Attachment 3

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Prepared for

METRO AWARD TALLAWONG PTY LTD

Traffic Impact Assessment Report

34 – 42 Tallawong Road, Rouse Hill
Planning Proposal

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1 Introduction

1.1 Overview

Ason Group has been engaged Metro Award Tallawong Pty Ltd, to prepare a Traffic Impact Assessment (TIA) report to support a Planning Proposal for a site at 34 -42 Tallawong Road, Rouse Hill (the Site).

The proposal seeks changes to permissible height and density controls in addition to changes to the Indicative Layout Plan (ILP) road network. As a result of these changes, the development potential of the subject site is expected to increase from approximately 630 to 940 residential units. The Site is located within the Blacktown City Council (LGA) and is therefore subject to that's Council's controls.

This TIA report provides an assessment of the relevant traffic, transport and parking implications of the Proposal. In preparing this TIA, Ason Group has referenced key planning documents, these include:

- Blacktown City Council Development Control Plan 2015
- Blacktown City Council Local Environmental Plan 2015 (LEP)
- The Department of Planning and Environment's Riverstone East Precinct Transport Study: Post Exhibition Report (2015) by Arup.
- Blacktown City Council Growth Centre Precincts Development Control Plan 2016 (Growth Centre DCP)
- The Department of Planning and Environment's Schedule 4: Cudgegong Road (Area 20) Precinct (2016).
- Transport for New South Wales (TfNSW) – Northwest Rail Link Cudgegong Road Station Structure Plan Report (2013).

This TIA also references general access, traffic and parking guidelines, including:

- Roads and Maritime Services, Guide to Traffic Generating Developments (RMS Guide)
- Australian Standard 2890.1: Parking Facilities – Off Street Car Parking (AS 2890.1)
- Australian Standard 2890.2: Parking Facilities – Off Street Commercial Vehicle Facilities (AS 2890.2)

1.2 Report Structure

The report is structured as follows:

- Section 2 discusses the strategic context for the development.
- Section 3 describes the existing site conditions and land use
- Section 4 describes planned public transport, pedestrian and cycling links.
- Section 5 provides a summary of the proposal
- Section 6 outlines applicable parking requirements
- Section 7 assesses the traffic impacts of the development including the Site's projected trip generation and forecasted network performance
- Section 8 discusses the site access and internal design
- Section 9 provides a summary of the key conclusions.

2 Strategic Context

2.1 North West Rail Link Corridor Strategy

As part of the planning for future growth in the area, the NSW Government is investing $8.3 Billion to deliver Australia's largest public transport infrastructure project – the Sydney Metro Northwest. The project will provide access to employment centres, retail and educational facilities across North Western Sydney. To support the project, the Department of Planning and Environment (DP&E) has identified a number of Priority Precincts, including the Cudgegong Road Station Precinct, with the aim to provide housing and jobs in centres with good existing or planned transport services. This will be supported by traffic and road improvements, commuter car parks, bus priorities and introduction of pedestrian and cycle paths. Major road improvements to reduce congestion and improve travel times include:

- Priority bus lanes;
- Improved Connections for cyclists and pedestrians throughout the precinct;
- Provision for improved public transport connections to the station and employment areas.

Investment in the Sydney Metro - Northwest will help drive a more diverse, competitive and sustainable economy and generate substantial and lasting economic, social and environmental benefits.

2.2 Riverstone East Precinct

The Riverstone East Precinct Plan has been prepared by the DP&E with the aim to establish a framework to guide the future development of the Riverstone East Precinct, as well as address the need for new and diverse housing in Sydney that is well connected to major centres and employment, protects natural assets and encourages sustainable living. The precinct plan aims to:

- Optimise convenient living near retail, community facilities, schools and public transport with a mix of housing types. Low-to-medium density housing will occur around village centres, schools and open spaces, while medium-to high-density housing is to be located within a close proximity to Cudgegong Road station (in Area 20). The construction of the Cudgegong Road Station, and the subsequent changes in land-use will result in approximately 5,800 new homes when fully developed;
- Give consideration of the surrounding context, history and natural environment has guided the precincts planning framework,
- Ensure that development occurs in a coordinated manner consistent with the vision and development principles of the Precinct;
- Develop a local centre in the area surrounding the station;

- A safe and permeable street network will promote accessibility, connectivity and social interaction, with provision of cycle ways and pedestrian and public transport links to surrounding centres promoting active lifestyles that are less dependent on private vehicle usage; and
- Development within the precinct will need to have regard to Blacktown City Council Growth Centres Precinct Development Control Plan, however in the event of any inconsistency, the Riverstone East Precinct Plan will take precedence.

2.3 Riverstone East Precinct Transport Study (2015)

The report developed by Arup identified suitable facilities for Riverstone East. It outlines that the North West Growth Centre comprises of 16 precincts, and will generate approximately 70,000 new dwellings for 200,000 people in the next 20 years. The specific objectives of the study were:

- Provide a strategic overview of the existing and future transport network in the North West Growth Centre;
- Assess and test transport impacts of the proposed development of the study areas reflected in the indicative ILP,
- Recommend infrastructure upgrades and other measures to address the impacts within the Riverstone East Precinct;
- Recommend suitable land uses that will appropriately utilise the Sydney Metro Northwest Staging Yard and Cudgegong Road Station within the locality; and
- Ensure all modes of transport, including private vehicles, public transport, and active transport modes are considered in the planning and development of the Riverstone East Precinct.

2.4 Cudgegong Road (Area 20) Precinct

Whilst located within the Riverstone East Precinct, the Site is located near the interface with the adjoining Area 20 release area which has implication for road connections between the two precincts. Furthermore, Cudgegong Road station sits within the Area 20 precinct.

The Sydney Metro Northwest and the Cudgegong Road station will introduce opportunities for a village centre linked to the station with surrounding higher density residential development and mixed-use areas adjacent to the station.

The Precinct is closely associated to the nationally significant Rouse Hill Estate, and the accompanying Regional Park. New development associated with Cudgegong Road (Area 20) Precinct will consider and incorporate the important historical, environmental and visual sensitivities of the Rouse Hill Estate and regional park.

These new homes will have convenient access to the Cudgegong Road Station, jobs, shops, cafés and open spaces. it is expected that the Cudgegong Road Station Precinct will be transformed into a vibrant, connected and walkable centre which is attractive to live, work and spend time. The Cudgegong Road (Area 20) Precinct Plan forms part of the Blacktown City Growth Centre Precincts Development Control Plan 2010 (Growth Centre DCP).

The majority of housing will be in medium-density forms, although there will be a wide range of densities, dwelling types and affordability options throughout the precinct. Larger lots and semi-detached housing will exist, while there will be apartments in close proximity to Rouse Hill Town Centre and Cudgegong Road Stations.

Any Development within the precinct will need to have regard to Blacktown City Council DCP, however in the event of any inconsistency, the Cudgegong Road (Area 20) Precinct Plan will take precedence.

2.5 State Environmental Planning Policy No 65

The State Environmental Planning Policy No 65 - Design Quality of Residential Apartment Development (SEPP 65) states the following:

"*Parking requirements should be determined in relation to the availability, frequency and convenience of public transport or proximity to a centre in regional areas. Reduced requirements promote a reduction in car dependency and encourage walking, cycling and use of public transport. Provision of parking for alternative forms of transport such as car share vehicles, motorcycles and bicycles should also be considered. Where less car parking is provided, councils should not provide on street resident parking permits.*"

Having regard for the above, SEPP 65 stipulates that minimum car parking shall be based on either the RMS *Guide to Traffic Generating Developments* or the relevant Council codes, whichever is less. This control applies:

- on sites that are within 800 metres of a railway station or light rail stop in the Sydney Metropolitan Area; or
- on land zoned, and sites within 400 metres of land zoned, B3 Commercial Core, B4 Mixed Use or equivalent in a nominated regional centre.

3 Existing Conditions

3.1 Site & Location

The Site is located at 34-42 Tallawong Road, Rouse Hill and lies within Blacktown City Council Local Government Area. It forms part of the North West Growth Centre and, more specifically, part of the Riverstone East Precinct.

The Site includes the following properties:

- Lot 69 in DP 30186 (34 Tallawong Road), and
- Lot 68 in DP 30186 (42 Tallawong Road).

It is approximately 260 metres north-west of the future Cudgegong Road Metro Station. Rouse Hill Town Centre lies approximately 2 kilometres to the east.

Tallawong Road forms the western site frontage, with other site boundaries formed by neighbouring properties. In the future, these northern, eastern and southern boundaries shall be formed by new public roads. The site has an area of approximately 40,846m^2.

3.1.1 Existing Land Use

Currently, the site is being used for rural residential purposes, however, the State Environmental Planning Policy (Sydney Region Growth Centres) Amendment (Blacktown Growth Centres Precinct Plan) (2016) nominates the subject lands as R3 Medium Density Residential.

Two residential properties at 42 Tallawong Road, with a single residential dwelling and accompanying shed-like structures to the rear of site at 34 Tallawong Road.

3.1.2 Existing Site Access

Each residential dwelling located between 34 – 42 Tallawong Road has their own dedicated driveway that can be accessed to and from Tallawong Road.

3.2 Existing Site Generation

The Site comprises 2 residential properties containing 3 residential dwellings. These dwelling are estimated to generate in the order of 3 vehicles per hour (veh/hr) during peak periods, based on the traffic generation rates established by RMS *Guide to Traffic Generation Developments*.

3.3 Road Hierarchy

The key roads provided in the vicinity of the site are summarised below:

- Windsor Road – a classified RMS Main Road (MR184) that generally runs in a north-south direction to the east of the Site. Windsor Road carries approximately 53,500 vehicles per day (bi-directional), and forms one of the major arterial connections to the North-west Growth Centre. It is currently carries two lanes in each direction with a posted speed limit of 70km/hr with "No Stopping" restrictions in the vicinity of the site.
- Schofields Road – a classified RMS State Road (MR 687) that generally runs in an east-west direction to the south of the Site. Schofields Road carries approximately 5,500 vehicles per day (bi-directional). It carries two-lanes in each direction between Windsor Road and Tallawong Road. Only a single lane in either direction is currently available to the west of Tallawong Road, however the future design is for a four-lane (2 lanes in each direction plus median turning bays) for the full length of Schofields Road. The speed limit along the road in the locality of the site is 70km/hr with "No Stopping" restrictions.
- Tallawong Road – a local road with a speed limit of 60km/hr that generally runs in the north-south direction and forms the western frontage to the Site. Tallawong Road provides connection from Schofields Road in the south to Guntawong Road to the north as part of a future collector road connection. It currently carries a single lane of traffic in each direction, however, it is planned to provide two lanes in each direction, south of the site on approach to the signalised intersections. The width of Tallawong Road reduces to a single lane in each direction in the vicinity of the site to be consistent with the typical cross-sections for a collector road. Works are currently being undertaken within Tallawong Road adjacent to the site associated with the North West Metro stabling yards construction, resulting in temporary speed limit of 40km/h. Given the future collector road status of Tallawong Road, it is expected that a 50km/hr speed limit shall apply in the future. A "seagull" type intersection is to be provided for access to the adjoining Metro stabling yards. Accordingly, it is anticipated that the future intersection of local roads planned within the site shall be restricted to left-in / left-out movements only.
- Cudgegong Road – a local road that generally runs in a north-south direction, to the east of the Site. Cudgegong Road provides connection from Schofields Road in the south to Guntawong Road in the north. It is currently closed from Schofields Road to 59 Cudgegong Road for the construction of the Cudgegong Road Station, however, it is planned to provide a two-lane road in each direction to and from Schofields Road in the future. There are a number of works currently being undertaken within the vicinity of the site along Cudgegong Road in preparation for the Sydney Metro Northwest.

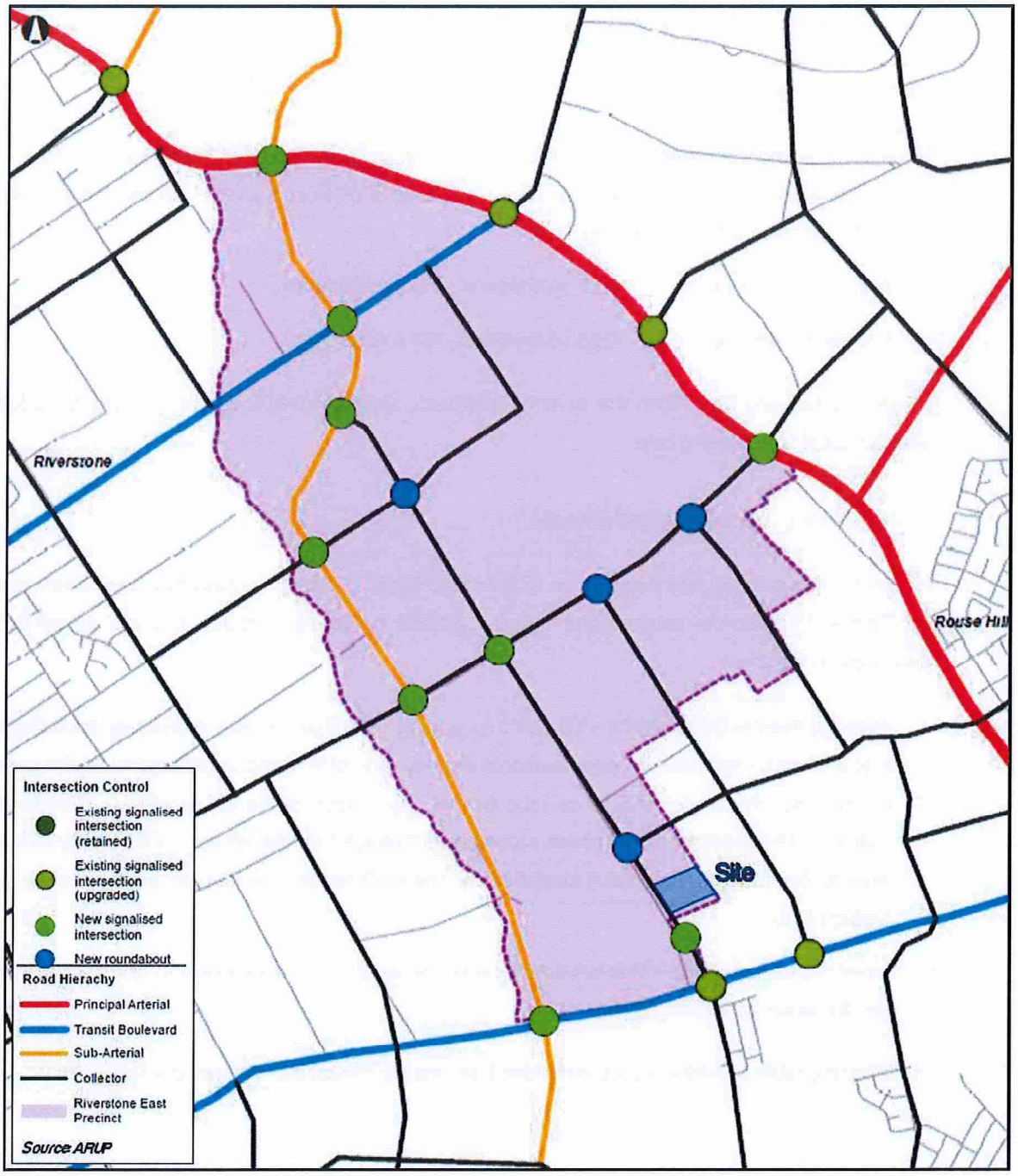

Figure 1: Site and Road Hierarchy

3.4 Existing Network Performance

3.4.1 Mid-block Capacity

Surveys were undertaken at the critical intersection of Schofields Road / Tallawong Road on 4th May 2017 to establish existing baseline conditions. The results of these surveys indicate the following two-way traffic volumes within Tallawong Road:

- AM peak 439 veh/hr (179 northbound, 260 southbound)
- PM peak 495 veh/hr (298 northbound, 197 southbound)

These volumes are well within the nominal mid-block capacity of 900 veh/hr one-way for a kerbside lane, adjacent to a parking lane.

3.4.2 Existing Intersection Performance

The performance of the key intersection of Schofield Road / Tallawong Road has been analysed using the SIDRA Intersection computer program. SIDRA modelling outputs a range of performance measures, in particular:

- Average Vehicle Delay (AVD) – The AVD (or average delay per vehicle in seconds) for intersections also provides a measure of the operational performance of an intersection and is used to determine an intersection's Level of Service (see below). For signalised intersections, the AVD reported relates to the average of all vehicle movements through the intersection. For priority (Give Way, Stop & Roundabout controlled) intersections, the AVD reported is that for the movement with the highest AVD.
- Level of Service (LOS) – This is a comparative measure that provides an indication of the operating performance, based on AVD.

The following table provides a recommended baseline for assessment as per the RMS Guide:

Table 1: Level of Service Criteria

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode
F	More than 70	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires other control mode or major treatment.

A summary of the modelled intersection performance is provided in Table 2. Relevant model outputs are attached at **Appendix A**.

Table 2: Intersection Performance - Existing

Intersection	Control Type	Period	Intersection Delay	Level of Service
Tallawong Road / Schofields Road	Signals	AM	36.7	C
		PM	37.1	C

The analysis indicates that the key intersections in the locality operate satisfactorily under the existing conditions, with spare capacity.

It is also noted that the above performance relates to the existing road geometry provided at this intersection – as presented in Figure 2 - which is an interim arrangement prior to the ultimate arrangement which includes additional through lanes to Schofields Road

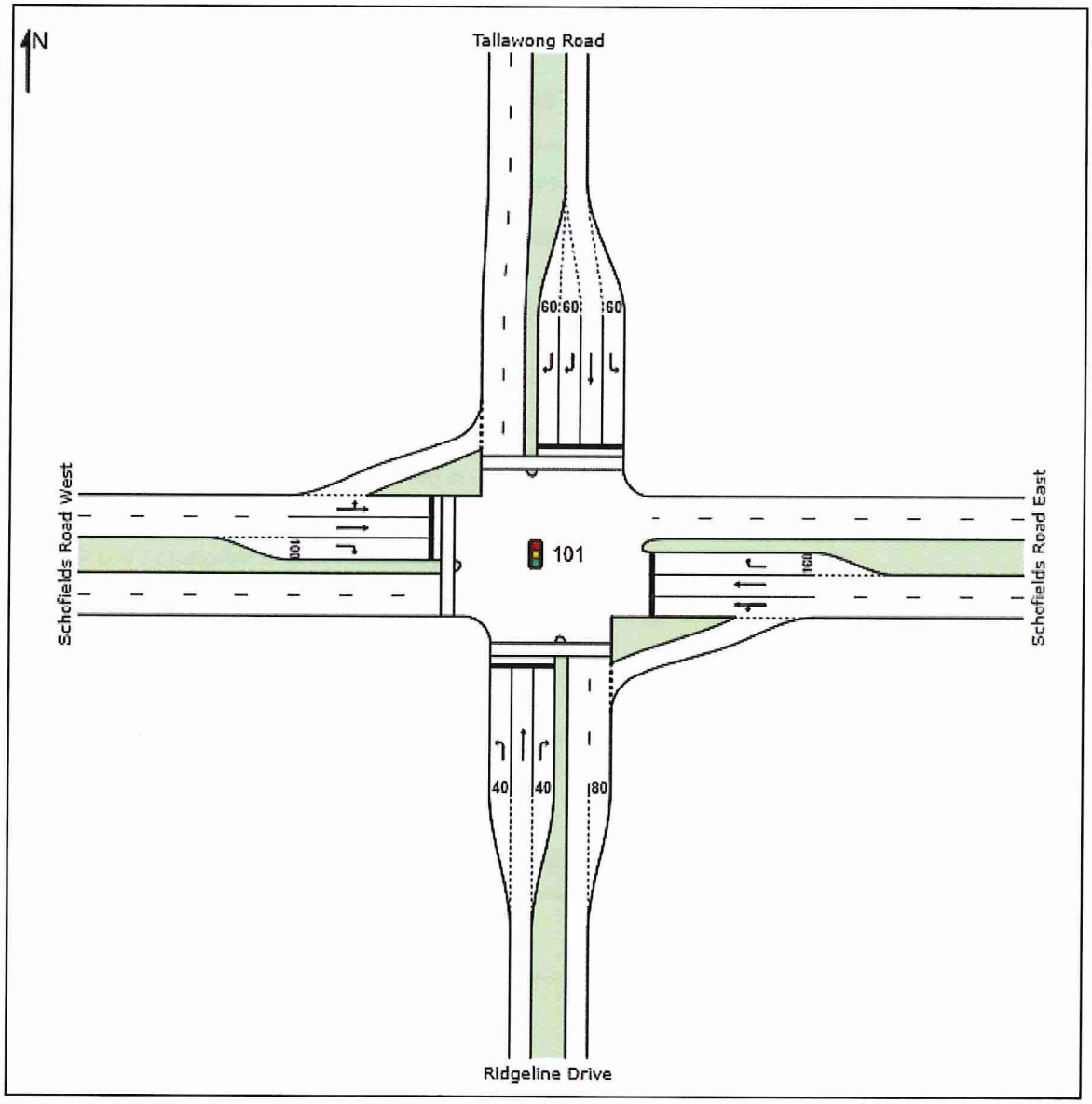

Figure 2: Schofield Rd / Tallawong Rd Layout - Existing

4 Active & Public Transport Connections

Key future rail and bus services local to the Site are presented in Figure 3 and summarised below.

4.1 Rail Connections

The Sydney Metro Northwest is planned to operate with a service frequency of 15 trains per hour during peak periods. Cudgegong Road Station is located well within 400 metres of the subject site. Indeed, the south-east corner of the site is less than 200 metres from the future station.

4.2 Bus Services

The *Integrated Public Transport Service Planning Guidelines* state that bus services influence the travel mode choices of sites within 400 metres (approximately 5 minutes) of a bus stop. In this regard, the Site is well serviced by three bus stops within 400 walking distance of the Site as shown in Figure 3; these include:

- Bus service T75 provides connections to Blacktown Station and Rouse Hill Town Centre via Riverstone with approximately 1-hour frequencies throughout the day.
- Bus service T72 provides connections to Blacktown Station and Rouse Hill Town Centre via Quakers Hill with approximately 1-hour frequencies throughout the day.

4.3 Active (Walking & Cycling) Transport Connections

Windsor Road has a dedicated shared pedestrian/cycle path along its full length within the locality of the site. There is also a shared pedestrian/cycle path along Schofields Road from Windsor Road to Hambledon Road on at least one side. Due to the construction works on Tallawong Road and Cudgegong Road, there are no pedestrian facilities available surrounding the site at present.

The Riverstone East Transport Study nominates typical road cross sections within the Precinct. All roads within the Riverstone East Precinct (except for the "Rear Lane" type road) will have a footpath and/or a shared path on each side of the road.

The proposed roads, providing access to the respective lots, deliver a "best practice' approach to positive street accessibility outcomes and include;

- Shared use of street parking by the local neighbourhood, particularly for visitors,
- Serve a function for pedestrian-based trips and cycling trips, and
- Provide access to property whilst maintaining a good level of pedestrian amenity.

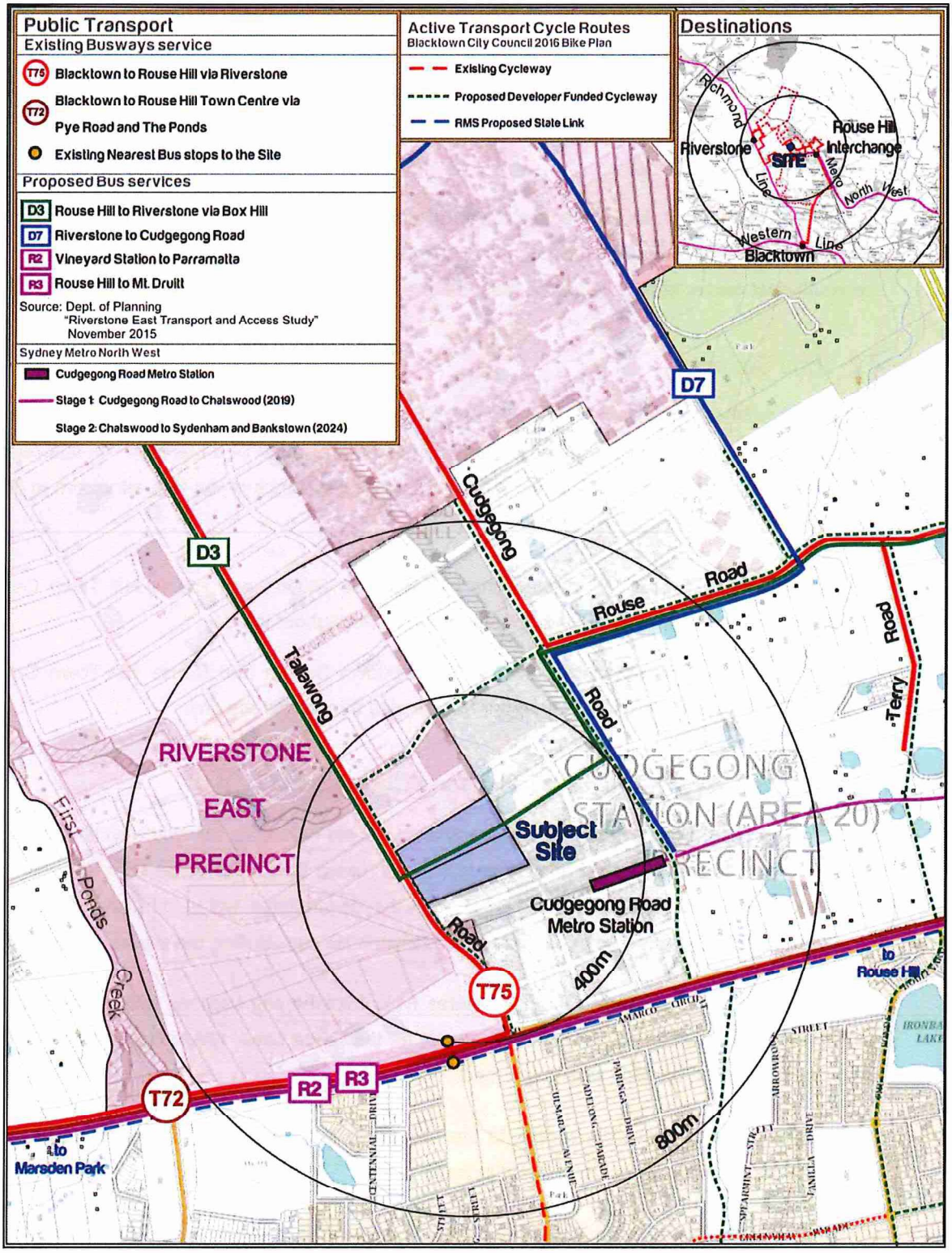

Figure 3: Public Transport Network

5 Overview of Proposal

5.1 Summary of Proposal

A detailed description of the proposed development is included in the Environmental Impact Statement, prepared separately by Ethos Urban. In summary, this planning proposal relates to the following:

- Changes to the Indicative Layout Plan (ILP) road network. This includes:
  - Removal of the road indicated by the Riverstone East ILP that traverses in an east-west direction along the southern boundary. It is noted that this road – forming the interface between the Riverstone East and Area 20 precincts - is not consistent with the ILP road layout for Area 20 to the south.
  - Minor changes to the alignment of east-west roads within the site (Road 02) to better (more perpendicular) alignment with Tallawong Road.
- An increase in building envelopes and heights (including basement) to accommodate approximately 940 residential dwellings and 1,200m^2 of retail and food and drink premises;
- Provision of a new public square and community centre.

Physical works do not form part of this Planning Proposal and will be subject to future detailed development applications, subject to the outcome of the Planning Proposal process.

5.2 Indicative Development Yield

To assist in assessment of the Proposal, Ethos Urban has prepared a concept plan for the site which results in a residential apartment yield of approximately 940 units in addition of 1,200m^2 of to retail, and food and drink premises. It also includes provision of a new community centre.

Application of similar development assumptions to the planning controls envisaged under the Riverstone East Precinct Planning Proposal would be expected to yield up to 630 units. Accordingly, the 'net' effect of the proposed changes would be an uplift of some 310 units as demonstrated in Table 3.

Table 3: Summary of Yield Changes

Dwelling Type	Current Controls	Proposed Controls	Net Change
Residential Units	630	940	+310 unit
Retail / Food and drink premises	200m^2	1,200m^2	+1,000m^2
Community Centre	-	Yes	

The impacts of these changes are assessed below.

6 Design Commentary

6.1 Relevant Design Standards

The on-site access, car park and loading areas have been designed to comply with the following relevant Australian Standards:

- AS2890.1 for car parking areas;
- AS2890.2 for commercial vehicle loading areas;
- AS2890.3 for bicycle parking; and
- AS2890.6 for accessible (disabled) parking.

In addition to the above, the future public roads shall be designed having regard for:

- Austroads *Guide to Road Design*; and
- Blacktown City Council, *Engineering Guide for Development* (2005)

Compliance with the above Standards would be expected to form a standard condition of consent to any development approval that may follow this planning proposal.

6.2 Site Access Arrangements

6.2.1 Building Vehicular Access

Access to basement car parking areas will be provided via the proposed new public roads. Each residential 'block' shall be accessed via a single access driveway. To minimise ramp lengths, it is proposed that vehicular access be provided via the northern frontage road to each 'block' having regard for the topography.

Having regard for the number of car parking spaces expected to be required in each basement, it is expected that respective accesses would require Category 2-3 driveway.

6.2.2 New Road Connections

The proposed new public roads will connect with Tallawong Road in the west and a planned north-south local road at the eastern end of the site.

A "seagull" intersection is planned to be provided for access to the Sydney Metro Northwest stabling yards, adjacent to the site. As a result of this 'intersection' treatment, it is understood that Council will require the intersection of new public roads traversing the site and Tallawong Road to be restricted to left-in /left-out only by way of a raised median within Tallawong Road.

The Riverstone East ILP indicates a future road along the southern boundary of the subject site. However, it is noted that the road is not contemplated by the Area 20 ILP and, accordingly, the landowner to the south will not be providing the other half road as would normally occur. Furthermore, the following are noteworthy:

- The road traversing the southern site boundary forms the interface between the Riverstone East and Area 20 precincts. However, this road is not shown on the Area 20 ILP and, accordingly, there is an inconsistency between the two precinct plans. As such, road has questionable status when considering the road network planning for the wider precinct. Consultation with the adjoining landowner to the south (TfNSW) indicates that there is no intention for the required half road to ever be provided.
- The concept plans do not propose any basement access driveways from this road due to topography, nor would any be expected from the site to the south having regard for the above. Accordingly, the road provided no substantial access function to adjoining development.
- Furthermore, the road terminates as a T-junction at both ends. Accordingly, it does not provide any through movement function for the wider precinct.
- If provided, the southern east-west road would result in an intersection spacing of some 30 metres. This spacing would be considered the minimum to comply, with 'best practice' suggesting an increased space to be more appropriate, particularly for intersections along a key collector road. In this regard, AMCORD recommends and average intersection spacing of 80 metres for major collector roads. With reference to Table A1 of Austroads *Guide to Road Design Part 4: Intersections and Crossing – General*, it is evident that an increased number of unsignalised accesses has detrimental implications for relative crash rates. Indeed, an intersection spacing of 30 metres would be expected to double the relative crash rate compared to an 80 metre spacing.

For the above reasons and urban design considerations more generally, it is proposed to remove the road from the Riverstone East ILP to provide clarity for future development.

6.3 Internal Road Design

Relevant road cross-sections outlined in the BCCGCPDCP2016 are provided below.

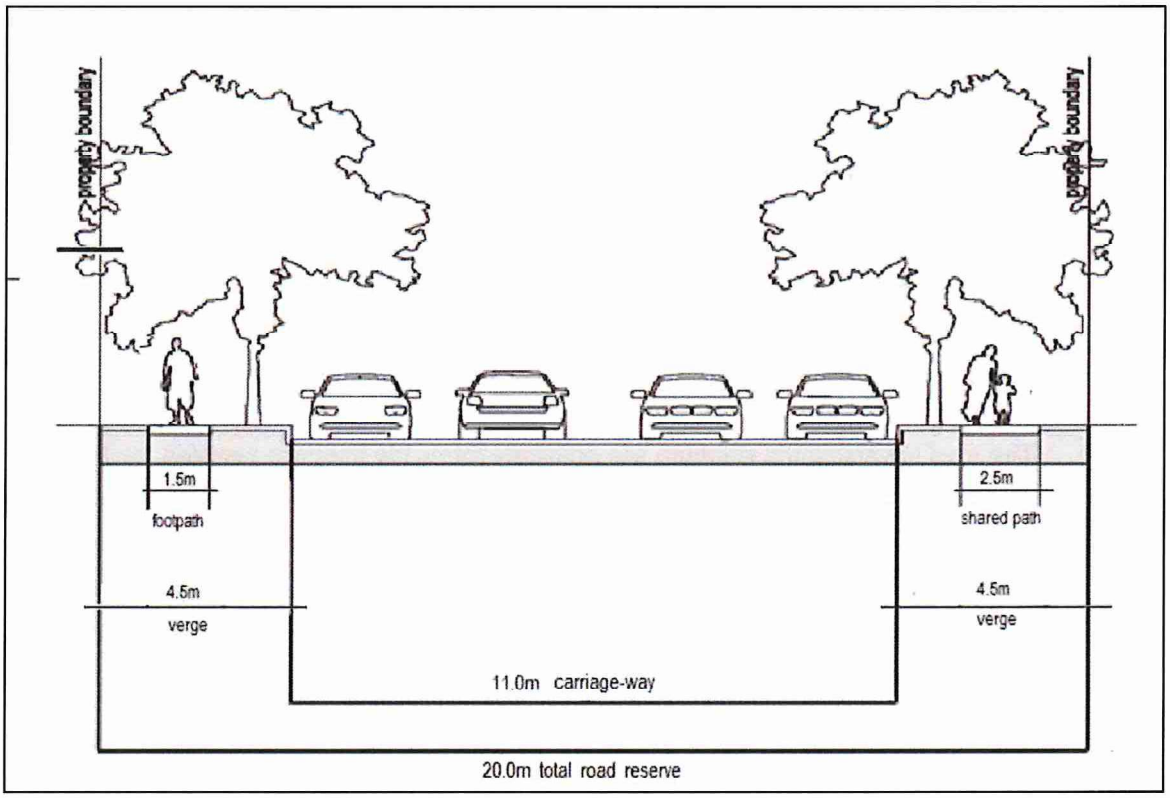

Figure 4: Typical Collector Road Dimensions

The above cross-section is nominally required for Tallawong Road as a future 'Collector Road', with a road reserve width of 20 metres.

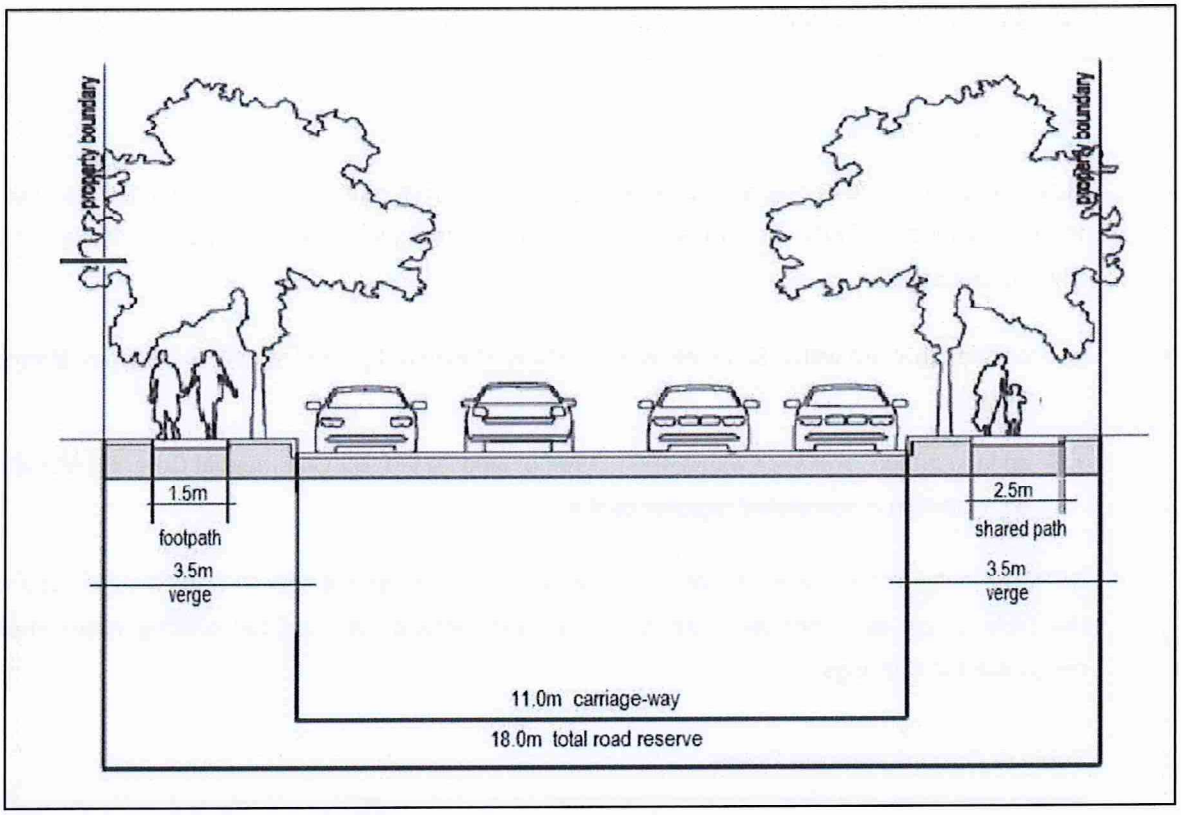

Figure 5: Typical Local Street

The site is located within an R3 residential zone. Accordingly, the above cross-section nominally applies to the internal subdivision roads which are to be designed as 'Local Streets' including an 18 metre road reserve width.

7 Parking & Servicing Requirements

7.1 Car Parking

Having regard for the above, the SEPP 65 stipulates that minimum car parking shall be based on either the RMS *Guide to Traffic Generating Developments* or the relevant Council codes, whichever is less. This control applies:

- on sites that are within 800 metres of a railway station or light rail stop in the Sydney Metropolitan Area; or
- on land zoned, and sites within 400 metres of land zoned, B3 Commercial Core, B4 Mixed Use or equivalent in a nominated regional centre.

SEPP 65 outlines the minimum parking requirements and does not specify a maximum. Accordingly, the table below also includes both SEPP 65 and Growth Centre DCP parking requirements for residential flat buildings.

Table 4: Council Parking Rates

Land Use	Dwelling Type	SEPP 65 (RMS Guide)	BCC Growth Centre Precincts DCP 2016
Residential Flat Building	One Bedroom	0.6 spaces per dwelling	1.0 spaces per dwelling
	Two Bedroom	0.9 spaces per dwelling	1.0 spaces per dwelling
	Three or more Bedroom	1.4 spaces per dwelling	1.5 spaces per dwelling
	Visitor	1 space per 5 dwellings	1 space per 5 dwellings
Retail / Food and drink premises	<200m^2	n/a	1 space per 30m^2 (min 3 spaces)
	>200m^2	n/a	1 space per 22m^2 (min 3 spaces)

Notwithstanding, car parking provisions are a detailed matter for assessment during Development Application submissions. There is sufficient site area to readily cater for the basements of a size necessary to accommodate future parking requirements on-site.

8 Traffic Assessment

8.1 Traffic Generation

The traffic generation of the development has been assessed having regard for the traffic generation rates adopted by the Riverstone East Precinct Transport Study which underpins road network planning for the locality. This study outlines the following traffic generation rates:

- 0.19 peak hour trips per dwelling for high density residential flat buildings in the AM peak
- 0.15 peak hour trips per dwelling for high density residential flat buildings in the PM peak
- 1.94 peak hour trips per 100m^2 for the retail, and food and drink premises in the AM Peak
- 9.84 peak hour trips per 100m^2 for the retail, and food and drink premises in the AM Peak .

The traffic generated by the proposed development has been calculated using the above rates and has been based off a development of 940 units and 1,200m^2 of retail, and food and drink premises. The proposed trip generation from the increased yield, and the comparison to the approved development yield is outlined below in Table 5 below. It is assumed that the proposed community centre would generally attract traffic outside of on-street peak periods. Furthermore, the community centre and retail, and food and drink premises would be expected to primarily cater for the local community and therefore not generate substantial traffic flows on the wider network, outside of Riverstone East and Area 20.

Table 5: Traffic Generation Comparison

Scenario	No. of Units	Retail / Food and drink premises GFA	AM Peak (veh/hr)	PM Peak (veh/hr)
Existing Controls	630	200	120	95
Proposed	940	1,200	202	259
Difference	**+310**	**+1,000**	**+82**	**+164**

It can be seen from above that the proposed development could result in an increase of up to 82 and 164 vehicle trips per hour during weekday morning and evening peak periods. This is a moderate increase and accordingly, a localised assessment of traffic impacts is expected to be required. The impacts of these additional trips are assessed further below.

8.2 Traffic Distribution

The Riverstone East Precinct Report developed by Arup outlined the Journey-to-Work (JTW) data based on the totality of the North West Growth Centre.

Below is a summary of various modes of transport used by workers and residents in the selected Travel Zone (TZ 3948).

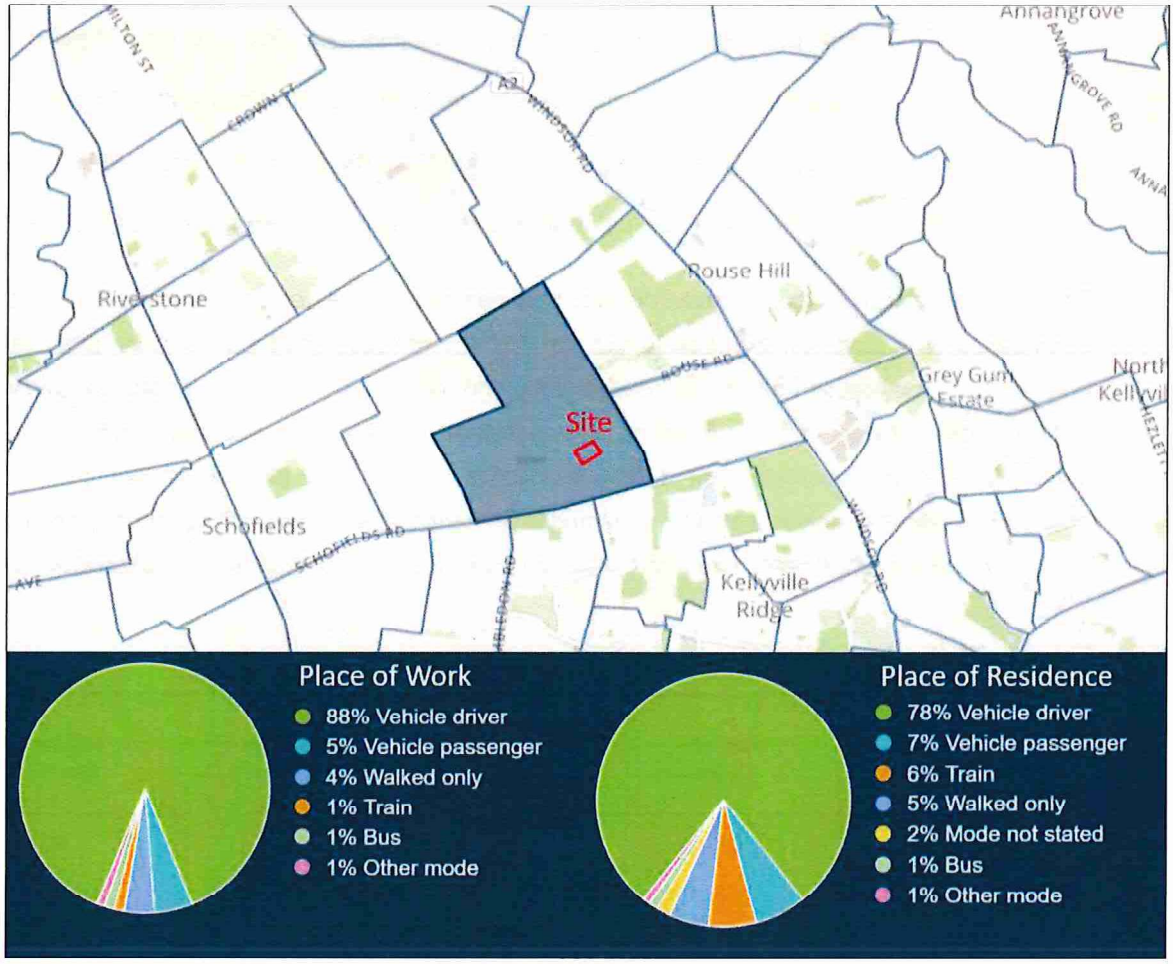

Figure 6: JTW Summary

The JTW data also highlighted that most of the residents in the surrounding locality travel to Blacktown North and Baulkham hills for employment. Norwest Business Centre (Norwest Shopping Centre, Lexington Drive and Brookhollow Drive) are the main employment areas within Baulkham Hills, and it can be assumed that most of the residents who travel to Baulkham Hills for work travel to Norwest Business Park.

This data provides an understanding of current travel modes.

Noting that the site is within close walking distance to the Cudgegong Road Station, the introduction of the Sydney Metro Northwest line and new bus routes within the North West Priority Growth Area, it would be expected to further increase the proportion of trips made by public transport. Indeed, the wider Precinct, which includes schools, employment and recreational areas is being designed to encourage the use of non-car travel as far as is practicable. To encourage improved mode share outcomes, improved pedestrian and cyclist connections are to be provided throughout the local area to improve access.

The retail, and food and drink premises will primarily service residents who live within the local catchment area north of Schofields Road and are therefore not expected to result in any material increase in traffic demands at the key intersections outlined above in Table 6.

The distribution of traffic onto the network has also had consideration of the local intersection arrangements discussed in Section 6.2.

8.3 Traffic Impacts

8.3.1 Future (Long-term) Network Performance

Upon full development of the Riverstone East precinct and other surrounding release areas, a number of planned changes to the surrounding road network are proposed. These changes are proposed, irrespective of any uplift on the subject site. Of particular relevance are the future intersection layouts for Schofields Road with Tallawong Road and Cudgegong Road which are presented in below.

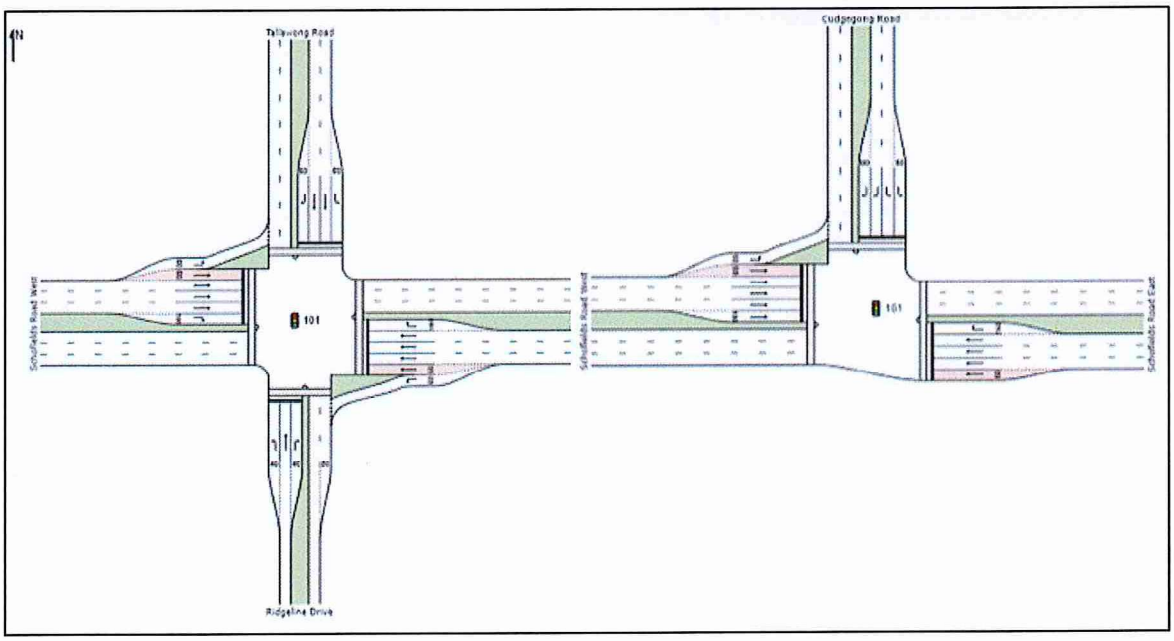

Figure 7: Future Schofields Rd Intersection Layouts

The previous precinct-wide transport modelling that underpins the planned road network infrastructure includes development traffic associated with the subject site. In this regard, the Riverstone East Transport Study identifies a total 606 high density residential dwellings within the wider Study Area. Of these, having regard for the relative proportion of site areas, it is assumed that 335 apartments were adopted for the subject site as part of the previous modelling.

Accordingly, any future case traffic modelling need only consider any uplift over and above this previously assumed yield . For the purpose of this TIA report, an assessment of the proposal has been undertaken with the following scenarios;

- Future plus Approved Development – which consists of 2036 future volumes from the Riverstone East Transport Study report (which assumed 335 units on the subject site) plus the traffic associated with the additional 295 units to get to the total yield of 630 possible under existing development controls and 1,200m^2 of retail, and food and drink premises. Accordingly, the scenario assumes an increase of 79 and 163 veh/hr in the AM and PM peak periods above that previously adopted by the Riverstone East Transport Study for modelling purposes.
- Future plus Proposed Development – which consists of 2036 volumes above, plus the proposed development yield associated with the current proposal and 1,200m^2 of retail, and food and drink premises. This scenario results in a net increase of 79 and 163 veh/hr above that of the above scenario. Consequently, this is a net increase of some 138 and 209veh/hr above that of the previous RETS report.

The impact of the proposed development on the critical intersections in the locality have been assessed, with the results summarised in Table 6.

Table 6: Intersection Performance - Existing + Development

Intersection	Control Type	Scenario	Period	Intersection Delay	Level of Service
Tallawong Rd/ Schofields Rd	Signals	Future + Approved Development	AM	37.0	C
			PM	39.9	C
		Future + Proposed Development	AM	41.7	C
			PM	47.7	D
Cudgegong Rd/ Schofields Rd	Signals	Future + Approved Development	AM	32.2	C
			PM	40.1	C
		Future + Proposed Development	AM	32.3	C
			PM	40.9	C
Site Access / Tallawong Rd	Priority	Future + Approved Development	AM	13.0	A
			PM	18.8	B
		Future + Proposed Development	AM	13.9	A
			PM	23.1	B

Modelling results indicate the that intersection of Tallawong Road and Schofields Road will continue to operate within acceptable thresholds with a LOS C, similar to the approved scenario in the AM peak. The intersection reduces from a LOS C to a LOS D in the PM peak; however, the intersection still operates at a satisfactory level.

The intersection of Cudgegong Road and Schofields Road also continues to operate within an acceptable Level of Service with each scenario in the both AM and PM peaks resulting in a LOS C. The average delays of the intersections do increase, but the modelling demonstrates that the increased yield in the proposed development will have minimal impact to the overall network.

With the construction of the development, there will be left-in-left-out intersections along Tallawong Road. The modelling of the site access and Tallawong Road demonstrates that the intersection remains at a LOS A and LOS B in the AM and PM peaks respectively.

It is evident from Table 6 that the proposed increase in development yield, assessed as a net increase above approved future conditions, will have minimal impact on the performance of the surrounding road network.

In summary, the traffic generated by the development can be readily accommodated by the surrounding road network.

9 Conclusions

The key findings of this Traffic Impact Assessment are:

- This submission relates to a Planning Proposal for a proposed 940 residential development, 1,200m^2 of retail, and food and drink premises, and a new community centre and associated works at 34-42 Tallawong Road, Rouse Hill. It lies within the Blacktown City Council as part of the North West Growth Centre precinct of Riverstone East. Accordingly, development is subject to the requirements of the Blacktown City Growth Centre Precincts Development Control Plan (Growth Centre DCP).
- Located close to future public transport facilities, the development will encourage new residents to use alternative transport modes (other than private vehicles) to travel to and from the Site. The future pedestrian facilities to be implemented as per the Growth Centre DCP would provide convenient and safe access to nearby public transport nodes.
- In this regard, increased residential development on the site seeks to capitalise on this proximity and maximise the benefits arising from the Governments investment in infrastructure in the locality
- Car parking provisions are a matter to be addressed during subsequent detailed Development Applications. Notwithstanding, it is generally assumed that parking will be provided in accordance with the relevant Growth Centre DCP and there is sufficient area available on-site for these demands to be readily accommodated within future basements.
- The proposed development is expected to generate in the order of 202 and 259 veh/hr during the AM and PM peak periods, respectively. This represent an increase of 82 and 164 veh/hr above that previously assessed (120 and 95 veh/hr in the AM and PM peak periods respectively) in relation to the development potential of the site under current controls (630 units).
- This is a moderate increase and can readily be accommodated by the surrounding road network with no change to existing Level of Service to key surrounding intersections.
- The localised changes to the ILP road network proposed are supportable from a traffic management perspective, with the following considered noteworthy:
    - The road traversing the southern site boundary forms the interface between the Riverstone East and Area 20 precincts. However, this road is not shown on the Area 20 ILP and, accordingly, there is an inconsistency between the two precinct plans. As such, road has questionable status when considering the road network planning for the wider precinct. Consultation with the adjoining landowner to the south (TfNSW) indicates that there is no intention for the required half road to ever be provided.

- The proposed concept plans which do not proposed any basement access driveways from this road, nor would any be expected from the site to the south having regard for the above. Accordingly, the road provided no substantial access function to adjoining development.
- Furthermore, the road terminates as a T-junction at both ends. Accordingly, it does not provide any through movement function for the wider precinct.
- If provided, the southern east-west road would result in an intersection spacing of some 30 metres. This spacing would be considered the minimum to comply, with 'best practice' suggesting an increased space to be more appropriate, particularly for intersections along a key collector road. In this regard, AMCORD recommends and average intersection spacing of 80 metres for major collector roads. With reference to Table A1 of Austroads *Guide to Road Design Part 4: Intersections and Crossing – General*, it is evident that an increased number of unsignalised accesses has detrimental implications for relative crash rates. Indeed, an intersection spacing of 30 metres would be expected to double the relative crash rate compared to an 80-metre spacing.

In summary, the Proposal is supportable on traffic planning grounds and will not result in any adverse impacts on the surrounding road network or the availability of on-street parking.

Appendix A

SIDRA Model Outputs

MOVEMENT SUMMARY

Site: 101 [Cudgegong Rd and Schofields Rd - Future + Approved - AM Peak]

Cudgegong Road and Schofields Road
Signals - Fixed Time Isolated Cycle Time = 75 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Schofields Road East											
5	T1	1067	7.0	0.815	35.0	LOS C	13.7	100.3	1.00	0.97	38.2
6	R2	73	5.0	0.506	44.3	LOS D	2.8	20.2	1.00	0.76	34.5
Approach		1140	6.9	0.815	35.6	LOS C	13.7	100.3	1.00	0.96	38.0
North: Cudgegong Road											
7	L2	323	5.0	0.233	22.4	LOS B	4.0	29.3	0.71	0.75	42.9
9	R2	435	5.0	0.826	45.9	LOS D	8.9	65.0	1.00	0.98	34.2
Approach		758	5.0	0.826	35.9	LOS C	8.9	65.0	0.88	0.88	37.4
West: Schofields Road West											
10	L2	152	5.0	0.102	6.5	LOS A	0.7	5.1	0.21	0.60	53.3
11	T1	922	7.0	0.660	29.4	LOS C	9.8	71.7	0.95	0.81	40.6
Approach		1074	6.7	0.660	26.1	LOS B	9.8	71.7	0.85	0.78	42.0
All Vehicles		2972	6.3	0.826	32.2	LOS C	13.7	100.3	0.91	0.87	39.2

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	53	31.8	LOS D	0.1	0.1	0.92	0.92
P3	North Full Crossing	53	31.8	LOS D	0.1	0.1	0.92	0.92
P4	West Full Crossing	53	31.8	LOS D	0.1	0.1	0.92	0.92
All Pedestrians		158	31.8	LOS D			0.92	0.92

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

MOVEMENT SUMMARY

Site: 101 [Cudgegong Rd and Schofields Rd - Future + Approved - PM Peak]

Cudgegong Road and Schofields Road
Signals - Fixed Time Isolated Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Schofields Road East											
5	T1	1154	7.0	0.599	36.8	LOS C	19.2	140.2	0.88	0.77	37.5
6	R2	257	5.0	0.778	62.0	LOS E	15.9	115.8	1.00	0.89	29.6
Approach		1411	6.6	0.778	41.4	LOS C	19.2	140.2	0.90	0.79	35.8
North: Cudgegong Road											
7	L2	139	5.0	0.093	29.0	LOS C	2.5	18.5	0.64	0.71	39.8
9	R2	285	5.0	0.765	69.5	LOS E	9.1	66.6	1.00	0.88	28.0
Approach		424	5.0	0.765	56.2	LOS D	9.1	66.6	0.88	0.82	31.0
West: Schofields Road West											
10	L2	386	5.0	0.278	8.9	LOS A	5.9	42.9	0.31	0.64	51.5
11	T1	1523	7.0	0.796	42.3	LOS C	28.9	211.1	0.96	0.88	35.5
Approach		1909	6.6	0.796	35.6	LOS C	28.9	211.1	0.83	0.83	37.9
All Vehicles		3744	6.4	0.796	40.1	LOS C	28.9	211.1	0.86	0.82	36.2

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	53	56.8	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	40.1	LOS E	0.1	0.1	0.80	0.80
P4	West Full Crossing	53	56.8	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		158	51.2	LOS E			0.90	0.90

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

MOVEMENT SUMMARY

Site: 101 [Cudgegong Rd and Schofields Rd - Future + Proposed - AM Peak]

Cudgegong Road and Schofields Road
Signals - Fixed Time Isolated Cycle Time = 75 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Schofields Road East											
5	T1	1067	7.0	0.815	35.0	LOS C	13.7	100.3	1.00	0.97	38.2
6	R2	78	5.0	0.543	44.6	LOS D	3.0	21.8	1.00	0.78	34.4
Approach		1145	6.9	0.815	35.6	LOS C	13.7	100.3	1.00	0.96	37.9
North: Cudgegong Road											
7	L2	323	5.0	0.233	22.4	LOS B	4.0	29.3	0.71	0.75	42.9
9	R2	435	5.0	0.826	45.9	LOS D	8.9	65.0	1.00	0.98	34.2
Approach		758	5.0	0.826	35.9	LOS C	8.9	65.0	0.88	0.88	37.4
West: Schofields Road West											
10	L2	152	5.0	0.103	6.6	LOS A	0.8	5.7	0.22	0.60	53.2
11	T1	922	7.0	0.660	29.4	LOS C	9.8	71.7	0.95	0.81	40.6
Approach		1074	6.7	0.660	26.2	LOS B	9.8	71.7	0.85	0.78	42.0
All Vehicles		2977	6.3	0.826	32.3	LOS C	13.7	100.3	0.91	0.87	39.2

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	53	31.8	LOS D	0.1	0.1	0.92	0.92
P3	North Full Crossing	53	31.8	LOS D	0.1	0.1	0.92	0.92
P4	West Full Crossing	53	31.8	LOS D	0.1	0.1	0.92	0.92
All Pedestrians		158	31.8	LOS D			0.92	0.92

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

MOVEMENT SUMMARY

Site: 101 [Cudgegong Rd and Schofields Rd - Future + Proposed - PM Peak]

Cudgegong Road and Schofields Road
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Schofields Road East											
5	T1	1154	7.0	0.619	36.6	LOS C	18.8	137.0	0.90	0.78	37.6
6	R2	276	5.0	0.839	64.1	LOS E	17.3	126.1	1.00	0.94	29.1
Approach		1429	6.6	0.839	41.9	LOS C	18.8	137.0	0.92	0.81	35.6
North: Cudgegong Road											
7	L2	139	5.0	0.091	27.4	LOS B	2.4	17.4	0.63	0.71	40.5
9	R2	285	5.0	0.795	68.8	LOS E	8.9	65.2	1.00	0.90	28.1
Approach		424	5.0	0.795	55.2	LOS D	8.9	65.2	0.88	0.84	31.2
West: Schofields Road West											
10	L2	386	5.0	0.282	9.2	LOS A	5.9	43.0	0.32	0.65	51.3
11	T1	1523	7.0	0.823	44.0	LOS D	29.1	212.4	0.98	0.93	35.0
Approach		1909	6.6	0.823	37.0	LOS C	29.1	212.4	0.84	0.87	37.4
All Vehicles		3763	6.4	0.839	40.9	LOS C	29.1	212.4	0.88	0.84	35.9

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	40.1	LOS E	0.1	0.1	0.82	0.82
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		158	49.5	LOS E			0.91	0.91

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

MOVEMENT SUMMARY

▽ Site: 101 [Tallawong Rd and Access Rd - Future + Approved - AM Peak]

Tallawong Road and Access Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tallawong Road South											
2	T1	660	5.0	0.349	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		660	5.0	0.349	0.0	NA	0.0	0.0	0.00	0.00	59.9
East: Access Road											
4	L2	23	0.0	0.055	13.0	LOS A	0.2	1.2	0.75	0.90	48.3
Approach		23	0.0	0.055	13.0	LOS A	0.2	1.2	0.75	0.90	48.3
North: Tallawong Road North											
7	L2	1	0.0	0.531	5.6	LOS A	0.0	0.0	0.00	0.00	58.2
8	T1	1001	5.0	0.531	0.1	LOS A	0.0	0.0	0.00	0.00	59.8
Approach		1002	5.0	0.531	0.1	NA	0.0	0.0	0.00	0.00	59.8
All Vehicles		1685	4.9	0.531	0.3	NA	0.2	1.2	0.01	0.01	59.7

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

MOVEMENT SUMMARY

▽ Site: 101 [Tallawong Rd and Access Rd - Future + Approved - PM Peak]

Tallawong Road and Access Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tallawong Road South											
2	T1	714	5.0	0.378	0.1	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		714	5.0	0.378	0.1	NA	0.0	0.0	0.00	0.00	59.9
East: Access Road											
4	L2	5	0.0	0.022	18.8	LOS B	0.1	0.4	0.85	0.94	44.9
Approach		5	0.0	0.022	18.8	LOS B	0.1	0.4	0.85	0.94	44.9
North: Tallawong Road North											
7	L2	3	0.0	0.640	5.7	LOS A	0.0	0.0	0.00	0.00	58.1
8	T1	1206	5.0	0.640	0.2	LOS A	0.0	0.0	0.00	0.00	59.7
Approach		1209	5.0	0.640	0.2	NA	0.0	0.0	0.00	0.00	59.7
All Vehicles		1928	5.0	0.640	0.2	NA	0.1	0.4	0.00	0.00	59.7

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

MOVEMENT SUMMARY

▽ Site: 101 [Tallawong Rd and Access Rd - Future + Proposed - AM Peak]

Tallawong Road and Access Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tallawong Road South											
2	T1	665	5.0	0.352	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		665	5.0	0.352	0.0	NA	0.0	0.0	0.00	0.00	59.9
East: Access Road											
4	L2	35	0.0	0.090	13.9	LOS A	0.3	2.0	0.78	0.91	47.8
Approach		35	0.0	0.090	13.9	LOS A	0.3	2.0	0.78	0.91	47.8
North: Tallawong Road North											
7	L2	1	0.0	0.550	5.6	LOS A	0.0	0.0	0.00	0.00	58.2
8	T1	1037	5.0	0.550	0.1	LOS A	0.0	0.0	0.00	0.00	59.8
Approach		1038	5.0	0.550	0.1	NA	0.0	0.0	0.00	0.00	59.8
All Vehicles		1738	4.9	0.550	0.4	NA	0.3	2.0	0.02	0.02	59.5

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

MOVEMENT SUMMARY

▽ Site: 101 [Tallawong Rd and Access Rd - Future + Proposed- PM Peak]

Tallawong Road and Access Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tallawong Road South											
2	T1	692	5.0	0.366	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		692	5.0	0.366	0.0	NA	0.0	0.0	0.00	0.00	59.9
East: Access Road											
4	L2	27	0.0	0.140	23.1	LOS B	0.4	2.9	0.90	0.96	42.6
Approach		27	0.0	0.140	23.1	LOS B	0.4	2.9	0.90	0.96	42.6
North: Tallawong Road North											
7	L2	1	0.0	0.676	5.7	LOS A	0.0	0.0	0.00	0.00	58.1
8	T1	1275	5.0	0.676	0.2	LOS A	0.0	0.0	0.00	0.00	59.7
Approach		1276	5.0	0.676	0.2	NA	0.0	0.0	0.00	0.00	59.6
All Vehicles		1995	4.9	0.676	0.4	NA	0.4	2.9	0.01	0.01	59.4

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

MOVEMENT SUMMARY

Site: 101 [Tallawong Rd and Schofield Rd - Future + Approved - AM Peak]

Tallawong Road and Schofields Road
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Ridgeline Drive											
1	L2	88	5.0	0.108	20.5	LOS B	2.2	16.1	0.60	0.71	43.8
2	T1	499	5.0	0.904	45.7	LOS D	25.7	187.7	0.99	1.09	34.5
3	R2	24	5.0	0.203	51.4	LOS D	1.1	7.8	0.98	0.71	32.6
Approach		612	5.0	0.904	42.3	LOS C	25.7	187.7	0.93	1.02	35.5
East: Schofields Road East											
4	L2	57	5.0	0.051	9.5	LOS A	0.7	5.1	0.36	0.63	51.1
5	T1	683	7.0	0.560	34.9	LOS C	9.0	65.6	0.94	0.78	38.2
6	R2	74	5.0	0.616	53.9	LOS D	3.4	25.2	1.00	0.80	31.7
Approach		814	6.7	0.616	34.9	LOS C	9.0	65.6	0.91	0.77	38.2
North: Tallawong Road											
7	L2	186	5.0	0.199	17.8	LOS B	4.3	31.5	0.57	0.72	45.3
8	T1	574	5.0	0.508	21.8	LOS B	12.5	91.3	0.78	0.67	44.4
9	R2	218	5.0	0.911	61.9	LOS E	11.7	85.2	1.00	1.08	29.8
Approach		978	5.0	0.911	30.0	LOS C	12.5	91.3	0.79	0.77	40.2
West: Schofields Road West											
10	L2	274	5.0	0.269	13.2	LOS A	5.2	38.2	0.53	0.70	48.6
11	T1	1063	7.0	0.872	46.6	LOS D	17.4	127.0	1.00	1.03	34.1
12	R2	92	5.0	0.766	56.2	LOS D	4.4	32.5	1.00	0.88	30.9
Approach		1428	6.5	0.872	40.8	LOS C	17.4	127.0	0.91	0.96	35.9
All Vehicles		3832	5.9	0.911	37.0	LOS C	25.7	187.7	0.88	0.88	37.3

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P2	East Full Crossing	53	33.9	LOS D	0.1	0.1	0.87	0.87
P3	North Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		211	37.9	LOS D			0.92	0.92

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

MOVEMENT SUMMARY

Site: 101 [Tallawong Rd and Schofield Rd - Future + Approved - PM Peak]

Tallawong Road and Schofields Road
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Ridgeline Drive											
1	L2	36	5.0	0.056	26.0	LOS B	1.0	7.5	0.69	0.70	41.2
2	T1	297	5.0	0.769	39.4	LOS C	13.2	96.3	0.99	0.91	36.7
3	R2	21	5.0	0.176	51.2	LOS D	0.9	6.8	0.97	0.70	32.6
Approach		354	5.0	0.769	38.8	LOS C	13.2	96.3	0.96	0.88	36.8
East: Schofields Road East											
4	L2	42	5.0	0.040	9.7	LOS A	0.5	3.9	0.37	0.63	51.0
5	T1	667	7.0	0.693	40.3	LOS C	9.5	69.7	0.99	0.85	36.2
6	R2	135	5.0	0.966	75.2	LOS F	7.9	57.9	1.00	1.13	26.8
Approach		844	6.6	0.966	44.3	LOS D	9.5	69.7	0.96	0.89	34.8
North: Tallawong Road											
7	L2	82	5.0	0.081	15.0	LOS B	1.6	11.8	0.48	0.68	47.0
8	T1	719	5.0	0.619	20.4	LOS B	15.2	110.6	0.78	0.67	45.2
9	R2	409	5.0	0.995	86.5	LOS F	27.8	202.8	1.00	1.25	24.9
Approach		1211	5.0	0.995	42.4	LOS C	27.8	202.8	0.83	0.87	35.5
West: Schofields Road West											
10	L2	282	5.0	0.243	10.6	LOS A	4.4	31.8	0.44	0.67	50.3
11	T1	718	7.0	0.746	41.7	LOS C	10.6	77.1	1.00	0.89	35.7
12	R2	61	5.0	0.438	51.3	LOS D	2.7	20.0	0.99	0.75	32.3
Approach		1061	6.4	0.746	34.0	LOS C	10.6	77.1	0.85	0.83	38.5
All Vehicles		3469	5.8	0.995	39.9	LOS C	27.8	202.8	0.88	0.86	36.3

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P2	East Full Crossing	53	31.3	LOS D	0.1	0.1	0.84	0.84
P3	North Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		211	37.3	LOS D			0.91	0.91

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

MOVEMENT SUMMARY

Site: 101 [Tallawong Rd and Schofield Rd - Future + Proposed - AM Peak]

Tallawong Road and Schofields Road
Signals - Fixed Time Isolated Cycle Time = 105 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Ridgeline Drive											
1	L2	88	5.0	0.113	24.1	LOS B	2.6	19.3	0.62	0.71	42.0
2	T1	499	5.0	0.909	51.8	LOS D	29.5	215.0	0.98	1.09	32.7
3	R2	24	5.0	0.236	60.1	LOS E	1.3	9.2	0.99	0.71	30.2
Approach		612	5.0	0.909	48.2	LOS D	29.5	215.0	0.93	1.02	33.6
East: Schofields Road East											
4	L2	57	5.0	0.051	9.2	LOS A	0.7	5.3	0.32	0.62	51.4
5	T1	683	7.0	0.564	40.7	LOS C	10.4	76.2	0.95	0.78	36.1
6	R2	74	5.0	0.719	63.9	LOS E	4.1	30.0	1.00	0.84	29.2
Approach		814	6.7	0.719	40.6	LOS C	10.4	76.2	0.91	0.78	36.1
North: Tallawong Road											
7	L2	211	5.0	0.209	17.7	LOS B	5.3	38.5	0.53	0.72	45.4
8	T1	574	5.0	0.441	20.5	LOS B	13.1	95.3	0.71	0.61	45.1
9	R2	287	5.0	0.886	62.9	LOS E	16.9	123.6	1.00	1.01	29.6
Approach		1072	5.0	0.886	31.4	LOS C	16.9	123.6	0.75	0.74	39.6
West: Schofields Road West											
10	L2	280	5.0	0.267	13.9	LOS A	6.1	44.8	0.51	0.70	48.2
11	T1	1063	7.0	0.883	54.2	LOS D	20.3	148.4	1.00	1.03	31.9
12	R2	92	5.0	0.894	71.0	LOS F	5.5	40.1	1.00	0.98	27.5
Approach		1435	6.5	0.894	47.4	LOS D	20.3	148.4	0.90	0.96	33.7
All Vehicles		3932	5.9	0.909	41.7	LOS C	29.5	215.0	0.87	0.87	35.6

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	45.8	LOS E	0.1	0.1	0.94	0.94
P2	East Full Crossing	53	31.3	LOS D	0.1	0.1	0.77	0.77
P3	North Full Crossing	53	46.8	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	42.2	LOS E	0.1	0.1	0.90	0.90
All Pedestrians		211	41.5	LOS E			0.89	0.89

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

MOVEMENT SUMMARY

Site: 101 [Tallawong Rd and Schofield Rd - Future + Proposed - PM Peak]

Tallawong Road and Schofields Road
Signals - Fixed Time Isolated Cycle Time = 105 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Ridgeline Drive											
1	L2	36	5.0	0.060	31.0	LOS C	1.2	9.0	0.71	0.70	39.0
2	T1	297	5.0	0.820	49.0	LOS D	15.9	116.3	1.00	0.96	33.5
3	R2	21	5.0	0.205	59.9	LOS E	1.1	8.0	0.98	0.70	30.3
Approach		354	5.0	0.820	47.8	LOS D	15.9	116.3	0.97	0.92	33.8
East: Schofields Road East											
4	L2	42	5.0	0.039	9.4	LOS A	0.5	4.0	0.33	0.62	51.2
5	T1	667	7.0	0.713	47.3	LOS D	11.1	81.4	1.00	0.86	33.9
6	R2	135	5.0	0.986	91.5	LOS F	9.5	69.3	1.00	1.15	23.9
Approach		844	6.6	0.986	52.5	LOS D	11.1	81.4	0.96	0.90	32.3
North: Tallawong Road											
7	L2	128	5.0	0.117	14.7	LOS B	2.7	19.8	0.45	0.69	47.2
8	T1	719	5.0	0.573	19.3	LOS B	15.3	112.0	0.70	0.61	45.8
9	R2	455	5.0	1.020	109.9	LOS F	39.4	287.9	1.00	1.26	21.4
Approach		1302	5.0	1.020	50.5	LOS D	39.4	287.9	0.78	0.85	32.8
West: Schofields Road West											
10	L2	260	5.0	0.218	11.2	LOS A	4.5	33.2	0.41	0.67	50.0
11	T1	718	7.0	0.767	49.1	LOS D	12.3	90.2	1.00	0.90	33.3
12	R2	61	5.0	0.447	58.7	LOS E	3.2	23.2	1.00	0.75	30.3
Approach		1039	6.4	0.767	40.2	LOS C	12.3	90.2	0.85	0.83	36.1
All Vehicles		3539	5.8	1.020	47.7	LOS D	39.4	287.9	0.86	0.86	33.7

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	46.8	LOS E	0.1	0.1	0.94	0.94
P2	East Full Crossing	53	29.0	LOS C	0.1	0.1	0.74	0.74
P3	North Full Crossing	53	46.8	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	53	46.8	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		211	42.3	LOS E			0.89	0.89

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.