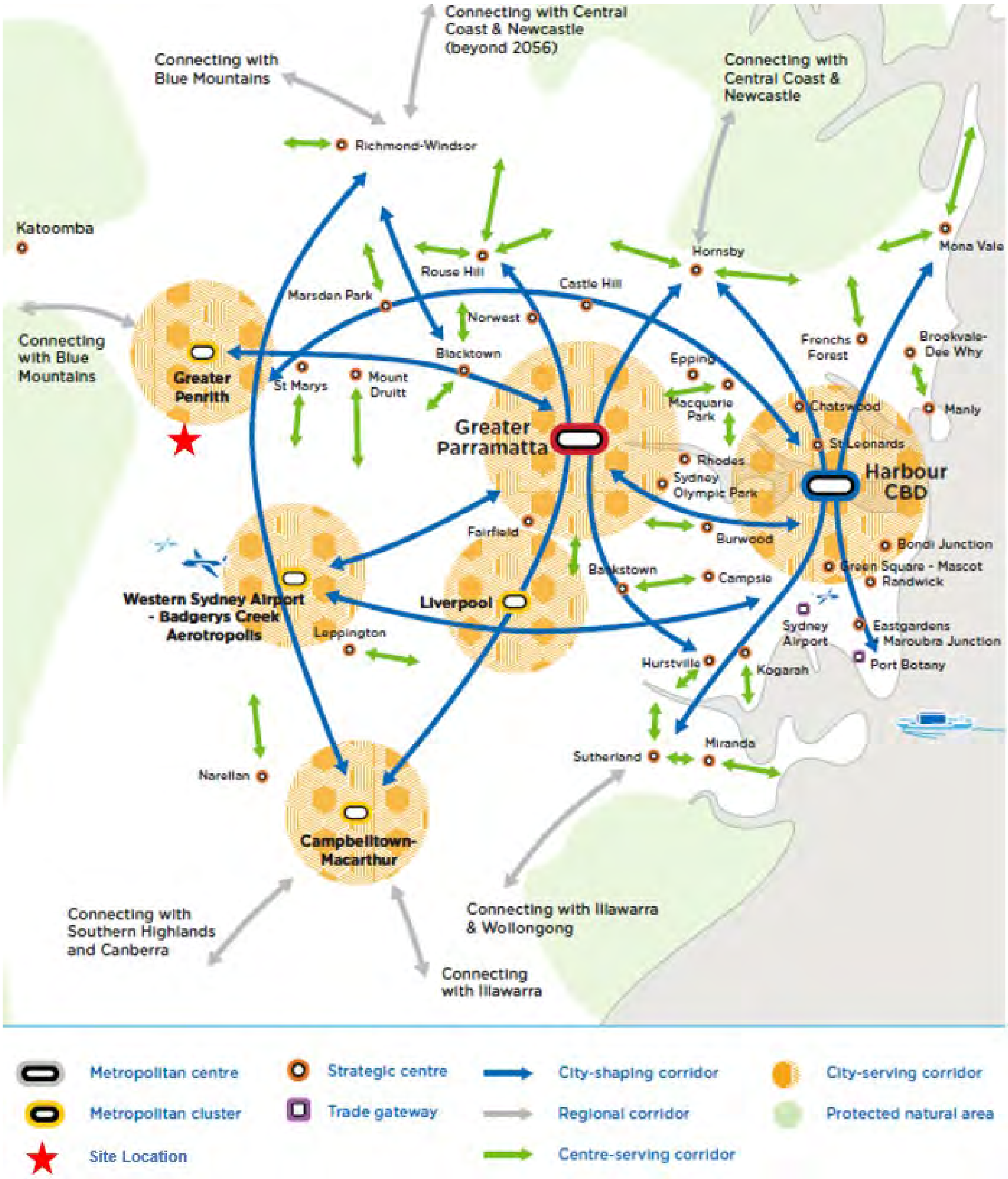
The future transport network as prescribed in the Future Transport Strategy 2056 focuses on establishment of Greater Sydney Strategic Transport Corridors as shown in Figure 3.1. It also leaves some flexibility in planning around these strategic locations and corridors.

The development site is closely located to the major north-south strategic transport corridor, which provides connectivity by both public transport (Sydney Metro – Western Sydney Airport Line) and The Northern Road.

The development site is strategically located close to a north-south oriented principal bicycle network link along The Northern Road (A9). This link has recently been constructed along the west side of The Northern Road and runs directly alongside the Glenmore Park development boundary. This Principal Bicycle link is important due to it being a direct connection between the existing Greater Penrith Metropolitan City Cluster and the future Western Sydney Airport Metropolitan City Cluster.

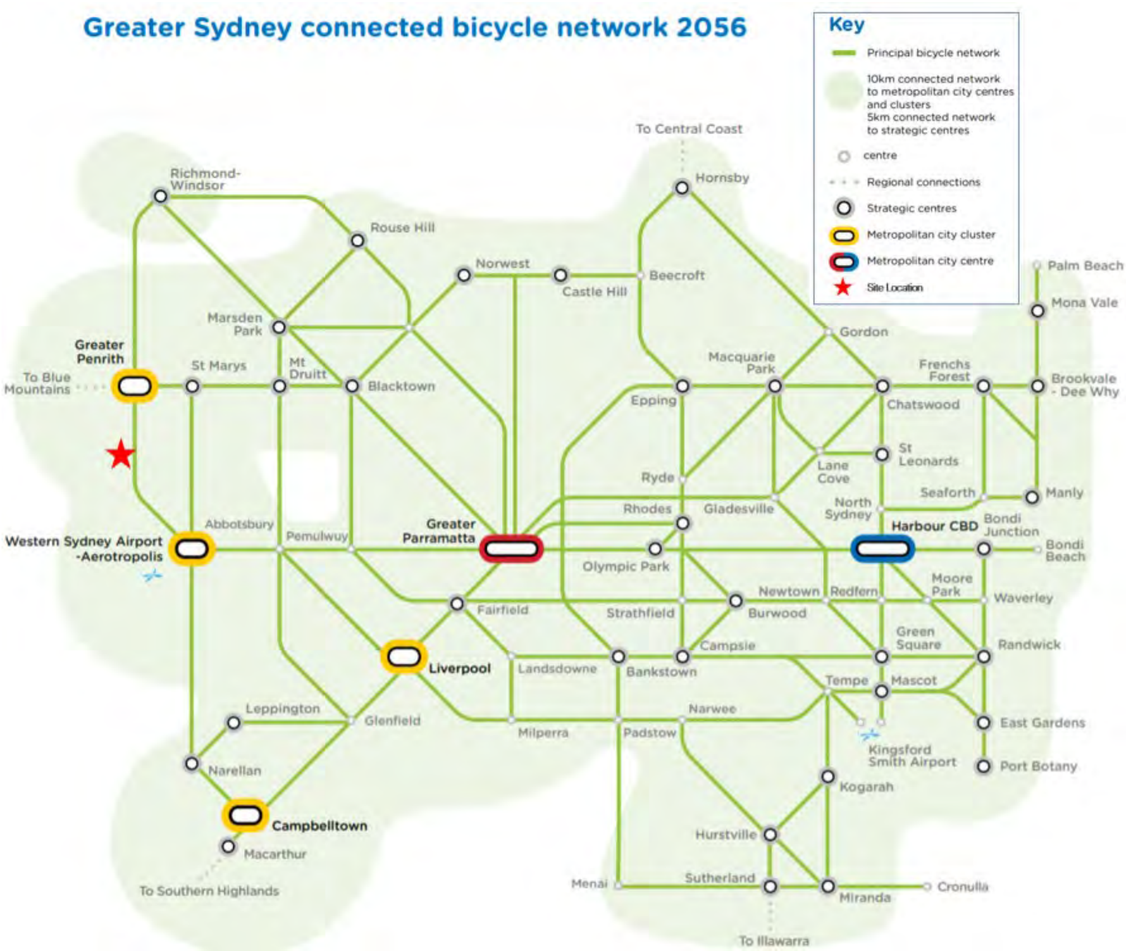
Adequate consideration has been given in the development of GP3 active transport strategy to connect the internal bicycle and pedestrian network with the shared use path along The Northern Road. The location of the site with respect to the Greater Sydney's future Principal Bicycle Network as stated in the Future Transport Strategy 2056 is shown in Figure 3.2.

Figure 3.1: Greater Future Transport Corridors



Source: Future Transport Strategy 2056

Figure 3.2: Greater Sydney Principal Bicycle Network 2056



Source: Future Transport Strategy 2056

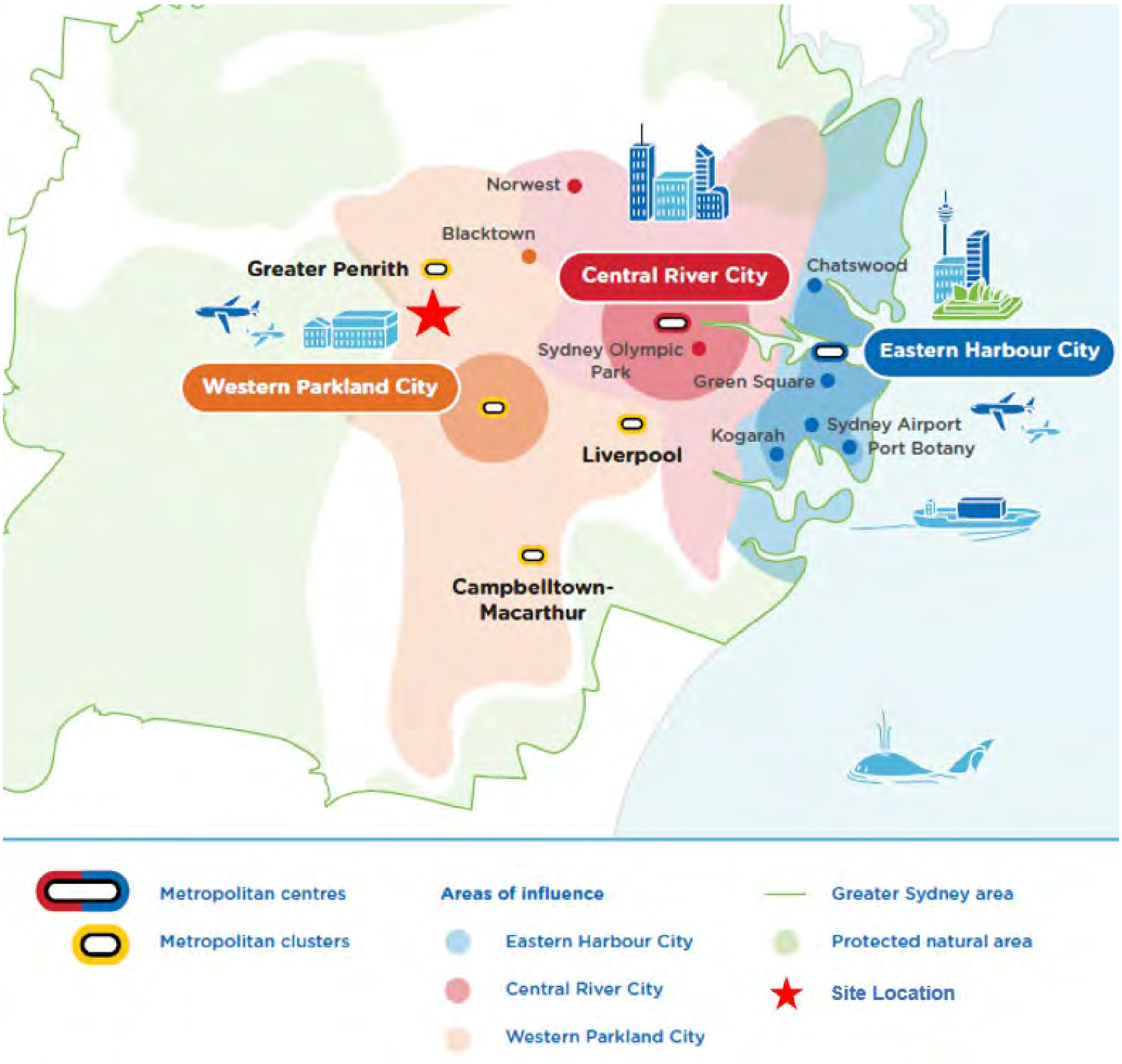
3.2 Greater Sydney Regional Plan 2018

The Greater Sydney Region Plan is part of the NSW Government's Future Transport 2056 Strategy and informs Infrastructure NSW's State Infrastructure Strategy. The Greater Sydney Region Plan is a plan that focuses on establishing a metropolis of three cities in the greater Sydney Region namely the Western Parkland City, the Central River City, and the Eastern Harbour City. The extent of these three metropolitan areas is shown indicatively in Figure 3.3.

The vision for the Greater Sydney Regional Plan has four key focuses: infrastructure and collaboration, liveability, productivity and sustainability. While focusing on these traits, the target is to achieve a 30-minute city. Living in a '30-minute city' will mean residents can access jobs and services in their nearest metropolitan or strategic centre within 30 minutes by public transport, walking and/or cycling, seven days a week.

Glenmore Park development lies within two very important sub-regions of the Western Parkland City which are the Greater Penrith and the Western Sydney Airport and hence will have more choice in terms of accessibility to these regions.

Figure 3.3: Greater Sydney Structure Plan 2056 – The Three Cities



Source: Greater Sydney Region Plan (March 2018)

3.3 Western City District Plan (March 2018) – Greater Sydney Commission

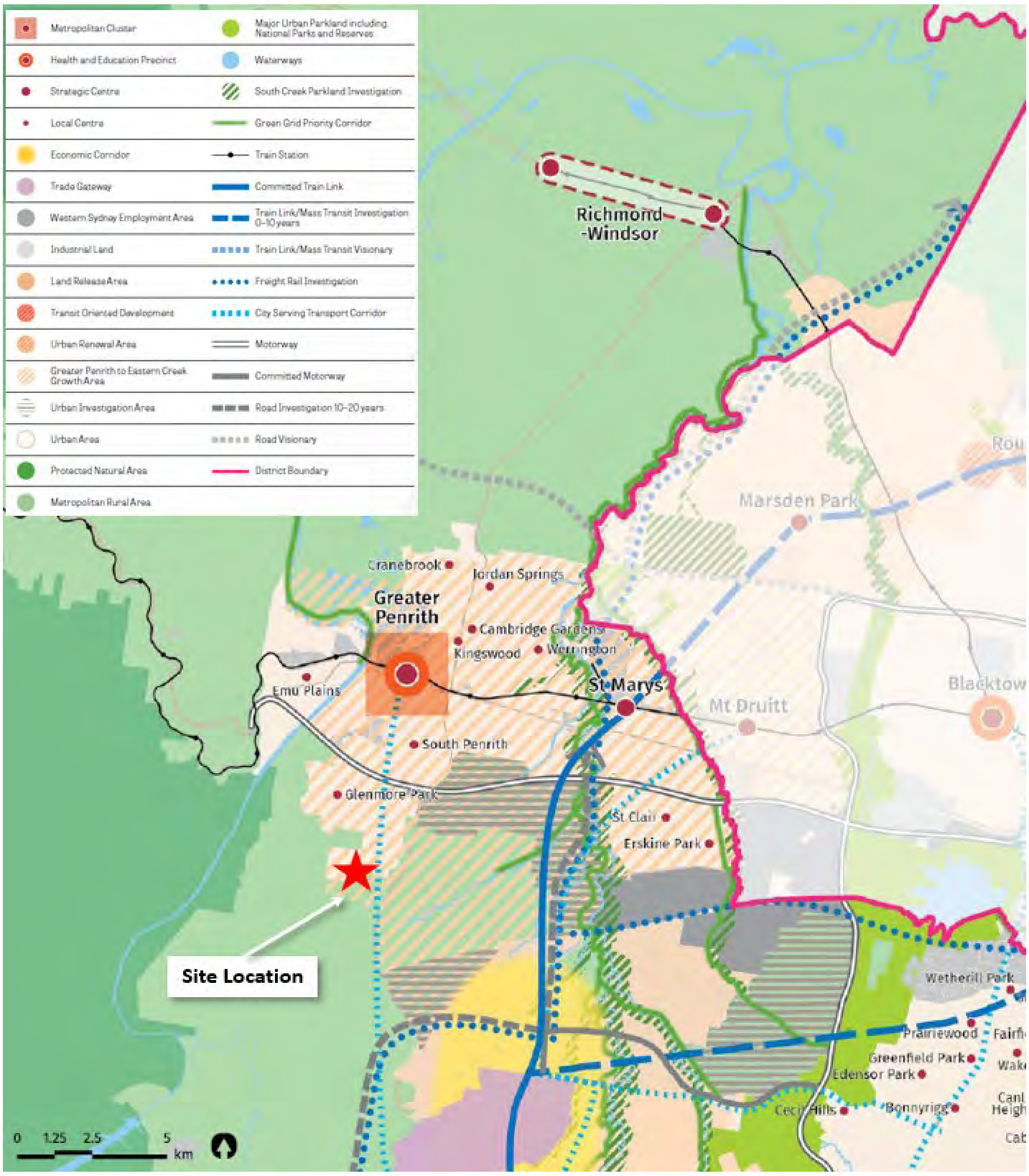
The Western City District Plan is a 20-year plan to manage growth within the Western District to support the 40-year vision of Greater Sydney. The Plan defines guidelines for regional and local planning to achieve outcomes in the context of economic, social, and environmental matters. This also paves the way for local council to keep their strategic planning in line with the Western City District Plan.

Glenmore Park falls within Penrith City Council and is part of the Greater Penrith to Eastern Creek Growth Area as shown in Figure 3.4. Penrith City Council aims to achieve a housing supply target of 6,600 for the five year period (2016-2021).

The development of GP3 is in line with the Western City District Plan not only for housing supply but also for the other key economic and social considerations including liveability, productivity and sustainability in the local context.

The development of Glenmore Park residential area is aligned with the planning priorities as set out in the Western City District Plan.

Figure 3.4: Western City District Plan



Source: Western City District Plan – (March 2018)

3.4 Ministerial Direction 3.4 Integrating Land Use and Transport

The objective of this direction is to ensure that urban design and associated land use is planned in such a way as to provide integrated solutions for the community. This needs to be done not only from environmental and sustainability perspectives but should also focus on enhanced transport choices, accessibility to the basic needs such as housing, jobs, entertainment and other factors. TfNSW and Department of Planning, Industry and Environment's (DPIE) guide 'Integrating Land use and Transport' sets out the rules for the project planning at all levels to improve transport choices for all types of developments at a more detailed level.

The Glenmore Park site is in an area which is primarily a car dominant area. However, given the planned Sydney Metro corridor from St Marys to Western Sydney Aerotropolis, construction of The Northern Road with a dedicated bus lane and off-road shared use path and the future M12 has enhanced modal choices. This means that residents would have access to direct or interconnected modes. Consideration has also been given during the design of local access roads within the development to provide an integrated transport solution for residents. The site location in relation to all these transport facilities is shown in Figure 3.5.

Figure 3.5: Available Modal Choices in Context of the Site Location

Source: Project Overview Sydney Metro – Western Sydney Airport

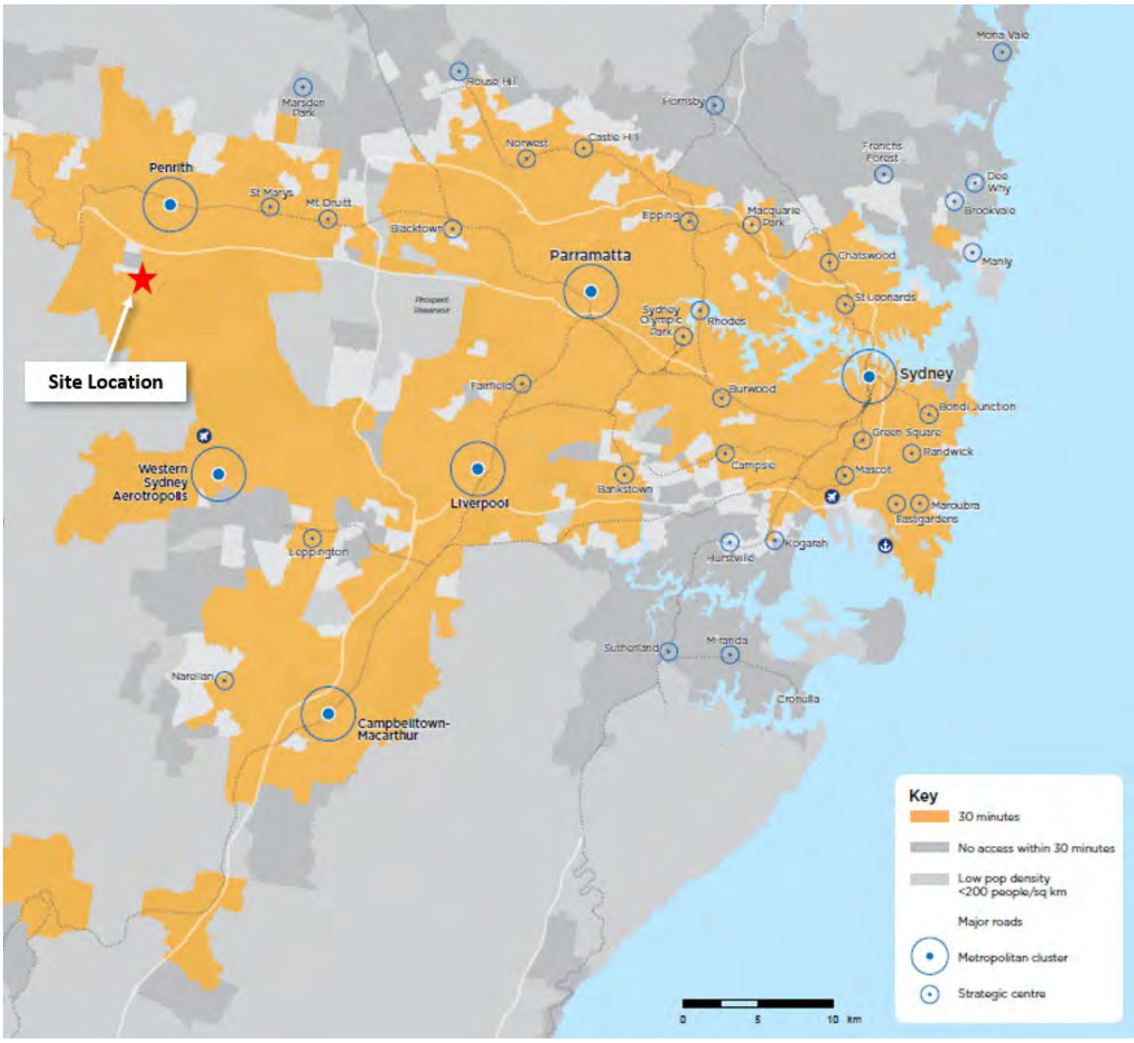
3.5 Sydney's 30-Minute Centres

A 30-minute city is where most people can travel to their nearest metropolitan centre and strategic centre by public transport within 30 minutes, and where everyone can travel to their nearest strategic centre by public transport seven days a week to access jobs, shops and services. This is integral for economic competitiveness and will make Greater Sydney a more attractive place for investment, businesses, and skilled workers.

The location of the Study Area, in the context of the 30-minute centre by public transport, is shown in Figure 3.6. This figure also shows that 76% of the Greater Sydney's population will be within 30 minutes travel of their nearest city or city cluster, by public transport by 2056.

The proposed development falls within the area which is part of the 30-minute city target. The location of GP3 development is between two major metropolitan centres i.e. Greater Penrith and the Western Sydney Aerotropolis and both would be accessible not only by public transport but also through bicycle mode within 30 minutes. It is anticipated that the bus services would be improved within the development precinct for access to the surrounding strategic centres as well. These centres would otherwise be accessible by Sydney Metro – Western Sydney Airport line.

Figure 3.6: Greater Sydney's 30-minute cities



Source: Future Transport Strategy 2056

3.6 Western Sydney City Deal

The Western Sydney City Deal will establish rapid bus services from the metropolitan centres of Penrith, Liverpool and Campbelltown to Western Sydney International (Nancy-Bird Walton) Airport before it opens in 2026, and to the Western Sydney Aerotropolis.

A strategic business case was completed in early 2020, which recommended detailed planning and a final business case be completed for the implementation of the three rapid bus routes identified in the City Deal Commitment as well as investigating two other rapid bus routes (servicing Parramatta and Blacktown) to support the growth of Western Parkland City.

Detailed planning commenced in mid-2020, which involved a significant engagement program with key stakeholders to confirm the project vision, objectives and planning assumptions.

Design guidelines and baseline engineering and transport modelling investigations were completed by the end of year 2020.

Detailed planning was scheduled to be completed by year 2021 to confirm the services, fleet and infrastructure requirements for the rapid bus routes. Evaluation of preferred bus route operations was completed in year 2021. At this stage, detailed planning for rapid bus services is being finalised for the final business case, which will inform an investment decision regarding priority routes by the NSW Government in year 2022 to progress into delivery.

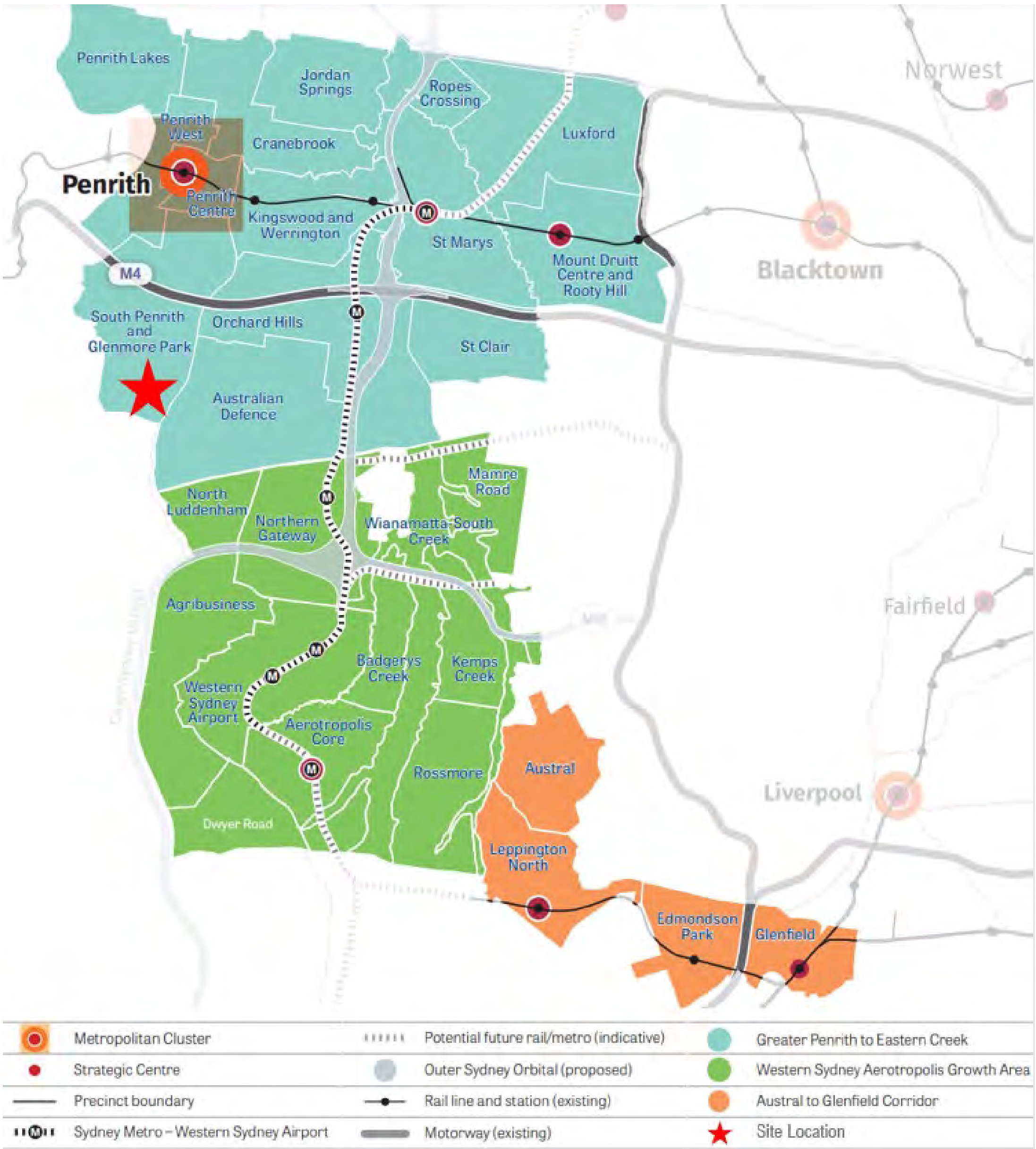
3.7 Western Sydney Place-based Infrastructure Compact (PIC)

Western Sydney PIC program is part of Western City Deal, which is a shared commitment from all three tiers of government to create Western Parkland City, which would make a more vibrant place to live. Launching the first phase of the PIC program means to focus an area spanning almost 36,000 hectares within Western Parkland City as shown in the Figure 3.7.

The purpose of implementing the placed-based model is to attain the goals for Greater Sydney's development. This focus on balancing the jobs within the Western Parkland City would be achieved through investments on projects, which include major public transport projects, housing supply, business centres and other attractions. Hundreds of hectares of land within the initial PIC area have been rezoned in the last 15 years to support this future vision.

The development site in Glenmore Park is part of the Greater Penrith to Eastern Creek area which has the primary focus on new land release for housing, health and education facilities and innovation hubs.

Figure 3.7: Initial PIC Area and Site Location



Source: Draft PIC Report (2020) – Greater Sydney

4 Future Transport Context

4.1 Western Sydney International Airport

Construction of Western Sydney International Airport is underway and is scheduled to begin operations in year 2026. The Airport is supported by the Western Sydney Infrastructure Plan (WSIP) which outlines major road infrastructure projects to keep traffic moving in Sydney's west.

4.2 Western Sydney Infrastructure Plan

The Australian and NSW governments are jointly funding a $4.4 billion road investment program for Western Sydney. The Western Sydney Infrastructure Plan (WSIP) is delivering major road infrastructure upgrades to support an integrated transport solution for the development of the Western Sydney International Airport. WSIP includes Local Roads Package funded to some Western Sydney Councils with road improvement projects, including:

- The Northern Road upgrade
- Bringelly Road upgrade
- Elizabeth Drive upgrade
- M12 Motorway linking the M7 Motorway to the Western Sydney International Airport
- Sydney Metro – Western Sydney Airport.

4.3 Strategic Traffic Forecasting Model

TfNSW's Strategic Traffic Forecasting Model (STFM) considers population and employment growth and is used for high level assessment of major infrastructure proposals, transport strategies and policy decision making. The traffic demand forecast considers major projects such as Western Sydney Airport and M12 Motorway.

In year 2021, TfNSW provided TTPP with the following STFM model outputs for the 2-hour AM peak period and 2-hour PM peak period:

- Base Volume Development Plots (2019, 2026 and 2036)
- Glenmore Park Select Volume Plots (2019, 2026 and 2036).

In terms of the application of the STFM base volume plots, the year 2019 base volumes and the future year base volumes were used to determine growth rates per annum (p.a). The calculated growth rates up to year 2026 and 2036 were applied to the May 2021 SCATS count data that formed the basis for the existing base volumes.

In terms of development traffic distribution, the Select Volume plots indicate the traffic distribution on the surrounding external road network to/from the Glenmore Park development site i.e. major collector and arterial roads. As such, the traffic split proportions calculated from the plots have been utilised to distribute development traffic on The Northern Road and Chain-O-Ponds Road.

Further detailed discussion of the internal (within residential subdivision) and external (The Northern Road corridor) development traffic distribution is provided in Section 7.3.

4.4 Baseline Traffic Demand Forecast

Table 4.1 provides the future AM and PM peak hour traffic volumes on The Northern Road following the upgrade. The traffic volumes have been adjusted from the STFM model based on the procedure described in Section 4.3.

Table 4.1: Future Baseline Traffic Volumes on The Northern Road (without Development Traffic)

The Northern Road	Direction	Year 2026		Year 2036	
		AM Peak	PM Peak	AM Peak	PM Peak
Between Glenmore Parkway and Bradley Street	Northbound	1,670	1,710	1,760	1,890
	Southbound	1,170	1,740	1,350	1,950
Between Bradley Street and New Entry Boulevard	Northbound	1,060	1,430	1,040	1,690
	Southbound	1,040	1,320	1,180	1,330
Between New Entry Boulevard and Chain O-Ponds Road	Northbound	1,090	1,410	1,050	1,680
	Southbound	1,050	1,320	1,210	1,300
South of Chain-O-Ponds Road	Northbound	1,060	1,390	1,030	1,660
	Southbound	1,040	1,280	1,200	1,260

4.5 Public Transport

4.5.1 Future Bus Network

4.5.1.1 Rapid Bus Services

The Western Sydney City Deal Annual Progress Report (year 2021) outlines the plan for Penrith, Liverpool and Campbelltown to be connected by fast and frequent rapid bus services that will provide connectivity to the Western Sydney International Airport and Aerotropolis from year 2026.

TfNSW is also planning two additional rapid bus routes to the Western Sydney International Airport, connecting Parramatta and Blacktown.

The Annual Progress Report indicates that the final business case is being finalised and investment decision regarding priority routes would be made by the NSW Government in year 2022 to progress towards delivery.

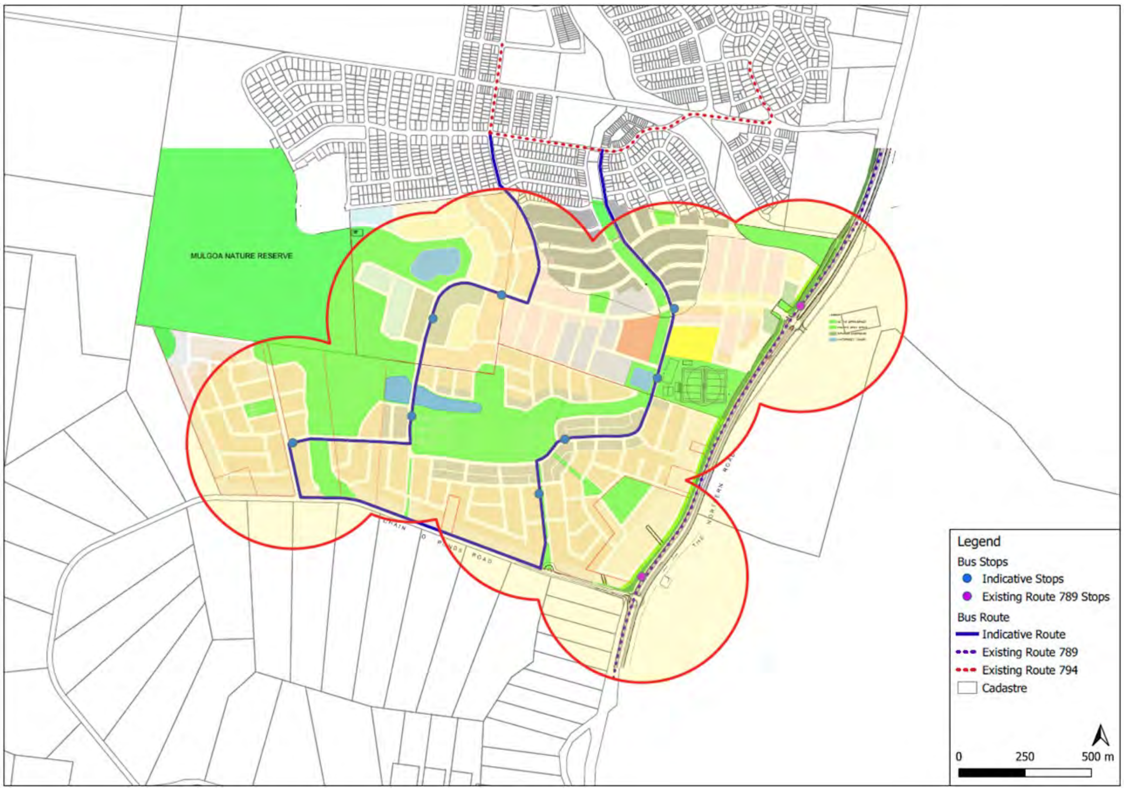
The recent upgrade of The Northern Road includes the provision of kerbside bus lanes in both directions that would support the future operation of high-frequency, 'rapid-transit' bus services from Penrith, Liverpool and Campbelltown to Western Sydney Airport. This would provide the operating conditions required to deliver the travel speed and reliability that customers would expect from a higher-order, centre-to-centre public transport connection.

4.5.1.2 Re-Routing of Bus Service 794

The primary objective of routing an existing bus service is to increase opportunities for use of public transport by providing bus services within GP3. The existing bus service 794 (Glenmore Park to Penrith via The Northern Road) is proposed to be modified and re-routed to service GP3. The existing bus route would be extended from Bradley Street to GP3 via Riverflat Drive and Durag Avenue. Riverflat Drive provides a better connection to the north-south collector road than Gunyah Drive.

Figure 4.1 shows the proposed future bus route of the modified bus service 794 and the indicative location of bus stops on collector roads which capture the vast majority of dwellings within the development.

Figure 4.1: Proposed Bus Route and Bus Stops within GP3



Source: Mirvac (8 April 2022)

The future bus infrastructure will be designed, constructed and marked in accordance with requirements set out in Council DCP, State Transit Bus Infrastructure Guide and Guidelines for Public Transport Capable Infrastructure in Greenfield Sites (July 2018). Swept path assessments would be completed at the DA stage to ensure all roads and intersections along the future bus route will accommodate a 12.5m bus.

4.5.1.3 Additional Services for Bus Service 789

Bus Service 789 is a direct service between Luddenham and Penrith that operates twice a day during peak periods on weekdays only. Consideration should be given to providing additional services to accommodate the future bus passengers, subject to consultation with the bus company and TfNSW.

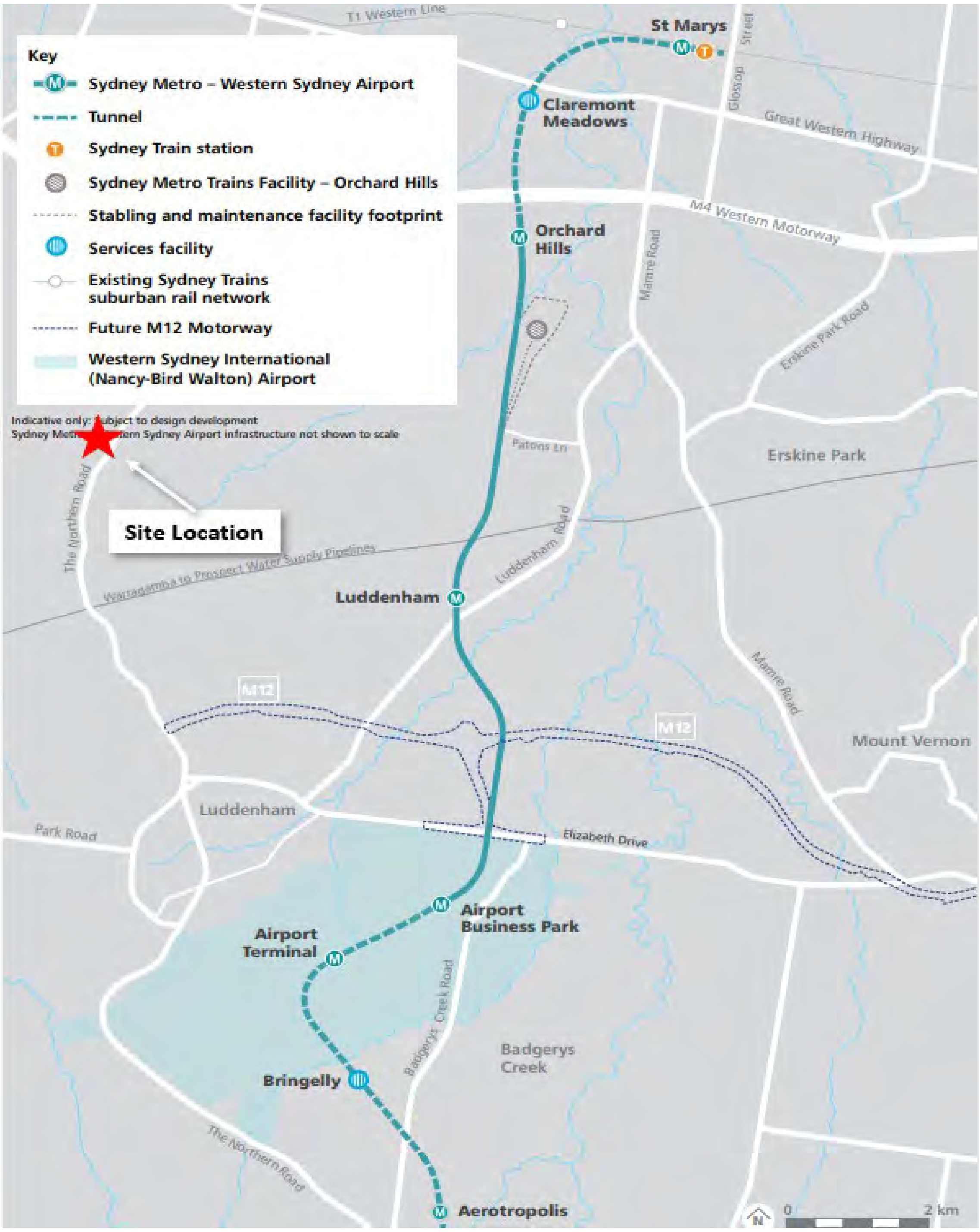
Bus stops are located at The Northern Road intersections with the entry boulevard and Chain-O-Ponds Road. Therefore dwellings located at the north-eastern and south-eastern sections of the GP3 and the GP3 primary school would have good accessibility within a 400m distance to these bus stops on The Northern Road.

4.5.2 Sydney Metro Network

Sydney Metro network will include a 23 km new metro line to serve Western Sydney International (Nancy-Bird Walton) Airport connecting residential areas with employment centres to the rest of Sydney's public transport system. A total of six new metro stations will be constructed along the Western Sydney Airport line as shown in Figure 4.2, including:

- St Marys, interchanging with the existing suburban railway station and connecting customers with the rest of Sydney's rail system
- Orchard Hills, to service a future commercial and mixed-use precinct
- Luddenham, to service a future education, innovation and commercial precinct
- Two stations within the airport site, at the airport terminal and at the airport business park
- The commercial heart of the Western Sydney Aerotropolis.

Figure 4.2: Sydney Metro Stations along the Proposed Western Sydney Airport Line



Source: https://www.sydneymetro.info/westernsydneyairportline (last accessed on 12 January 2022)

Future metro stations will be constructed at Orchard Hills, Luddenham and the Western Sydney Aerotropolis ensuring future residents can gain access to the 30-minute city consistent with the strategic plans discussed above.

4.6 Pedestrian and Cyclist Facilities

As part of The Northern Road upgrade, a number of significant improvements for pedestrians and cyclists have been introduced along The Northern Road. A 3m wide shared pedestrian and cycle path is provided along the west side of The Northern Road between Maxwell Street and Mersey Street. To the north of Glenmore Parkway, sealed pedestrian footpaths are provided on both sides of The Northern Road and continue up to Jamison Road near Penrith. Signalised pedestrian crossings are provided at all signalised intersections along The Northern Road within the vicinity of Glenmore Park. As such, these crossing facilities are sufficient to address pedestrian desire lines across The Northern Road to/from the bus stops located near the signalised intersections with the entry boulevard and Chain-O-Ponds Road.

Further to the above, shared use paths and on-road cycling facilities would be provided within the proposed GP3 subdivision which would also connect to the existing facilities within GP2 and The Northern Road. This is further discussed in Section 5.5.

5 Proposed Development

5.1 Proposed Yield

The proposed development will comprise the following land use schedule by Year 2026 and Year 2036 as summarised in Table 5.1. The site area is previously shown in Figure 2.1.

Table 5.1: GP3 Development Yield

Land Use	Type	2026 Yield	2036 Yield
Residential (dwellings)	Large Lots	0	81
	Low Density	200	1,702
	Medium Density	0	487
	Fonzie Flats	0	30
	Shoptop Housing	0	100
Mixed Use Centre	Retail (sqm)	0	5,000
School	Primary School	0	1,000 children
		70 staff	70 staff

5.2 Access Roads

Access to the proposed residential development would be provided at the following locations:

- An entry boulevard as an extension of the western leg to the intersection of The Northern Road with DEOH Access Road
- Three access points off the north side of Chain-O-Ponds Road
- Primary local road access to GP2, namely, Darug Avenue, Gunyah Drive and Riverflat Drive.

Notably, no direct vehicular access would be provided to The Northern Road. Driveways would be provided on Chain-O-Ponds Road for vehicular access to the large lots.

The access points on Chain-O-Ponds Road would be in the form of a roundabout and priority controlled T-junctions:

- A roundabout would be provided at the eastern access to facilitate U-turn movements associated with traffic accessing existing rural properties along The

Northern Road. This is because right turn movements across the central median would not be permitted as part of the road upgrade on The Northern Road. The roundabout is located as far as practical away from The Northern Road intersection to ensure queueing back to the signals would not occur.

- Priority controlled T-junctions would be provided at the middle and western access with a dedicated right turn lane to provide safe and efficient intersection operation.

For active transport users, there are multiple access points proposed as detailed in Section 8.3. There are three access points for pedestrians and cyclists to the shared use path along The Northern Road. There are also three access points proposed for pedestrians and cyclists to the shared use path along Chain-O-Ponds Road.

5.3 Internal Road Hierarchy

The proposed development is essentially an extension of Glenmore Park and therefore the internal roads would be designed in accordance with the Glenmore Park Development Control Plan.

The proposed hierarchy of the internal road network is shown in Figure 5.1, with collector roads shown in red dashed lines.

Figure 5.1: Hierarchy of Internal Roads

Source: Mirvac (12 April 2022)

The proposed hierarchy of the internal road network as shown in Figure 5.1 is explained below.

5.3.1 Collector Roads

These roads provide a high level of accessibility for all road users throughout the development, including vehicles, bicycles, and pedestrians. Collector roads provide clear lane widths able to handle local bus services on bus routes.

Collector roads in GP3 adjoin The Northern Road and Chain-O-Ponds Road. A shared use path is provided along one side of the collector road to establish pedestrian amenity.

Bus routes also run along the collector road, and this can comfortably accommodate the co-location of bus shelters and pathways. Parking will be allowed on both sides of the roads.

5.3.2 Entry Boulevard

These roads provide a landscaped boulevard along the main entry points to GP3 from The Northern Road and Chain-O-Ponds Road.

A shared use path is provided along one side of the entry boulevard road. Parking will be allowed on both sides of the road for most sections. The main trait of these roads is the widened median with landscaping.

5.3.3 Minor Local Roads

Minor local roads are residential streets which provide limited vehicle access for through traffic looking to access or exit the local road network. Regular, minor delays or the need for driver co-operation due to vehicles parking on local roads are acceptable, as a traffic calming measure, maintaining high levels of permeability for non-vehicle road users. Roads are designed to ensure a low-speed traffic environment. Informal on-street parking constrains traffic movement.

Footpaths will be provided adjoining all minor local roads. A low speed environment will also permit opportunities for mix-use traffic and better permeability for active transport users.

5.4 Local Area Traffic Management

Objectives of implementing traffic calming measures within GP3 include:

- Create a safe environment by reducing traffic volumes and speeds within the precinct

- Discourage ‘rat running’ through the precinct
- Make the precinct more pedestrian and cyclist friendly with the intention to increase uptake of sustainable modes for travel to and from the mixed-use centre and the existing facilities in GP2 and The Northern Road.

A gateway treatment will be provided at the eastern end of the entry boulevard and the three access points on Chain-O-Ponds Road. Design features will provide visual cues to road users including changed road surface pavement and speed limit signage to encourage a low-speed environment.

Amenity and safety on internal roads will be maintained by restricting vehicle speeds. The local roads will be signposted at a speed that is consistent with other local roads in the wider Glenmore Park. Internal roads will be signposted as 50km/h to reduce speed of vehicles and raise awareness of potential conflict points, and to encourage a low-speed environment to all road users.

The layout of streets itself is designed in such a way which reduces travel speeds naturally due to the alignment and the short lengths of the local roads.

Other streets slightly longer in length or carry more volume than minor local roads would have signage and line-marking to advise drivers of speed limits. Inclusion of pedestrian crossings and pedestrian refuges would also act as speed reduction measures especially in streets along central parks and around the mixed-use centre. Intersections at regular intervals and after short distances also help reduce speed.

LATM measures have been considered as per TfNSW’s Cycleway Design Toolbox and Walking Space Guide for guidance on appropriate measures.

In consideration of the above, the following traffic calming measures are recommended which provide visual and physical cues to reduce traffic speeds and increase safety for road users:

- Kerb blisters / kerb extensions to narrow roadway
- Reduce intersection size and crossing distance
- Pedestrian crossing facilities (with a flat top speed hump) to provide safe and designated crossing locations
- Landscaping elements.

5.5 Pedestrian and Cyclist Facilities

Walking and cycling are active and sustainable transport modes. Encouraging more people to walk and cycle, and combining more walking and cycling with public transport trips, would be an effective way to reduce the demand for other modes of transport.

Well-placed walking and cycling networks can encourage people to take active transport for short distance trips to the shops and bus stops, and also increase the uptake of buses serving the precinct. In addition, good connectivity with the existing cycling route would also encourage people to cycle to work e.g. Penrith as a key workplace destination as shown in Section 2.8.

5.5.1 Design Guides

The guidelines used to propose the pedestrian and cyclist facilities are below:

- Austroads Guide to Road Design Part 6A
- RMS/TfNSW Bicycle Guidelines
- NSW Cycleway Design Toolbox.

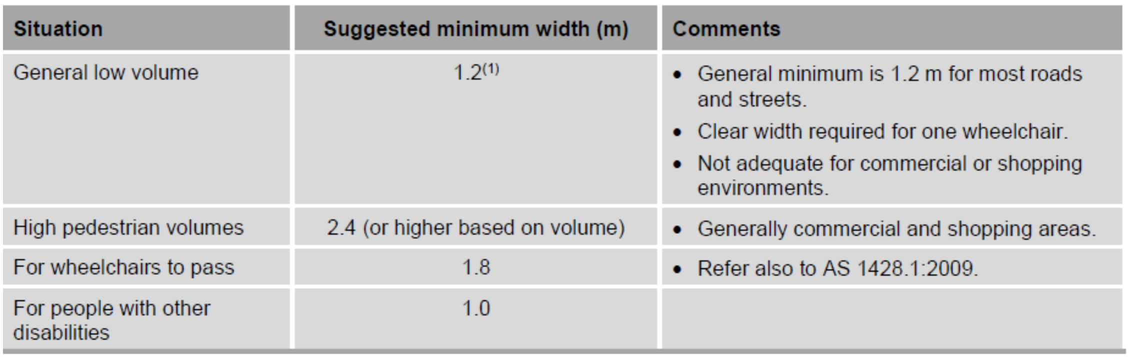
Austroads and TfNSW bicycle guidelines requirements for provision of bicycle facilities are shown in Table 5.2 and Figure 5.2 below.

Table 5.2: Austroads and TfNSW Bicycle Guidelines

Type	Minimum Width	
	Austroads Guidelines	TfNSW Bicycle Guidelines
On road bicycle lane	-	1.4m – 2.5m
Off road shared use path	2.5m – 3.0m	2.0m – 4.0m
Off road shared use path (recreational)	3.0m – 4.0m	-

Source: Austroads, 2009 and TfNSW, 2005

Figure 5.2: Austroads Footpath Requirement



Situation	Suggested minimum width (m)	Comments
General low volume	1.2(1)	• General minimum is 1.2 m for most roads and streets. • Clear width required for one wheelchair. • Not adequate for commercial or shopping environments.
High pedestrian volumes	2.4 (or higher based on volume)	• Generally commercial and shopping areas.
For wheelchairs to pass	1.8	• Refer also to AS 1428.1:2009.
For people with other disabilities	1.0	

Source: Austroads 2009

5.5.2 Active Transport Plan

The proposed development is essentially an extension of Glenmore Park and therefore active transport facilities would be connected with GP2. The design provides walking and cycling routes connecting with GP2 and The Northern Road forming an extended network, and enables cyclists separated from traffic to provide a safe environment as a way to encourage cycling.

Shared use paths would be provided on collector and local roads that connect with The Northern Road, Chain-O-Ponds Road and GP2 as shown in Figure 5.3.

Figure 5.3: Proposed GP3 Active Transport Plan

Source: Mirvac (13 April 2022)

Orange lines depict a shared use path on one side of the road, while green lines depict footpaths on the other side of the road. Blue lines depict the shared use path in the open space area through local and district parks.

Footpaths would be provided in the verge of local roads where asterisks are shown. No dedicated on-road bicycle lanes are proposed within GP3. However, some of the local streets are expected to accommodate cyclists as they travel between their residence and the nearest shared use path on the collector/local roads.

Shared use paths are provided to enable direct east-west access between the open space areas in GP3 and the existing shared use path on The Northern Road, at three locations where vehicular access is not allowed.

A mixed-use environment would be provided on local roads for cyclists within a 50km/h speed zone and designed to ensure these roads are safe and comfortable for riders of all ages and abilities to mix with traffic. Shared use paths would be provided on the internal collector roads and through the park to provide connectivity to the existing cycling routes in GP2 and The Northern Road. Refer to Section 5.4 for the recommended LATM measures to make the internal roads safer and to support walking and cycling for users of all ages and abilities.

The proposed grid pattern of streets allows greater pedestrian and cyclist permeability. Provision of cul-de-sacs is minimised in the design, but one is proposed in the vicinity of the western most intersection on Chain-O-Ponds Road. A shared use path is provided to connect the cul-de-sac with Chain-O-Ponds Road to enable direct and convenient connectivity to the green space and Chain-O-Ponds Road, even where a ‘No-Through Road’ prevents through traffic.

There is a pair of short cul-de-sacs located in the south-eastern quadrant of the subject development, which will be reviewed at the DA stage and if possible, through connections would be provided.

5.5.3 Path Width

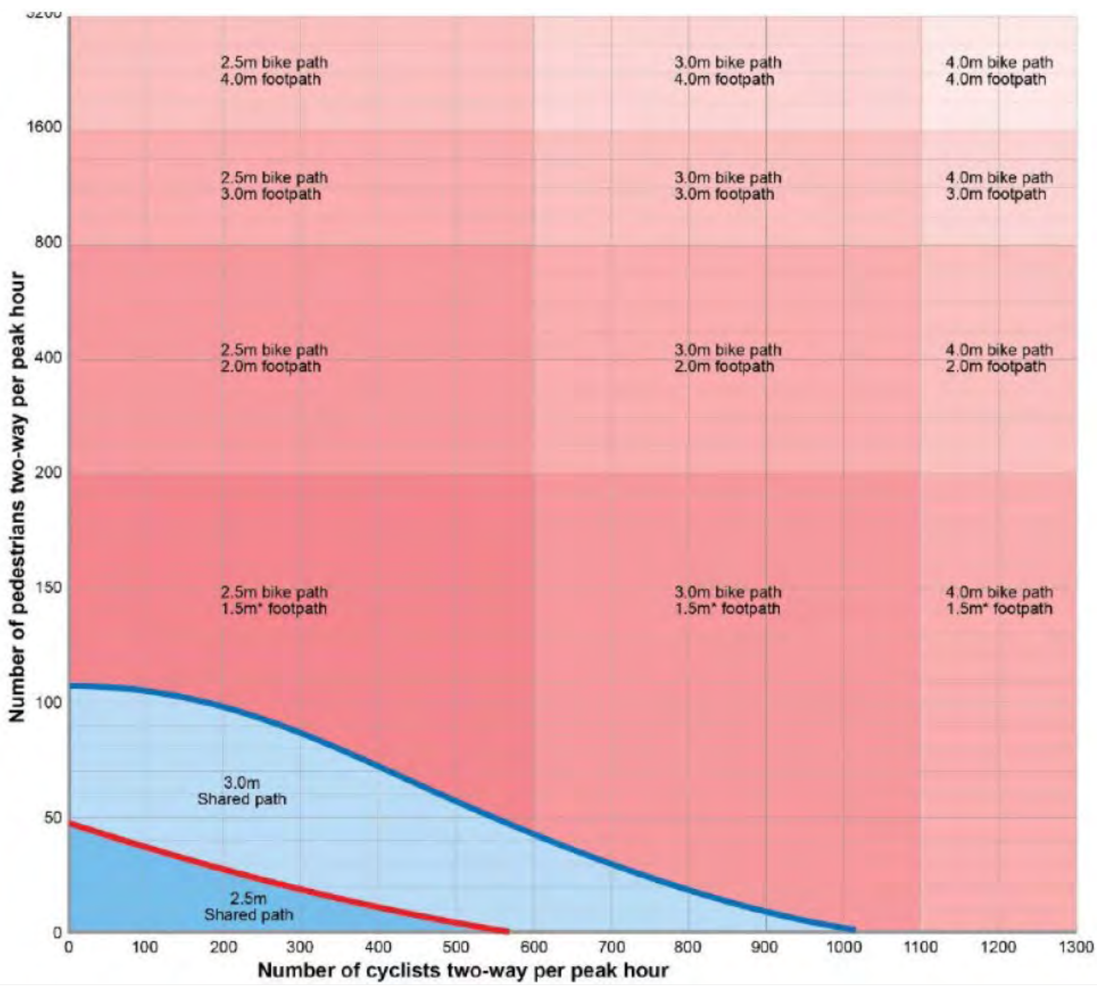
The width of the active transport facilities in GP2 are generally 1.2m wide footpath or 2.5m wide shared use path on local roads.

For GP3, similar criteria have been adopted to maintain consistency with GP2 and to also meet Austroads minimum requirements. An aerial image of existing footpaths and shared use paths within GP2 is shown in Figure 5.4 while the Austroads path width graph is shown in Figure 5.5.

Figure 5.5 shows that the Austroads guide indicates that a 2.5m shared use path can support up to 50 pedestrians and 560 cyclists per hour. The subject development would not generate demands higher than this threshold on local roads, but could on busier paths along collector roads.

Figure 5.4: Existing Footpath and Shared Use Path Widths in GP2

Figure 5.5: Austroads Path Widths for a 50/50 Direction Split



Source: Austroads

Therefore, a minimum 1.2m wide footpath or 2.5m wide shared use path provides a compliant requirement for paths on roads in GP3 as consistent with the GP2 provision. This is consistent with the approach taken for the minor local roads, with a 1.2 metre path provided on one side only.

It is acknowledged that while government agencies may have expressed a keenness for wider paths, there is also a push to reduce the urban heat island effect. Provision of a shared path on one side of the road will provide additional planting space, especially because the site is located in a western suburb of Greater Sydney which is vulnerable to the urban heat island effect.

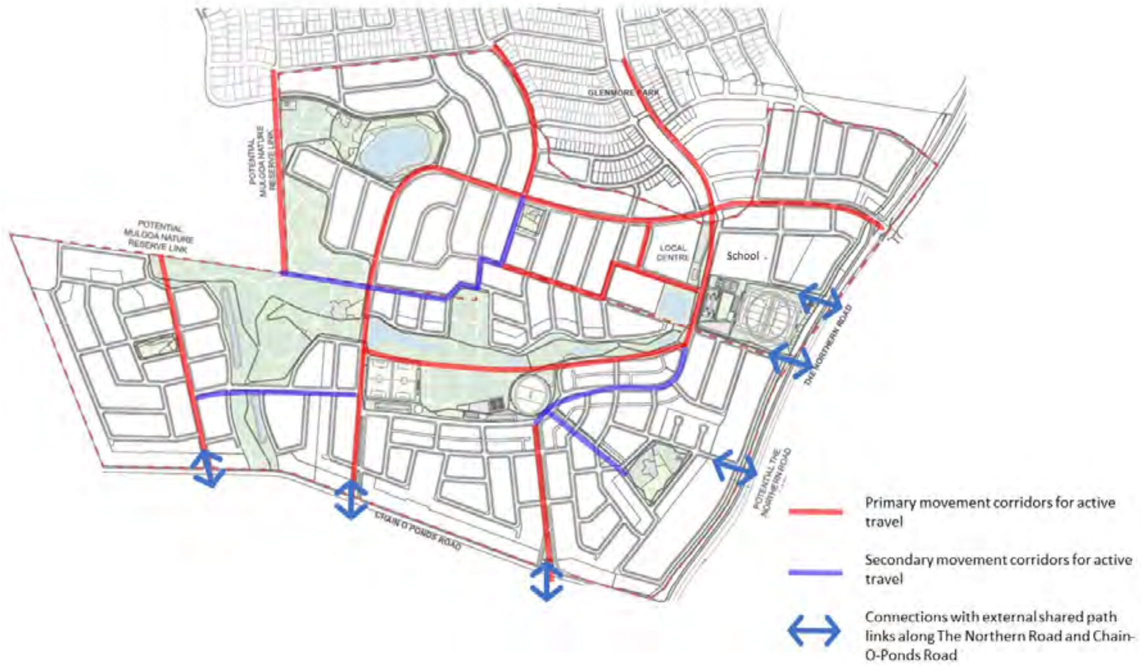
Further information on path widths will be provided during the detailed design stage.

5.5.4 Pedestrian and Cyclist Movements

Figure 5.6 shows the primary movement corridors for active travel within GP3 where shared use paths would be provided to accommodate these major active travel movements.

Secondary movement corridors are shown in Figure 5.6 to support the primary movements and a mix of shared use paths, on-road mixed environment cycle link and connections of footpaths.

Figure 5.6: Primary and Secondary Movement Corridors for Active Travel



5.5.5 Crossing Facilities

The proposed crossing facilities within the precinct would be designed to make it easy for pedestrians of all abilities and ages to cross roads.

The NSW cycleway design toolbox and the NSW bicycle guidelines have been consulted to propose suitable types of crossing facilities. Three types of crossings have been considered for GP3:

- Pedestrian/cyclist refuge – this has been proposed along the main shared use path connections where they cross the collector roads.
- Raised zebra crossing – this has been considered near the mixed-use centre and along the route of major recreational open spaces where the TfNSW numeric warrant is met.
- Signalised pedestrian crossing – this has been considered near the public school but the TfNSW numeric warrant cannot be met.

It is expected that the above types of crossings, where the warrant is met, would provide a reasonable level of road safety for active transport users. Refer to Section 5.5.6 for the warrant assessment.

Provision of a good quality walking environment within the precinct will result in a greater use of active modes of transport, assisting in the shift towards sustainable mode share target set out in Section 8.1.

5.5.6 Warrants

The TfNSW numeric warrants for the following pedestrian crossing facilities have been reviewed based on the pedestrian and vehicular flow:

- Signalised mid-block crossing
- Pedestrian (zebra) crossing
- Children's crossing.

TfNSW Traffic Signal Design Section 2 Warrants (2008) stipulates the numeric warrants for signalised mid-block pedestrian crossings:

> ***Signalised mid-block crossing predominantly used by children:***
>
> *For each of two one-hour periods of an average day*
>
> *(a) The pedestrian flow exceeds 50 persons/hour; and*
> *(b) The vehicular flow exceeds 600 vehicles/hour in each direction*

While the pedestrian flow is expected to exceed 50 persons/hour outside the 1,000-student school, the school frontage road is not anticipated to carry more than 600 vehicles/hour in each direction (refer to Figure 7.3) to meet the numeric warrant. Therefore, a signalised mid-block crossing is not warranted within GP3.

Numerical warrants for the pedestrian (zebra) crossing and children's crossing are shown as follows in accordance with TfNSW Supplement to Austroads Guide to Traffic Management Part 10: Traffic Control and Communication Devices (2016):

> ***A pedestrian (zebra) crossing is warranted where:***
>
> ***Normal warrant***
> *In each of three separate one hour periods in a typical day:*
>
> *(a) the pedestrian flow per hour (P) crossing the road is greater than or equal to 30 AND*
> *(b) the vehicular flow per hour (V) through the site is greater than or equal to 500 AND*
> *(c) the product PV is greater than or equal to 60,000*
>
> ***Reduced warrant for sites used predominantly by children and by aged or impaired pedestrians***
> *If the crossing is used predominantly by school children, is not suitable site for a children's crossing and in two counts of one hour duration immediately before and after school hours:-*
>
> *(a) P ≥ 30 AND*
> *(b) V ≥ 200.*
>
> ***A children's crossing is warranted where:***
>
> *The crossing is located on local and lightly trafficked roads where in a one hour duration immediately before and after school hours the traffic flow exceeds 50 vehicles per hour in each direction and during the same hour 20 or more children cross the road within 20 m of the proposed crossing location.*

5.5.6.1 Recommended Pedestrian (Zebra) Crossing

The school frontage road is predicted to carry in the order of 300 to 400 vehicle/hour in each direction in the AM and PM peak hours as shown in Figure 7.3. These traffic volumes exceed the threshold of 500 vehicles/hour for three hours (both directions combined) for a pedestrian (zebra) crossing, and the reduced warrant of 200 vehicles/hour (both directions combined) before and after school. These traffic volumes also exceed the threshold of 50 vehicles/hour (each direction) for a children's crossing.

The proposed number of school students is 1,000, and therefore, the number of pedestrians immediately before and after school at the crossing would exceed the threshold of 20-30 in the peak hours.

It is recommended to provide a pedestrian (zebra) crossing on the school frontage road to cater for students, with an option of a crossing supervisor to be on duty if required before and after school hours.

The pedestrian (zebra) crossing can also provide a safe route to connect the mixed use centre, primary school and open space areas. The connection is further extended to The Northern Road via a shared use path adjacent to the school.

For the entry boulevard section along the northern frontage of the mixed use centre, traffic volumes are anticipated to be in the order of 850-950 vehicles/hour in the peak direction and 300-400 vehicles/hour in the anti-peak direction as shown in Figure 7.3. It is expected two travel lanes are required in each direction to accommodate the predicted traffic volumes. On this basis, a pedestrian (zebra) crossing cannot be used as it is not permitted on roads with two or more marked travel lanes in the same direction.

Other road sections are predicted to carry low traffic volumes and would not meet the warrant for pedestrian (zebra) crossings.

5.5.6.2 Recommended Pedestrian Refuge

Pedestrian refuge facilities are recommended at the two roundabouts on the entry boulevard, with sufficient width to be provided for storing pedestrians and bicycles to assist with staged crossing. These would provide good opportunities to accommodate pedestrian desire lines to the school and mixed-use centre located south of the entry boulevard. An example from GP2 is provided in Figure 5.7.

Figure 5.7: Proposed Pedestrian/ Cyclist Refuge on Entry Boulevard

Reference: Bradley Street and Glengarry Drive intersection, Glenmore Park (Stage 2)

Given there are no numeric warrants for pedestrian refuges, pedestrian refuges would be provided throughout GP3 to accommodate pedestrian desire lines. Further discussion is provided in Section 5.5.7.

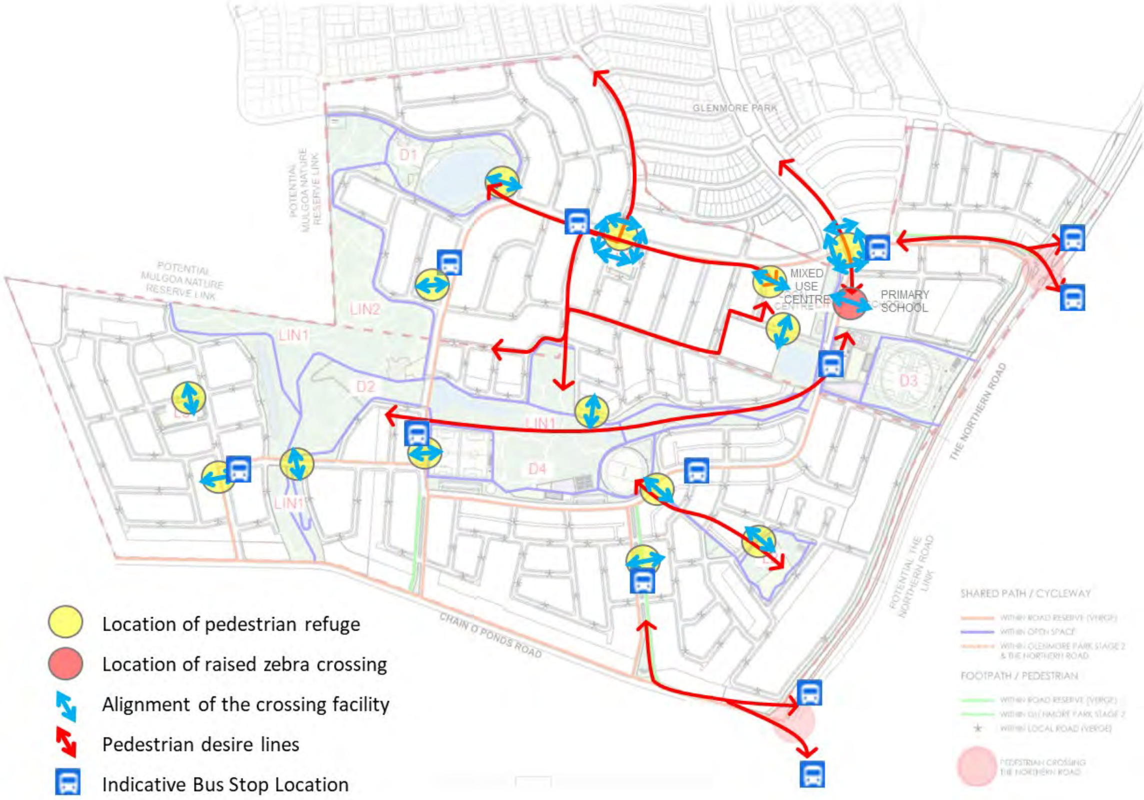
Kerb ramps would be provided at all intersections along the footpaths and shared use paths.

5.5.7 Desire Lines

Based on the warrant check undertaken above, the recommended crossing facilities are shown in Figure 5.8 to accommodate the major desire lines to/from the following trip attractors:

- Bus stops (along The Northern Road, Chain-O-Ponds Road and internal roads)
- Mixed-use centre
- Park and recreational areas
- Primary school.

Figure 5.8: Proposed Locations of Crossing Facilities



Crossing facilities have been proposed where an increased number of conflicts are expected between vehicular traffic and pedestrian/cyclist traffic.

6 Parking Control

The parking controls for the proposed development have been sourced from the Penrith Development Control Plan (DCP) 2014 Part C10 Transport Access and Parking.

The DCP sets out the minimum parking requirements to ensure that developments function efficiently and there is limited impact on street parking and congestion. Car parking is to be provided on-site unless the consent authority is satisfied that adequate car parking is provided elsewhere.

In contrast, TfNSW suggests Council considers appropriate restrained maximum parking rates to discourage the use of private vehicles particularly for short/local trips.

6.1 Car Parking

The DCP parking requirements for the proposed land uses are summarised in Table 6.1. Given the number of bedrooms and the retail mix is unknown at this early stage, no specific parking requirement is provided for each land use.

Table 6.1: Penrith DCP Car Parking Requirements

Land Use	Type	Car Parking Rate
Residential	Low Density	2 spaces per dwelling – stack or tandem parking acceptable
	Medium Density	Multi dwelling housing • 1 car space per 1 bedroom • 1.5 car spaces per 2 bedrooms or part thereof • 2 car spaces per 3 or more bedrooms • In addition, visitor parking is to be provided for developments that have 5 or more dwellings: 1 space for every 5 dwellings (or part thereof)
	Shop top housing	Residential flat buildings • 1 space per 1 or 2 bedrooms • 2 spaces per 3 or more bedrooms • 1 space per 40 units for service vehicles • In addition, visitor parking is to be provided for developments that have 5 or more dwellings: 1 space per every 5 dwellings, or part thereof. • 1 space for car washing for every 50 units, up to a maximum of 4
Mixed Use Centre	Retail	• Supermarkets – 1 space per 10m² of floor area that is to be used for retailing purposes • Other neighbourhood and specialty shops – 1 space per 30m² GFA

It is understood that Council does not currently support residential parking schemes. The proposed location of No Stopping zones and other parking restrictions will be provided at the DA stage.

6.2 Accessible Parking

The DCP stipulates that accessible parking be provided in accordance with the Access to Premises Standards, Building Code of Australia (BCA) and AS2890.

In accordance with the BCA, the retail use (Class 6 building) would require one accessible space for every 50 car parking spaces or part thereof for up to 1,000 car parking spaces, and 1 accessible space for each additional 100 car parking spaces or part thereof in excess of 1,000 car parking spaces.

6.3 Bicycle and Motorcycle Parking

The DCP stipulates that bicycle parking be provided in accordance with the suggested bicycle parking provision rates in the NSW Government's Planning Guidelines for Walking and Cycling 2004. Bicycle parking spaces should comply with AS2890.3 Bicycle Parking Facilities.

The planning guideline suggested bicycle parking requirements for the proposed land uses is summarised in Table 6.2.

Table 6.2: Bicycle Parking Requirements

Land Use	Type		Bicycle Parking Rate	
			Resident/Staff (long-term use)	Customer/Visitor (short-term use)
Residential	Low Density		1 per dwelling	3-5% * dwelling (1 minimum)
	Medium Density			
	Shop top housing [1]	1-bedroom unit/flat	20-30% * Units	5-10% * Units
		2 or more bedroom unit/flat	20-30% * Units	5-10% * Units
Mixed Use Centre	Retail		3-5% * Staff	5-10% * Staff

The DCP does not stipulate motorcycle parking requirements.

7 Traffic Impact Assessment

7.1 Consultation

As discussed in Section 1.3, TTPP has consulted with TfNSW and Council to formulate the study methodology of this CTIA. Both authorities have agreed the traffic generation rates for the proposed residential dwellings, mixed-use centre and school as discussed below.

7.2 Traffic Generation

7.2.1 Low Density Dwellings

Typical traffic generation estimates for the proposed residential development have been sourced from the TfNSW's Guide to Traffic Generating Developments (2002) and the updates in the Technical Direction TDT2013/04a.

Low density dwellings

- AM peak hour vehicle trips = 0.95 trips/ dwelling
- PM peak hour vehicle trips = 0.99 trips/ dwelling.

7.2.2 Medium Density Dwellings

As the medium density dwellings for this greenfield precinct are likely to be three-to-four-bedroom dwellings with off-street parking, the vehicle trip rates are likely to be the same as the low-density dwellings.

Medium density dwellings

- AM peak hour vehicle trips = 0.95 trips/ dwelling
- PM peak hour vehicle trips = 0.99 trips/ dwelling.

7.2.3 Fonzie Flats and Shop-top Housings

Fonzie flats and shop-top housing comprise studios or up to two-bedrooms. As such, it is assumed that the vehicle trip rates are likely to be lower than the low and medium density dwellings. While there are no guidelines that provide traffic generation rates for these housing types, reference has been made to TfNSW Guide to Traffic Generating Developments (2002) for the following traffic generation rates for medium density dwellings:

- AM peak hour: 0.65 trips/dwelling/hour
- PM peak hour: 0.65 trips/dwelling/hour.

The more recent TfNSW research for medium density dwellings involves a selection of Sydney sites with varying public transport accessibility. It stipulates lower traffic generation rates as follows:

- AM peak hour: 0.40 trips/dwelling/hour
- PM peak hour: 0.48 trips/dwelling/hour.

The higher and more conservative traffic generation rates have been adopted for Fonzie flats and shoptop housing to enable a robust traffic assessment.

7.2.4 Retail

Trip generation rates for retail development have been sourced from TfNSW's *Trip Generation Surveys – NSW Small Suburban Shopping Centres* Analysis Report (November 2018). The following rates have been used based on the conversion of exponential models with the GLFA of the survey sites ranging from 1,000m² to 6,000m² for the AM and PM peak periods on Wednesday/ Thursday:

- AM peak hour: 0.066GLFA +126
- PM peak hour: 0.089GLFA +170.

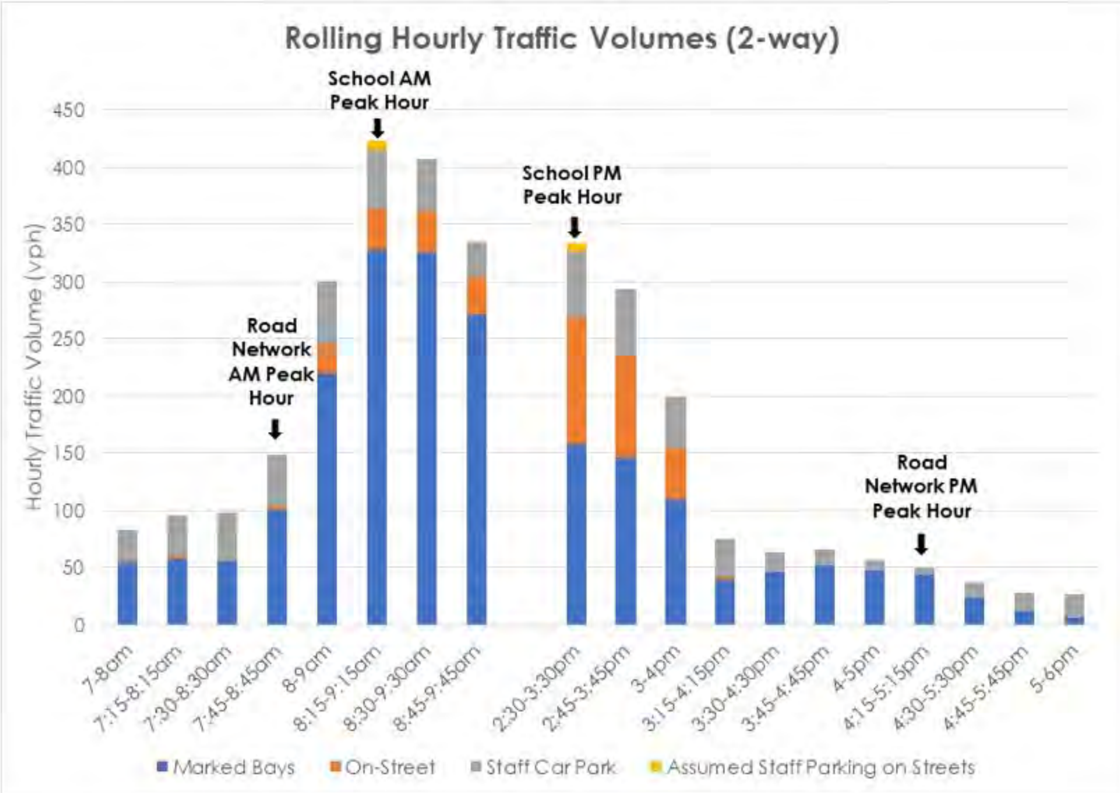
TfNSW has agreed that some of these trips will be internal to the subdivision based on the economic assessment (refer to Section 7.3.2), with 'pass-by' trips i.e. linked trips from an origin to a destination that previously passed the development site. Austroads Guide to Traffic Management Part 12 recommends a 28% discount to pass-by trips associated with a supermarket. Notably, this discount applies only to the retail component and not the residential trips.

7.2.5 Primary School

TTPP commissioned a traffic survey at Surveyors Creek Public School located in GP1 to establish traffic generation rates for comparison with the above TfNSW traffic generation rates. The selection of this school was agreed by TfNSW and Council. Surveyors Creek Public School has an enrolment of 560 students (provided by Council).

The survey recorded 2-way traffic movements in relation to pick up and drop off on the school frontage roads, and at the school car park entrance and exit. The rolling hourly traffic volume profile is shown in Figure 7.1.

Figure 7.1: Rolling Hourly Traffic Volumes Associated with Surveyors Creek Primary School



Note: The on-site car park provides 35 spaces but there are a total of 42 staff. It has been assumed all staff drive to work with 35 staff parked on site and 7 staff parked on surrounding streets during the AM and PM peak hours, not the shoulder peak hours.

Traffic generation rates during the school AM and PM peak hour have been derived as follows based on the enrolment of 560 students:

- Surveyed school AM peak hour (8:15am-9:15am): 0.76 vehicle trips/ student
- Surveyed school PM peak hour (2:30 pm -3:30pm): 0.60 vehicle trips/ student.

These traffic generation rates are higher than the average TfNSW traffic generation rates for Sydney Metropolitan primary school during the school peak hours:

- TfNSW School AM peak hour: 0.67 vehicle trips/ student
- TfNSW School PM peak hour: 0.53 vehicle trips/ student.

Thus, the higher and more conservative rates were adopted in the intersection modelling to determine the intersection layout for the eastern intersection on the entry boulevard, located adjacent to the proposed primary school. The highest school trips would occur during these school peak hours being the before and after school periods, albeit outside the road network peak hours that have been determined in Section 2.9 for 7:45am-8:45am and 4:15pm-5:15pm on The Northern Road.

The road network peak hours do not coincide with the school peak hours as shown in Figure 7.1. School trips during the road network peak hours are significantly less than those during the school peak hours. Based on the hourly traffic movements in the survey results and the enrolment of 560 students, the derived traffic generation rates for the road network peak hours are shown as follows:

- Road network AM peak hour (7:45am-8:45am): 0.27 vehicle trips/ student (i.e. 27% of the school AM peak hour)
- Road network PM peak hour (4:15pm-5:15pm): 0.09 vehicle trips/ student (i.e. 15% of the school PM peak hour).

These rates derived for the road network peak hours have been adopted for SIDRA network modelling for the intersections along The Northern Road and the internal intersections within GP3. Refer to Section 7.7 and 7.11 for SIDRA network modelling based on the road network AM and PM peak hours.

The peak hour traffic generation includes parent vehicle trips for drop off (inbound and outbound) and staff trips (inbound only) in the AM peak; and similarly parent vehicle trips for pickup (inbound and outbound) and staff trips (outbound only) in the PM peak. For staff trips, it has been assumed all trips are from the external road network with an assumed car occupancy of one staff per vehicle.

7.2.6 Total Traffic Generation Summary

For trips generated by the residential area, it has been assumed 20% of trips would be inbound and 80% of trips would be outbound in the AM peak hour, and these have been reversed in the PM peak hour.

For trips generated by the mixed-use centre, it has been assumed 50% of trips would be inbound and 50% of trips would be outbound during the AM and PM peak hours. Similar proportions have been assumed for school drop off and pick up trips, albeit it has been assumed school staff trips would be 100% inbound in the AM peak hour, and 100% outbound in the PM peak hour. The ultimate number of school students of 1,000 has been taken into consideration to allow for the worst-case scenario.

The AM and PM peak hour traffic generation for the proposed residential development are provided in Table 7.1.

Table 7.1: Traffic Generation Potential

Land Use	2036 Yield	Trip Generation Rate		AM Peak Hour Trip Generation		PM Peak Hour Trip Generation	
		AM Peak	PM Peak	Inbound Trips	Outbound Trips	Inbound Trips	Outbound Trips
Low density dwellings	1783	0.95 trips/ dwelling	0.99 trips/ dwelling	339	1,355	1,412	353
Medium density dwellings	487	0.95 trips/ dwelling	0.99 trips/ dwelling	93	370	386	96
Fonzie flats (within medium density)	30	0.65 trips/ dwelling	0.65 trips/ dwelling	4	16	16	4
Shop-top Housing	100	0.65 trips/ dwelling	0.65 trips/ dwelling	13	52	52	13
Retail	5,000m^2 GLFA	0.066 x GLFA +126	0.089 x GLFA +170	228	228	308	308
Primary School	1,000 students 70 staff	0.27 trips per student	0.09 trips per student	170	100	10	80
Total	-	-	-	**846**	**2,121**	**2,183**	**854**

Note: Primary school trip rates are 27% of the TfNSW school AM peak trip rate, and 15% of the TfNSW school PM peak trip rate, as derived based on the traffic survey at Surveyors Creek Primary School. Road network and school peak hours occur at different periods as discussed in Section 7.2.5.

The proposed development is estimated to generate 2,967 two-way trips in the AM peak hour and 3,037 two-way trips in the PM peak hour. These trips would be assigned to the internal and external road networks, including The Northern Road, Chain-O-Ponds Road, Riverflat Drive and Darug Avenue.

7.3 Traffic Distribution

7.3.1 Residential Trips

Directional distribution and assignment of residential traffic generated by the proposed development has been obtained based on the select link analysis provided to TTPP by TfNSW as part of the STFM model output. The proportion of development traffic that is distributed to/from the north and south via The Northern Road and the west via Chain-O-Ponds Road has been summarised in Table 7.2.

Table 7.2: STFM Traffic Distribution for Residential Trips (Year 2036)

Travel Direction	AM Peak		PM Peak	
	Inbound	Outbound	Inbound	Outbound
North	79%	72%	70%	83%

South	14%	23%	24%	14%
West	6%	6%	6%	3%
Total	**100%**	**100%**	**100%**	**100%**

Some residential trips involve direct travel to/from the wider road network via The Northern Road and Chain-O-Ponds Road, and some involve drop off/pick up at the primary school and high schools located within GP1, GP2 and GP3. There are a few roads connecting with GP2 but only Riverflat Drive and Darug Avenue have been considered for simplicity and provide a more conservative assessment.

7.3.2 Retail Trips

The economic assessment undertaken by Urbis (April 2022) demonstrated the market potential for a mid-size supermarket within GP3 which could anchor a neighbourhood shopping centre of 4,500 to 5,000m^2 GLFA.

A summary of the potential trade area is shown in Table 7.3 for GP2, Stage 3, Mulgoa Village area. TTPP assumed a 10% catchment for areas beyond the trade area.

Table 7.3: Traffic Distribution for Retail Trips (Year 2036)

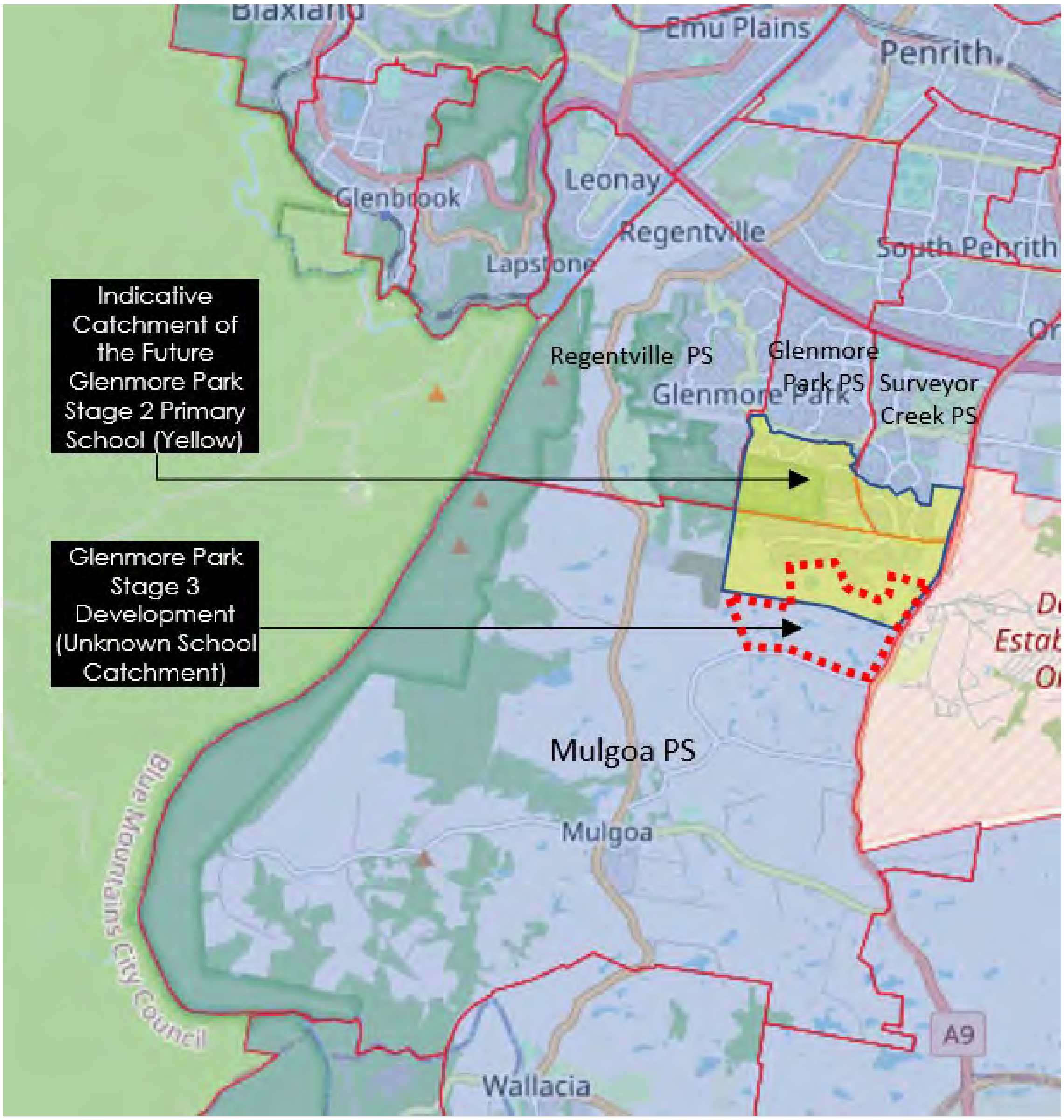
Trade Area	Proportion	TTPP Assumed Travel Route	
		Via Durag Avenue & Riverflat Drive	Via The Northern Road and Chain-O-Ponds
Secondary north (GP2)	29%	10%	19%
Primary (GP3)	59%	59%	0%
Secondary south (Mulgoa Village)	2%	0%	2%
Beyond Trade Area	10%	0%	10%
Total	**100%**	**69%**	**31%**

7.3.3 Primary School

While the catchment area is not clearly defined at this stage for the proposed primary school in GP3, SINSW advised that 70% of the school catchment is within GP3.

Catchment of the existing nearby primary schools is shown in Figure 7.2, overlaid by the indicative catchment for the new primary school in GP2 as shown in yellow.

Figure 7.2: Existing Catchment of Nearby Schools and Indicative Catchment of Future GP2 School



Reference: www.schoolcatchment.com and New Primary School In Mulgoa Rise Transport and Traffic Assessment (PTC, August 2021)

Catchment of the proposed primary school in GP3 is likely to take on part of the future catchment of the new school in GP2, and part of the existing catchment of Mulgoa Primary School.

On this basis, the following assumptions have been made for school traffic distribution:

- Student trips based on catchment
  - 70% within GP3 via the internal road network (with a further breakdown in Table 7.4)

- 15% within GP2 via Riverflat Drive and Darug Avenue (assumption suggested by Council)
- Remaining 15% via The Northern Road and Chain-O-Ponds based on the school catchment as shown in Figure 7.2:
    - 60% via Chain-O-Ponds Road, Kings Hill Road and Mulgoa Road (west and south-west)
    - 20% via The Northern Road (south)
    - 20% via The Northern Road (north) to allow for future developments located east of The Northern Road
- Staff trips based on STFM traffic distribution for the AM inbound trips and PM outbound trips (refer to Table 7.2).

A breakdown of the school trips between GP3 residents and the GP3 school is provided in Table 7.4, noting that these school trips exclude the 70 staff trips (based on one staff per vehicle) in the AM and PM peak hours.

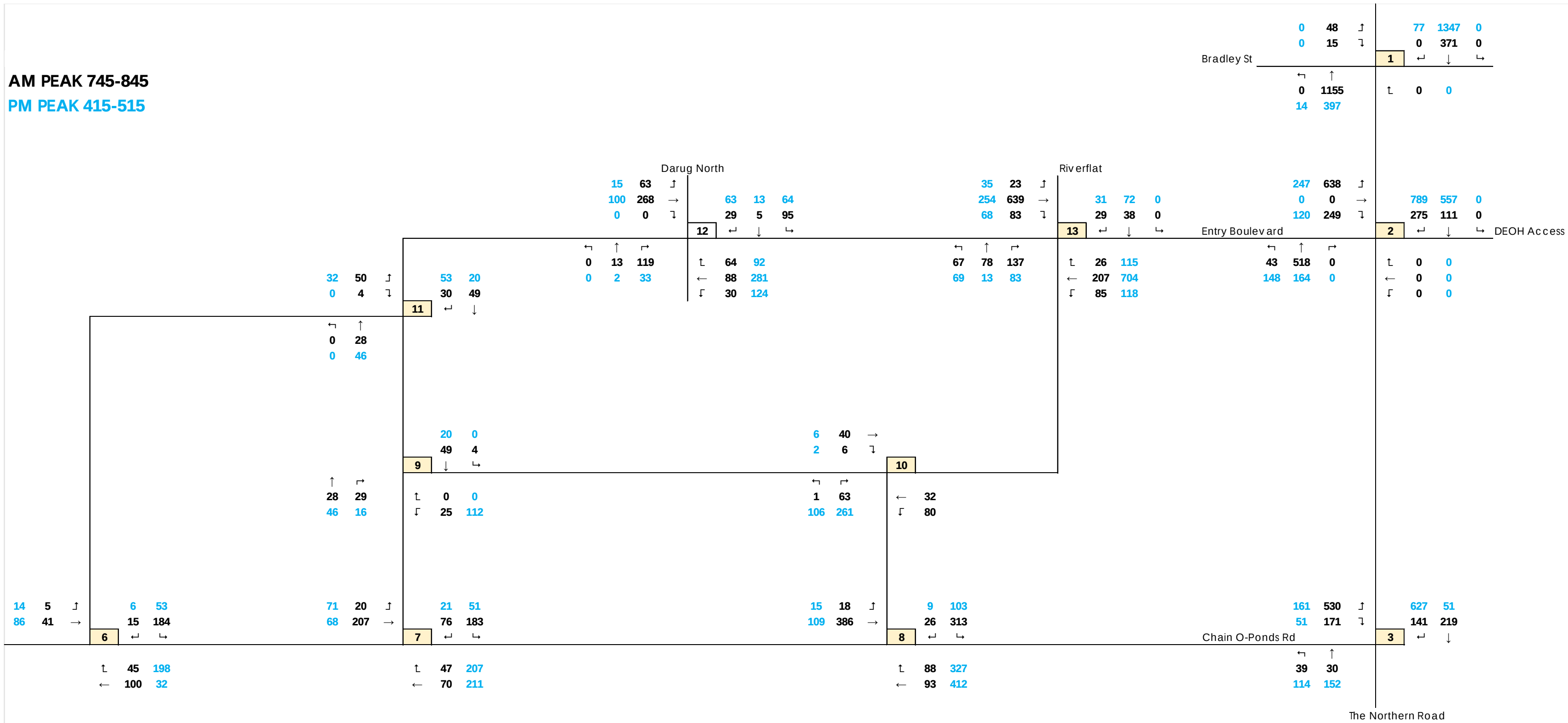
Table 7.4: School Trips (70% Catchment within GP3)

Peak Hour	Direction	Proportion	Travel Route	GP3 School Student Trips (70% Catchment)
AM	Inbound to School	30%	Drop off trips then external (as part of the 80% residential outbound trips)	42
		20%	GP3 internal drop-off trips	28
	Outbound from School	30%	Drop off trips then external (as part of the 80% residential outbound trips)	42
		20%	GP3 internal drop-off trips	28
AM Peak Total	-	**100%**	-	**140**
PM	Inbound to School	30%	From external to GP3 school for pick up (as part of the 80% residential inbound trips)	4
		20%	GP3 internal pick-up trips	4
	Outbound from School	30%	External and internal return trip from school (as part of the 80% residential inbound trips)	3
		20%	GP3 internal pick-up trips	3
PM Peak Total	**-**	**100%**	**-**	**14**

7.3.4 All trips

In summary, Figure 7.3 depicts the total traffic generation involving residential, retail and school trips distributed on the road network.

Figure 7.3: Residential, Retail and School Trips (Year 2036)



Note: Mid-block flows may not balance in the stick diagram due to traffic loss/gain to/from minor roads and driveways.

7.4 Assessment Scenarios

The following scenarios have been considered to assess the potential traffic impact of the proposed development on the surrounding road network, as agreed with by TfNSW and Council:

- **Scenario 1**: 2026 “do-minimum” base case without the proposed development

  This scenario only includes the key intersections along The Northern Road corridor.

- **Scenario 2**: 2036 “do-minimum” base case, without the proposed development

  This scenario includes the key intersections along The Northern Road corridor.

- **Scenario 3**: Scenario 2, plus the proposed ultimate development

  This scenario includes the key intersections along The Northern Road corridor and all key internal intersections within GP3.

- **Scenario 4**: Recommendations to improve intersection performance

7.5 Future Traffic Volumes

Peak hour turning movement volumes have been estimated based on the adjusted STFM flows provided by TfNSW as mentioned in Section 4.3.

Year 2026 and Year 2036 baseline peak hour traffic flows are shown in Figure 7.4 and Figure 7.5, respectively.

Future traffic volumes with additional traffic associated with the development for Year 2036 is shown in Figure 7.6.

Figure 7.4: Year 2026 Baseline Traffic Volumes (without Development Traffic)

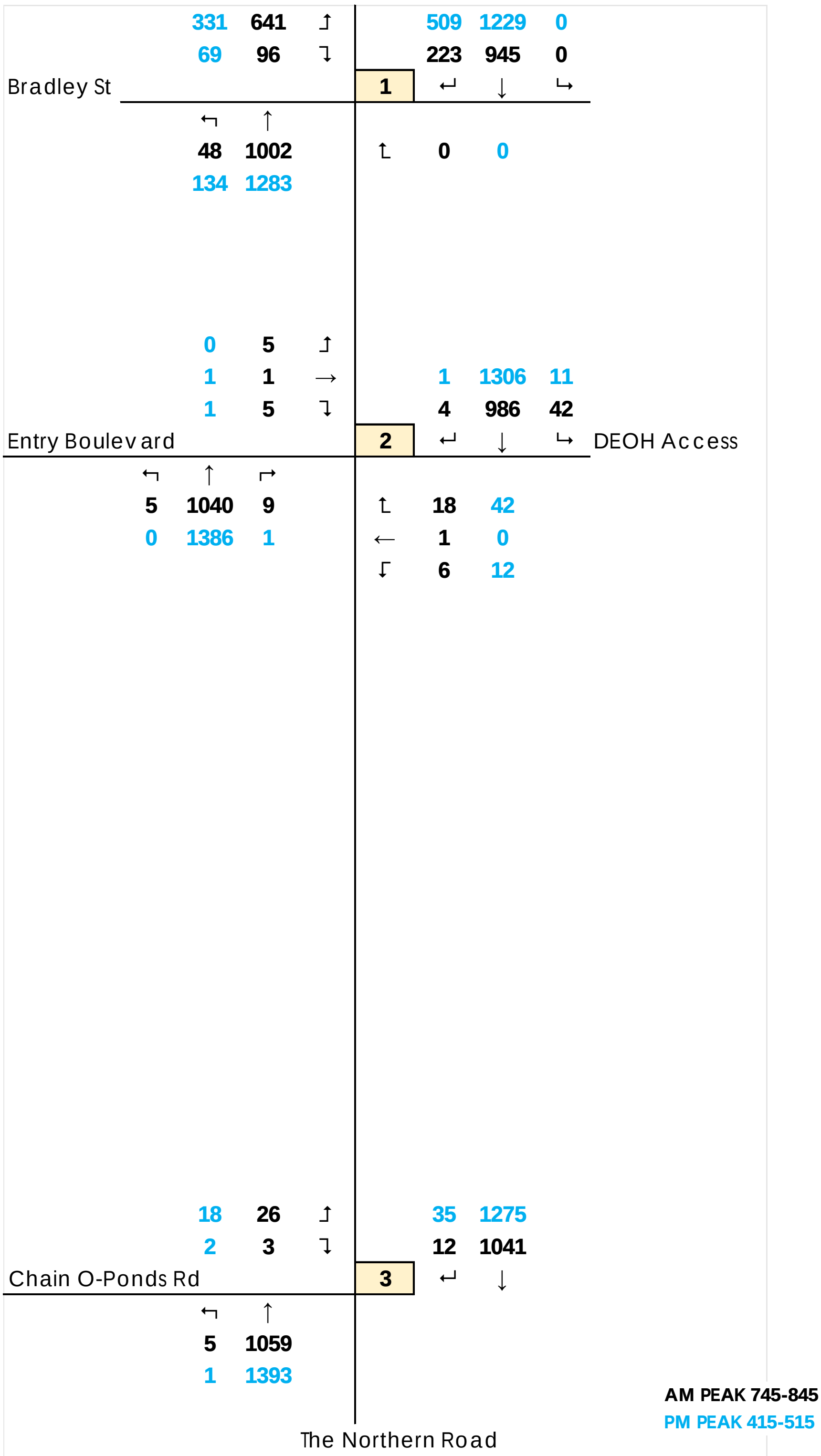


Figure 7.5: Year 2036 Baseline Traffic Volumes (without Development Traffic)

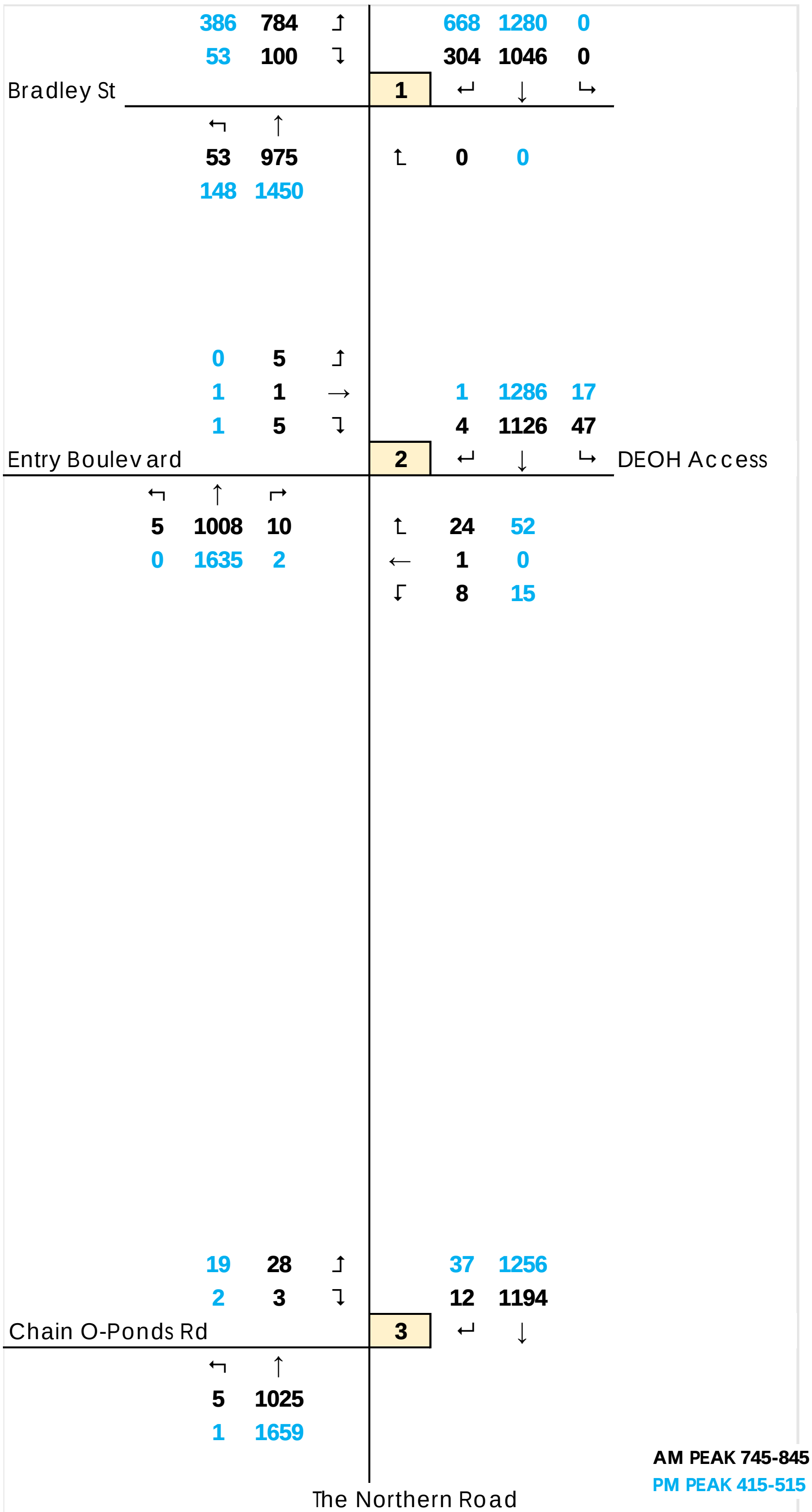
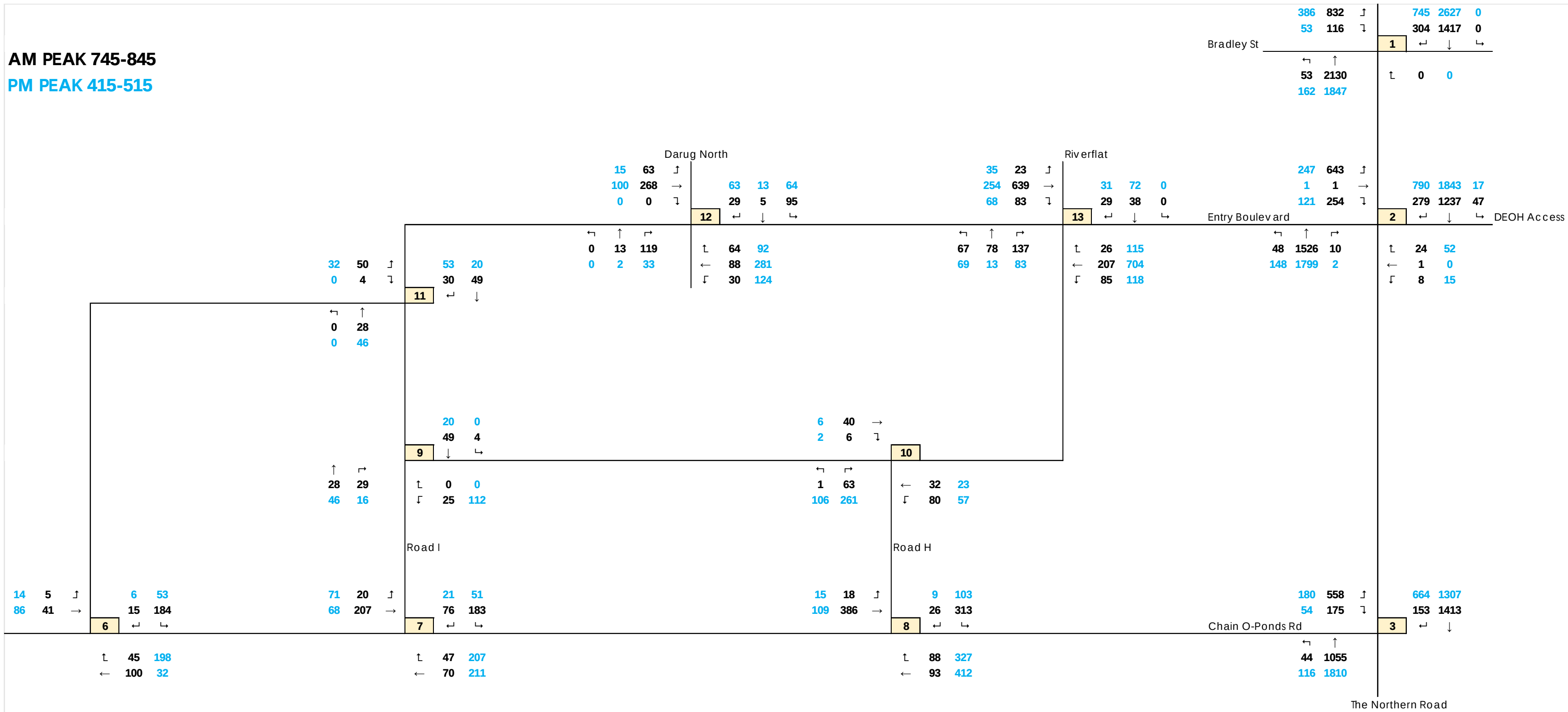


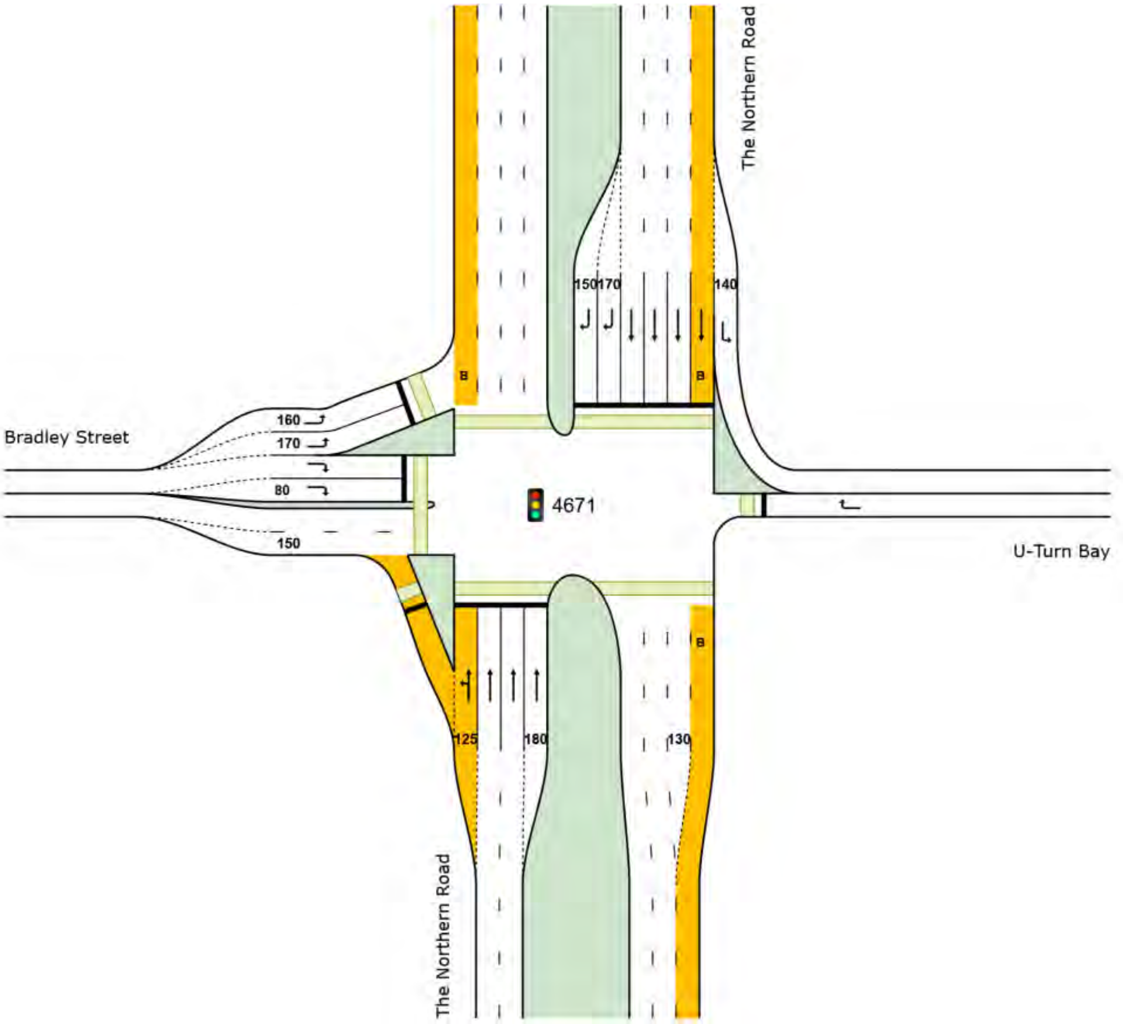
Figure 7.6: Year 2036 Future Traffic Volumes (with Development Traffic)



7.6 External Road Network – Existing Intersection Layout

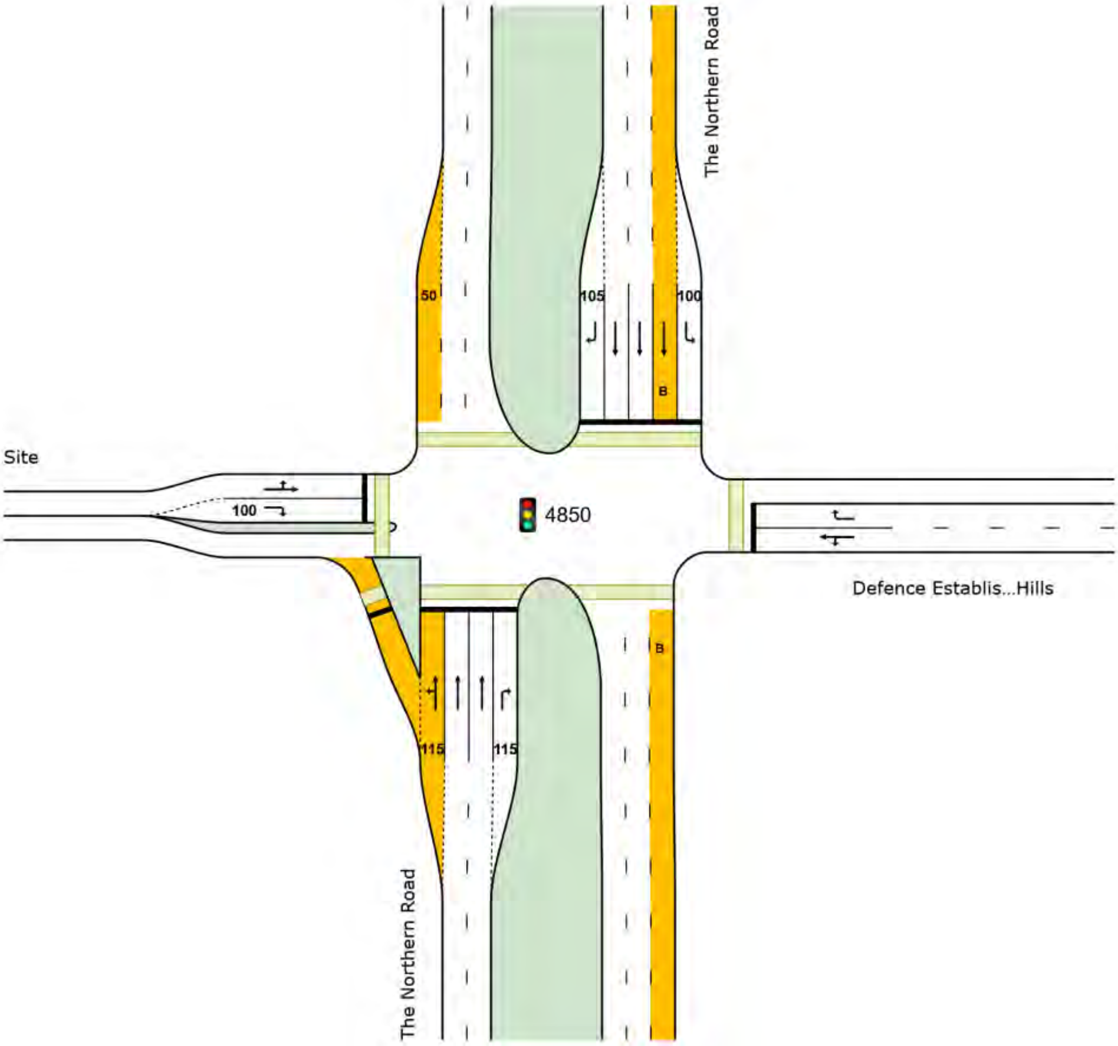
The Northern Road intersections have been assessed based on the existing layout with the recent completion of The Northern Road Upgrade, as shown in Figure 7.7 to Figure 7.9. The orange shade depicts the bus lane on The Northern Road.

Figure 7.7: Existing Layout of The Northern Road and Bradley Street



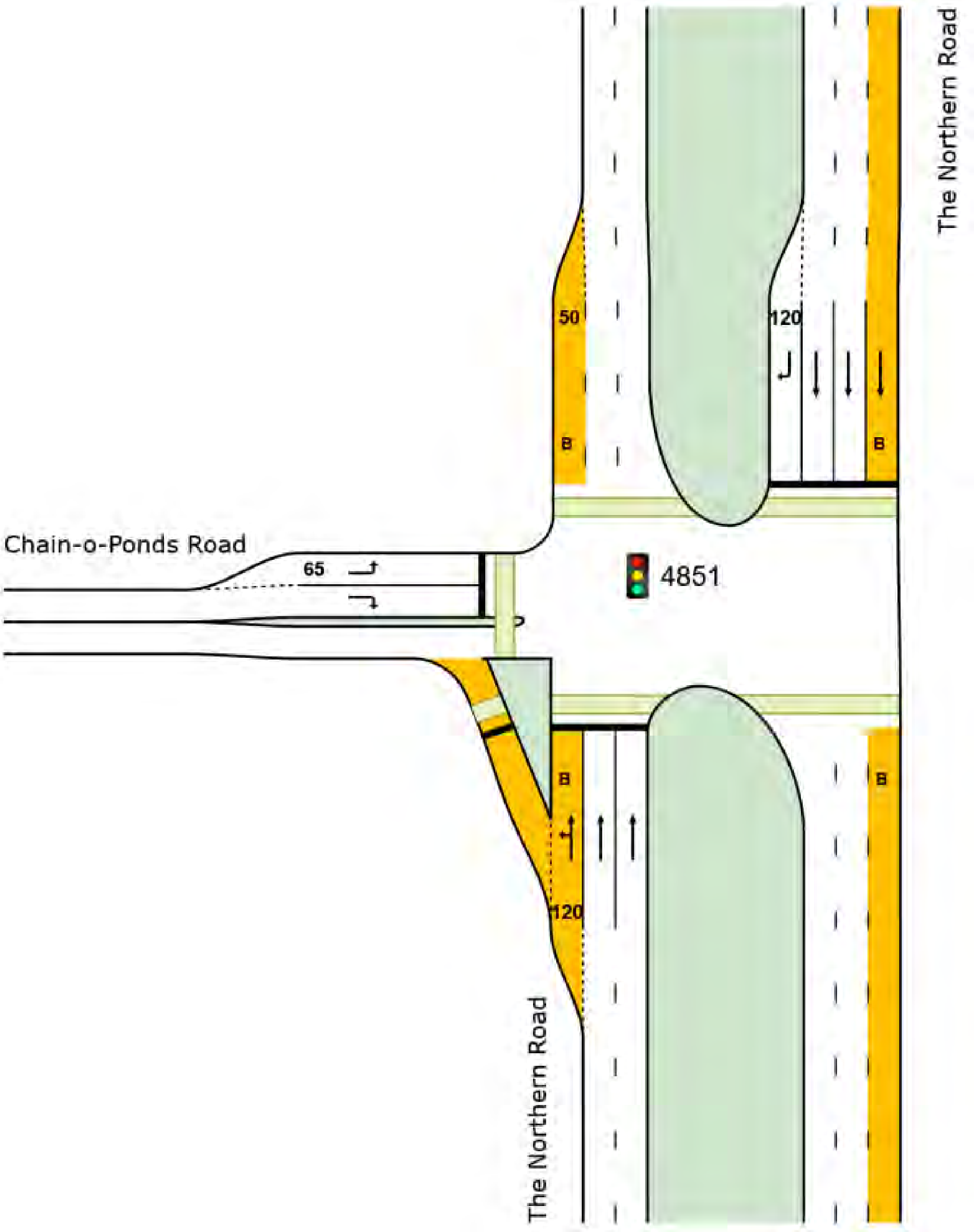
Note: Orange highlight denotes existing bus lane on The Northern Road

Figure 7.8: Existing Layout of The Northern Road and Entry Boulevard/DEOH Access



Note: Orange highlight denotes existing bus lane on The Northern Road

Figure 7.9: Existing Layout of The Northern Road and Chain-O-Ponds Road



Note: Orange highlight denotes existing bus lane on The Northern Road

7.7 External Road Intersection Capacity Analysis

The key intersections have been modelled in SIDRA Intersection 9 for a weekday AM and PM peak hour in Year 2026 and Year 2036. Based on a network cycle time of 140 seconds as required by TfNSW, the results are shown in Table 7.5. SIDRA modelling output is provided in Appendix A.

Table 7.5: Year 2026 and Year 2036 Peak Hour Intersection Operating Conditions

Intersection	Scenario 1: 2026 (without Development)				Scenario 2: 2036 (without Development)				Scenario 3: 2036 (with Development)			
	AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LoS	Delay	LoS	Delay	LoS	Delay	LoS	Delay	LoS	Delay	LoS
The Northern Road – Bradley Street	18	B	21	B	18	B	31	C	21	B	54	D
The Northern Road – Entry Boulevard	20	B	23	B	23	B	24	B	163	F	309	F
The Northern Road – Chain-O-Ponds	10	A	15	B	8	A	11	A	26	B	145	F

Scenario 1: Year 2026 Base

The Scenario 1 modelling results indicate that the key intersections along The Northern Road would operate at acceptable levels of service, based on the Year 2026 traffic demand without the proposed development traffic.

Scenario 2: Year 2036 Base

The Scenario 2 modelling results indicate that the key intersections along The Northern Road would operate at acceptable levels of service, based on the Year 2036 traffic demand without the proposed development traffic.

Scenario 3: Year 2036 with Development

The Scenario 3 modelling results indicate that The Northern Road- Bradley Street intersection would operate at an acceptable level of service by Year 2036 with development traffic. However, the Northern Road intersections with the entry boulevard and Chain-O-Ponds Road would not be capable of accommodating the additional traffic generated by the proposed development by Year 2036.

Although the recent road upgrade has allowed provision for turning lanes to the entry boulevard and Chain-O-Ponds Road intersections for future developments, the provision would not be sufficient to accommodate the anticipated future traffic volume. The modelling results indicate that long delays would be experienced by motorists entering the site during peak periods at the entry boulevard and Chain-O-Ponds Road intersections. Traffic queues at these intersections for the right turning movements on the northern approach would exceed the length of the right turn storage lanes and impede the southbound through movements in the adjacent lane.

Additional capacity would be required at these intersections to sufficiently accommodate the future traffic volumes associated with the proposed development to reduce traffic delay and queue lengths. It is recommended to provide dual right turn lanes at these intersections to contain the right turning traffic without overspilling to the adjacent southbound through lane. Provision of dual right turn lanes at these intersections would minimise queue length and delay for southbound traffic. Refer to Section 7.9 for the recommended layouts for these intersections involving the dual right turn lanes and the additional through lanes on The Northern Road.

Additional capacity is also required for the northbound through movement at The Northern Road- entry boulevard intersection. While more green time is allocated to the side road to accommodate the egress traffic from the development, more capacity is required on The Northern Road through the provision of an additional northbound lane.

Notwithstanding the above results, the eastbound traffic queues along the entry boulevard and Chain-O-Ponds Road towards The Northern Road intersection would not extend to the next intersection to the west.

The available length between The Northern Road and the first major intersection is 400m on the entry boulevard and 285m on Chain-O-Ponds Road, while the modelled traffic queues are 182m and 175m respectively. As such, the traffic queues would not impede the operation of the adjacent intersections.

7.8 External Road Level of Service

An analysis of roadway level of service has been undertaken to determine the impact of development-related traffic in Year 2036. Mid-block lane capacity for urban arterial roads with interrupted flows is dependent upon a number of factors. In accordance with TfNSW Guide to Traffic Generating Development (2002), the typical lane capacity is 1,900 pcu/hr for a four lane divided road under clearway conditions.

The definition of the mid-block level of service based on the maximum volume to capacity ratio (V/C) is shown in Table 7.6 for multi-lane roads with a free flow speed of 70km/h, in accordance with Austroads Guide to Traffic Management.

Table 7.6: Mid-Block Level of Service Definitions and Criteria for Multi-Lane Road

LoS	Definition	V/C Ratio
A	A condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high.	Less than or equal to 0.26

LoS	Definition	V/C Ratio
B	In the zone of stable flow where drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort is a little less than with level of service A.	0.27 to 0.41
C	Also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.	0.42 to 0.59
D	Close to the limit of stable flow and approaching unstable flow. All drivers are severely restricted in their freedom to elect their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow would generally cause operational problems.	0.60 to 0.81
E	Traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream would cause breakdown.	0.82 to 1.00
F	In the zone of forced flow, where the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs, and queuing and delays result.	Greater than 1.00

The lane capacity and mid-block capacity assessment results for the AM and PM peak hours are shown in Table 7.7 for the 2026 Base Case and for 2036 Base Case and 2036 with development. The volume capacity ratio is shown as V/C.

Table 7.7: Year 2026 Peak Hour Mid-Block Operating Performance Summary – No Road Upgrade Improvement Works

Road Section	Direction	2026 Base Case							
		No. Lanes	Mid-Block Capacity	AM Peak			PM Peak		
				Flow	V/C	LOS	Flow	V/C	LOS
The Northern Road, between Glenmore Parkway and Bradley Street	Northbound	3	5,700	1,673	0.29	B	1,711	0.30	B
	Southbound	3	5,700	1,167	0.20	A	1,738	0.30	B
The Northern Road, between Bradley Street and Entry Boulevard	Northbound	2	3,800	1,062	0.28	B	1,428	0.38	B
	Southbound	2	3,800	1,040	0.27	B	1,319	0.35	B
The Northern Road, between Entry Boulevard and Chain O-Ponds Road	Northbound	2	3,800	1,085	0.29	B	1,411	0.37	B
	Southbound	2	3,800	1,052	0.28	B	1,319	0.35	B
The Northern Road, South of Chain-O-Ponds Road	Northbound	2	3,800	1,064	0.28	B	1,394	0.37	B
	Southbound	2	3,800	1,044	0.27	B	1,277	0.34	B

Table 7.8: Year 2036 Peak Hour Mid-Block Operating Performance Summary

Road Section	Direction	2036 Base Case								2036 with Development							
		No. Lanes	Mid-Block Capacity	AM			PM			No. Lanes	Mid-Block Capacity	AM			PM		
				Flow	V/C	LOS	Flow	V/C	LOS			Flow	V/C	LOS	Flow	V/C	LOS
The Northern Road, between Glenmore Parkway and Bradley Street	Northbound	3	5,700	1,759	0.31	B	1,886	0.33	B	3	5,700	2,962	0.52	C	2,283	0.40	B
	Southbound	3	5,700	1,350	0.24	A	1,947	0.34	B	3	5,700	1,721	0.30	B	3,371	0.59	D
The Northern Road, between Bradley Street and Entry Boulevard	Northbound	2	3,800	1,037	0.27	B	1,687	0.44	C	2	3,800	2,193	0.58	C	2,098	0.55	C
	Southbound	2	3,800	1,177	0.31	B	1,333	0.35	B	2	3,800	1,563	0.41	C	2,680	0.71	D
The Northern Road, between Entry Boulevard and Chain O-Ponds Road	Northbound	2	3,800	1,052	0.28	B	1,678	0.44	C	2	3,800	1,613	0.42	C	1,990	0.52	C
	Southbound	2	3,800	1,206	0.32	B	1,302	0.34	B	2	3,800	1,566	0.41	C	1,979	0.52	C
The Northern Road, South of Chain-O-Ponds Road	Northbound	2	3,800	1,030	0.27	B	1,660	0.44	C	2	3,800	1,099	0.29	B	1,926	0.51	C
	Southbound	2	3,800	1,198	0.32	B	1,258	0.33	B	2	3,800	1,588	0.42	C	1,361	0.36	B

Year 2026 Base Case

Table 7.7 shows that the mid-block LoS along The Northern Road would operate satisfactorily during the AM and PM peak hour in Year 2026 at LoS C or better, indicating spare capacity would be available to accommodate additional traffic volume on The Northern Road.

Year 2036 Scenarios

2036 Base Case

Table 7.8 shows that The Northern Road during the 2036 AM and PM peak will continue to operate similarly to 2026 at LoS C or better, indicating spare capacity would be available to accommodate additional traffic volume on The Northern Road.

2036 with Development

Table 7.8 shows that the majority of The Northern Road will continue to operate at LoS C or better during the AM and PM peak with the additional development traffic. The southbound flows between Glenmore Parkway and Entry Boulevard would operate acceptably at LoS D during the PM peak.

Overall, the mid-block level of service indicates that the mid-block road capacity on The Northern Road would be sufficient to accommodate the future traffic growth and even with the additional traffic associated with the proposed development.

7.9 Future Road Network (with Intersection Upgrade)

7.9.1 Recommended Intersection Upgrade Measures (Year 2036)

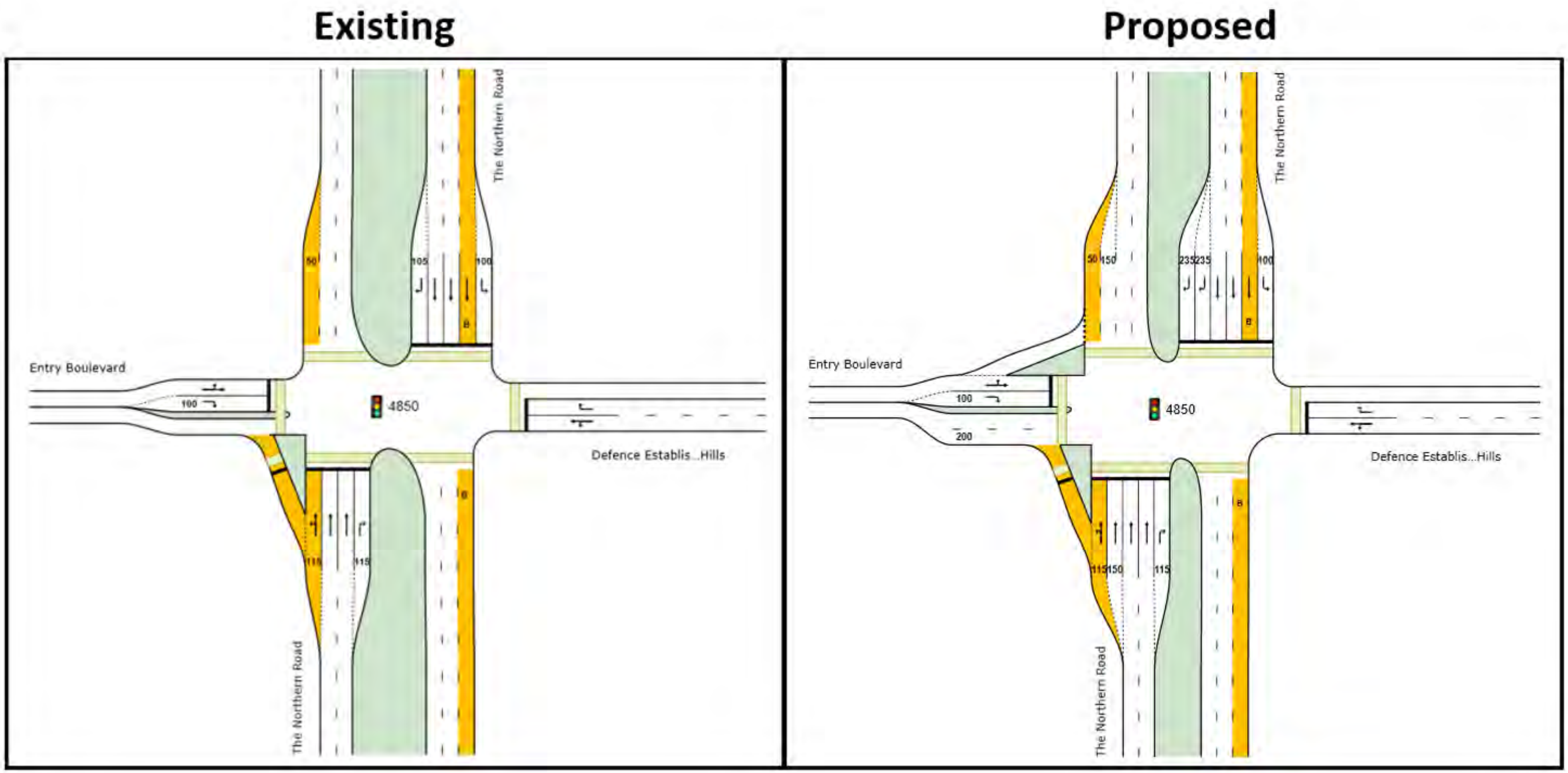
The recommended intersection upgrade works are described as follows for Year 2036:

- The Northern Road intersection with the Entry Boulevard (refer to Figure 7.10)
  - Add a 235m long southbound right turn lane and increase existing the right turn lane length to 235m.
  - Add a short northbound through approach lane 150m in length.
  - Add a short northbound through departure lane 150m in length.
  - Provide a left turn high angle slip lane on the Entry Boulevard.
- The Northern Road intersection with Chain-O-Ponds Road (refer to Figure 7.11)
  - Add a short northbound through approach lane 150m in length.
  - Add a short northbound through departure lane 100m in length.
  - Add a 220m long southbound right turn lane and increase the existing right turn lane length to 220m.

- Re-line mark Chain-O-Ponds Road to swap the existing 65m short lane with the full length lane to provide more storage capacity to accommodate the dominant left turn movement, without being impeded by the right turn traffic.

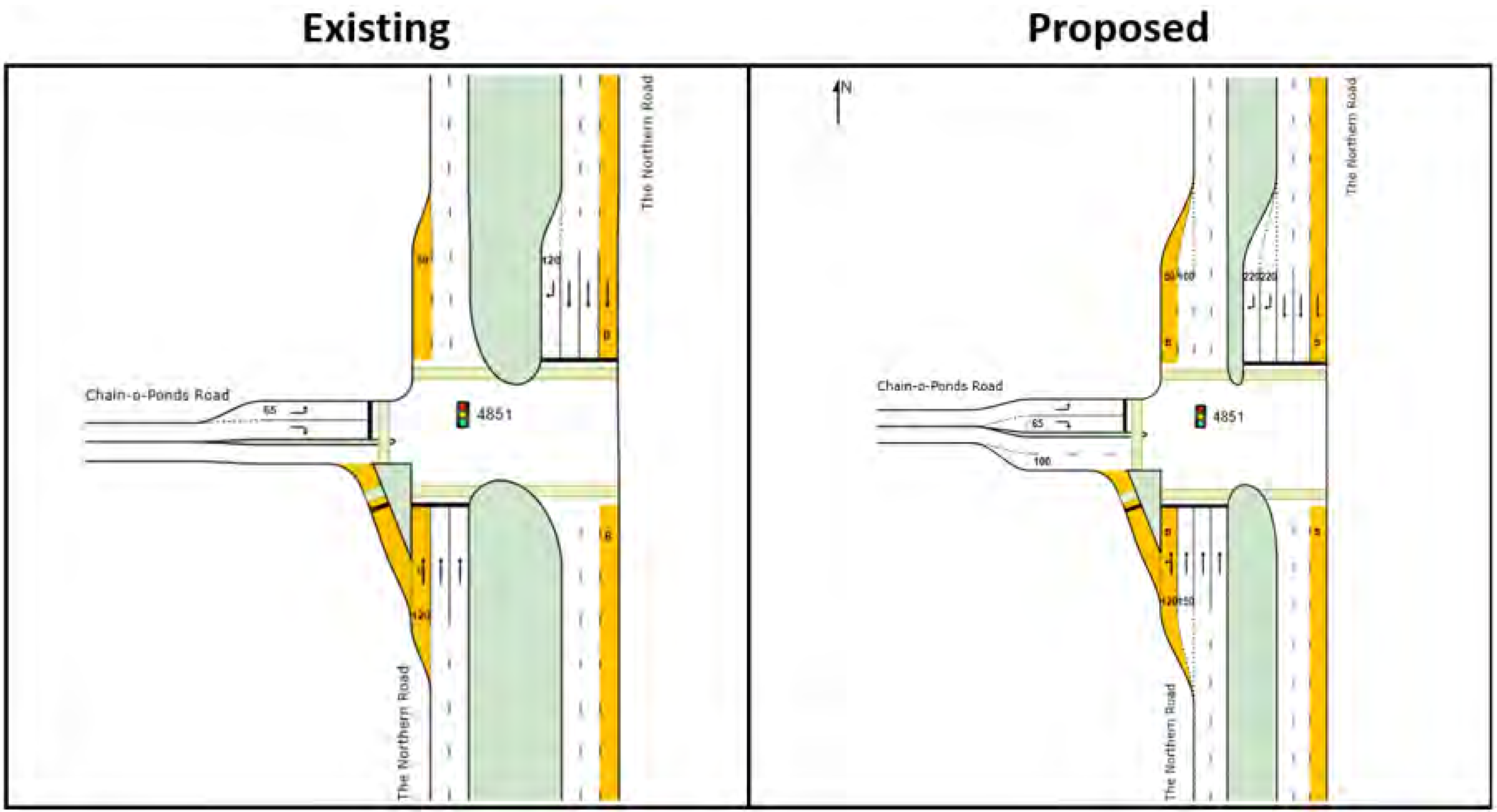
Strategic design concept plans illustrating the above recommended intersection upgrade measures are provided in Appendix B.

Figure 7.10: The Northern Road / Defence Establishment Orchard Hills / Entry Boulevard Proposed Upgrades



Note: Orange highlight denotes existing bus lane on The Northern Road

Figure 7.11: The Northern Road / Chain-O-Ponds Road Proposed Upgrades



Note: Orange highlight denotes existing bus lane on The Northern Road

7.9.2 Operating Conditions

Table 7.9 shows the operating conditions of the intersections based on the recommended intersection upgrades at The Northern Road intersections with entry boulevard and Chain-O-Ponds Road.

Table 7.9: Year 2036 Peak Hour Intersection Operating Conditions (with Intersection Upgrades)

Intersection	Scenario 4 (2036 with Development)			
	AM Peak		PM Peak	
	Delay	LoS	Delay	LoS
The Northern Road – Bradley Street	24	B	30	C
The Northern Road – Entry Boulevard	45	D	48	D
The Northern Road – Chain-O-Ponds	30	C	30	C

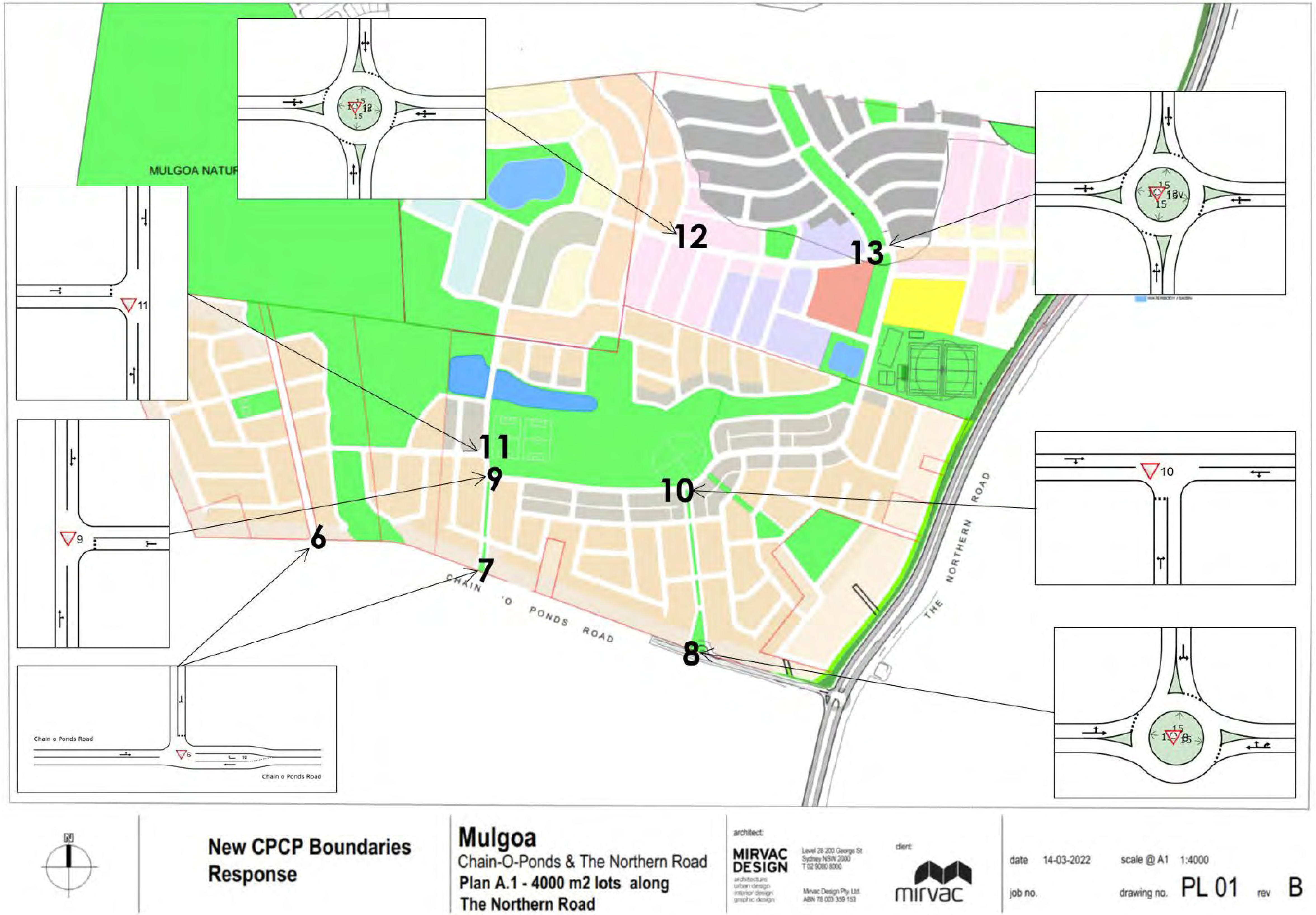
As can be seen in Table 7.9, these intersections are expected to operate at an acceptable LoS at D or better in Scenario 4 (2036 with Development Traffic and Intersection Upgrades).

7.10 Internal Road Network Intersection Layout

Control of the internal intersections has been determined using SIDRA modelling for year 2036 with a target LoS D when the residential dwellings, mixed-use centre and primary school are assumed to be fully occupied. The internal road intersection capacity analysis is discussed in Section 7.11.

Figure 7.12 shows the suggested intersection control for the internal intersections.

Figure 7.12: Proposed Internal Intersection Control



7.11 Internal Road Intersection Capacity Analysis

7.11.1 Network Peak Hours

Table 7.10 shows the operating conditions of the internal intersections based on the recommended intersection controls as shown in Figure 7.12 during the following road network peak hours:

- 7:45am-8:45am
- 4:15pm-5:15pm.

Table 7.10: Year 2036 Peak Hour Intersection Operating Conditions – Internal Intersections

Intersection	Control	Road Network AM Peak		Road Network PM Peak	
		Delay	LoS	Delay	LoS
6	Give-way	7	A	8	A
7	Give-way	8	A	9	A
8	Single Lane Roundabout	12	A	12	A
9	Give-way	6	A	6	A
10	Give-way	6	A	6	A
11	Give-way	6	A	6	A
12	Single Lane Roundabout	11	A	11	A
13	Single Lane Roundabout	17	B	18	B

As can be seen in Table 7.10, the internal intersections all function at LoS B or better indicating that the intersection layouts as shown in Figure 7.12 can adequately accommodate all development traffic.

7.11.2 Sensitivity Test (School Peak Hours)

A sensitivity test has been undertaken for the entry boulevard and Riverflat Drive intersection (Intersection 13) to confirm suitability of the recommended layout during school peak hours. It is considered that school trips would be higher during the school peak hours (8:15am-9:15am and 2:30 pm -3:30pm) as compared with the road network peak hours (7:45am-8:45am and 4:15pm-5:15pm).

Consideration has been taken for the following factors:

- School trips based on the following traffic generation rates derived from the survey conducted at Surveyors Creek Primary School:

- School AM peak hour (8:15am-9:15am): 0.76 vehicle trips/ student
- School PM peak hour (2:30 pm -3:30pm): 0.60 vehicle trips/ student

- Inclusion of 100% of school staff inbound trips in the school AM peak and 100% of school staff outbound trips in the school PM peak.
  - It is noted that school staff are likely to arrive prior to the school network peak and depart after the school network peak and therefore this is a conservative assessment.
- Reduction of resident trips through the subject intersection. Refer to Table 7.11 for the comparison of the traffic volume that occurred at The Northern Road- Glenmore Parkway Intersection based on the SCATS counts. Table 7.11 shows the traffic volume during the school AM peak hour is 83% of that during the road network AM peak hour, and similarly the traffic volume during the school PM peak hour is 86% during the road network PM peak hour.

Table 7.11: Traffic Volume during Road Network Peak Hours and School Peak Hours

Peak Hour		Period	Total SCATS Traffic Volume at The Northern Road- Glenmore Parkway Intersection (27 May 2021)	Proportion
AM	Road network	7:45am-8:45am	3,730	83%
	School	8:15am-9:15am	3,094	
PM	School	2:30pm-3:30pm	3,319	86%
	Road network	4:15pm-5:15pm	3,849	

The predicted traffic volume during the school peak hours are shown in Figure 7.13 as follows.

Figure 7.13: Year 2036 Traffic Volume at Intersection 13 during School AM and PM Peak Hours

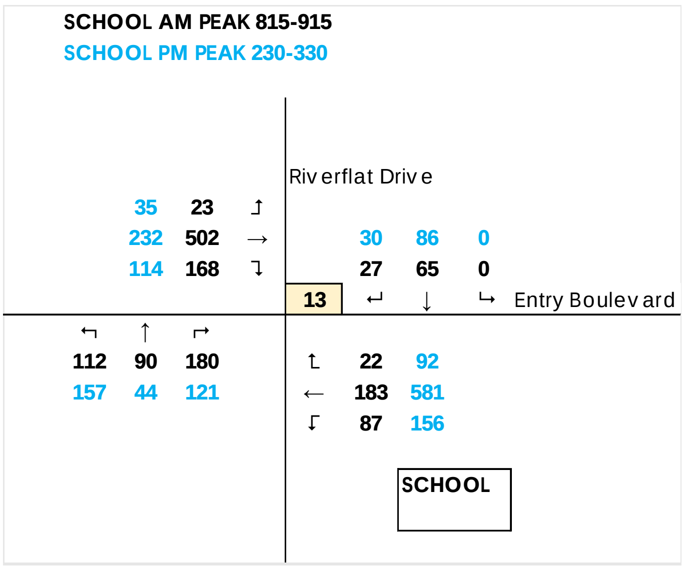


Table 7.12 shows the operating conditions of Intersection 13 based on the recommended single lane roundabout during the following school peak hours:

- 8:15am-9:15am
- 2:30pm-3:30pm

Table 7.12: Year 2036 School Peak Hour Intersection Operating Conditions – Intersection 13

Intersection	Control	School AM Peak		School PM Peak	
		Delay	LoS	Delay	LoS
13	Single Lane Roundabout	16	B	20	B

The modelling results indicate that the entry boulevard and Riverflat Drive Intersection would operate at LoS B during the school peak hours. Despite the higher turning volumes to/from the proposed primary school, the single lane roundabout can adequately accommodate all development traffic during the school peak hours.

7.12 Internal Road Level of Service

The internal road midblock level of service has been assessed similarly to the external road level of service assessment in Section 7.6. However, for urban roads there are various criteria to be met which account for clearway conditions, divided or undivided road and parking lanes. The one-way mid-block lane capacity criteria from TfNSW's Guide to Traffic Generating Developments (2002) is shown in Figure 7.14.

Figure 7.14: Typical Mid-block Capacities for Urban Roads with Interrupted Flows

Type of Road	One-Way Mid-block Lane Capacity (pcu/hr)	
Median or inner lane:	Divided Road	1,000
	Undivided Road	900
Outer or kerb lane:	With Adjacent Parking Lane	900
	Clearway Conditions	900
	Occasional Parked Cars	600
4 lane undivided:	Occasional Parked Cars	1,500
	Clearway Conditions	1,800
4 lane divided:	Clearway Conditions	1,900

Source: Table 4.3 Guide to Traffic Generating Developments (2002)

The lane capacity and assessment results for the AM and PM peak hours are shown in Table 7.13, and the internal road names are shown in Figure 7.15 for locations that Council required the assessment to be undertaken for.

Table 7.13 indicates that all internal roads would operate below the capacity threshold for each respective road type. All internal roads would operate with one lane in each direction, except for the entry boulevard (B) between the mixed-use centre and Riverflat Drive where two lanes will be required in each direction to accommodate the future traffic volumes. This could be achieved through the use of No Stopping signs on both sides of the road to free up the kerbside lane to enable two travel lanes.

The final number of travel lanes for intersections is subject to SIDRA modelling as depicted in Figure 7.10 and Figure 7.11 for the external intersections and Figure 7.12 for the internal intersections.

Figure 7.15: Internal Road Names

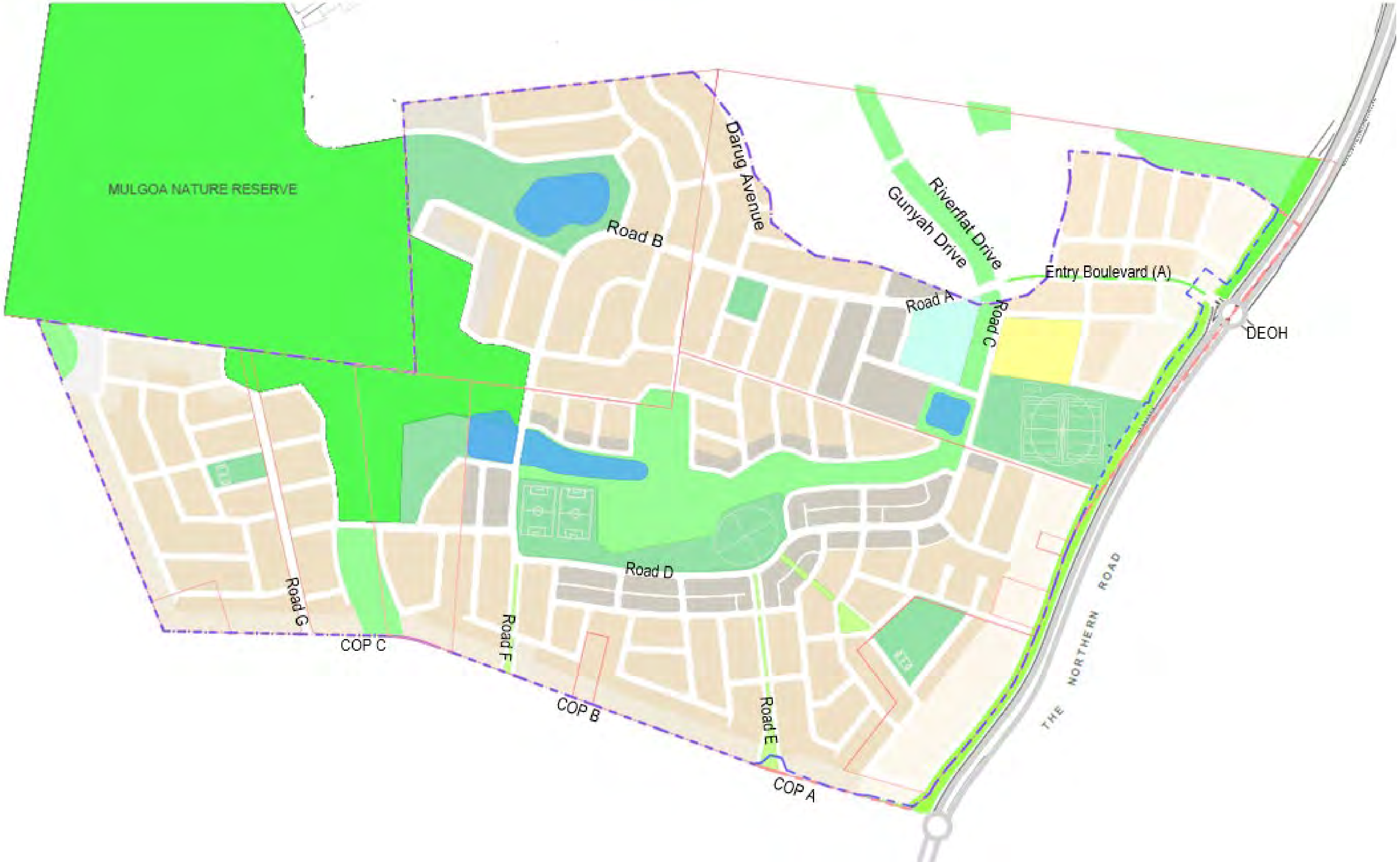


Table 7.13: Year 2036 Peak Hour Mid-Block Operating Performance – Internal Roads

Road Section	Road Type	Capacity (vph/ lane)	AM Peak			PM Peak			No. of Lanes Required for both AM and PM Peak	
			Northbound / Eastbound	Southbound / Westbound	Two-way	Northbound / Eastbound	Southbound / Westbound	Two-way	Northbound / Eastbound	Southbound / Westbound
Entry Boulevard (A)	Divided	1,000	886	317	1,203	367	938	1,305	1	1
Road A	Undivided (no parking)	600	746	302	1,048	357	804	1,161	2	2
Road B	Undivided (with parking)	600	321	117	438	114	344	458	1	1
Road C	Undivided (with parking)	600	286	206	492	165	257	422	1	1
Road D	Undivided (with parking)	600	47	36	83	36	133	168	1	1
Road E	Undivided (with parking)	600	127	353	481	367	133	500	1	1
Road F	Undivided (with parking)	600	87	267	354	281	79	360	1	1
Road G	Undivided (with parking)	600	68	217	285	229	75	304	1	1
Chain-O-Ponds Road (A)	Undivided (no parking)	900	701	180	881	212	741	953	1	1
Chain-O-Ponds Road (B)	Undivided (no parking)	900	404	119	523	124	420	544	1	1
Chain-O-Ponds Road (C)	Undivided (no parking)	600	226	145	371	139	230	369	1	1
Riverflat Drive	Undivided (with parking)	600	140	71	212	165	113	279	1	1
Darug Avenue	Undivided (with parking)	600	142	132	274	109	141	250	1	1

8 Travel Demand Management

This section identifies the required travel demand management measures to encourage a mode shift to more sustainable travel modes in line with overarching transport planning strategies and guidelines as mentioned in Section 3.

8.1 Target Mode Share

As discussed in Section 2.7, the 2016 Census data has been assessed for the existing Glenmore Park to appreciate the existing baseline mode share of residents already residing within the area. Based on the census data it indicates that most employed residents work in surrounding areas in Penrith followed by areas such as Mount Druitt, Parramatta, Sydney Inner City and Blacktown.

The recent upgrade of The Northern Road with bus lanes and off-road shared use path offers non-private vehicle modal choices as compared with the baseline travel modal share recorded in 2016 prior to the road upgrade.

Measures which have been proposed to encourage future residents of GP3 to take public transport and active transport to workplace and other destinations include:

- Re-routing of existing Bus Service 794 into GP3 with a good coverage of catchment to a bus stop (refer to Figure 4.1)
- New shared use path along The Northern Road constructed as part of the recent upgrade
- Good connectivity to the proposed walking and cycling routes throughout the precinct and with the existing facilities in GP2 and The Northern Road. This would encourage people to take active transport to the workplace, bus stops and shops, and also increase the uptake of buses to further destinations.

Furthermore, the future Sydney Metro stations (Western Sydney Airport Line) will provide GP3 residents with public transport connection between the Metro stations (Orchard Hill and Luddenham) and the T1 Western Line at St Marys Station. GP3 residents could still catch a train at Penrith Station to other destinations.

These proposed measures and the new Metro line would be key to address the 30-Minute City target from the Future Transport and Greater Sydney Region and Western City District Plan.

A mode shift of 10% has been targeted for GP3 for implementation of appropriate transport initiatives and demand management to promote a mode shift towards more sustainable transport options. It is noted that a modal shift between 3%-5% is typically considered to be a significant achievement, based on knowledge on local and international green travel plans, and advice from experts in Land and Environment Court proceedings. However, given the existing limited public transport provision is subject to significant changes in the future with Sydney Metro and bus service improvements, a higher mode shift of 10% has been set as a target to increase the uptake of public transport and active transport, given the subject site is located at a convenient location to enjoy the benefit of the new transport infrastructure.

Given Census 2016 data indicates key destinations of workplace are located in Penrith (32%), Parramatta (9%), Mount Druitt (8%) and Sydney Inner City (8%), the following target mode shift as shown in Table 8.1 are considered realistic:

- 2% shift from car to bus to destinations such as Penrith serviced by Bus Route 794. Refer to Section 8.2.2 for the proposed bus re-routing to maximise bus stop catchment at GP3
- 5% shift from car to car-train due to the new Sydney Metro services (Western Sydney Airport Line) with the closest stations at Luddenham and Orchard Hill Metro Station where residents can park-and-ride to further destinations
- 2% shift from car-train connection to bus-train connection where people take a bus to Penrith train station instead of driving to destinations serviced by the train line, such as Parramatta, Mount Druitt, and Sydney inner city
- 1% shift from car to bicycle to destinations such as Penrith which is within a 10km distance from GP3. This is considered an acceptable cycling distance (approximately 25-30 minutes) on a designated cycling route with a flat terrain.

Table 8.1: Travel Mode Targets

Mode of Travel		Proportion (%)	
		Adjusted Existing Mode Share for GP1 and 2 as shown in Table 2.2	**Target Shift**
Car (as driver or passenger)		87.1%	79.1%, including: • (-2%) shift to bus • (-5%) shift to car-train (or Metro) • (-1%) to bicycle
Train	Train-bus	2.2%	4.2%, including (+2%) from train-car so people take a bus to Penrith train station instead of driving
	Train-car (driver and passenger)	7.1%	10.1%, including • (-2%) shift to train-bus so people take a bus to Penrith train station instead of driving • (+5%) shift from car to car-metro connection at Luddenham and Orchard Hill Metro Station for connection to further destination which will reduce car trips in the wider Sydney road network
	Train-bus-car (driver and passenger)	1.1%	No change, 1.1%
	Train-others	0.1%	No change, 0.1%
Bus only		1.0%	3%, including (+2%) shift from car

Mode of Travel	Proportion (%)	
	Adjusted Existing Mode Share for GP1 and 2 as shown in Table 2.2	Target Shift
Motorcycle	0.4%	No change, 0.4%
Bicycle	0.2%	1.2%, including (+1%) shift from car
Walked only	0.7%	No change, 0.7%
Total	**100%**	**10% mode shift to public and active transport**

Notwithstanding, further reduction in private vehicle reliance could be expected due to integral land use planning. Future residents could shop/work in the proposed mixed-use centre instead of travelling outside the site in this mixed use development, thus reducing external car trips. Furthermore, residents may also be shifted to the current trend of working from home and working with flexible hours in workplaces. These changes would also reduce the future traffic demand in the commuter peak periods.

8.2 Public Transport

8.2.1 Future Sydney Metro and Rapid Bus Services

Future Metro stations will be constructed at Orchard Hills, Luddenham and the Western Sydney Aerotropolis to ensure future residents can gain access to the 30-minute city consistent with the strategic plans as discussed in Section 3.

The NSW Government will establish rapid bus services from the metropolitan centres of Penrith, Liverpool and Campbelltown to Western Sydney International Airport before it opens in 2026, and to the Western Sydney Aerotropolis. A business case is being developed to enable further details to be developed to progress towards delivery.

The recent upgrade of The Northern Road involves the provision of kerbside bus lanes in both directions that would support the operation of a high-frequency, ‘rapid-transit’ bus services from Penrith, Liverpool and Campbelltown to Western Sydney.

The closest existing bus stops are located adjacent to The Northern Road intersections with the entry boulevard/DEOH and Chain-O-Ponds Road. For residents located more than 400m from these bus stop locations, it is anticipated that they may park-and-ride, or be dropped off for the bus services along The Northern Road.

8.2.2 Proposed Re-Routing of Bus Service 794

It is proposed to re-route the existing bus route 794 from GP2 via Riverflat Drive and Darug Avenue to provide a good coverage of bus catchment in the subject development. This service provides connection to Penrith CBD via GP2 and The Northern Road. This would provide a key link to Penrith Train Station as well as the bus-train connection at Penrith bus interchange that forms the basis for a successful uptake of public transport leading to further destinations. As such, the bus re-routing would provide good access and connectivity to a lot of the key employment destinations as shown in Section 2.8.

The Guidelines for Public Transport Capable Infrastructure in Greenfield Sites (July 2018) sets a weekday target of 90% of households to be within 400m (as the crow flies) of a bus stop, ferry wharf, light rail station or train station between the hours of 06:00 – 22:00. Although a number of households in the western most part of the site would be outside the 400m catchment of a bus stop, it is anticipated that 99% of overall households (2,365 out of 2,400 dwellings) will be within 400m of a bus stop.

The GP3 development will be bus accessible from Riverflat Drive and Darug Avenue until Chain-O-Ponds Road. The roads set out for these routes will be capable of allowing a12.5m bus to pass through as well as have intersections large enough for their turning paths.

8.2.3 Additional Services for Bus Service 789

The 400m catchment from the bus stop on The Northern Road would cover the north-eastern and south-eastern sections of GP3 and the GP3 primary school.

Given Bus Service 789 is a direct service between Luddenham and Penrith, there is scope to increase the twice daily services to higher frequency in order to better accommodate the future bus passengers, subject to consultation with the bus company and TfNSW.

8.2.4 Impact on Bus Services

The impact on bus service 794 which is proposed to be diverted to service the proposed development has been assessed using bus occupancy data obtained from TfNSW's Open Data. The data provides bus occupancy data based on tap on / tap off data along the bus service route. The bus occupancy is provided in ranges of 20. i.e. if there were 12 occupants the data would indicate 0-20 while 25 occupants would indicate 21-40.

The existing bus service 794 will be diverted to continue southbound on Darug Avenue rather than turning left onto Bradley Street. As such the bus occupancy data has been obtained for the closest bus stop before entering/exiting GP3 which would be the two bus stops on either side of Darug Avenue before/after Bradley Street. The bus stop IDs are: 2745230 and 2745236.

The 794-bus route is serviced by a standard two-door city bus which has a seating capacity of 47 seats and standing capacity of 25 for a total bus capacity of 72 occupants. During the AM and PM peaks assessed there are four 794-bus services per hour.

Based on the services which run during the assessed AM and PM peak hours the data indicated that there were 0-20 occupants on each of the four services. As such, this assessment has conservatively assumed the upper limit of 20 occupants per service. This equates to an average bus occupancy of 28% during the AM and PM peaks. Over the course of 1-hour peak period this is equivalent to 208 unoccupied out of a capacity of 288 (72 total capacity multiplied by 4 services).

Based on the residential car trip generation discussed in Section 7.2 and the census data mode share analysis the estimated bus occupant increase is calculated in Table 8.2.

Table 8.2: Mode Shift Target Impacts on Trip Generation

Mode	%	Trip Generation (two-way)	
		AM Peak	PM Peak
Residential Car (2016 Census)	87% (refer to Table 8.1)	2,242 trips	2,332 trips
Total trip generation	100%	2,577 trips	2,680 trips
Residential Car (Target %)	79% (refer to Table 8.1)	2,036 trips	2,118 trips
Bus Uptake (target %)	**4%** (refer to Table 8.1)	**103 new bus occupants**	**107 new bus occupants**

The overall mode shift of 4% from private vehicles to public buses as discussed above shows 103-107 new bus occupants generated from GP3 during the AM and PM peak hours. As noted above there is 208 unoccupied capacity which would be sufficient to cater for the new bus patrons from GP3. Furthermore, when Sydney Metro and Future Buses are operational in the future, it is anticipated that there will be a further reduction from driving as a single transport mode.

8.3 Active Transport

This section identifies the future active transport strategy for GP3. A comprehensive active transport network is proposed for the Glenmore Park Precinct. The focus of the active transport plan for GP3 is to connect to the already developed active transport links within GP2 and to the principal bicycle network along The Northern Road.

In conjunction with good quality footpaths and shared use paths in the precinct, this will be helpful in creating a homogenous network of active transport facilities encouraging mode shift to more sustainable modes of travel. The internal connections of the GP3 active transport network has a special focus to connect with the public transport stops, retail precinct, school and recreational facilities. The master plan aims to improve active transport network within the site and its connection with external network to enhance local movement, encourage short trips by active travel modes and reduce reliance on private vehicles.

The main features of active transport strategy are shown in Figure 8.1.

- South side of Amber Oak Road (loop) – the shared use path connection along Amber Oak Road is extended southbound through to the D1 open space area and providing a southbound connection all the way up to Chain-O-Ponds Road.
- West side of Darug Avenue – the shared use path connection is extended in the north-south direction to join the L1 open space area and to the main boulevard road of the GP3 and finally joining the central recreation area of LIN1.
- East side of Gunyah Drive – the shared use path along Gunyah Drive is further extended into GP3 to connect with the mixed-use centre and recreational precinct.
- The proposed shared use path along the north side of Chain-O-Ponds Road which will join the existing shared use path along The Northern Road at the signalised intersection. It will also connect with the shared use paths into the precinct through the site accesses on Chain-O-Ponds Road.
- Connections to the shared use path along The Northern Road are proposed at three locations between Chain O-Ponds Road and the entry boulevard into the GP3.

Figure 8.1: Connections to Active Transport Links

All the internal road network into the GP3 will have a default urban speed limit of 50km/hr. The alignment and lengths of the local roads are designed in such a way which will naturally encourage a low-speed environment. Pedestrian crossings including raised crossing and refuge islands are proposed along major desire lines and local attractions to act as speed reductions measures. The locations of these crossing facilities can be viewed in Section 4.6.

All bicycle connections within GP3 have been provided in the form of a shared use path with a width of 2.5m. This will be further assessed during the detail design stage.

The current mode share for active transport travel is between 0% to 1% for bicycles and between 1% to 4% for pedestrians in GP1 and 2. This is quite low compared to some other areas for Greater Penrith. Better connected cycleway links are key to modal shift especially within newly built areas like GP3. It is expected that the proposed active transport strategy with active transport facilities and the connections to the Principal Bicycle Network will encourage the modal shift to active transport mode or with a combination of other public transport modes such as the existing train and bus services, and the future Sydney Metro and rapid bus services when available.

Encouraging more people to walk and cycle and combining more walking and cycling with public transport trips, is an effective way to free up capacity and reduce congestion on the road network. The greater use of active modes of transport would help shift towards sustainable mode share target as discussed in Section 8.1.

8.4 Green Travel Plan

8.4.1 What is a Green Travel Plan (GTP)?

The key role of a Green Travel Plan (GTP) is to bring about better transport arrangements to manage travel demands, particularly promoting more sustainable modes of travel modes which have a low environmental impact, such as active transport modes (e.g. walking, cycling, public transport) and better management of car use.

Active transport presents a number of interrelated benefits including:

- Improved health benefits
- Reduced traffic congestion, noise and air pollution caused by cars
- Greater social connections within communities
- Cost savings to economy and individual.

A Travel Plan will be prepared for the proposed development to promote sustainable travel. This GTP would be prepared to mainly target residents and retail staff of the proposed development with the intention to improve health and wellbeing of residents and retail staff, as well as to decrease their car dependency.

It is however noted that the GTP works hand in hand with the proposed active and public transport provision to promote more walking and cycling in short trips and public transport usage for longer trips. GTP strategies have been proven at a number of other sites to increase active travel modes.

This section provides a framework for the implementation of such travel plan, noting that the full travel plan document will be provided later at DA stage.

8.4.2 Objectives and Strategies

A GTP is a package of coordinated strategies and measures to promote a range of sustainable travel choices, whilst reducing the reliance on private car usage, particularly single occupancy car trips.

It is envisaged that the GTP for the site would relate to the following principal areas of action:

- **Public Transport** – increase public transport use of residents and retail staff by development targeted information to increase knowledge and aware of surrounding public transport facilities. This information could be provided in community and residential building noticeboards, staff area in retail establishments, and website and/or social media account of the proposed development.
- **Cycling and walking** – increase cycling and walking activities as a means to public transport by the provision of quality shared use path which connect with the shared use path in GP2 and The Northern Road. Provide bicycle parking in retail establishments and end-of-trip facilities such as change rooms and shower areas should be made available for retail staff. Regular audits/inspections of the facilities would be conducted to ensure that the facilities are accessible and in working order.
- **Development access and connectivity** – improve active transport access and connectivity from outside and within the Study Area by developing a Transport Access Guide (TAG) to detail local walking, cycling and public transport routes. This TAG would be disseminated to residents and retail staff and will be posted on community noticeboards and online platforms.
- **Community involvement** – influence greater uptake of active transport by conducting community consultations or workshops to explore opportunities and/or constrains to increase active transport to/from and within the development.

9 Summary and Conclusions

The Transport Planning Partnership (TTPP) undertook a comprehensive transport impact assessment (CTIA) on behalf of Mirvac to assess the impacts of the proposed mixed use development as part of GP3 which consists of the following land uses:

- 1,783 low density dwellings (including 81 large lots)
- 487 medium density dwellings
- 30 Fonzie flats
- 100 shoptop dwellings
- 5,000m^2 GLFA mixed-use centre
- A primary school to accommodate up to 1,000 students and 70 staff.

The scope of work of this CTIA was formulated through consultation with TfNSW and Penrith City Council. The objective of the CTIA is to identify the following:

- road hierarchy impact and any significant risk that if any further infrastructure requirements are identified, in addition to The Northern Road upgrade, to support the planning proposal upon completion.
- detailed assessment of the internal road network has also been undertaken in public transport and active transport connectivity, internal intersection control and traffic management measures.

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

i. The proposed mixed use development is estimated to generate approximately 2,967 (two-way) vehicle trips in the AM peak hour and 3,037 (two-way) vehicle trips in the PM peak hour.
ii. Traffic distribution has taken into consideration the STFM select link plots provided by TfNSW, Urbis economic assessment and SINSW advice on school catchment.
iii. Access to the site is via the intersections on The Northern Road and Chain-O-Ponds Road frontages, as well as the connecting roads with GP2. For analytical purposes, Riverflat Drive and Darug Avenue have been assessed as the connecting roads between GP2 and GP3.
iv. In Year 2036, dual right turn lanes from The Northern Road into the subject site would be required to accommodate the anticipated development traffic at the entry boulevard and Chain-O-Ponds Road intersections. Furthermore, an additional northbound and southbound travel lane would be required on The Northern Road to provide additional capacity at the intersections with the entry boulevard and Chain-O-Ponds Road.

v. An acceptable level of service (LoS D or better) would be maintained with the recommended intersection upgrade improvements in Year 2036 with the proposed development traffic.

vi. Local Area Traffic Management (LATM) measures would be implemented to make the precinct more pedestrian and cyclist friendly with the intention to increase uptake of sustainable modes for travel to and from the mixed-use centre and the existing facilities in GP2 and The Northern Road. This would also encourage commuters to cycle to key destination such as Penrith which is within an acceptable 10km distance (approximately 25-30 minutes) on a designated cycling route with a flat terrain.

vii. An active transport plan has been developed to provide walking and cycling routes connected with GP2 and The Northern Road forming an extended network. The shared use path would provide good connectivity to school, mixed-use centre, bus stops and open space areas.

viii. Pedestrian refuge islands would be provided along the desire lines throughout the site to mixed-use centre, school, bus stops and open space areas. A raised zebra crossing would be provided on the school frontage road to accommodate pedestrians and cyclists to the school, mixed-used centre, bus stops and open space areas.

ix. A 10% target mode shift towards public transport and active transport with less reliance on private vehicles with implementation of the following measures and future public transport improvements:

- Re-routing of existing Bus Service 794 into GP3 with a good coverage of catchment to a bus stop
- Providing additional services to Bus Service 789 along The Northern Road, subject to consultation with the bus company and TfNSW
- New shared use path along The Northern Road constructed as part of the recent upgrade
- Good connectivity to the proposed walking and cycling routes throughout the precinct and with the existing facilities in GP2 and The Northern Road. This would encourage people to take active transport to the workplace, bus stops and shops, and also increase the uptake of buses to further destinations
- The future Sydney Metro stations (Western Sydney Airport Line) and bus service improvements along The Northern Road.

Overall, it is concluded that the proposed development can be accommodated with road capacity upgrades at the intersections of The Northern Road with Chain-O-Ponds Road and the entry boulevard in Year 2036.

Appendix A

SIDRA Modelling Output

MOVEMENT SUMMARY

Site: 4671 [2026 AM TNR - Bradley (Site Folder: Scenario 1)]

Network: N101 [AM (Network Folder: Scenario 1 2026)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 120 seconds (Network Optimum Cycle Time - Minimum Delay)

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	51	0.0	51	0.0	0.320	12.3	LOS A	2.0	22.9	0.18	0.29	0.18	59.7
2	T1	1055	16.0	1055	16.0	* 0.320	4.5	LOS A	3.2	22.1	0.17	0.17	0.17	76.1
Approach		1105	15.3	1105	15.3	0.320	4.9	LOS A	3.2	22.9	0.17	0.17	0.17	75.5
East: U-Turn Bay														
6	R2	1	0.0	1	0.0	0.011	64.2	LOS E	0.1	0.4	0.97	0.58	0.97	37.9
Approach		1	0.0	1	0.0	0.011	64.2	LOS E	0.1	0.4	0.97	0.58	0.97	37.9
North: The Northern Road														
7	L2	1	0.0	1	0.0	0.001	7.6	LOS A	0.0	0.0	0.00	0.60	0.00	68.5
8	T1	995	13.0	995	13.0	0.213	4.7	LOS A	5.3	37.3	0.31	0.27	0.31	74.2
9	R2	245	0.0	245	0.0	* 0.322	50.2	LOS D	6.5	45.4	0.88	0.78	0.88	45.1
Approach		1241	10.4	1241	10.4	0.322	13.7	LOS A	6.5	45.4	0.42	0.37	0.42	63.7
West: Bradley Street														
10	L2	675	0.0	675	0.0	0.568	41.2	LOS C	16.4	115.1	0.89	0.82	0.89	46.6
12	R2	101	0.0	101	0.0	* 0.180	53.1	LOS D	2.6	18.3	0.91	0.73	0.91	20.7
Approach		776	0.0	776	0.0	0.568	42.8	LOS D	16.4	115.1	0.89	0.81	0.89	44.3
All Vehicles		3123	9.6	3123	9.6	0.568	17.8	LOS B	16.4	115.1	0.45	0.41	0.45	61.3

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.
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: The Northern Road											
P11	Stage 1	53	54.3	LOS E	0.2	0.2	0.95	0.95	82.0	36.0	0.44
P12	Stage 2	53	54.3	LOS E	0.2	0.2	0.95	0.95	82.3	36.5	0.44
P1B	Slip/ Bypass	53	54.3	LOS E	0.2	0.2	0.95	0.95	74.3	26.0	0.35
East: U-Turn Bay											
P2	Full	53	54.3	LOS E	0.2	0.2	0.95	0.95	78.1	31.0	0.40
North: The Northern Road											
P31	Stage 1	53	54.3	LOS E	0.2	0.2	0.95	0.95	87.3	43.0	0.49

P32	Stage 2	53	54.3	LOS E	0.2	0.2	0.95	0.95	83.5	38.0	0.46
West: Bradley Street											
P4	Full	53	54.3	LOS E	0.2	0.2	0.95	0.95	84.3	39.0	0.46
P4B	Slip/ Bypass	53	54.3	LOS E	0.2	0.2	0.95	0.95	77.3	30.0	0.39
All Pedestrians		421	54.3	LOS E	0.2	0.2	0.95	0.95	81.1	34.9	0.43

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.

Organisation: TTPP - THE TRANSPORT PLANNING PARTNERSHIP | Licence: NETWORK / 1PC | Processed: Wednesday, April 13, 2022 2:42:19 PM
Project: X:\17285 Mulgoa Planning Proposal\07 Modelling Files\2022\17285-2026 (3-int).sip9

MOVEMENT SUMMARY

Site: 4850 [2026 AM TNR - Defence (Site Folder: Scenario 1)]

Network: N101 [AM (Network Folder: Scenario 1 2026)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Network Optimum Cycle Time - Minimum Delay)

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	5	0.0	5	0.0	0.005	21.4	LOS B	0.1	1.0	0.49	0.65	0.49	54.2
2	T1	1095	14.0	1095	14.0	* 0.577	20.7	LOS B	21.6	169.2	0.73	0.66	0.73	56.7
3	R2	9	0.0	9	0.0	* 0.050	60.6	LOS E	0.5	3.6	0.93	0.68	0.93	39.6
Approach		1109	13.8	1109	13.8	0.577	21.0	LOS B	21.6	169.2	0.74	0.66	0.74	56.3
East: Defence Establishment Orchard Hills														
4	L2	6	0.0	6	0.0	0.020	45.6	LOS D	0.3	2.4	0.83	0.64	0.83	22.7
5	T1	1	0.0	1	0.0	0.020	41.1	LOS C	0.3	2.4	0.83	0.64	0.83	31.0
6	R2	19	0.0	19	0.0	* 0.202	67.0	LOS E	1.1	7.9	0.99	0.70	0.99	18.0
Approach		26	0.0	26	0.0	0.202	60.8	LOS E	1.1	7.9	0.94	0.68	0.94	19.6
North: The Northern Road														
7	L2	44	0.0	44	0.0	0.038	16.0	LOS B	1.0	6.7	0.40	0.69	0.40	52.6
8	T1	1038	13.0	1038	13.0	0.436	17.8	LOS B	14.1	98.9	0.58	0.51	0.58	53.2
9	R2	4	0.0	4	0.0	0.022	60.1	LOS E	0.2	1.6	0.94	0.65	0.94	35.2
Approach		1086	12.4	1086	12.4	0.436	17.9	LOS B	14.1	98.9	0.57	0.52	0.57	53.0
West: Site														
10	L2	5	0.0	5	0.0	0.018	46.5	LOS D	0.3	2.1	0.83	0.63	0.83	22.5
11	T1	1	0.0	1	0.0	0.018	41.9	LOS C	0.3	2.1	0.83	0.63	0.83	30.8
12	R2	5	0.0	5	0.0	0.056	65.7	LOS E	0.3	2.1	0.98	0.64	0.98	18.2
Approach		12	0.0	12	0.0	0.056	54.8	LOS D	0.3	2.1	0.90	0.64	0.90	21.3
All Vehicles		2234	12.9	2234	12.9	0.577	20.1	LOS B	21.6	169.2	0.66	0.59	0.66	54.0

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: The Northern Road											
P11	Stage 1	53	54.3	LOS E	0.2	0.2	0.95	0.95	83.5	38.0	0.46
P12	Stage 2	53	54.3	LOS E	0.2	0.2	0.95	0.95	81.2	35.0	0.43
P1B	Slip/ Bypass	53	54.3	LOS E	0.2	0.2	0.95	0.95	74.3	26.0	0.35
East: Defence Establishment Orchard Hills											

P2 Full	53	54.3	LOS E	0.2	0.2	0.95	0.95	85.0	40.0	0.47
North: The Northern Road										
P31 Stage 1	53	54.3	LOS E	0.2	0.2	0.95	0.95	84.3	39.0	0.46
P32 Stage 2	53	54.3	LOS E	0.2	0.2	0.95	0.95	81.2	35.0	0.43
West: Site										
P4 Full	53	54.3	LOS E	0.2	0.2	0.95	0.95	82.0	36.0	0.44
All Pedestrians	368	54.3	LOS E	0.2	0.2	0.95	0.95	81.6	35.6	0.44

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 4851 [2026 AM TNR - Chain-o-Ponds (Site Folder: Scenario 1)]

Network: N101 [AM (Network Folder: Scenario 1 2026)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 140 seconds (Site 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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	5	0.0	5	0.0	0.003	9.6	LOS A	0.1	0.4	0.18	0.63	0.18	60.0
2	T1	1115	13.0	1115	13.0	* 0.688	13.8	LOS A	34.2	265.8	0.60	0.55	0.60	62.3
Approach		1120	13.0	1120	13.0	0.688	13.8	LOS A	34.2	265.8	0.59	0.55	0.59	62.3
North: The Northern Road														
8	T1	1096	13.0	1096	13.0	0.297	3.3	LOS A	7.7	54.1	0.26	0.23	0.26	77.3
9	R2	13	0.0	13	0.0	* 0.072	70.5	LOS F	0.8	5.6	0.94	0.69	0.94	37.1
Approach		1108	12.9	1108	12.9	0.297	4.0	LOS A	7.7	54.1	0.27	0.24	0.27	76.6
West: Chain-o-Ponds Road														
10	L2	27	0.0	27	0.0	0.062	48.7	LOS D	1.4	10.0	0.81	0.70	0.81	21.6
12	R2	3	0.0	3	0.0	0.017	65.8	LOS E	0.2	1.4	0.92	0.63	0.92	36.1
Approach		31	0.0	31	0.0	0.062	50.4	LOS D	1.4	10.0	0.82	0.69	0.82	24.1
All Vehicles		2259	12.8	2259	12.8	0.688	9.5	LOS A	34.2	265.8	0.44	0.40	0.44	70.5

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: The Northern Road											
P11	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	90.0	33.5	0.37
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P1B	Slip/ Bypass	53	64.3	LOS F	0.2	0.2	0.96	0.96	84.3	26.0	0.31
North: The Northern Road											
P31	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P32	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	88.9	32.0	0.36
West: Chain-o-Ponds Road											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
All Pedestrians		316	64.3	LOS F	0.2	0.2	0.96	0.96	89.8	33.3	0.37

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: 4671 [2026 PM TNR - Bradley (Site Folder: Scenario 1)]

Network: N101 [PM (Network Folder: Scenario 1 2026)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Network Optimum Cycle Time - Minimum Delay)

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: The Northern Road														
1	L2	141	0.0	141	0.0	0.502	47.4	LOS D	9.4	94.6	0.96	0.84	0.96	40.7
2	T1	1298	16.0	1298	16.0	* 0.502	17.0	LOS B	12.6	88.2	0.43	0.37	0.43	67.6
Approach		1439	14.5	1439	14.5	0.502	20.0	LOS B	12.6	94.6	0.48	0.42	0.48	64.7
East: U-Turn Bay														
6	R2	1	0.0	1	0.0	0.004	50.3	LOS D	0.0	0.2	0.87	0.58	0.87	42.4
Approach		1	0.0	1	0.0	0.004	50.3	LOS D	0.0	0.2	0.87	0.58	0.87	42.4
North: The Northern Road														
7	L2	1	0.0	1	0.0	0.001	7.6	LOS A	0.0	0.0	0.00	0.60	0.00	68.5
8	T1	1294	13.0	1294	13.0	0.277	5.0	LOS A	4.5	31.6	0.33	0.29	0.33	73.9
9	R2	536	0.0	536	0.0	* 0.508	44.7	LOS D	8.5	59.3	0.87	0.82	0.87	47.0
Approach		1831	9.2	1831	9.2	0.508	16.6	LOS B	8.5	59.3	0.49	0.44	0.49	61.1
West: Bradley Street														
10	L2	348	0.0	348	0.0	0.309	39.3	LOS C	4.8	33.6	0.82	0.77	0.82	47.3
12	R2	73	0.0	73	0.0	* 0.129	52.6	LOS D	1.1	8.0	0.90	0.72	0.90	20.9
Approach		421	0.0	421	0.0	0.309	41.6	LOS C	4.8	33.6	0.83	0.76	0.83	44.1
All Vehicles		3692	10.2	3692	10.2	0.508	20.8	LOS B	12.6	94.6	0.52	0.47	0.52	60.2

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: The Northern Road											
P11	Stage 1	53	54.3	LOS E	0.2	0.2	0.95	0.95	82.0	36.0	0.44
P12	Stage 2	53	54.3	LOS E	0.2	0.2	0.95	0.95	82.3	36.5	0.44
P1B	Slip/ Bypass	53	54.3	LOS E	0.2	0.2	0.95	0.95	74.3	26.0	0.35
East: U-Turn Bay											
P2	Full	53	54.3	LOS E	0.2	0.2	0.95	0.95	78.1	31.0	0.40
North: The Northern Road											
P31	Stage 1	53	54.3	LOS E	0.2	0.2	0.95	0.95	87.3	43.0	0.49
P32	Stage 2	53	54.3	LOS E	0.2	0.2	0.95	0.95	83.5	38.0	0.46

West: Bradley Street											
P4	Full	53	54.3	LOS E	0.2	0.2	0.95	0.95	84.3	39.0	0.46
P4B	Slip/ Bypass	53	54.3	LOS E	0.2	0.2	0.95	0.95	77.3	30.0	0.39
All Pedestrians		421	54.3	LOS E	0.2	0.2	0.95	0.95	81.1	34.9	0.43

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: 4850 [2026 PM TNR - Defence (Site Folder: Scenario 1)]

Network: N101 [PM (Network Folder: Scenario 1 2026)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 120 seconds (Network Optimum Cycle Time - Minimum Delay)

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: The Northern Road														
1	L2	1	0.0	1	0.0	0.001	21.3	LOS B	0.0	0.1	0.49	0.61	0.49	54.3
2	T1	1459	14.0	1459	14.0	* 0.770	24.2	LOS B	20.6	161.9	0.86	0.79	0.86	54.0
3	R2	1	0.0	1	0.0	0.006	59.4	LOS E	0.0	0.2	0.92	0.60	0.92	39.9
Approach		1461	14.0	1461	14.0	0.770	24.2	LOS B	20.6	161.9	0.86	0.79	0.86	53.9
East: Defence Establishment Orchard Hills														
4	L2	13	0.0	13	0.0	0.032	42.4	LOS C	0.4	2.6	0.80	0.66	0.80	23.5
5	T1	1	0.0	1	0.0	0.032	37.8	LOS C	0.4	2.6	0.80	0.66	0.80	31.8
6	R2	44	0.0	44	0.0	* 0.471	68.6	LOS E	1.7	11.6	1.00	0.74	1.00	17.8
Approach		58	0.0	58	0.0	0.471	62.3	LOS E	1.7	11.6	0.95	0.72	0.95	19.0
North: The Northern Road														
7	L2	12	0.0	12	0.0	0.010	14.2	LOS A	0.1	0.8	0.28	0.65	0.28	53.7
8	T1	1375	13.0	1375	13.0	0.578	19.4	LOS B	13.2	92.3	0.64	0.57	0.64	51.7
9	R2	1	0.0	1	0.0	0.006	59.4	LOS E	0.0	0.2	0.96	0.60	0.96	35.4
Approach		1387	12.9	1387	12.9	0.578	19.4	LOS B	13.2	92.3	0.64	0.57	0.64	51.6
West: Site														
10	L2	1	0.0	1	0.0	0.008	51.8	LOS D	0.1	0.5	0.88	0.58	0.88	21.6
11	T1	1	0.0	1	0.0	0.008	47.2	LOS D	0.1	0.5	0.88	0.58	0.88	29.9
12	R2	1	0.0	1	0.0	0.011	64.5	LOS E	0.0	0.3	0.97	0.58	0.97	18.4
Approach		3	0.0	3	0.0	0.011	54.5	LOS D	0.1	0.5	0.91	0.58	0.91	23.8
All Vehicles		2909	13.2	2909	13.2	0.770	22.7	LOS B	20.6	161.9	0.76	0.68	0.76	51.9

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: The Northern Road											
P11	Stage 1	53	54.3	LOS E	0.2	0.2	0.95	0.95	83.5	38.0	0.46
P12	Stage 2	53	54.3	LOS E	0.2	0.2	0.95	0.95	81.2	35.0	0.43
P1B	Slip/ Bypass	53	54.3	LOS E	0.2	0.2	0.95	0.95	74.3	26.0	0.35
East: Defence Establishment Orchard Hills											
P2	Full	53	54.3	LOS E	0.2	0.2	0.95	0.95	85.0	40.0	0.47

North: The Northern Road										
P31 Stage 1	53	54.3	LOS E	0.2	0.2	0.95	0.95	84.3	39.0	0.46
P32 Stage 2	53	54.3	LOS E	0.2	0.2	0.95	0.95	81.2	35.0	0.43
West: Site										
P4 Full	53	54.3	LOS E	0.2	0.2	0.95	0.95	82.0	36.0	0.44
All Pedestrians	368	54.3	LOS E	0.2	0.2	0.95	0.95	81.6	35.6	0.44

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 4851 [2026 PM TNR - Chain-o-Ponds (Site Folder: Scenario 1)]

Network: N101 [PM (Network Folder: Scenario 1 2026)]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 140 seconds (Site 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: The Northern Road														
1	L2	1	0.0	1	0.0	0.001	9.6	LOS A	0.0	0.1	0.18	0.62	0.18	60.0
2	T1	1466	13.0	1466	13.0	* 0.905	24.4	LOS B	41.9	325.9	0.79	0.77	0.83	53.8
Approach		1467	13.0	1467	13.0	0.905	24.4	LOS B	41.9	325.9	0.79	0.77	0.83	53.8
North: The Northern Road														
8	T1	1342	13.0	1342	13.0	0.364	3.5	LOS A	6.3	43.8	0.28	0.25	0.28	77.2
9	R2	37	0.0	37	0.0	* 0.211	72.0	LOS F	1.5	10.2	0.96	0.73	0.96	36.8
Approach		1379	12.7	1379	12.7	0.364	5.3	LOS A	6.3	43.8	0.30	0.26	0.30	75.4
West: Chain-o-Ponds Road														
10	L2	19	0.0	19	0.0	0.043	48.4	LOS D	0.6	4.2	0.80	0.68	0.80	21.7
12	R2	2	0.0	2	0.0	0.011	65.6	LOS E	0.1	0.6	0.92	0.61	0.92	36.2
Approach		21	0.0	21	0.0	0.043	50.1	LOS D	0.6	4.2	0.81	0.68	0.81	24.1
All Vehicles		2867	12.8	2867	12.8	0.905	15.4	LOS B	41.9	325.9	0.56	0.53	0.57	66.0

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: The Northern Road											
P11	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	90.0	33.5	0.37
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P1B	Slip/ Bypass	53	64.3	LOS F	0.2	0.2	0.96	0.96	84.3	26.0	0.31
North: The Northern Road											
P31	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P32	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	88.9	32.0	0.36
West: Chain-o-Ponds Road											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
All Pedestrians		316	64.3	LOS F	0.2	0.2	0.96	0.96	89.8	33.3	0.37

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: 4671 [2036 AM TNR - Bradley (Site Folder: Scenario 2)]

Network: N101 [AM (Network Folder: Scenario 2 (2036))]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 120 seconds (Network Optimum Cycle Time - Minimum Delay)

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	56	0.0	56	0.0	0.123	13.5	LOS A	1.1	10.1	0.29	0.52	0.29	56.7
2	T1	1026	19.1	1026	19.1	* 0.520	12.7	LOS A	8.3	65.9	0.44	0.39	0.44	70.3
Approach		1082	18.1	1082	18.1	0.520	12.7	LOS A	8.3	65.9	0.43	0.39	0.43	69.8
East: U-Turn Bay														
6	R2	1	0.0	1	0.0	* 0.011	64.2	LOS E	0.1	0.4	0.97	0.58	0.97	37.9
Approach		1	0.0	1	0.0	0.011	64.2	LOS E	0.1	0.4	0.97	0.58	0.97	37.9
North: The Northern Road														
7	L2	1	0.0	1	0.0	0.001	7.6	LOS A	0.0	0.0	0.00	0.60	0.00	68.5
8	T1	1101	15.9	1101	15.9	0.288	4.9	LOS A	7.1	55.3	0.33	0.29	0.33	73.8
9	R2	320	0.0	320	0.0	0.268	38.0	LOS C	7.2	50.3	0.76	0.77	0.76	49.3
Approach		1422	12.3	1422	12.3	0.288	12.4	LOS A	7.2	55.3	0.43	0.40	0.43	64.6
West: Bradley Street														
10	L2	825	0.0	825	0.0	* 0.511	30.3	LOS C	17.3	120.8	0.77	0.79	0.77	50.6
12	R2	105	0.0	105	0.0	0.192	53.3	LOS D	2.7	19.2	0.91	0.74	0.91	20.7
Approach		931	0.0	931	0.0	0.511	32.9	LOS C	17.3	120.8	0.79	0.79	0.79	48.1
All Vehicles		3436	10.8	3436	10.8	0.520	18.1	LOS B	17.3	120.8	0.53	0.50	0.53	60.7

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.
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: The Northern Road											
P11	Stage 1	53	54.3	LOS E	0.2	0.2	0.95	0.95	82.0	36.0	0.44
P12	Stage 2	53	54.3	LOS E	0.2	0.2	0.95	0.95	82.3	36.5	0.44
P1B	Slip/ Bypass	53	25.4	LOS C	0.1	0.1	0.90	0.90	45.4	26.0	0.57
East: U-Turn Bay											
P2	Full	53	54.3	LOS E	0.2	0.2	0.95	0.95	78.1	31.0	0.40
North: The Northern Road											
P31	Stage 1	53	54.3	LOS E	0.2	0.2	0.95	0.95	87.3	43.0	0.49

P32	Stage 2	53	54.3	LOS E	0.2	0.2	0.95	0.95	83.5	38.0	0.46
West: Bradley Street											
P4	Full	53	54.3	LOS E	0.2	0.2	0.95	0.95	84.3	39.0	0.46
P4B	Slip/ Bypass	53	54.3	LOS E	0.2	0.2	0.95	0.95	77.3	30.0	0.39
All Pedestrians		421	50.7	LOS E	0.2	0.2	0.95	0.95	77.5	34.9	0.45

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: 4850 [2036 AM TNR - Defence (Site Folder: Scenario 2)]

Network: N101 [AM (Network Folder: Scenario 2 (2036))]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated   Cycle Time = 120 seconds (Network Optimum Cycle Time - Minimum Delay)

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	5	0.0	5	0.0	0.054	17.7	LOS B	1.0	11.8	0.49	0.41	0.49	65.1
2	T1	1061	17.0	1061	17.0	0.544	19.9	LOS B	19.8	155.7	0.71	0.63	0.71	57.3
3	R2	11	0.0	11	0.0	* 0.056	60.7	LOS E	0.6	4.0	0.93	0.68	0.93	39.6
Approach		1077	16.8	1077	16.8	0.544	20.3	LOS B	19.8	155.7	0.71	0.63	0.71	56.9
East: Defence Establishment Orchard Hills														
4	L2	8	0.0	8	0.0	0.024	44.0	LOS D	0.4	3.0	0.81	0.65	0.81	23.1
5	T1	1	0.0	1	0.0	0.024	39.4	LOS C	0.4	3.0	0.81	0.65	0.81	23.1
6	R2	25	0.0	25	0.0	0.066	43.8	LOS D	1.2	8.1	0.82	0.69	0.82	23.2
Approach		35	0.0	35	0.0	0.066	43.7	LOS D	1.2	8.1	0.82	0.68	0.82	23.1
North: The Northern Road														
7	L2	49	0.0	49	0.0	0.043	19.1	LOS B	1.6	10.9	0.58	0.72	0.58	50.8
8	T1	1185	15.7	1185	15.7	* 0.614	24.0	LOS B	26.5	207.0	0.84	0.75	0.84	47.6
9	R2	4	0.0	4	0.0	0.023	60.1	LOS E	0.2	1.6	0.94	0.65	0.94	29.7
Approach		1239	15.0	1239	15.0	0.614	23.9	LOS B	26.5	207.0	0.83	0.75	0.83	47.7
West: Site														
10	L2	5	0.0	5	0.0	0.016	40.5	LOS C	0.3	1.9	0.82	0.62	0.82	21.5
11	T1	1	0.0	1	0.0	0.016	35.9	LOS C	0.3	1.9	0.82	0.62	0.82	31.2
12	R2	5	0.0	5	0.0	* 0.018	45.4	LOS D	0.3	1.8	0.85	0.63	0.85	20.0
Approach		12	0.0	12	0.0	0.018	42.3	LOS C	0.3	1.9	0.83	0.63	0.83	22.1
All Vehicles		2362	15.5	2362	15.5	0.614	22.7	LOS B	26.5	207.0	0.77	0.70	0.77	51.6

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
South: The Northern Road											
P11	Stage 1	53	54.3	LOS E	0.2	0.2	0.95	0.95	83.5	38.0	0.46
P12	Stage 2	53	54.3	LOS E	0.2	0.2	0.95	0.95	81.2	35.0	0.43
P1B	Slip/ Bypass	53	25.0	LOS C	0.1	0.1	0.90	0.90	45.0	26.0	0.58
East: Defence Establishment Orchard Hills											

P2 Full	53	54.3	LOS E	0.2	0.2	0.95	0.95	85.0	40.0	0.47
North: The Northern Road										
P31 Stage 1	53	54.3	LOS E	0.2	0.2	0.95	0.95	84.3	39.0	0.46
P32 Stage 2	53	54.3	LOS E	0.2	0.2	0.95	0.95	81.2	35.0	0.43
West: Site										
P4 Full	53	54.3	LOS E	0.2	0.2	0.95	0.95	82.0	36.0	0.44
All Pedestrians	368	50.1	LOS E	0.2	0.2	0.94	0.94	77.5	35.6	0.46

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.

Organisation: TTPP - THE TRANSPORT PLANNING PARTNERSHIP | Licence: NETWORK / 1PC | Processed: Wednesday, April 13, 2022 11:01:36 AM
Project: X:\17285 Mulgoa Planning Proposal\07 Modelling Files\2022\17285-2036-220412. (3-int)sip9.sip9

MOVEMENT SUMMARY

Site: 4851 [2036 AM TNR - Chain-o-Ponds (Site Folder: Scenario 2)]

Network: N101 [AM (Network Folder: Scenario 2 (2036))]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site 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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	5	0.0	5	0.0	0.043	12.8	LOS A	0.7	8.1	0.33	0.31	0.33	69.8
2	T1	1079	16.0	1079	16.0	* 0.426	10.6	LOS A	15.8	123.3	0.48	0.44	0.48	65.0
Approach		1084	15.9	1084	15.9	0.426	10.6	LOS A	15.8	123.3	0.48	0.44	0.48	65.0
North: The Northern Road														
8	T1	1257	15.5	1257	15.5	0.419	3.8	LOS A	11.5	89.6	0.30	0.28	0.30	76.9
9	R2	13	0.0	13	0.0	* 0.073	70.6	LOS F	0.8	5.6	0.94	0.69	0.94	33.3
Approach		1269	15.4	1269	15.4	0.419	4.5	LOS A	11.5	89.6	0.31	0.28	0.31	76.4
West: Chain-o-Ponds Road														
10	L2	29	0.0	29	0.0	0.067	48.7	LOS D	1.5	10.8	0.81	0.70	0.81	15.4
12	R2	3	0.0	3	0.0	0.017	65.8	LOS E	0.2	1.4	0.92	0.63	0.92	34.6
Approach		33	0.0	33	0.0	0.067	50.4	LOS D	1.5	10.8	0.82	0.69	0.82	18.7
All Vehicles		2386	15.4	2386	15.4	0.426	7.9	LOS A	15.8	123.3	0.40	0.36	0.40	72.0

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: The Northern Road											
P11	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	90.0	33.5	0.37
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P1B	Slip/ Bypass	53	36.2	LOS D	0.1	0.1	0.92	0.92	56.2	26.0	0.46
North: The Northern Road											
P31	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P32	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	88.9	32.0	0.36
West: Chain-o-Ponds Road											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
All Pedestrians		316	59.6	LOS E	0.2	0.2	0.95	0.95	85.2	33.3	0.39

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: 4671 [2036 PM TNR - Bradley (Site Folder: Scenario 2)]

Network: N101 [PM (Network Folder: Scenario 2 (2036))]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 130 seconds (Network Optimum Cycle Time - Minimum Delay)

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: The Northern Road														
1	L2	156	0.0	156	0.0	0.182	14.0	LOS A	2.3	18.3	0.49	0.68	0.49	55.9
2	T1	1526	17.8	1526	17.8	* 0.678	42.4	LOS C	17.9	142.3	0.98	0.88	0.98	55.0
Approach		1682	16.1	1682	16.1	0.678	39.8	LOS C	17.9	142.3	0.94	0.86	0.94	55.0
East: U-Turn Bay														
6	R2	1	0.0	1	0.0	0.004	54.5	LOS D	0.0	0.2	0.87	0.58	0.87	40.9
Approach		1	0.0	1	0.0	0.004	54.5	LOS D	0.0	0.2	0.87	0.58	0.87	40.9
North: The Northern Road														
7	L2	1	0.0	1	0.0	0.001	7.6	LOS A	0.0	0.0	0.00	0.60	0.00	68.5
8	T1	1347	15.4	1347	15.4	0.348	5.2	LOS A	5.9	45.9	0.34	0.30	0.34	73.6
9	R2	703	0.0	703	0.0	* 0.670	50.2	LOS D	12.8	89.3	0.92	0.84	0.92	45.2
Approach		2052	10.1	2052	10.1	0.670	20.6	LOS B	12.8	89.3	0.54	0.49	0.54	58.2
West: Bradley Street														
10	L2	406	0.0	406	0.0	0.370	42.9	LOS D	6.2	43.4	0.84	0.78	0.84	46.1
12	R2	56	0.0	56	0.0	* 0.104	56.7	LOS E	0.9	6.6	0.90	0.71	0.90	19.9
Approach		462	0.0	462	0.0	0.370	44.6	LOS D	6.2	43.4	0.84	0.77	0.84	43.9
All Vehicles		4197	11.4	4197	11.4	0.678	30.9	LOS C	17.9	142.3	0.73	0.67	0.73	54.8

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: The Northern Road											
P11	Stage 1	53	59.3	LOS E	0.2	0.2	0.96	0.96	87.0	36.0	0.41
P12	Stage 2	53	59.3	LOS E	0.2	0.2	0.96	0.96	87.3	36.5	0.42
P1B	Slip/ Bypass	53	27.0	LOS C	0.1	0.1	0.91	0.91	47.0	26.0	0.55
East: U-Turn Bay											
P2	Full	53	59.3	LOS E	0.2	0.2	0.96	0.96	83.1	31.0	0.37
North: The Northern Road											
P31	Stage 1	53	59.3	LOS E	0.2	0.2	0.96	0.96	92.3	43.0	0.47
P32	Stage 2	53	59.3	LOS E	0.2	0.2	0.96	0.96	88.5	38.0	0.43

West: Bradley Street											
P4	Full	53	59.3	LOS E	0.2	0.2	0.96	0.96	89.3	39.0	0.44
P4B	Slip/ Bypass	53	59.3	LOS E	0.2	0.2	0.96	0.96	82.3	30.0	0.36
All Pedestrians		421	55.2	LOS E	0.2	0.2	0.95	0.95	82.1	34.9	0.43

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: 4850 [2036 PM TNR - Defence (Site Folder: Scenario 2)]

Network: N101 [PM (Network Folder: Scenario 2 (2036))]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 130 seconds (Network Optimum Cycle Time - Minimum Delay)

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: The Northern Road														
1	L2	1	0.0	1	0.0	0.048	23.2	LOS B	0.6	7.8	0.47	0.39	0.47	60.5
2	T1	1721	15.9	1721	15.9	* 0.857	29.4	LOS C	29.5	231.6	0.90	0.86	0.94	50.5
3	R2	2	0.0	2	0.0	0.011	63.9	LOS E	0.1	0.5	0.92	0.62	0.92	38.7
Approach		1724	15.8	1724	15.8	0.857	29.5	LOS C	29.5	231.6	0.90	0.86	0.94	50.4
East: Defence Establishment Orchard Hills														
4	L2	16	0.0	16	0.0	0.041	46.7	LOS D	0.5	3.6	0.81	0.68	0.81	22.2
5	T1	1	0.0	1	0.0	* 0.041	42.2	LOS C	0.5	3.6	0.81	0.68	0.81	22.2
6	R2	55	0.0	55	0.0	0.154	50.0	LOS D	1.7	12.2	0.86	0.73	0.86	21.5
Approach		72	0.0	72	0.0	0.154	49.1	LOS D	1.7	12.2	0.85	0.72	0.85	21.7
North: The Northern Road														
7	L2	18	0.0	18	0.0	0.015	10.1	LOS A	0.1	0.5	0.12	0.64	0.12	56.3
8	T1	1354	15.4	1354	15.4	0.665	15.2	LOS B	14.0	109.4	0.57	0.52	0.57	55.9
9	R2	1	0.0	1	0.0	0.006	68.7	LOS E	0.0	0.3	1.00	0.60	1.00	27.3
Approach		1373	15.1	1373	15.1	0.665	15.2	LOS B	14.0	109.4	0.56	0.52	0.56	55.9
West: Entry Boulevard														
10	L2	1	0.0	1	0.0	0.008	52.0	LOS D	0.1	0.5	0.89	0.58	0.89	19.0
11	T1	1	0.0	1	0.0	0.008	47.4	LOS D	0.1	0.5	0.89	0.58	0.89	28.6
12	R2	1	0.0	1	0.0	* 0.004	49.9	LOS D	0.0	0.2	0.85	0.58	0.85	18.9
Approach		3	0.0	3	0.0	0.008	49.7	LOS D	0.1	0.5	0.88	0.58	0.88	23.0
All Vehicles		3172	15.2	3172	15.2	0.857	23.8	LOS B	29.5	231.6	0.75	0.71	0.78	51.3

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.
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: The Northern Road											
P11	Stage 1	53	59.3	LOS E	0.2	0.2	0.96	0.96	88.5	38.0	0.43
P12	Stage 2	53	59.3	LOS E	0.2	0.2	0.96	0.96	86.2	35.0	0.41
P1B	Slip/ Bypass	53	28.1	LOS C	0.1	0.1	0.91	0.91	48.1	26.0	0.54
East: Defence Establishment Orchard Hills											
P2	Full	53	59.3	LOS E	0.2	0.2	0.96	0.96	90.0	40.0	0.44

North: The Northern Road										
P31 Stage 1	53	59.3	LOS E	0.2	0.2	0.96	0.96	89.3	39.0	0.44
P32 Stage 2	53	59.3	LOS E	0.2	0.2	0.96	0.96	86.2	35.0	0.41
West: Entry Boulevard										
P4 Full	53	59.3	LOS E	0.2	0.2	0.96	0.96	87.0	36.0	0.41
All Pedestrians	368	54.8	LOS E	0.2	0.2	0.95	0.95	82.2	35.6	0.43

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: 4851 [2036 PM TNR - Chain-o-Ponds (Site Folder: Scenario 2)]

Network: N101 [PM (Network Folder: Scenario 2 (2036))]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 140 seconds (Site 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: The Northern Road														
1	L2	1	0.0	1	0.0	0.040	12.7	LOS A	0.4	4.5	0.34	0.28	0.34	71.0
2	T1	1746	14.8	1746	14.8	* 0.701	14.3	LOS A	21.7	169.2	0.66	0.61	0.66	60.9
Approach		1747	14.8	1747	14.8	0.701	14.3	LOS A	21.7	169.2	0.66	0.61	0.66	60.9
North: The Northern Road														
8	T1	1322	15.4	1322	15.4	0.442	3.9	LOS A	7.6	59.5	0.31	0.29	0.31	76.8
9	R2	39	0.0	39	0.0	* 0.226	72.1	LOS F	1.6	10.9	0.96	0.74	0.96	32.9
Approach		1361	15.0	1361	15.0	0.442	5.9	LOS A	7.6	59.5	0.33	0.30	0.33	75.3
West: Chain-o-Ponds Road														
10	L2	20	0.0	20	0.0	0.045	48.4	LOS D	0.6	4.5	0.80	0.69	0.80	15.4
12	R2	2	0.0	2	0.0	0.011	65.6	LOS E	0.1	0.6	0.92	0.61	0.92	34.6
Approach		22	0.0	22	0.0	0.045	50.1	LOS D	0.6	4.5	0.81	0.68	0.81	18.7
All Vehicles		3131	14.8	3131	14.8	0.701	10.9	LOS A	21.7	169.2	0.52	0.48	0.52	68.7

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.
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: The Northern Road											
P11	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	90.0	33.5	0.37
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P1B	Slip/ Bypass	53	36.2	LOS D	0.1	0.1	0.92	0.92	56.2	26.0	0.46
North: The Northern Road											
P31	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P32	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	88.9	32.0	0.36
West: Chain-o-Ponds Road											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
All Pedestrians		316	59.6	LOS E	0.2	0.2	0.95	0.95	85.2	33.3	0.39

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.

Organisation: TTPP - THE TRANSPORT PLANNING PARTNERSHIP | Licence: NETWORK / 1PC | Processed: Wednesday, April 13, 2022 11:03:40 AM
Project: X:\17285 Mulgoa Planning Proposal\07 Modelling Files\2022\17285-2036-220412. (3-int)sip9.sip9

MOVEMENT SUMMARY

Site: 4671 [2036 AM TNR - Bradley (Site Folder: Scenario 3)]

Network: N101 [AM (Network Folder: Scenario 3 (2036+D))]

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	56	0.0	49	0.0	0.091	14.9	LOS B	1.3	12.5	0.36	0.54	0.36	56.0
2	T1	2242	17.0	1971	17.2	* 0.724	11.9	LOS A	26.9	213.6	0.47	0.43	0.47	70.9
Approach		2298	16.6	2020 N1	16.8	0.724	11.9	LOS A	26.9	213.6	0.47	0.44	0.47	70.7
East: U-Turn Bay														
6	R2	1	0.0	1	0.0	* 0.013	75.3	LOS F	0.1	0.5	0.97	0.58	0.97	34.9
Approach		1	0.0	1	0.0	0.013	75.3	LOS F	0.1	0.5	0.97	0.58	0.97	34.9
North: The Northern Road														
7	L2	1	0.0	1	0.0	0.001	7.6	LOS A	0.0	0.0	0.00	0.60	0.00	68.5
8	T1	1492	13.9	1492	13.9	0.375	4.9	LOS A	11.0	85.3	0.33	0.29	0.33	73.8
9	R2	320	0.0	320	0.0	0.388	55.7	LOS D	9.8	68.6	0.88	0.80	0.88	43.4
Approach		1813	11.4	1813	11.4	0.388	13.9	LOS A	11.0	85.3	0.43	0.38	0.43	63.6
West: Bradley Street														
10	L2	876	0.0	876	0.0	* 0.728	49.0	LOS D	26.3	184.0	0.95	0.86	0.95	44.2
12	R2	122	0.0	122	0.0	0.246	63.6	LOS E	3.8	26.5	0.93	0.75	0.93	18.6
Approach		998	0.0	998	0.0	0.728	50.7	LOS D	26.3	184.0	0.94	0.85	0.94	41.9
All Vehicles		5109	11.5	4832 N1	12.2	0.728	20.7	LOS B	26.9	213.6	0.55	0.50	0.55	60.4

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)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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: The Northern Road											
P11	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.3	36.5	0.40
P1B	Slip/ Bypass	53	29.6	LOS C	0.1	0.1	0.92	0.92	49.6	26.0	0.52
East: U-Turn Bay											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	88.1	31.0	0.35
North: The Northern Road											

P31	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	97.3	43.0	0.44
P32	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	93.5	38.0	0.41
West: Bradley Street											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	94.3	39.0	0.41
P4B	Slip/ Bypass	53	64.3	LOS F	0.2	0.2	0.96	0.96	87.3	30.0	0.34
All Pedestrians		421	59.9	LOS E	0.2	0.2	0.95	0.95	86.8	34.9	0.40

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.

Project: X:\17285 Mulgoa Planning Proposal\07 Modelling Files\2022\17285-2036-220412. (3-int)sip9.sip9

MOVEMENT SUMMARY

Site: 4850 [2036 AM TNR - Defence (Site Folder: Scenario 3)]

Network: N101 [AM (Network Folder: Scenario 3 (2036+D))]

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	51	0.0	50	0.0	0.107	19.4	LOS B	2.2	20.5	0.56	0.61	0.56	60.2
2	T1	1606	15.9	1603	15.9	* 1.228	266.5	LOS F	127.7	1002.8	0.99	1.91	2.36	13.1
3	R2	11	0.0	10	0.0	0.044	64.7	LOS E	0.6	4.4	0.90	0.68	0.90	38.5
Approach		1667	15.3	1664 N1	15.3	1.228	257.7	LOS F	127.7	1002.8	0.98	1.87	2.29	12.7
East: Defence Establishment Orchard Hills														
4	L2	8	0.0	8	0.0	0.026	53.3	LOS D	0.5	3.6	0.84	0.66	0.84	20.7
5	T1	1	0.0	1	0.0	0.026	48.7	LOS D	0.5	3.6	0.84	0.66	0.84	20.7
6	R2	25	0.0	25	0.0	* 0.135	40.2	LOS C	1.2	8.1	0.89	0.70	0.89	24.2
Approach		35	0.0	35	0.0	0.135	43.7	LOS D	1.2	8.1	0.88	0.68	0.88	23.1
North: The Northern Road														
7	L2	49	0.0	49	0.0	0.059	33.7	LOS C	2.3	16.3	0.74	0.74	0.74	43.8
8	T1	1302	15.3	1302	15.3	1.052	130.5	LOS F	76.8	598.4	0.99	1.37	1.65	17.2
9	R2	294	0.0	294	0.0	* 1.230	285.7	LOS F	45.5	318.5	1.00	1.36	2.49	8.5
Approach		1645	12.1	1645	12.1	1.230	155.3	LOS F	76.8	598.4	0.99	1.35	1.78	14.7
West: Site														
10	L2	677	0.0	676	0.0	0.401	5.2	LOS A	4.1	29.0	0.17	0.59	0.17	42.5
11	T1	1	0.0	1	0.0	* 0.401	0.6	LOS A	4.1	29.0	0.17	0.59	0.17	46.3
12	R2	267	0.0	267	0.0	0.447	38.8	LOS C	13.3	92.9	0.82	0.79	0.82	21.9
Approach		945	0.0	944 N1	0.0	0.447	14.7	LOS B	13.3	92.9	0.35	0.64	0.35	33.6
All Vehicles		4293	10.6	4288 N1	10.6	1.230	163.1	LOS F	127.7	1002.8	0.84	1.39	1.66	14.5

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)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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: The Northern Road											
P11	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	93.5	38.0	0.41
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	91.2	35.0	0.38
P1B	Slip/ Bypass	53	30.5	LOS D	0.1	0.1	0.92	0.92	50.5	26.0	0.51

East: Defence Establishment Orchard Hills										
P2 Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	95.0	40.0	0.42
North: The Northern Road										
P31 Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	94.3	39.0	0.41
P32 Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	91.2	35.0	0.38
West: Site										
P4 Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
All Pedestrians	368	59.4	LOS E	0.2	0.2	0.95	0.95	86.8	35.6	0.41

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: 4851 [2036 AM TNR - Chain-o-Ponds (Site Folder: Scenario 3)]

Network: N101 [AM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 140 seconds (Site 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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	46	0.0	46	0.0	0.109	22.3	LOS B	2.3	22.0	0.59	0.63	0.59	56.3
2	T1	1111	15.8	1111	15.8	* 0.738	36.8	LOS C	31.3	243.9	0.90	0.81	0.90	44.3
Approach		1157	15.1	1157	15.1	0.738	36.2	LOS C	31.3	243.9	0.89	0.80	0.89	44.7
North: The Northern Road														
8	T1	1487	15.3	1431	15.3	0.563	11.3	LOS A	23.5	183.7	0.54	0.50	0.54	71.5
9	R2	161	0.0	155	0.0	0.417	35.8	LOS C	5.8	40.9	0.92	0.79	0.92	46.8
Approach		1648	13.8	1586 N1	13.8	0.563	13.7	LOS A	23.5	183.7	0.58	0.53	0.58	69.5
West: Chain-o-Ponds Road														
10	L2	587	0.0	584	0.0	* 0.747	30.7	LOS C	28.0	196.3	0.77	0.81	0.77	20.7
12	R2	184	0.0	183	0.0	0.440	55.3	LOS D	10.8	75.7	0.91	0.80	0.91	37.5
Approach		772	0.0	767 N1	0.0	0.747	36.6	LOS C	28.0	196.3	0.81	0.81	0.81	27.9
All Vehicles		3577	11.2	3509 N1	11.5	0.747	26.1	LOS B	31.3	243.9	0.73	0.68	0.73	54.9

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)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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: The Northern Road											
P11	Stage 1	53	31.2	LOS D	0.1	0.1	0.92	0.92	56.9	33.5	0.59
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P1B	Slip/ Bypass	53	29.7	LOS C	0.1	0.1	0.92	0.92	49.7	26.0	0.52
North: The Northern Road											
P31	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P32	Stage 2	53	31.2	LOS D	0.1	0.1	0.92	0.92	55.8	32.0	0.57
West: Chain-o-Ponds Road											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
All Pedestrians		316	47.5	LOS E	0.2	0.2	0.94	0.94	73.0	33.3	0.46

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: 6 [6 AM (Site Folder: Scenario 3)]

Network: N101 [AM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Give-Way (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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Chain o Ponds Road														
5	T1	105	1.0	104	1.0	0.053	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	47	1.0	47	1.0	0.025	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	51.8
Approach		153	1.0	150 N1	1.0	0.053	1.7	NA	0.0	0.0	0.00	0.19	0.00	57.2
North: RoadName														
7	L2	194	1.0	194	1.0	0.140	5.7	LOS A	0.6	4.3	0.12	0.55	0.12	50.2
9	R2	16	1.0	16	1.0	0.140	6.7	LOS A	0.6	4.3	0.12	0.55	0.12	52.7
Approach		209	1.0	209	1.0	0.140	5.8	LOS A	0.6	4.3	0.12	0.55	0.12	50.5
West: Chain o Ponds Road														
10	L2	5	1.0	5	1.0	0.042	5.7	LOS A	0.2	1.4	0.16	0.11	0.16	57.1
11	T1	43	1.0	43	1.0	0.042	0.3	LOS A	0.2	1.4	0.16	0.11	0.16	57.5
Approach		48	1.0	48	1.0	0.042	0.9	NA	0.2	1.4	0.16	0.11	0.16	57.4
All Vehicles		411	1.0	408 N1	1.0	0.140	3.7	NA	0.6	4.3	0.08	0.36	0.08	54.1

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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 7 [7 AM (Site Folder: Scenario 3)]

Network: N101 [AM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Give-Way (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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Chain o Ponds Road														
5	T1	74	1.0	72	1.0	0.037	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	49	1.0	48	1.0	0.026	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	51.9
Approach		123	1.0	120 N1	1.0	0.037	2.2	NA	0.0	0.0	0.00	0.24	0.00	56.4
North: RoadName														
7	L2	193	1.0	189	1.0	0.239	6.4	LOS A	1.1	7.6	0.39	0.63	0.39	37.4
9	R2	80	1.0	78	1.0	0.239	8.1	LOS A	1.1	7.6	0.39	0.63	0.39	37.4
Approach		273	1.0	267 N1	1.0	0.239	6.9	LOS A	1.1	7.6	0.39	0.63	0.39	37.4
West: Chain o Ponds Road														
10	L2	21	1.0	21	1.0	0.210	5.8	LOS A	1.1	7.9	0.19	0.12	0.19	56.2
11	T1	218	1.0	218	1.0	0.210	0.4	LOS A	1.1	7.9	0.19	0.12	0.19	56.2
Approach		239	1.0	239	1.0	0.210	0.9	NA	1.1	7.9	0.19	0.12	0.19	56.2
All Vehicles		635	1.0	626 N1	1.0	0.239	3.7	NA	1.1	7.9	0.24	0.36	0.24	49.8

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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 8 [8 AM (Site Folder: Scenario 3)]

Network: N101 [AM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Roundabout

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Chain o Ponds Road														
5	T1	98	1.0	95	1.0	0.141	4.6	LOS A	0.7	5.7	0.11	0.55	0.11	43.7
6	R2	93	1.0	90	1.0	0.141	8.6	LOS A	0.7	5.7	0.11	0.55	0.11	43.7
6u	U	11	100.0	11	100.0	0.141	12.3	LOS A	0.7	5.7	0.11	0.55	0.11	43.7
Approach		201	6.2	195 N1	6.4	0.141	6.8	LOS A	0.7	5.7	0.11	0.55	0.11	43.7
North: RoadName														
7	L2	329	1.0	324	1.0	0.369	7.0	LOS A	2.4	17.1	0.65	0.72	0.65	46.3
9	R2	27	1.0	27	1.0	0.369	11.4	LOS A	2.4	17.1	0.65	0.72	0.65	46.3
Approach		357	1.0	351 N1	1.0	0.369	7.4	LOS A	2.4	17.1	0.65	0.72	0.65	46.3
West: Chain o Ponds Road														
10	L2	19	1.0	19	1.0	0.319	4.9	LOS A	2.3	16.4	0.33	0.46	0.33	51.1
11	T1	406	1.0	405	1.0	0.319	5.2	LOS A	2.3	16.4	0.33	0.46	0.33	51.1
Approach		425	1.0	424 N1	1.0	0.319	5.2	LOS A	2.3	16.4	0.33	0.46	0.33	51.1
All Vehicles		983	2.1	971 N1	2.1	0.369	6.3	LOS A	2.4	17.1	0.40	0.57	0.40	48.4

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.
Roundabout Capacity Model: SIDRA Standard.
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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Organisation: TTPP - THE TRANSPORT PLANNING PARTNERSHIP | Licence: NETWORK / 1PC | Processed: Wednesday, April 13, 2022 1:53:37 PM
Project: X:\17285 Mulgoa Planning Proposal\07 Modelling Files\2022\17285-2036-220412. (3-int)sip9.sip9

MOVEMENT SUMMARY

Site: 9 [9 AM (Site Folder: Scenario 3)]

Network: N101 [AM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Give-Way (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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
2	T1	29	1.0	29	1.0	0.033	0.1	LOS A	0.1	1.0	0.12	0.29	0.12	46.7
3	R2	31	1.0	30	1.0	0.033	5.6	LOS A	0.1	1.0	0.12	0.29	0.12	46.7
Approach		60	1.0	59 [N1]	1.0	0.033	2.9	NA	0.1	1.0	0.12	0.29	0.12	46.7
East: RoadName														
4	L2	26	1.0	25	1.1	0.017	5.7	LOS A	0.1	0.5	0.12	0.54	0.12	50.1
6	R2	1	1.0	1	1.1	0.017	5.8	LOS A	0.1	0.5	0.12	0.54	0.12	50.1
Approach		27	1.0	26 [N1]	1.1	0.017	5.7	LOS A	0.1	0.5	0.12	0.54	0.12	50.1
North: RoadName														
7	L2	4	1.0	4	1.1	0.027	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	57.7
8	T1	52	1.0	48	1.1	0.027	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	57.7
Approach		56	1.0	52 [N1]	1.1	0.027	0.4	NA	0.0	0.0	0.00	0.05	0.00	57.7
All Vehicles		143	1.0	136 [N1]	1.1	0.033	2.5	NA	0.1	1.0	0.07	0.24	0.07	50.7

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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Organisation: TTPP - THE TRANSPORT PLANNING PARTNERSHIP | Licence: NETWORK / 1PC | Processed: Wednesday, April 13, 2022 1:53:37 PM
Project: X:\17285 Mulgoa Planning Proposal\07 Modelling Files\2022\17285-2036-220412. (3-int)sip9.sip9

MOVEMENT SUMMARY

Site: 10 [10 AM (Site Folder: Scenario 3)]

Network: N101 [AM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Give-Way (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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
1	L2	1	1.0	1	1.0	0.057	5.6	LOS A	0.2	1.3	0.19	0.58	0.19	48.0
3	R2	66	1.0	65	1.0	0.057	5.9	LOS A	0.2	1.3	0.19	0.58	0.19	48.0
Approach		67	1.0	66 [N1]	1.0	0.057	5.9	LOS A	0.2	1.3	0.19	0.58	0.19	48.0
East: RoadName														
4	L2	84	1.0	79	1.1	0.059	5.6	LOS A	0.0	0.0	0.00	0.42	0.00	55.6
5	T1	34	1.0	31	1.1	0.059	0.0	LOS A	0.0	0.0	0.00	0.42	0.00	55.6
Approach		118	1.0	110 [N1]	1.1	0.059	4.0	NA	0.0	0.0	0.00	0.42	0.00	55.6
West: RoadName														
11	T1	42	1.0	41	1.0	0.025	0.1	LOS A	0.0	0.3	0.06	0.08	0.06	58.1
12	R2	6	1.0	6	1.0	0.025	5.8	LOS A	0.0	0.3	0.06	0.08	0.06	58.1
Approach		48	1.0	48	1.0	0.025	0.8	NA	0.0	0.3	0.06	0.08	0.06	58.1
All Vehicles		234	1.0	224 [N1]	1.0	0.059	3.9	NA	0.2	1.3	0.07	0.39	0.07	54.4

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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Organisation: TTPP - THE TRANSPORT PLANNING PARTNERSHIP | Licence: NETWORK / 1PC | Processed: Wednesday, April 13, 2022 1:53:37 PM
Project: X:\17285 Mulgoa Planning Proposal\07 Modelling Files\2022\17285-2036-220412. (3-int)sip9.sip9

MOVEMENT SUMMARY

Site: 11 [11 AM (Site Folder: Scenario 3)]

Network: N101 [AM (Network Folder: Scenario 3 (2036+D))]

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

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	DEMAND FLOWS HV] %	ARRIVAL FLOWS [Total veh/h	ARRIVAL FLOWS HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	95% BACK OF QUEUE Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
1	L2	1	1.0	1	1.0	0.016	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	57.2
2	T1	29	1.0	29	1.0	0.016	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	58.9
Approach		31	1.0	30 N1	1.0	0.016	0.2	NA	0.0	0.0	0.00	0.02	0.00	58.7
North: RoadName														
8	T1	52	1.0	47	1.1	0.042	0.0	LOS A	0.1	1.0	0.07	0.22	0.07	57.1
9	R2	32	1.0	29	1.1	0.042	5.5	LOS A	0.1	1.0	0.07	0.22	0.07	56.5
Approach		83	1.0	76 N1	1.1	0.042	2.1	NA	0.1	1.0	0.07	0.22	0.07	56.8
West: RoadName														
10	L2	53	1.0	53	1.0	0.037	5.6	LOS A	0.1	1.0	0.09	0.55	0.09	50.4
12	R2	4	1.0	4	1.0	0.037	5.8	LOS A	0.1	1.0	0.09	0.55	0.09	50.4
Approach		57	1.0	57	1.0	0.037	5.6	LOS A	0.1	1.0	0.09	0.55	0.09	50.4
All Vehicles		171	1.0	163 N1	1.0	0.042	3.0	NA	0.1	1.0	0.06	0.30	0.06	55.0

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.
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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 12 [12 AM (Site Folder: Scenario 3)]

Network: N101 [AM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Roundabout

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName															
1	L2	1	1.0	1	1.0	0.117	4.7	LOS A	0.6	4.2	0.34	0.62	0.34	46.4
2	T1	14	1.0	14	1.0	0.117	4.9	LOS A	0.6	4.2	0.34	0.62	0.34	52.5
3	R2	125	1.0	125	1.0	0.117	9.6	LOS A	0.6	4.2	0.34	0.62	0.34	46.4
Approach		140	1.0	140	1.0	0.117	9.1	LOS A	0.6	4.2	0.34	0.62	0.34	47.3
East: Bradley Street															
4	L2	32	1.0	28	1.1	0.119	4.0	LOS A	0.7	4.8	0.16	0.50	0.16	53.6
5	T1	93	1.0	83	1.1	0.119	4.3	LOS A	0.7	4.8	0.16	0.50	0.16	49.9
6	R2	67	1.0	60	1.1	0.119	8.9	LOS A	0.7	4.8	0.16	0.50	0.16	54.9
Approach		192	1.0	171 N1	1.1	0.119	5.9	LOS A	0.7	4.8	0.16	0.50	0.16	52.9
North: RoadName															
7	L2	100	1.0	100	1.0	0.137	6.0	LOS A	0.8	5.3	0.54	0.64	0.54	48.8
8	T1	5	1.0	5	1.0	0.137	6.2	LOS A	0.8	5.3	0.54	0.64	0.54	54.3
9	R2	31	1.0	31	1.0	0.137	10.8	LOS A	0.8	5.3	0.54	0.64	0.54	48.8
Approach		136	1.0	136	1.0	0.137	7.1	LOS A	0.8	5.3	0.54	0.64	0.54	49.1
West: Bradley Street															
10	L2	66	1.0	66	1.0	0.292	5.0	LOS A	1.8	12.5	0.43	0.51	0.43	54.9
11	T1	282	1.0	282	1.0	0.292	5.2	LOS A	1.8	12.5	0.43	0.51	0.43	52.9
12	R2	1	1.0	1	1.0	0.292	9.9	LOS A	1.8	12.5	0.43	0.51	0.43	55.9
Approach		349	1.0	349	1.0	0.292	5.2	LOS A	1.8	12.5	0.43	0.51	0.43	53.5
All Vehicles		817	1.0	796 N1	1.0	0.292	6.3	LOS A	1.8	12.5	0.37	0.55	0.37	51.9

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.
Roundabout Capacity Model: SIDRA Standard.
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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 13v [13 AM (Site Folder: Scenario 3)]

Network: N101 [AM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Roundabout

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
1	L2	71	1.0	70	1.0	0.263	5.5	LOS A	2.0	13.8	0.52	0.60	0.52	51.5
2	T1	82	1.0	82	1.0	0.263	5.8	LOS A	2.0	13.8	0.52	0.60	0.52	54.8
3	R2	144	1.0	143	1.0	0.263	10.4	LOS A	2.0	13.8	0.52	0.60	0.52	51.5
Approach		297	1.0	295 N1	1.0	0.263	8.0	LOS A	2.0	13.8	0.52	0.60	0.52	52.7
East: Bradley Street														
4	L2	89	1.0	75	1.2	0.236	4.9	LOS A	1.4	9.7	0.33	0.50	0.33	48.5
5	T1	218	1.0	184	1.2	0.236	5.2	LOS A	1.4	9.7	0.33	0.50	0.33	48.5
6	R2	27	1.0	23	1.2	0.236	9.8	LOS A	1.4	9.7	0.33	0.50	0.33	54.6
Approach		335	1.0	282 N1	1.2	0.236	5.5	LOS A	1.4	9.7	0.33	0.50	0.33	49.4
North: RoadName														
7	L2	1	1.0	1	1.0	0.142	11.3	LOS A	1.0	7.2	0.90	0.84	0.90	42.4
8	T1	40	1.0	40	1.0	0.142	11.5	LOS A	1.0	7.2	0.90	0.84	0.90	42.4
9	R2	31	1.0	31	1.0	0.142	16.2	LOS B	1.0	7.2	0.90	0.84	0.90	42.4
Approach		72	1.0	72	1.0	0.142	13.5	LOS A	1.0	7.2	0.90	0.84	0.90	42.4
West: Bradley Street														
10	L2	24	1.0	24	1.0	0.692	7.5	LOS A	8.5	60.1	0.81	0.71	0.87	51.5
11	T1	673	1.0	673	1.0	0.692	7.8	LOS A	8.5	60.1	0.81	0.71	0.87	46.3
12	R2	87	1.0	87	1.0	0.692	12.4	LOS A	8.5	60.1	0.81	0.71	0.87	46.3
Approach		784	1.0	784	1.0	0.692	8.3	LOS A	8.5	60.1	0.81	0.71	0.87	46.6
All Vehicles		1487	1.0	1433 N1	1.0	0.692	7.9	LOS A	8.5	60.1	0.66	0.65	0.69	48.7

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Organisation: TTPP - THE TRANSPORT PLANNING PARTNERSHIP | Licence: NETWORK / 1PC | Processed: Wednesday, April 13, 2022 1:53:37 PM
Project: X:\17285 Mulgoa Planning Proposal\07 Modelling Files\2022\17285-2036-220412. (3-int)sip9.sip9

MOVEMENT SUMMARY

Site: 4671 [2036 PM TNR - Bradley (Site Folder: Scenario 3)]

Network: N101 [PM (Network Folder: Scenario 3 (2036+D))]

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: The Northern Road														
1	L2	171	0.0	109	0.0	0.168	19.0	LOS B	1.8	15.4	0.66	0.71	0.66	53.1
2	T1	1944	17.0	1247	17.4	0.646	58.1	LOS E	16.7	132.3	0.99	0.87	0.99	49.4
Approach		2115	15.6	1356 N1	16.0	0.646	55.0	LOS D	16.7	132.3	0.96	0.86	0.96	49.4
East: U-Turn Bay														
6	R2	1	0.0	1	0.0	0.004	59.7	LOS E	0.0	0.3	0.88	0.59	0.88	39.2
Approach		1	0.0	1	0.0	0.004	59.7	LOS E	0.0	0.3	0.88	0.59	0.88	39.2
North: The Northern Road														
7	L2	1	0.0	1	0.0	0.001	7.6	LOS A	0.0	0.0	0.00	0.60	0.00	68.5
8	T1	2765	14.7	2765	14.7	* 1.024	63.6	LOS E	64.5	504.8	0.84	1.04	1.15	38.5
9	R2	784	0.0	784	0.0	0.653	31.1	LOS C	9.9	69.4	0.89	0.83	0.89	52.1
Approach		3551	11.5	3551	11.5	1.024	56.4	LOS D	64.5	504.8	0.85	0.99	1.09	41.4
West: Bradley Street														
10	L2	406	0.0	406	0.0	0.324	24.9	LOS B	4.2	29.3	0.78	0.76	0.78	52.8
12	R2	56	0.0	56	0.0	* 0.183	64.2	LOS E	1.3	8.8	0.92	0.73	0.92	18.5
Approach		462	0.0	462	0.0	0.324	29.7	LOS C	4.2	29.3	0.80	0.75	0.80	49.3
All Vehicles		6128	12.0	5370 N1	13.7	1.024	53.8	LOS D	64.5	504.8	0.87	0.94	1.04	44.4

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)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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: The Northern Road											
P11	Stage 1	53	33.1	LOS D	0.1	0.1	0.92	0.92	60.8	36.0	0.59
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.3	36.5	0.40
P1B	Slip/ Bypass	53	30.9	LOS D	0.1	0.1	0.92	0.92	50.9	26.0	0.51
East: U-Turn Bay											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	88.1	31.0	0.35
North: The Northern Road											
P31	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	97.3	43.0	0.44

P32	Stage 2	53	33.1	LOS D	0.1	0.1	0.92	0.92	62.3	38.0	0.61
West: Bradley Street											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	94.3	39.0	0.41
P4B	Slip/ Bypass	53	29.7	LOS C	0.1	0.1	0.92	0.92	52.7	30.0	0.57
All Pedestrians		421	48.0	LOS E	0.2	0.2	0.94	0.94	74.9	34.9	0.47

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: 4850 [2036 PM TNR - Defence (Site Folder: Scenario 3)]

Network: N101 [PM (Network Folder: Scenario 3 (2036+D))]

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	HV]	ARRIVAL FLOWS [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Veh.	Dist]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: The Northern Road														
1	L2	156	0.0	129	0.0	0.207	17.1	LOS B	2.2	18.0	0.56	0.69	0.56	61.1
2	T1	1894	15.7	1577	16.0	* 1.409	420.5	LOS F	97.1	762.6	0.99	2.28	2.98	9.2
3	R2	2	0.0	2	0.0	0.006	59.8	LOS E	0.1	0.4	0.86	0.62	0.86	39.8
Approach		2052	14.5	1709 [N1]	14.8	1.409	389.6	LOS F	97.1	762.6	0.96	2.16	2.79	8.9
East: Defence Establishment Orchard Hills														
4	L2	16	0.0	16	0.0	0.038	47.5	LOS D	0.5	3.7	0.79	0.67	0.79	22.0
5	T1	1	0.0	1	0.0	0.038	42.9	LOS D	0.5	3.7	0.79	0.67	0.79	22.0
6	R2	55	0.0	55	0.0	0.189	56.7	LOS E	1.9	13.6	0.88	0.74	0.88	20.0
Approach		72	0.0	72	0.0	0.189	54.5	LOS D	1.9	13.6	0.86	0.72	0.86	20.4
North: The Northern Road														
7	L2	18	0.0	18	0.0	0.016	13.0	LOS A	0.1	0.9	0.19	0.65	0.19	54.4
8	T1	1940	15.1	1940	15.1	1.232	254.5	LOS F	98.5	770.0	0.99	1.95	2.32	10.1
9	R2	832	0.0	832	0.0	* 1.424	425.6	LOS F	86.3	604.0	1.00	1.61	3.03	5.7
Approach		2789	10.5	2789	10.5	1.424	304.0	LOS F	98.5	770.0	0.99	1.84	2.52	8.0
West: Site														
10	L2	260	0.0	243	0.0	0.156	6.0	LOS A	1.5	10.3	0.20	0.59	0.20	41.6
11	T1	1	0.0	1	0.0	* 0.156	1.5	LOS A	1.5	10.3	0.20	0.59	0.20	45.8
12	R2	127	0.0	119	0.0	* 0.469	62.0	LOS E	4.6	32.0	0.95	0.84	0.95	16.4
Approach		388	0.0	363 [N1]	0.0	0.469	24.4	LOS B	4.6	32.0	0.44	0.67	0.44	27.6
All Vehicles		5301	11.1	4933 [N1]	12.0	1.424	309.4	LOS F	98.5	770.0	0.94	1.85	2.44	8.7

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.
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)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Ped	Dist]	Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	sec		ped	m			sec	m	m/sec
South: The Northern Road											
P11	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	93.5	38.0	0.41
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	91.2	35.0	0.38
P1B	Slip/ Bypass	53	32.2	LOS D	0.1	0.1	0.92	0.92	52.2	26.0	0.50
East: Defence Establishment Orchard Hills											

P2 Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	95.0	40.0	0.42
North: The Northern Road										
P31 Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	94.3	39.0	0.41
P32 Stage 2	53	29.8	LOS C	0.1	0.1	0.92	0.92	56.7	35.0	0.62
West: Site										
P4 Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
All Pedestrians	368	54.8	LOS E	0.2	0.2	0.95	0.95	82.1	35.6	0.43

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.

Organisation: TTPP - THE TRANSPORT PLANNING PARTNERSHIP | Licence: NETWORK / 1PC | Processed: Wednesday, April 13, 2022 1:46:13 PM
Project: X:\17285 Mulgoa Planning Proposal\07 Modelling Files\2022\17285-2036-220412. (3-int)sip9.sip9

MOVEMENT SUMMARY

Site: 4851 [2036 PM TNR - Chain-o-Ponds (Site Folder: Scenario 3)]

Network: N101 [PM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 140 seconds (Site 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: The Northern Road														
1	L2	122	0.0	122	0.0	0.143	14.8	LOS B	2.1	17.3	0.42	0.63	0.42	62.0
2	T1	1905	14.8	1905	14.8	* 1.173	218.0	LOS F	86.0	671.0	0.99	1.84	2.13	14.2
Approach		2027	13.9	2027	13.9	1.173	205.8	LOS F	86.0	671.0	0.96	1.76	2.03	14.3
North: The Northern Road														
8	T1	1376	15.4	1024	15.6	0.339	3.5	LOS A	5.2	40.3	0.27	0.25	0.27	77.2
9	R2	699	0.0	519	0.0	* 1.163	229.0	LOS F	44.6	312.3	1.00	1.29	2.18	14.0
Approach		2075	10.2	1543 N1	10.4	1.163	79.3	LOS F	44.6	312.3	0.52	0.60	0.91	39.5
West: Chain-o-Ponds Road														
10	L2	189	0.0	175	0.0	0.271	35.9	LOS C	5.0	34.8	0.73	0.75	0.73	18.8
12	R2	57	0.0	53	0.0	* 0.280	68.9	LOS E	2.1	14.6	0.96	0.75	0.96	33.8
Approach		246	0.0	228 N1	0.0	0.280	43.5	LOS D	5.0	34.8	0.78	0.75	0.78	25.1
All Vehicles		4348	11.4	3799 N1	13.0	1.173	144.6	LOS F	86.0	671.0	0.77	1.23	1.50	22.5

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)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

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: The Northern Road											
P11	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	90.0	33.5	0.37
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P1B	Slip/ Bypass	53	30.0	LOS D	0.1	0.1	0.92	0.92	50.0	26.0	0.52
North: The Northern Road											
P31	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P32	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	88.9	32.0	0.36
West: Chain-o-Ponds Road											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
All Pedestrians		316	58.6	LOS E	0.2	0.2	0.95	0.95	84.1	33.3	0.40

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: 6 [6 PM (Site Folder: Scenario 3)]

Network: N101 [PM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Give-Way (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
East: Chain o Ponds Road														
5	T1	34	1.0	25	1.4	0.013	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	208	1.0	152	1.4	0.083	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	51.8
Approach		242	1.0	177 N1	1.4	0.083	4.7	NA	0.0	0.0	0.00	0.52	0.00	52.8
North: RoadName														
7	L2	56	1.0	56	1.0	0.044	5.8	LOS A	0.1	0.5	0.18	0.55	0.18	49.9
9	R2	6	1.0	6	1.0	0.044	7.1	LOS A	0.1	0.5	0.18	0.55	0.18	52.5
Approach		62	1.0	62	1.0	0.044	5.9	LOS A	0.1	0.5	0.18	0.55	0.18	50.3
West: Chain o Ponds Road														
10	L2	15	1.0	15	1.0	0.105	6.2	LOS A	0.2	1.4	0.33	0.25	0.33	56.3
11	T1	91	1.0	91	1.0	0.105	1.2	LOS A	0.2	1.4	0.33	0.25	0.33	55.9
Approach		105	1.0	105	1.0	0.105	1.9	NA	0.2	1.4	0.33	0.25	0.33	56.0
All Vehicles		409	1.0	344 N1	1.2	0.105	4.1	NA	0.2	1.4	0.14	0.44	0.14	53.2

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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 7 [7 PM (Site Folder: Scenario 3)]

Network: N101 [PM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Give-Way (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
East: Chain o Ponds Road														
5	T1	222	1.0	162	1.4	0.084	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	218	1.0	159	1.4	0.087	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	51.9
Approach		440	1.0	322 N1	1.4	0.087	2.7	NA	0.0	0.0	0.00	0.30	0.00	55.7
North: RoadName														
7	L2	54	1.0	43	1.3	0.052	5.8	LOS A	0.1	0.6	0.17	0.57	0.17	38.6
9	R2	22	1.0	18	1.3	0.052	8.2	LOS A	0.1	0.6	0.17	0.57	0.17	38.6
Approach		76	1.0	60 N1	1.3	0.052	6.5	LOS A	0.1	0.6	0.17	0.57	0.17	38.6
West: Chain o Ponds Road														
10	L2	75	1.0	75	1.0	0.135	6.2	LOS A	0.2	1.7	0.33	0.39	0.33	49.7
11	T1	72	1.0	72	1.0	0.135	1.3	LOS A	0.2	1.7	0.33	0.39	0.33	49.7
Approach		146	1.0	146	1.0	0.135	3.8	NA	0.2	1.7	0.33	0.39	0.33	49.7
All Vehicles		662	1.0	528 N1	1.3	0.135	3.5	NA	0.2	1.7	0.11	0.35	0.11	53.3

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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 8 [8 PM (Site Folder: Scenario 3)]

Network: N101 [PM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Roundabout

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: Chain o Ponds Road														
5	T1	434	1.0	315	1.4	0.358	4.5	LOS A	0.9	6.7	0.06	0.55	0.06	44.7
6	R2	344	1.0	250	1.4	0.358	8.5	LOS A	0.9	6.7	0.06	0.55	0.06	44.7
6u	U	11	100.0	11	100.0	0.358	11.9	LOS A	0.9	6.7	0.06	0.55	0.06	44.7
Approach		788	2.3	576 N1	3.2	0.358	6.3	LOS A	0.9	6.7	0.06	0.55	0.06	44.7
North: RoadName														
7	L2	108	1.0	101	1.1	0.093	4.8	LOS A	0.2	1.4	0.31	0.52	0.31	48.8
9	R2	9	1.0	9	1.1	0.093	9.1	LOS A	0.2	1.4	0.31	0.52	0.31	48.8
Approach		118	1.0	110 N1	1.1	0.093	5.1	LOS A	0.2	1.4	0.31	0.52	0.31	48.8
West: Chain o Ponds Road														
10	L2	16	1.0	14	1.1	0.108	5.7	LOS A	0.3	2.0	0.44	0.50	0.44	50.5
11	T1	115	1.0	105	1.1	0.108	6.0	LOS A	0.3	2.0	0.44	0.50	0.44	50.5
Approach		131	1.0	120 N1	1.1	0.108	5.9	LOS A	0.3	2.0	0.44	0.50	0.44	50.5
All Vehicles		1037	2.0	806 N1	2.6	0.358	6.1	LOS A	0.9	6.7	0.15	0.54	0.15	46.6

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.
Roundabout Capacity Model: SIDRA Standard.
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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 9 [9 PM (Site Folder: Scenario 3)]

Network: N101 [PM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Give-Way (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: RoadName															
2	T1	48	1.0	38	1.3	0.028	0.0	LOS A	0.0	0.2	0.04	0.15	0.04	52.7
3	R2	17	1.0	13	1.3	0.028	5.5	LOS A	0.0	0.2	0.04	0.15	0.04	52.7
Approach		65	1.0	52 N1	1.3	0.028	1.4	NA	0.0	0.2	0.04	0.15	0.04	52.7
East: RoadName															
4	L2	118	1.0	91	1.3	0.057	5.6	LOS A	0.1	0.7	0.07	0.55	0.07	50.4
6	R2	1	1.0	1	1.3	0.057	5.7	LOS A	0.1	0.7	0.07	0.55	0.07	50.4
Approach		119	1.0	92 N1	1.3	0.057	5.6	LOS A	0.1	0.7	0.07	0.55	0.07	50.4
North: RoadName															
7	L2	1	1.0	1	1.2	0.009	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	58.5
8	T1	21	1.0	17	1.2	0.009	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	58.5
Approach		22	1.0	18 N1	1.2	0.009	0.3	NA	0.0	0.0	0.00	0.03	0.00	58.5
All Vehicles		206	1.0	161 N1	1.3	0.057	3.7	NA	0.1	0.7	0.05	0.37	0.05	51.1

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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 10 [10 PM (Site Folder: Scenario 3)]

Network: N101 [PM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Give-Way (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: RoadName														
1	L2	112	1.0	84	1.3	0.222	5.6	LOS A	0.4	2.6	0.11	0.57	0.11	48.5
3	R2	275	1.0	207	1.3	0.222	5.7	LOS A	0.4	2.6	0.11	0.57	0.11	48.5
Approach		386	1.0	291 N1	1.3	0.222	5.7	LOS A	0.4	2.6	0.11	0.57	0.11	48.5
East: RoadName														
4	L2	60	1.0	52	1.2	0.039	5.6	LOS A	0.0	0.0	0.00	0.42	0.00	55.6
5	T1	24	1.0	21	1.2	0.039	0.0	LOS A	0.0	0.0	0.00	0.42	0.00	55.6
Approach		84	1.0	73 N1	1.2	0.039	4.0	NA	0.0	0.0	0.00	0.42	0.00	55.6
West: RoadName														
11	T1	6	1.0	5	1.2	0.004	0.1	LOS A	0.0	0.0	0.09	0.15	0.09	56.7
12	R2	2	1.0	2	1.2	0.004	5.7	LOS A	0.0	0.0	0.09	0.15	0.09	56.7
Approach		8	1.0	7 N1	1.2	0.004	1.5	NA	0.0	0.0	0.09	0.15	0.09	56.7
All Vehicles		479	1.0	371 N1	1.3	0.222	5.3	NA	0.4	2.6	0.09	0.53	0.09	50.8

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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Organisation: TTPP - THE TRANSPORT PLANNING PARTNERSHIP | Licence: NETWORK / 1PC | Processed: Wednesday, April 13, 2022 1:46:13 PM
Project: X:\17285 Mulgoa Planning Proposal\07 Modelling Files\2022\17285-2036-220412. (3-int)sip9.sip9

MOVEMENT SUMMARY

Site: 11 [11 PM (Site Folder: Scenario 3)]

Network: N101 [PM (Network Folder: Scenario 3 (2036+D))]

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

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
Vehicle Movement Performance														
South: RoadName														
1	L2	1	1.0	1	1.2	0.021	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	57.3
2	T1	48	1.0	40	1.2	0.021	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.3
Approach		49	1.0	40 N1	1.2	0.021	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.2
North: RoadName														
8	T1	21	1.0	17	1.2	0.035	0.1	LOS A	0.1	0.5	0.12	0.41	0.12	54.9
9	R2	56	1.0	45	1.2	0.035	5.6	LOS A	0.1	0.5	0.12	0.41	0.12	55.1
Approach		77	1.0	62 N1	1.2	0.035	4.1	NA	0.1	0.5	0.12	0.41	0.12	55.1
West: RoadName														
10	L2	34	1.0	34	1.0	0.022	5.7	LOS A	0.0	0.2	0.11	0.54	0.11	50.3
12	R2	1	1.0	1	1.0	0.022	5.8	LOS A	0.0	0.2	0.11	0.54	0.11	50.3
Approach		35	1.0	35	1.0	0.022	5.7	LOS A	0.0	0.2	0.11	0.54	0.11	50.3
All Vehicles		161	1.0	137 N1	1.2	0.035	3.3	NA	0.1	0.5	0.08	0.33	0.08	54.4

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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 12 [12 PM (Site Folder: Scenario 3)]

Network: N101 [PM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Roundabout

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: RoadName														
1	L2	1	1.0	1	1.0	0.036	5.5	LOS A	0.1	0.5	0.47	0.64	0.47	45.7
2	T1	2	1.0	2	1.0	0.036	5.7	LOS A	0.1	0.5	0.47	0.64	0.47	52.1
3	R2	35	1.0	35	1.0	0.036	10.3	LOS A	0.1	0.5	0.47	0.64	0.47	45.7
Approach		38	1.0	38	1.0	0.036	10.0	LOS A	0.1	0.5	0.47	0.64	0.47	46.2
East: Bradley Street														
4	L2	131	1.0	97	1.4	0.279	4.3	LOS A	0.7	5.0	0.27	0.48	0.27	53.7
5	T1	296	1.0	219	1.4	0.279	4.5	LOS A	0.7	5.0	0.27	0.48	0.27	50.0
6	R2	97	1.0	72	1.4	0.279	9.2	LOS A	0.7	5.0	0.27	0.48	0.27	55.0
Approach		523	1.0	387 N1	1.4	0.279	5.3	LOS A	0.7	5.0	0.27	0.48	0.27	52.5
North: RoadName														
7	L2	67	1.0	67	1.0	0.119	4.5	LOS A	0.2	1.7	0.30	0.56	0.30	48.9
8	T1	14	1.0	14	1.0	0.119	4.8	LOS A	0.2	1.7	0.30	0.56	0.30	54.3
9	R2	66	1.0	66	1.0	0.119	9.4	LOS A	0.2	1.7	0.30	0.56	0.30	48.9
Approach		147	1.0	147	1.0	0.119	6.7	LOS A	0.2	1.7	0.30	0.56	0.30	49.7
West: Bradley Street														
10	L2	16	1.0	15	1.1	0.090	4.4	LOS A	0.2	1.3	0.26	0.43	0.26	55.4
11	T1	105	1.0	98	1.1	0.090	4.6	LOS A	0.2	1.3	0.26	0.43	0.26	53.8
12	R2	1	1.0	1	1.1	0.090	9.2	LOS A	0.2	1.3	0.26	0.43	0.26	56.5
Approach		122	1.0	114 N1	1.1	0.090	4.6	LOS A	0.2	1.3	0.26	0.43	0.26	54.1
All Vehicles		831	1.0	686 N1	1.2	0.279	5.8	LOS A	0.7	5.0	0.29	0.50	0.29	52.0

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.
Roundabout Capacity Model: SIDRA Standard.
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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 13v [13 PM (Site Folder: Scenario 3)]

Network: N101 [PM (Network Folder: Scenario 3 (2036+D))]

Site Category: (None)
Roundabout

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: RoadName														
1	L2	73	1.0	54	1.3	0.168	9.0	LOS A	0.6	3.9	0.80	0.72	0.80	49.1
2	T1	14	1.0	10	1.3	0.168	9.2	LOS A	0.6	3.9	0.80	0.72	0.80	53.0
3	R2	87	1.0	65	1.3	0.168	13.9	LOS A	0.6	3.9	0.80	0.72	0.80	49.1
Approach		174	1.0	130 [N1]	1.3	0.168	11.5	LOS A	0.6	3.9	0.80	0.72	0.80	49.5
East: Bradley Street														
4	L2	124	1.0	89	1.4	0.577	5.6	LOS A	2.0	14.3	0.47	0.55	0.47	47.0
5	T1	741	1.0	533	1.4	0.577	5.8	LOS A	2.0	14.3	0.47	0.55	0.47	47.0
6	R2	121	1.0	87	1.4	0.577	10.5	LOS A	2.0	14.3	0.47	0.55	0.47	53.7
Approach		986	1.0	710 [N1]	1.4	0.577	6.4	LOS A	2.0	14.3	0.47	0.55	0.47	48.4
North: RoadName														
7	L2	1	1.0	1	1.0	0.116	6.3	LOS A	0.3	2.0	0.59	0.63	0.59	47.3
8	T1	76	1.0	76	1.0	0.116	6.5	LOS A	0.3	2.0	0.59	0.63	0.59	47.3
9	R2	33	1.0	33	1.0	0.116	11.2	LOS A	0.3	2.0	0.59	0.63	0.59	47.3
Approach		109	1.0	109	1.0	0.116	7.9	LOS A	0.3	2.0	0.59	0.63	0.59	47.3
West: Bradley Street														
10	L2	37	1.0	36	1.0	0.301	5.0	LOS A	0.9	6.4	0.45	0.52	0.45	53.0
11	T1	267	1.0	261	1.0	0.301	5.2	LOS A	0.9	6.4	0.45	0.52	0.45	48.7
12	R2	72	1.0	70	1.0	0.301	9.9	LOS A	0.9	6.4	0.45	0.52	0.45	48.7
Approach		376	1.0	367 [N1]	1.0	0.301	6.1	LOS A	0.9	6.4	0.45	0.52	0.45	49.4
All Vehicles		1645	1.0	1316 [N1]	1.3	0.577	6.9	LOS A	2.0	14.3	0.51	0.57	0.51	48.8

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.
Roundabout Capacity Model: SIDRA Standard.
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.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 4671 [2036 AM TNR - Bradley (Site Folder: Scenario 4)]

Network: N101 [AM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	56	0.0	56	0.0	0.091	11.2	LOS A	0.8	7.4	0.22	0.49	0.22	58.4
2	T1	2242	17.0	2242	17.0	* 0.786	16.9	LOS B	31.9	253.9	0.64	0.59	0.64	67.7
Approach		2298	16.6	2298	16.6	0.786	16.8	LOS B	31.9	253.9	0.63	0.59	0.63	67.5
East: U-Turn Bay														
6	R2	1	0.0	1	0.0	* 0.013	75.3	LOS F	0.1	0.5	0.97	0.58	0.97	34.9
Approach		1	0.0	1	0.0	0.013	75.3	LOS F	0.1	0.5	0.97	0.58	0.97	34.9
North: The Northern Road														
7	L2	1	0.0	1	0.0	0.001	7.6	LOS A	0.0	0.0	0.00	0.60	0.00	68.5
8	T1	1492	13.9	1492	13.9	0.375	5.5	LOS A	11.0	85.3	0.33	0.29	0.33	73.8
9	R2	320	0.0	320	0.0	0.441	59.6	LOS E	10.2	71.5	0.92	0.80	0.92	42.3
Approach		1813	11.4	1813	11.4	0.441	15.0	LOS B	11.0	85.3	0.43	0.38	0.43	63.1
West: Bradley Street														
10	L2	876	0.0	876	0.0	* 0.778	53.9	LOS D	27.8	194.6	0.98	0.88	1.01	42.7
12	R2	122	0.0	122	0.0	0.240	63.4	LOS E	3.8	26.4	0.93	0.75	0.93	18.6
Approach		998	0.0	998	0.0	0.778	55.1	LOS D	27.8	194.6	0.97	0.87	1.00	40.7
All Vehicles		5109	11.5	5109	11.5	0.786	23.6	LOS B	31.9	253.9	0.63	0.57	0.63	59.1

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: The Northern Road											
P11	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.3	36.5	0.40
P1B	Slip/ Bypass	53	30.0	LOS D	0.1	0.1	0.92	0.92	50.0	26.0	0.52
East: U-Turn Bay											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	88.1	31.0	0.35
North: The Northern Road											
P31	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	97.3	43.0	0.44
P32	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	93.5	38.0	0.41

West: Bradley Street											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	94.3	39.0	0.41
P4B	Slip/ Bypass	53	64.3	LOS F	0.2	0.2	0.96	0.96	87.3	30.0	0.34
All Pedestrians		421	60.0	LOS E	0.2	0.2	0.95	0.95	86.9	34.9	0.40

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: 4850 [2036 AM TNR - Defence (Site Folder: Scenario 4)]

Network: N101 [AM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	51	0.0	51	0.0	0.111	17.1	LOS B	1.4	12.7	0.45	0.57	0.45	62.4
2	T1	1606	15.9	1606	15.9	* 0.912	42.6	LOS D	37.6	295.0	0.87	0.84	0.95	46.4
3	R2	11	0.0	11	0.0	* 0.060	75.4	LOS F	0.7	5.0	1.00	0.69	1.00	36.0
Approach		1667	15.3	1667	15.3	0.912	42.0	LOS C	37.6	295.0	0.86	0.83	0.93	46.5
East: Defence Establishment Orchard Hills														
4	L2	8	0.0	8	0.0	0.028	54.2	LOS D	0.5	3.7	0.84	0.66	0.84	20.5
5	T1	1	0.0	1	0.0	0.028	49.7	LOS D	0.5	3.7	0.84	0.66	0.84	20.5
6	R2	25	0.0	25	0.0	* 0.099	41.4	LOS C	1.2	8.4	0.89	0.69	0.89	23.9
Approach		35	0.0	35	0.0	0.099	44.8	LOS D	1.2	8.4	0.88	0.68	0.88	22.9
North: The Northern Road														
7	L2	49	0.0	49	0.0	0.053	25.2	LOS B	1.7	11.6	0.53	0.71	0.53	47.6
8	T1	1302	15.3	1302	15.3	0.839	42.7	LOS D	41.4	322.8	0.98	0.92	1.03	36.3
9	R2	294	0.0	294	0.0	0.461	64.1	LOS E	9.2	64.7	0.96	0.81	0.96	28.6
Approach		1645	12.1	1645	12.1	0.839	46.0	LOS D	41.4	322.8	0.96	0.89	1.00	35.0
West: Entry Boulevard														
10	L2	677	0.0	677	0.0	0.753	51.5	LOS D	26.0	182.1	0.84	0.99	0.84	25.3
11	T1	1	0.0	1	0.0	* 0.753	25.3	LOS B	26.0	182.1	0.84	0.99	0.84	34.5
12	R2	267	0.0	267	0.0	0.480	41.2	LOS C	13.8	96.6	0.85	0.79	0.85	21.3
Approach		945	0.0	945	0.0	0.753	48.6	LOS D	26.0	182.1	0.84	0.93	0.84	24.0
All Vehicles		4293	10.6	4293	10.6	0.912	45.0	LOS D	41.4	322.8	0.90	0.87	0.94	37.8

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: The Northern Road											
P11	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	93.5	38.0	0.41
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	91.2	35.0	0.38
P1B	Slip/ Bypass	53	31.2	LOS D	0.1	0.1	0.92	0.92	51.2	26.0	0.51
East: Defence Establishment Orchard Hills											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	95.0	40.0	0.42

North: The Northern Road										
P31 Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	94.3	39.0	0.41
P32 Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	91.2	35.0	0.38
West: Entry Boulevard										
P4 Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
All Pedestrians	368	59.5	LOS E	0.2	0.2	0.95	0.95	86.9	35.6	0.41

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: 4851 [2036 AM TNR - Chain-o-Ponds (Site Folder: Scenario 4)]

Network: N101 [AM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	46	0.0	46	0.0	0.124	28.3	LOS B	2.8	26.5	0.66	0.65	0.66	51.6
2	T1	1111	15.8	1111	15.8	* 0.664	40.2	LOS C	24.2	188.9	0.88	0.77	0.88	42.9
Approach		1157	15.1	1157	15.1	0.664	39.7	LOS C	24.2	188.9	0.87	0.76	0.87	43.1
North: The Northern Road														
8	T1	1487	15.3	1487	15.3	0.661	21.7	LOS B	37.6	293.7	0.80	0.73	0.80	65.1
9	R2	161	0.0	161	0.0	0.306	35.1	LOS C	3.5	24.2	0.94	0.77	0.94	47.3
Approach		1648	13.8	1648	13.8	0.661	23.0	LOS B	37.6	293.7	0.81	0.73	0.81	63.8
West: Chain-o-Ponds Road														
10	L2	587	0.0	587	0.0	* 0.667	28.3	LOS B	25.0	174.7	0.69	0.78	0.69	23.2
12	R2	184	0.0	184	0.0	0.327	45.1	LOS D	9.7	67.8	0.82	0.77	0.82	40.9
Approach		772	0.0	772	0.0	0.667	32.3	LOS C	25.0	174.7	0.72	0.78	0.72	30.9
All Vehicles		3577	11.2	3577	11.2	0.667	30.4	LOS C	37.6	293.7	0.81	0.75	0.81	53.0

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: The Northern Road											
P11	Stage 1	53	29.4	LOS C	0.1	0.1	0.92	0.92	55.2	33.5	0.61
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P1B	Slip/ Bypass	53	30.9	LOS D	0.1	0.1	0.92	0.92	50.9	26.0	0.51
North: The Northern Road											
P31	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P32	Stage 2	53	29.4	LOS C	0.1	0.1	0.92	0.92	54.1	32.0	0.59
West: Chain-o-Ponds Road											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
All Pedestrians		316	47.1	LOS E	0.2	0.2	0.94	0.94	72.7	33.3	0.46

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: 6 [6 AM (Site Folder: Scenario 4)]

Network: N101 [AM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

Site Category: (None)
Give-Way (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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Chain o Ponds Road														
5	T1	105	1.0	105	1.0	0.054	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	47	1.0	47	1.0	0.026	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	51.8
Approach		153	1.0	153	1.0	0.054	1.7	NA	0.0	0.0	0.00	0.19	0.00	57.2
North: RoadName														
7	L2	194	1.0	194	1.0	0.140	5.7	LOS A	0.6	4.3	0.12	0.55	0.12	50.2
9	R2	16	1.0	16	1.0	0.140	6.7	LOS A	0.6	4.3	0.12	0.55	0.12	52.7
Approach		209	1.0	209	1.0	0.140	5.8	LOS A	0.6	4.3	0.12	0.55	0.12	50.5
West: Chain o Ponds Road														
10	L2	5	1.0	5	1.0	0.042	5.7	LOS A	0.2	1.4	0.16	0.11	0.16	57.1
11	T1	43	1.0	43	1.0	0.042	0.3	LOS A	0.2	1.4	0.16	0.11	0.16	57.5
Approach		48	1.0	48	1.0	0.042	0.9	NA	0.2	1.4	0.16	0.11	0.16	57.4
All Vehicles		411	1.0	411	1.0	0.140	3.7	NA	0.6	4.3	0.08	0.36	0.08	54.2

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: 7 [7 AM (Site Folder: Scenario 4)]

Network: N101 [AM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

Site Category: (None)
Give-Way (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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Chain o Ponds Road														
5	T1	74	1.0	74	1.0	0.038	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	49	1.0	49	1.0	0.027	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	51.9
Approach		123	1.0	123	1.0	0.038	2.2	NA	0.0	0.0	0.00	0.24	0.00	56.4
North: RoadName														
7	L2	193	1.0	193	1.0	0.245	6.4	LOS A	1.1	7.8	0.39	0.63	0.39	37.4
9	R2	80	1.0	80	1.0	0.245	8.1	LOS A	1.1	7.8	0.39	0.63	0.39	37.4
Approach		273	1.0	273	1.0	0.245	6.9	LOS A	1.1	7.8	0.39	0.63	0.39	37.4
West: Chain o Ponds Road														
10	L2	21	1.0	21	1.0	0.210	5.8	LOS A	1.1	7.9	0.20	0.12	0.20	56.2
11	T1	218	1.0	218	1.0	0.210	0.4	LOS A	1.1	7.9	0.20	0.12	0.20	56.2
Approach		239	1.0	239	1.0	0.210	0.9	NA	1.1	7.9	0.20	0.12	0.20	56.2
All Vehicles		635	1.0	635	1.0	0.245	3.7	NA	1.1	7.9	0.24	0.36	0.24	49.8

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: 8 [8 AM (Site Folder: Scenario 4)]

Network: N101 [AM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

Site Category: (None)
Roundabout

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Chain o Ponds Road														
5	T1	98	1.0	98	1.0	0.146	4.5	LOS A	0.7	6.0	0.11	0.55	0.11	43.8
6	R2	93	1.0	93	1.0	0.146	8.5	LOS A	0.7	6.0	0.11	0.55	0.11	43.8
6u	U	11	100.0	11	100.0	0.146	12.2	LOS A	0.7	6.0	0.11	0.55	0.11	43.8
Approach		201	6.2	201	6.2	0.146	6.8	LOS A	0.7	6.0	0.11	0.55	0.11	43.8
North: RoadName														
7	L2	329	1.0	329	1.0	0.384	7.1	LOS A	2.5	17.9	0.66	0.73	0.66	46.1
9	R2	27	1.0	27	1.0	0.384	11.4	LOS A	2.5	17.9	0.66	0.73	0.66	46.1
Approach		357	1.0	357	1.0	0.384	7.5	LOS A	2.5	17.9	0.66	0.73	0.66	46.1
West: Chain o Ponds Road														
10	L2	19	1.0	19	1.0	0.325	4.9	LOS A	2.4	17.0	0.34	0.46	0.34	51.1
11	T1	406	1.0	406	1.0	0.325	5.2	LOS A	2.4	17.0	0.34	0.46	0.34	51.1
Approach		425	1.0	425	1.0	0.325	5.2	LOS A	2.4	17.0	0.34	0.46	0.34	51.1
All Vehicles		983	2.1	983	2.1	0.384	6.3	LOS A	2.5	17.9	0.41	0.58	0.41	48.3

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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: 9 [9 AM (Site Folder: Scenario 4)]

Network: N101 [AM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

Site Category: (None)
Give-Way (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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
2	T1	29	1.0	29	1.0	0.033	0.1	LOS A	0.1	1.0	0.13	0.29	0.13	46.6
3	R2	31	1.0	31	1.0	0.033	5.6	LOS A	0.1	1.0	0.13	0.29	0.13	46.6
Approach		60	1.0	60	1.0	0.033	2.9	NA	0.1	1.0	0.13	0.29	0.13	46.6
East: RoadName														
4	L2	26	1.0	26	1.0	0.018	5.7	LOS A	0.1	0.5	0.13	0.54	0.13	50.0
6	R2	1	1.0	1	1.0	0.018	5.8	LOS A	0.1	0.5	0.13	0.54	0.13	50.0
Approach		27	1.0	27	1.0	0.018	5.7	LOS A	0.1	0.5	0.13	0.54	0.13	50.0
North: RoadName														
7	L2	4	1.0	4	1.0	0.029	5.6	LOS A	0.0	0.0	0.00	0.05	0.00	57.7
8	T1	52	1.0	52	1.0	0.029	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	57.7
Approach		56	1.0	56	1.0	0.029	0.4	NA	0.0	0.0	0.00	0.05	0.00	57.7
All Vehicles		143	1.0	143	1.0	0.033	2.5	NA	0.1	1.0	0.08	0.24	0.08	50.7

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: 10 [10 AM (Site Folder: Scenario 4)]

Network: N101 [AM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

Site Category: (None)
Give-Way (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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
1	L2	1	1.0	1	1.0	0.058	5.6	LOS A	0.2	1.3	0.19	0.58	0.19	48.0
3	R2	66	1.0	66	1.0	0.058	5.9	LOS A	0.2	1.3	0.19	0.58	0.19	53.7
Approach		67	1.0	67	1.0	0.058	5.9	LOS A	0.2	1.3	0.19	0.58	0.19	53.7
East: RoadName														
4	L2	84	1.0	84	1.0	0.063	5.6	LOS A	0.0	0.0	0.00	0.42	0.00	55.6
5	T1	34	1.0	34	1.0	0.063	0.0	LOS A	0.0	0.0	0.00	0.42	0.00	55.6
Approach		118	1.0	118	1.0	0.063	4.0	NA	0.0	0.0	0.00	0.42	0.00	55.6
West: RoadName														
11	T1	42	1.0	42	1.0	0.026	0.1	LOS A	0.0	0.3	0.07	0.08	0.07	59.3
12	R2	6	1.0	6	1.0	0.026	5.8	LOS A	0.0	0.3	0.07	0.08	0.07	58.1
Approach		48	1.0	48	1.0	0.026	0.8	NA	0.0	0.3	0.07	0.08	0.07	59.2
All Vehicles		234	1.0	234	1.0	0.063	3.9	NA	0.2	1.3	0.07	0.39	0.07	55.8

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: 11 [11 AM (Site Folder: Scenario 4)]

Network: N101 [AM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

New Site
Site Category: (None)
Give-Way (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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
1	L2	1	1.0	1	1.0	0.016	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	57.2
2	T1	29	1.0	29	1.0	0.016	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	58.9
Approach		31	1.0	31	1.0	0.016	0.2	NA	0.0	0.0	0.00	0.02	0.00	58.7
North: RoadName														
8	T1	52	1.0	52	1.0	0.045	0.0	LOS A	0.2	1.1	0.07	0.22	0.07	57.1
9	R2	32	1.0	32	1.0	0.045	5.5	LOS A	0.2	1.1	0.07	0.22	0.07	56.5
Approach		83	1.0	83	1.0	0.045	2.1	NA	0.2	1.1	0.07	0.22	0.07	56.8
West: RoadName														
10	L2	53	1.0	53	1.0	0.037	5.6	LOS A	0.1	1.0	0.09	0.55	0.09	50.4
12	R2	4	1.0	4	1.0	0.037	5.8	LOS A	0.1	1.0	0.09	0.55	0.09	50.4
Approach		57	1.0	57	1.0	0.037	5.6	LOS A	0.1	1.0	0.09	0.55	0.09	50.4
All Vehicles		171	1.0	171	1.0	0.045	3.0	NA	0.2	1.1	0.07	0.30	0.07	55.1

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: 12 [12 AM (Site Folder: Scenario 4)]

Network: N101 [AM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh.	Dist]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: RoadName														
1	L2	1	1.0	1	1.0	0.122	5.1	LOS A	0.6	4.4	0.36	0.63	0.36	46.4
2	T1	14	1.0	14	1.0	0.122	5.4	LOS A	0.6	4.4	0.36	0.63	0.36	52.2
3	R2	125	1.0	125	1.0	0.122	9.4	LOS A	0.6	4.4	0.36	0.63	0.36	46.4
Approach		140	1.0	140	1.0	0.122	9.0	LOS A	0.6	4.4	0.36	0.63	0.36	47.3
East: Bradley Street														
4	L2	32	1.0	32	1.0	0.135	4.3	LOS A	0.8	5.6	0.16	0.52	0.16	53.2
5	T1	93	1.0	93	1.0	0.135	4.6	LOS A	0.8	5.6	0.16	0.52	0.16	49.6
6	R2	67	1.0	67	1.0	0.135	8.6	LOS A	0.8	5.6	0.16	0.52	0.16	54.1
Approach		192	1.0	192	1.0	0.135	6.0	LOS A	0.8	5.6	0.16	0.52	0.16	52.4
North: Darug North														
7	L2	100	1.0	100	1.0	0.143	6.4	LOS A	0.8	5.5	0.55	0.66	0.55	48.5
8	T1	5	1.0	5	1.0	0.143	6.6	LOS A	0.8	5.5	0.55	0.66	0.55	53.7
9	R2	31	1.0	31	1.0	0.143	10.7	LOS A	0.8	5.5	0.55	0.66	0.55	48.5
Approach		136	1.0	136	1.0	0.143	7.3	LOS A	0.8	5.5	0.55	0.66	0.55	48.9
West: Bradley Street														
10	L2	66	1.0	66	1.0	0.304	5.4	LOS A	1.9	13.1	0.45	0.54	0.45	54.4
11	T1	282	1.0	282	1.0	0.304	5.7	LOS A	1.9	13.1	0.45	0.54	0.45	52.7
12	R2	1	1.0	1	1.0	0.304	9.7	LOS A	1.9	13.1	0.45	0.54	0.45	55.2
Approach		349	1.0	349	1.0	0.304	5.7	LOS A	1.9	13.1	0.45	0.54	0.45	53.1
All Vehicles		817	1.0	817	1.0	0.304	6.6	LOS A	1.9	13.1	0.38	0.57	0.38	51.6

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.
Roundabout Capacity Model: SIDRA Standard.
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: 13v [13 AM (Site Folder: Scenario 4)]

Network: N101 [AM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

Site Category: (None)
Roundabout

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
1	L2	71	1.0	71	1.0	0.284	6.2	LOS A	2.1	15.1	0.57	0.63	0.57	51.2
2	T1	82	1.0	82	1.0	0.284	6.5	LOS A	2.1	15.1	0.57	0.63	0.57	54.3
3	R2	144	1.0	144	1.0	0.284	10.5	LOS A	2.1	15.1	0.57	0.63	0.57	51.2
Approach		297	1.0	297	1.0	0.284	8.4	LOS A	2.1	15.1	0.57	0.63	0.57	52.3
East: Entry Boulevard														
4	L2	89	1.0	89	1.0	0.285	5.3	LOS A	1.8	12.4	0.35	0.52	0.35	54.4
5	T1	218	1.0	218	1.0	0.285	5.6	LOS A	1.8	12.4	0.35	0.52	0.35	47.9
6	R2	27	1.0	27	1.0	0.285	9.6	LOS A	1.8	12.4	0.35	0.52	0.35	53.7
Approach		335	1.0	335	1.0	0.285	5.8	LOS A	1.8	12.4	0.35	0.52	0.35	51.5
North: Riverflat														
7	L2	1	1.0	1	1.0	0.152	11.9	LOS A	1.1	7.6	0.91	0.86	0.91	41.8
8	T1	40	1.0	40	1.0	0.152	12.2	LOS A	1.1	7.6	0.91	0.86	0.91	51.3
9	R2	31	1.0	31	1.0	0.152	16.2	LOS B	1.1	7.6	0.91	0.86	0.91	41.8
Approach		72	1.0	72	1.0	0.152	13.9	LOS A	1.1	7.6	0.91	0.86	0.91	48.7
West: Bradley Street														
10	L2	24	1.0	24	1.0	0.720	8.7	LOS A	9.7	68.6	0.86	0.76	0.96	50.9
11	T1	673	1.0	673	1.0	0.720	9.0	LOS A	9.7	68.6	0.86	0.76	0.96	45.8
12	R2	87	1.0	87	1.0	0.720	13.0	LOS A	9.7	68.6	0.86	0.76	0.96	53.5
Approach		784	1.0	784	1.0	0.720	9.4	LOS A	9.7	68.6	0.86	0.76	0.96	47.7
All Vehicles		1487	1.0	1487	1.0	0.720	8.6	LOS A	9.7	68.6	0.69	0.69	0.74	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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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: 4671 [2036 PM TNR - Bradley (Site Folder: Scenario 4)]

Network: N101 [PM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	171	0.0	171	0.0	0.188	14.3	LOS A	3.8	29.8	0.38	0.64	0.38	55.9
2	T1	1944	17.0	1944	17.0	* 0.824	41.0	LOS C	40.9	324.9	0.97	0.90	0.99	55.6
Approach		2115	15.6	2115	15.6	0.824	38.8	LOS C	40.9	324.9	0.92	0.88	0.94	55.6
East: U-Turn Bay														
6	R2	1	0.0	1	0.0	0.004	59.7	LOS E	0.1	0.4	0.88	0.59	0.88	39.2
Approach		1	0.0	1	0.0	0.004	59.7	LOS E	0.1	0.4	0.88	0.59	0.88	39.2
North: The Northern Road														
7	L2	1	0.0	1	0.0	0.001	7.6	LOS A	0.0	0.0	0.00	0.60	0.00	68.5
8	T1	2765	14.7	2765	14.7	0.709	42.4	LOS C	32.8	256.7	0.50	0.47	0.50	70.9
9	R2	784	0.0	784	0.0	* 0.804	59.4	LOS E	27.7	193.8	0.98	0.88	1.01	42.5
Approach		3551	11.5	3551	11.5	0.804	46.2	LOS D	32.8	256.7	0.61	0.56	0.61	59.7
West: Bradley Street														
10	L2	406	0.0	406	0.0	0.389	48.3	LOS D	11.2	78.2	0.86	0.79	0.86	44.4
12	R2	56	0.0	56	0.0	* 0.110	62.0	LOS E	1.7	11.8	0.91	0.71	0.91	18.9
Approach		462	0.0	462	0.0	0.389	49.9	LOS D	11.2	78.2	0.86	0.78	0.86	42.2
All Vehicles		6128	12.0	6128	12.0	0.824	43.9	LOS D	40.9	324.9	0.74	0.69	0.75	56.2

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: The Northern Road											
P11	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.3	36.5	0.40
P1B	Slip/ Bypass	53	29.3	LOS C	0.1	0.1	0.92	0.92	49.3	26.0	0.53
East: U-Turn Bay											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	88.1	31.0	0.35
North: The Northern Road											
P31	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	97.3	43.0	0.44
P32	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	93.5	38.0	0.41

West: Bradley Street											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	94.3	39.0	0.41
P4B	Slip/ Bypass	53	64.3	LOS F	0.2	0.2	0.96	0.96	87.3	30.0	0.34
All Pedestrians		421	59.9	LOS E	0.2	0.2	0.95	0.95	86.8	34.9	0.40

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: 4850 [2036 PM TNR - Defence (Site Folder: Scenario 4)]

Network: N101 [PM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	156	0.0	156	0.0	0.173	13.3	LOS A	4.9	39.6	0.48	0.67	0.48	64.6
2	T1	1894	15.7	1894	15.7	0.909	58.2	LOS E	51.2	402.3	0.99	0.95	1.05	37.7
3	R2	2	0.0	2	0.0	0.012	62.5	LOS E	0.1	0.8	0.83	0.62	0.83	39.1
Approach		2052	14.5	2052	14.5	0.909	54.8	LOS D	51.2	402.3	0.95	0.93	1.01	38.8
East: Defence Establishment Orchard Hills														
4	L2	16	0.0	16	0.0	0.043	51.0	LOS D	0.9	6.3	0.82	0.68	0.82	21.2
5	T1	1	0.0	1	0.0	0.043	46.5	LOS D	0.9	6.3	0.82	0.68	0.82	21.2
6	R2	55	0.0	55	0.0	0.207	58.1	LOS E	3.3	23.2	0.90	0.72	0.90	19.8
Approach		72	0.0	72	0.0	0.207	56.3	LOS D	3.3	23.2	0.88	0.71	0.88	20.1
North: The Northern Road														
7	L2	18	0.0	18	0.0	0.015	15.2	LOS B	0.4	2.8	0.35	0.67	0.35	53.0
8	T1	1940	15.1	1940	15.1	* 0.929	31.9	LOS C	62.4	487.7	0.87	0.89	0.97	42.2
9	R2	832	0.0	832	0.0	0.922	81.5	LOS F	33.3	233.0	1.00	0.97	1.28	24.4
Approach		2789	10.5	2789	10.5	0.929	46.6	LOS D	62.4	487.7	0.91	0.91	1.06	34.7
West: Entry Boulevard														
10	L2	260	0.0	260	0.0	0.358	36.3	LOS C	10.9	76.6	0.68	0.82	0.68	25.2
11	T1	1	0.0	1	0.0	* 0.358	25.5	LOS B	10.9	76.6	0.68	0.82	0.68	34.5
12	R2	127	0.0	127	0.0	* 0.502	62.9	LOS E	8.0	55.9	0.96	0.87	0.96	16.4
Approach		388	0.0	388	0.0	0.502	45.0	LOS D	10.9	76.6	0.77	0.83	0.77	21.5
All Vehicles		5301	11.1	5301	11.1	0.929	49.8	LOS D	62.4	487.7	0.91	0.91	1.02	35.5

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: The Northern Road											
P11	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	93.5	38.0	0.41
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	91.2	35.0	0.38
P1B	Slip/ Bypass	53	29.4	LOS C	0.1	0.1	0.92	0.92	49.4	26.0	0.53
East: Defence Establishment Orchard Hills											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	95.0	40.0	0.42

North: The Northern Road										
P31 Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	94.3	39.0	0.41
P32 Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	91.2	35.0	0.38
West: Entry Boulevard										
P4 Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
All Pedestrians	368	59.3	LOS E	0.2	0.2	0.95	0.95	86.7	35.6	0.41

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: 4851 [2036 PM TNR - Chain-o-Ponds (Site Folder: Scenario 4)]

Network: N101 [PM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: The Northern Road														
1	L2	122	0.0	122	0.0	0.148	15.4	LOS B	3.3	27.2	0.42	0.63	0.42	62.5
2	T1	1905	14.8	1905	14.8	* 0.854	34.2	LOS C	47.5	370.4	0.86	0.82	0.90	46.3
Approach		2027	13.9	2027	13.9	0.854	33.1	LOS C	47.5	370.4	0.84	0.81	0.87	47.0
North: The Northern Road														
8	T1	1376	15.4	1376	15.4	0.460	0.9	LOS A	3.2	25.1	0.07	0.06	0.07	79.3
9	R2	699	0.0	699	0.0	* 0.851	63.4	LOS E	31.1	217.5	0.99	0.88	1.04	35.6
Approach		2075	10.2	2075	10.2	0.851	21.9	LOS B	31.1	217.5	0.38	0.34	0.40	62.9
West: Chain-o-Ponds Road														
10	L2	189	0.0	189	0.0	0.240	37.1	LOS C	8.2	57.3	0.68	0.74	0.68	20.1
12	R2	57	0.0	57	0.0	* 0.303	69.1	LOS E	3.7	25.9	0.97	0.75	0.97	33.9
Approach		246	0.0	246	0.0	0.303	44.5	LOS D	8.2	57.3	0.75	0.74	0.75	26.1
All Vehicles		4348	11.4	4348	11.4	0.854	28.4	LOS B	47.5	370.4	0.61	0.58	0.64	54.7

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.
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: The Northern Road											
P11	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	90.0	33.5	0.37
P12	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P1B	Slip/ Bypass	53	29.5	LOS C	0.1	0.1	0.92	0.92	49.5	26.0	0.53
North: The Northern Road											
P31	Stage 1	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
P32	Stage 2	53	64.3	LOS F	0.2	0.2	0.96	0.96	88.9	32.0	0.36
West: Chain-o-Ponds Road											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	92.0	36.0	0.39
All Pedestrians		316	58.5	LOS E	0.2	0.2	0.95	0.95	84.1	33.3	0.40

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: 6 [6 PM (Site Folder: Scenario 4)]

Network: N101 [PM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

Site Category: (None)
Give-Way (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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Chain o Ponds Road														
5	T1	34	1.0	34	1.0	0.017	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	208	1.0	208	1.0	0.113	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	51.8
Approach		242	1.0	242	1.0	0.113	4.7	NA	0.0	0.0	0.00	0.52	0.00	52.8
North: RoadName														
7	L2	56	1.0	56	1.0	0.045	5.8	LOS A	0.2	1.3	0.18	0.55	0.18	49.9
9	R2	6	1.0	6	1.0	0.045	7.5	LOS A	0.2	1.3	0.18	0.55	0.18	52.5
Approach		62	1.0	62	1.0	0.045	6.0	LOS A	0.2	1.3	0.18	0.55	0.18	50.3
West: Chain o Ponds Road														
10	L2	15	1.0	15	1.0	0.114	6.5	LOS A	0.5	3.7	0.40	0.31	0.40	56.0
11	T1	91	1.0	91	1.0	0.114	1.7	LOS A	0.5	3.7	0.40	0.31	0.40	55.4
Approach		105	1.0	105	1.0	0.114	2.3	NA	0.5	3.7	0.40	0.31	0.40	55.6
All Vehicles		409	1.0	409	1.0	0.114	4.3	NA	0.5	3.7	0.13	0.47	0.13	53.0

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.
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: 7 [7 PM (Site Folder: Scenario 4)]

Network: N101 [PM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

Site Category: (None)
Give-Way (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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Chain o Ponds Road														
5	T1	222	1.0	222	1.0	0.115	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	218	1.0	218	1.0	0.118	5.5	LOS A	0.0	0.0	0.00	0.60	0.00	51.8
Approach		440	1.0	440	1.0	0.118	2.7	NA	0.0	0.0	0.00	0.30	0.00	55.6
North: RoadName														
7	L2	54	1.0	54	1.0	0.071	5.8	LOS A	0.3	2.0	0.17	0.57	0.17	37.9
9	R2	22	1.0	22	1.0	0.071	9.4	LOS A	0.3	2.0	0.17	0.57	0.17	37.9
Approach		76	1.0	76	1.0	0.071	6.8	LOS A	0.3	2.0	0.17	0.57	0.17	37.9
West: Chain o Ponds Road														
10	L2	75	1.0	75	1.0	0.146	6.5	LOS A	0.7	4.6	0.39	0.44	0.39	49.2
11	T1	72	1.0	72	1.0	0.146	1.8	LOS A	0.7	4.6	0.39	0.44	0.39	49.2
Approach		146	1.0	146	1.0	0.146	4.2	NA	0.7	4.6	0.39	0.44	0.39	49.2
All Vehicles		662	1.0	662	1.0	0.146	3.5	NA	0.7	4.6	0.11	0.36	0.11	53.4

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: 8 [8 PM (Site Folder: Scenario 4)]

Network: N101 [PM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

Site Category: (None)
Roundabout

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Chain o Ponds Road														
5	T1	434	1.0	434	1.0	0.483	4.5	LOS A	3.8	27.7	0.07	0.54	0.07	44.7
6	R2	344	1.0	344	1.0	0.483	8.5	LOS A	3.8	27.7	0.07	0.54	0.07	44.7
6u	U	11	100.0	11	100.0	0.483	11.9	LOS A	3.8	27.7	0.07	0.54	0.07	44.7
Approach		788	2.3	788	2.3	0.483	6.3	LOS A	3.8	27.7	0.07	0.54	0.07	44.7
North: RoadName														
7	L2	108	1.0	108	1.0	0.100	4.9	LOS A	0.6	3.9	0.33	0.53	0.33	48.7
9	R2	9	1.0	9	1.0	0.100	9.1	LOS A	0.6	3.9	0.33	0.53	0.33	48.7
Approach		118	1.0	118	1.0	0.100	5.2	LOS A	0.6	3.9	0.33	0.53	0.33	48.7
West: Chain o Ponds Road														
10	L2	16	1.0	16	1.0	0.125	6.4	LOS A	0.9	6.2	0.52	0.53	0.52	49.9
11	T1	115	1.0	115	1.0	0.125	6.7	LOS A	0.9	6.2	0.52	0.53	0.52	49.9
Approach		131	1.0	131	1.0	0.125	6.7	LOS A	0.9	6.2	0.52	0.53	0.52	49.9
All Vehicles		1037	2.0	1037	2.0	0.483	6.2	LOS A	3.8	27.7	0.16	0.54	0.16	46.2

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.
Roundabout Capacity Model: SIDRA Standard.
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: 9 [9 PM (Site Folder: Scenario 4)]

Network: N101 [PM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

Site Category: (None)
Give-Way (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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
2	T1	48	1.0	48	1.0	0.035	0.0	LOS A	0.1	0.6	0.04	0.15	0.04	52.6
3	R2	17	1.0	17	1.0	0.035	5.5	LOS A	0.1	0.6	0.04	0.15	0.04	52.6
Approach		65	1.0	65	1.0	0.035	1.4	NA	0.1	0.6	0.04	0.15	0.04	52.6
East: RoadName														
4	L2	118	1.0	118	1.0	0.075	5.6	LOS A	0.3	2.2	0.08	0.55	0.08	50.3
6	R2	1	1.0	1	1.0	0.075	5.8	LOS A	0.3	2.2	0.08	0.55	0.08	50.3
Approach		119	1.0	119	1.0	0.075	5.6	LOS A	0.3	2.2	0.08	0.55	0.08	50.3
North: RoadName														
7	L2	1	1.0	1	1.0	0.011	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	58.5
8	T1	21	1.0	21	1.0	0.011	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	58.5
Approach		22	1.0	22	1.0	0.011	0.3	NA	0.0	0.0	0.00	0.03	0.00	58.5
All Vehicles		206	1.0	206	1.0	0.075	3.7	NA	0.3	2.2	0.06	0.37	0.06	51.0

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.
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: 10 [10 PM (Site Folder: Scenario 4)]

Network: N101 [PM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

Site Category: (None)
Give-Way (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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
1	L2	112	1.0	112	1.0	0.296	5.6	LOS A	1.3	9.2	0.13	0.57	0.13	48.3
3	R2	275	1.0	275	1.0	0.296	5.8	LOS A	1.3	9.2	0.13	0.57	0.13	53.9
Approach		386	1.0	386	1.0	0.296	5.7	LOS A	1.3	9.2	0.13	0.57	0.13	53.2
East: RoadName														
4	L2	60	1.0	60	1.0	0.045	5.6	LOS A	0.0	0.0	0.00	0.42	0.00	55.6
5	T1	24	1.0	24	1.0	0.045	0.0	LOS A	0.0	0.0	0.00	0.42	0.00	55.6
Approach		84	1.0	84	1.0	0.045	4.0	NA	0.0	0.0	0.00	0.42	0.00	55.6
West: RoadName														
11	T1	6	1.0	6	1.0	0.005	0.1	LOS A	0.0	0.1	0.09	0.15	0.09	58.7
12	R2	2	1.0	2	1.0	0.005	5.7	LOS A	0.0	0.1	0.09	0.15	0.09	56.7
Approach		8	1.0	8	1.0	0.005	1.5	NA	0.0	0.1	0.09	0.15	0.09	58.5
All Vehicles		479	1.0	479	1.0	0.296	5.3	NA	1.3	9.2	0.11	0.53	0.11	53.6

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.
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: 11 [11 PM (Site Folder: Scenario 4)]

Network: N101 [PM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

New Site
Site Category: (None)
Give-Way (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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
1	L2	1	1.0	1	1.0	0.026	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	57.3
2	T1	48	1.0	48	1.0	0.026	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.3
Approach		49	1.0	49	1.0	0.026	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.2
North: RoadName														
8	T1	21	1.0	21	1.0	0.044	0.1	LOS A	0.2	1.4	0.13	0.41	0.13	54.8
9	R2	56	1.0	56	1.0	0.044	5.6	LOS A	0.2	1.4	0.13	0.41	0.13	55.1
Approach		77	1.0	77	1.0	0.044	4.1	NA	0.2	1.4	0.13	0.41	0.13	55.0
West: RoadName														
10	L2	34	1.0	34	1.0	0.022	5.7	LOS A	0.1	0.6	0.12	0.54	0.12	50.2
12	R2	1	1.0	1	1.0	0.022	5.9	LOS A	0.1	0.6	0.12	0.54	0.12	50.2
Approach		35	1.0	35	1.0	0.022	5.7	LOS A	0.1	0.6	0.12	0.54	0.12	50.2
All Vehicles		161	1.0	161	1.0	0.044	3.2	NA	0.2	1.4	0.09	0.32	0.09	54.5

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: 12 [12 PM (Site Folder: Scenario 4)]

Network: N101 [PM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

Site Category: (None)
Roundabout

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
1	L2	1	1.0	1	1.0	0.041	6.4	LOS A	0.2	1.5	0.54	0.67	0.54	45.4
2	T1	2	1.0	2	1.0	0.041	6.7	LOS A	0.2	1.5	0.54	0.67	0.54	51.5
3	R2	35	1.0	35	1.0	0.041	10.7	LOS A	0.2	1.5	0.54	0.67	0.54	45.4
Approach		38	1.0	38	1.0	0.041	10.4	LOS A	0.2	1.5	0.54	0.67	0.54	46.0
East: Bradley Street														
4	L2	131	1.0	131	1.0	0.379	4.7	LOS A	2.7	18.9	0.30	0.50	0.30	53.2
5	T1	296	1.0	296	1.0	0.379	4.9	LOS A	2.7	18.9	0.30	0.50	0.30	49.6
6	R2	97	1.0	97	1.0	0.379	8.9	LOS A	2.7	18.9	0.30	0.50	0.30	54.1
Approach		523	1.0	523	1.0	0.379	5.6	LOS A	2.7	18.9	0.30	0.50	0.30	51.9
North: Darug North														
7	L2	67	1.0	67	1.0	0.124	4.9	LOS A	0.6	4.5	0.32	0.57	0.32	48.7
8	T1	14	1.0	14	1.0	0.124	5.2	LOS A	0.6	4.5	0.32	0.57	0.32	53.7
9	R2	66	1.0	66	1.0	0.124	9.2	LOS A	0.6	4.5	0.32	0.57	0.32	48.7
Approach		147	1.0	147	1.0	0.124	6.8	LOS A	0.6	4.5	0.32	0.57	0.32	49.5
West: Bradley Street														
10	L2	16	1.0	16	1.0	0.102	4.8	LOS A	0.5	3.7	0.30	0.47	0.30	54.9
11	T1	105	1.0	105	1.0	0.102	5.1	LOS A	0.5	3.7	0.30	0.47	0.30	53.3
12	R2	1	1.0	1	1.0	0.102	9.1	LOS A	0.5	3.7	0.30	0.47	0.30	55.6
Approach		122	1.0	122	1.0	0.102	5.1	LOS A	0.5	3.7	0.30	0.47	0.30	53.6
All Vehicles		831	1.0	831	1.0	0.379	6.0	LOS A	2.7	18.9	0.32	0.52	0.32	51.6

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.
Roundabout Capacity Model: SIDRA Standard.
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: 13v [13 PM (Site Folder: Scenario 4)]

Network: N101 [PM (Network Folder: Scenario 4 (2036+D w-Upgrades))]

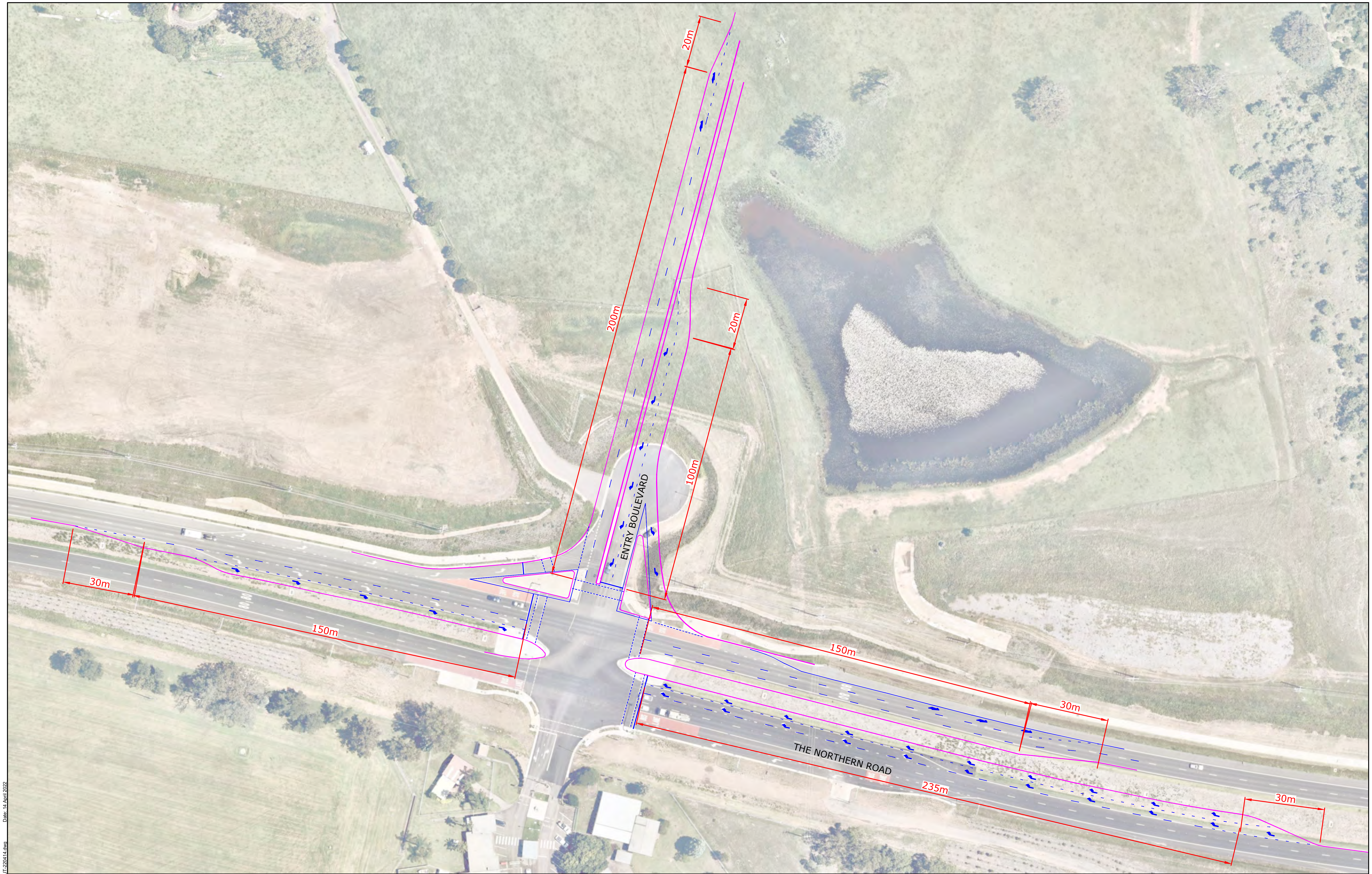
Site Category: (None)
Roundabout

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	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: RoadName														
1	L2	73	1.0	73	1.0	0.331	13.5	LOS A	3.0	21.4	1.00	0.87	1.00	45.9
2	T1	14	1.0	14	1.0	0.331	13.8	LOS A	3.0	21.4	1.00	0.87	1.00	50.3
3	R2	87	1.0	87	1.0	0.331	17.8	LOS B	3.0	21.4	1.00	0.87	1.00	45.9
Approach		174	1.0	174	1.0	0.331	15.7	LOS B	3.0	21.4	1.00	0.87	1.00	46.4
East: Entry Boulevard														
4	L2	124	1.0	124	1.0	0.810	8.0	LOS A	12.6	89.1	0.66	0.64	0.72	52.9
5	T1	741	1.0	741	1.0	0.810	8.3	LOS A	12.6	89.1	0.66	0.64	0.72	44.7
6	R2	121	1.0	121	1.0	0.810	12.3	LOS A	12.6	89.1	0.66	0.64	0.72	51.7
Approach		986	1.0	986	1.0	0.810	8.8	LOS A	12.6	89.1	0.66	0.64	0.72	47.9
North: Riverflat														
7	L2	1	1.0	1	1.0	0.125	6.9	LOS A	0.8	5.4	0.62	0.66	0.62	47.0
8	T1	76	1.0	76	1.0	0.125	7.2	LOS A	0.8	5.4	0.62	0.66	0.62	54.2
9	R2	33	1.0	33	1.0	0.125	11.2	LOS A	0.8	5.4	0.62	0.66	0.62	47.0
Approach		109	1.0	109	1.0	0.125	8.4	LOS A	0.8	5.4	0.62	0.66	0.62	53.0
West: Bradley Street														
10	L2	37	1.0	37	1.0	0.344	5.8	LOS A	2.6	18.4	0.55	0.59	0.55	52.2
11	T1	267	1.0	267	1.0	0.344	6.2	LOS A	2.6	18.4	0.55	0.59	0.55	47.9
12	R2	72	1.0	72	1.0	0.344	10.2	LOS A	2.6	18.4	0.55	0.59	0.55	54.6
Approach		376	1.0	376	1.0	0.344	6.9	LOS A	2.6	18.4	0.55	0.59	0.55	50.6
All Vehicles		1645	1.0	1645	1.0	0.810	9.1	LOS A	12.6	89.1	0.67	0.66	0.70	48.8

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.
Roundabout Capacity Model: SIDRA Standard.
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.

Appendix B

Recommended Intersection Upgrades



REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	KM	DL	WJ	14/04/22

ttpp transport planning

PROJECT
MULGOA RESIDENTIAL DEVELOPMENT

TITLE
INTERSECTION UPGRADES
THE NORTHERN ROAD - ENTRY BOULEVARD - DEFENCE ESTABLISHMENT ORCHARD HILLS INTERSECTION

DWG No. 17285CAD008
FIGURE 2

DATE STAMP 14 APRIL 2022

PROJECT No.	SCALE	REV.
17285	1:1300 @A3	A

Filename: 17285CAD008-ROAD LAYOUT-220414.dwg Date: 14 April 2022

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	KM	DL	WJ	14/04/22

ttpp transport planning

PROJECT
MULGOA RESIDENTIAL DEVELOPMENT

TITLE
INTERSECTION UPGRADES
THE NORTHERN ROAD - CHAIN-O-PONDS ROAD INTERSECTION

DWG No. 17285CAD008 FIGURE 3

DATE STAMP 14 APRIL 2022

PROJECT No. 17285 | SCALE 1:1400 @A3 | REV. A

Filename: 17285CAD008-ROAD LAYOUT-220414.dwg Date: 14 April 2022

The Transport Planning Partnership
Suite 402 Level 4, 22 Atchison Street
St Leonards NSW 2065

P.O. Box 237
St Leonards NSW 1590

02 8437 7800

info@ttpp.net.au

www.ttpp.net.au