

Traffic Impact Assessment

64 Mackillop Drive, Baulkham Hills
Planning Proposal

Ref: 0463r01v2
21/09/2017

Document Control

Project No: 0463r01v2

Project: 64 Mackillop Drive, Baulkham Hills – Planning Proposal

Client: Aqualand Projects Pty Ltd

File Reference: 0463r01 AG 64 Mackillop Drive, Baulkham Hills TIA (Draft)

Revision History

Revision	Date	Details	Author	Approved by
-	06/09/2017	Draft	J. Laidler	T. Lewis
1	21/09/2017	Issue I	J. Laidler	T. Lewis
2	21/09/2017	Issue II	J. Laidler	T. Lewis

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1 Introduction

1.1 Overview

Ason Group has been engaged by Aqualand Projects Pty Ltd to prepare a Traffic Impact Assessment (TIA) to support a Planning Proposal at 64 Mackillop Drive, Baulkham Hills (the Site). Located within The Hills Shire Council Local Government Area (LGA), the site is subject to the Hills Shire Council controls. However, the NSW Government’s Sydney Northwest Metro Station presents an opportunity for further development within the local area, including the Site.

Norwest Business Park is an industrial/commercial hub located at Baulkham Hills and currently provides employment for more than 20,000 people. There are more than 2,000 dwellings in the adjacent Bella Vista residential areas. The site is located within the Norwest Station Precinct and has been identified for future growth due to its proximity to the planned Sydney Metro Northwest Norwest Station. As a result, the Norwest Station Precinct is proposed be rezoned to maximise the benefits from investments in this key piece of public infrastructure.

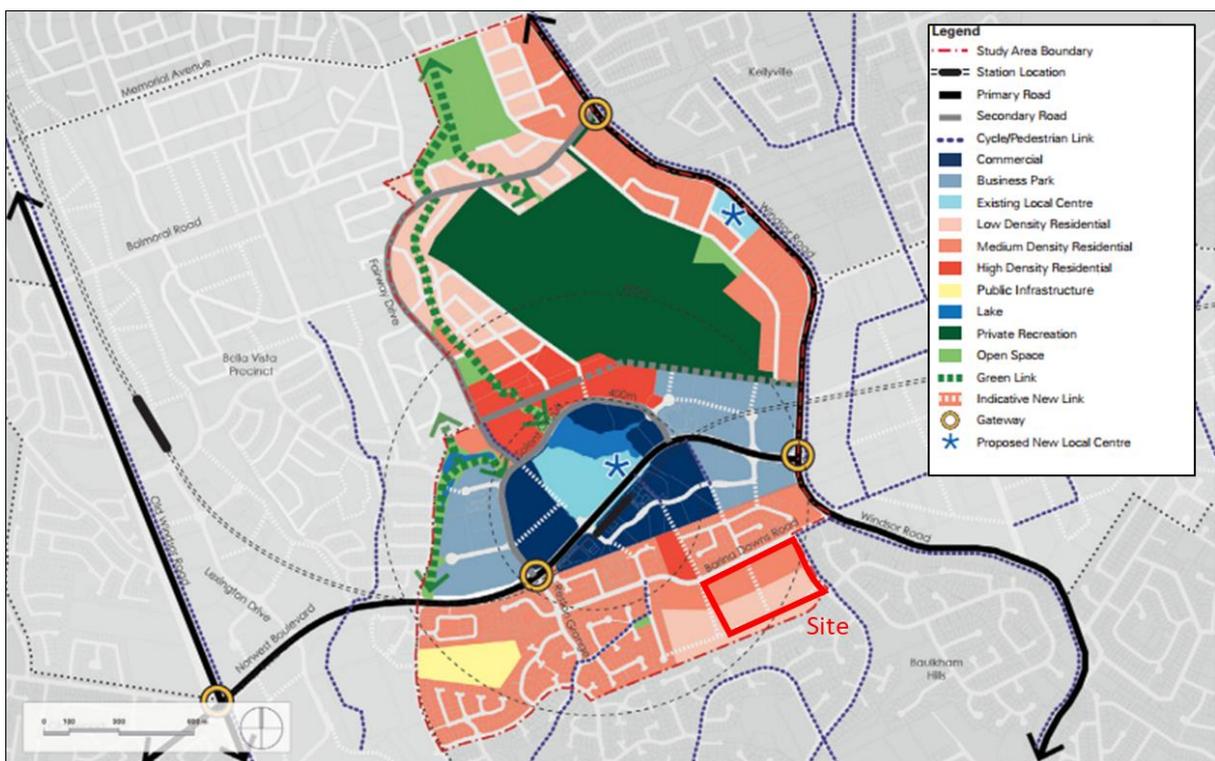


Figure 1: Site Context within the Norwest Station Precinct

In 2011, Traffix prepared a traffic report to support redevelopment of the Site for 191 dwellings. This was approved by the Joint Regional Planning Panel (6/2012/JP) on 23 September 2013.

This Planning Proposal seeks to amend The Hills Local Environmental Plan 2012 to rezone the site from the current split zoning of R2 Low Density Residential and R3 Medium Density Residential to part R3 Medium Density Residential, part R4 High Density Residential, part RE1 Public Recreation and retain existing R2 Low Density Residential.

In addition, the Planning Proposal includes amendments to the maximum building height development standards to allow varying heights of part 9m, part 12m and part 16m in the proposed R4 High Density Residential land and modifications to the heritage map.

The Planning Proposal is accompanied by a masterplan which provides for approximately 110 medium density dwellings comprising of townhouses and small lot dwellings, approximately 270 apartments in low rise residential flat buildings, a public reserve and a communal space incorporating the heritage farmhouse and curtilage

This TIA report has been prepared to assess the relevant traffic, transport and parking implications of the Proposal and has referenced the following key planning documents, general access, traffic and parking guidelines:

- North West Rail Link – Norwest Station Structure Plan: A Vision for Norwest Station Surrounds (2013).
- North West Rail Link Corridor Strategy (2013).
- North West Rail Link Operational Traffic and Transport Report (2012)
- NSW Department of Planning and Infrastructure State Significant Infrastructure Assessment: North West Rail Link – Stations, Rail Infrastructure and Systems (2013)
- Parson Brinkerhoff Norwest Station Subsurface Pedestrian Link and Northern Entry – Review of Environmental Factors (2015)
- Parson Brinkerhoff Appendix B: Norwest Station Subsurface Pedestrian Link and Transport Review (2015)
- SCAPE Integrated Transport Study – Final Report (2009)
- TDG Capital Bluestone: Mixed use development report, 11-13 Solent Circuit Norwest Town Centre (2016)
- The Hills Shire Council Development Control Plan (2012)
- The Hills Shire Council Local Environmental Plan (2012)

- The Hills Corridor Strategy: Sensibly delivering housing and employment around the Sydney Metro Northwest (2015)
- The Hills Shire Council Mayoral Minute No.9/2016 – Methodology for Providing Housing Mix and Diversity within the Sydney Metro Northwest Corridor (2016)

This report also references general access, traffic and parking guidelines, including;

- Roads and Maritime Services (RMS), *Guide to Traffic Generating Developments* (RMS Guide)
- Australian Standard 2890.1: Parking Facilities – Off Street Car Parking (AS 2890.1)
- NSW Government, *Planning Guidelines for Walking and Cycling*, December 2004

1.2 Report Structure

The report is structured as follows:

- Section 2 provides a summary of the proposal and indicative development potential.
- Section 3 details the existing site context including surrounding road hierarchy, active and public transport services.
- Section 4 discusses the strategic context for the development.
- Section 5 outlines parking requirements applicable to future development.
- Section 6 assesses the traffic impacts of the development including the Site's projected trip generation and forecasted network performance
- Section 7 discusses the site access and internal design considerations
- Section 8 provides a summary of the key conclusions.

2 Overview of Proposal

2.1 Planning Controls

The Site is currently zoned part R3 Medium Density Residential along the Barina Downs Road frontage, with the remainder zoned R2 Low Density Residential. It is currently subject to a 9-metre height control limit.

To the immediate west of the site, also on Barina Downs Road, is an R4 High Density Residential zone with a height control of 16 metres.

2.2 Indicative Development Yield

A detailed description of the proposed development is included in the Planning Proposal report, prepared separately.

To assist in assessment of the Proposal, DKO Architects has prepared a concept plan for the site, with reduced copy provided for context below.



Figure 2: General Layout

The conceptual master plan provides for a combination of residential apartments, medium density semi-detached housing and low-density dwellings with a yield of approximately 408 dwellings across the subject site. For the purpose of this assessment 408 dwellings will be the number of units adopted in this report. Accordingly, the ‘net’ effect of the proposed changes would be an uplift of some 217 dwellings from the approved Traffix report which designated a development yield of 191 dwellings. A comparison between the yield assumed by the approved master plan and that now proposed is provided Table 1 below.

Table 1: Indicative Development Yield

Dwelling Type	Approved	Proposed	Net Change
Low-density	71	28	-43
Medium-density	120 ¹	110	-10
Apartments		270	+270
TOTAL	191	408	+217

1) Subject to Council Approval.

The concept masterplan also includes:

- Retention of existing buildings with consideration to heritage items within the sites boundaries.
- Construction of 4 access routes intended to achieve an efficient means to disperse traffic to the surrounding road network.
- Development of an internal road system. This includes new public roads to be dedicated to Council (Roads 01 – 03) in addition to community title roads within the medium-density dwelling areas.

The impacts arising from the above are discussed in the following sections.

2.3 Proposed Site Access Arrangements

Site access is generally consistent with that of the approved master plan which envisaged a total of 5 new road connections to the Sisters of St Joseph site. This includes the four (4) roads nominated on the plans prepared by DKO. In addition, a fifth road connection (not shown on the plans) is provided at the north-west corner of the overall site. However, that road serves only the R4 zone in the north-west and is not relevant to the subject proposal.

It is anticipated that the northern connection to Mackillop Drive (with Road 02) will be restricted to a left-in, left-out movements due to sight distance issues caused by the crest in Mackillop Drive a short distance to the north of the access. The design of this access and other access is discussed further in Section 7.

3 Existing Conditions

3.1 Site Description

The overall site is historically known as the Sisters of St Joseph Convent, and incorporates a conference centre along with the convent.

It is located in Baulkham Hills approximately 25 kilometres north-west of Sydney CBD and 10 kilometres north of Parramatta. The site comprises of 3 large lots on the corner of Mackillop Drive and Barina Downs Road and is legally described as outlined in Table 2.

Table 2: Legally Described Lots

Lot	DP	Comments
1001	DP1190982	R2 zone
1002	DP1190982	Part R3 & R and includes the site access driveway serving the existing Convent and the heritage building to be retained
1003	DP1190982	The Sisters of St Joseph Convent and not part of the subject application

Barina Downs Road and Mackillop Drive, respectively, form the northern and eastern frontages of the site. To the south and west, the overall site is bounded by neighbouring low-density residential dwellings. Norwest Market Town and the future Norwest Station and are situated to the north-west of the site.

3.1.1 Site Access

Access to the site is currently provided via a driveway at the northern end of the Mackillop Drive frontage. This driveway extends through the site to the Convent complex that is located on the western part of the site.



Figure 3: Road Hierarchy and Site

3.2 Surrounding Road Network

3.2.1 Road Hierarchy

The road hierarchy within the vicinity of the site is shown in Figure 3, with the roads of interest outlined below:

- Windsor Road a classified RMS Main Road (MR 184) that generally runs in a north-south direction connecting McGraths Hills and other roads in the north with North Parramatta and other roads in the south. Having two lanes in each direction, it carries in excess of 32,000 vehicles a day and has a speed limit of 70km/h within the locality of the site. It has 'No Parking' restrictions in place along the full length of road within the vicinity of site.
- Old Windsor Road an arterial road (MR635) to the west of the site that runs in a north-south direction connecting to Abbott Road and the M2 in the south and Windsor Road in the north. Having three lanes in each direction, it carries in excess of 31,000 vehicles per day and had a speed limit of 80km/h within the locality of the site.
- Norwest Boulevard a classified RMS Road (MR690) to the north of this site that generally runs in a north-south direction connecting Old Windsor Road to the west and Windsor Road to the east. Having 2 lanes in each direction, it carries in excess of 29,000 vehicles per day and has a speed limit of 70km/h
- Reston Grange a local collector road that generally runs in a north-south direction between Norwest Boulevard in the north and Seven Hills Road in the south. Reston Grange has a single lane in each direction and is 50km/h along its full length.
- Barina Downs Road a local road to the north of the site that forms the boundary and provides access to the site. It generally runs in an east-west direction connection Mackillop Drive and Windsor Road to Reston Grange and Norwest Boulevard. Barina Downs Road has a single lane in each direction with an environmental capacity of 467 to the east, and 366 to the west of Mackillop Drive, with a speed limit of 50km along its full length.
- Mackillop Drive a local road which forms the sites eastern boundary and provides access to the site. It generally runs in a north-south direction between Barina Downs Road in the north and Seven Hills Road in the south (however the roads name changes to Chapel Lane before reaching Seven Hills Road). It has a single lane in each direction with an environmental capacity of 401 vehicles per hour and a speed limit of 50km along its full length.
- Hillsborough Way a local road generally runs in a north-south direction between Barina Downs Road in the north and Fairmont Avenue. It has a single lane in each direction and has a speed limit of 50km along its full length.

3.2.2 Network Performance

Traffic surveys were undertaken on Thursday, 25th May 2017, to determine existing traffic volumes at key intersections within the vicinity of the site. These 4 key intersections include:

- Windsor Road and Barina Downs Road; and
- Mackillop Drive and Barina Downs Road; and
- Reston Grange and Barina Downs Road, and
- Reston Grange and Norwest Boulevard.

The performance of the above intersection has been analysed using the SIDRA Intersection modelling program. SIDRA modelling outputs a range of performance measures, specifically:

- *Degree of Saturation (DOS) – The DOS is defined as the ratio of demand (arrival) flow to capacity. The DOS is used to measure the performance of intersections where a value of 1.0 represents an intersection at theoretical capacity, above 1.0 represent over-saturated conditions (demand flows exceed capacity) and degrees of saturation below 1.0 represent under-saturated conditions (demand flows are below capacity). As the performance of an intersection approaches DOS of 1.0, queue lengths and delays increase rapidly. It is usual to attempt to keep DOS to less than 0.9, with satisfactory intersection operation generally achieved with a DOS below 0.8.*
- *Average Vehicle Delay (AVD) – Delay represents the difference between interrupted and uninterrupted travel times through an intersection and is measured in seconds per vehicle. Delays include queued vehicles accelerating and decelerating from/to the intersection stop lines, as well as general delays to all vehicles travelling through the intersection. 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. For signalised and roundabout intersections, LOS is based on the average delay to all vehicles, while at priority controlled intersections LOS is based on the worst approach delay. The following table provides a recommended baseline for assessment as per the RMS Guide.*

Table 3: Traffic Model Performance Criteria

Level of Service	Average Delay per Vehicle (sec/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.

The results of the modelling are summarised in Table 4 below. Supporting SIDRA outputs and intersection layouts are attached to this report in **Appendix A**.

Table 4: Intersection Performance – Existing

Intersection	Control Type	Period	Average Vehicle Delay (AVD) (Sec)	Level of Service (LOS)
Windsor Road and Barina Downs Road	Priority	AM	182.7	F
		PM	22.0	B
Mackillop Drive and Barina Downs Road	Roundabout	AM	9.2	A
		PM	9.2	A
Reston Grange and Barina Downs Road	Roundabout	AM	12.5	A
		PM	12.2	A
Reston Grange and Norwest Boulevard	Roundabout	AM	78.4	F
		PM	101.3	F

Note: 1) Capacity reductions applied to account for downstream blockage to calibrated modelled with observed queues.

It can be seen from Table 4 that the existing left in-left out intersection of Windsor Road and Barina Downs Road exceeds capacity, with a Level of Service F during the morning peak. Queues generated by vehicles waiting to turn left into Norwest Boulevard restrict the ability for vehicles to exit Barina Downs Road causing excessive delays and queues within Barina Downs Road.

The intersection of Reston Grange and Norwest Boulevard also exceeds capacity. This is largely due to the significant east-west traffic movements along Norwest Boulevard which preventing traffic on the minor legs of the intersections (Reston Grange and Solent Circuit) from entering the roundabout.

Intersection of local roads (Barina Downs Road with Reston Grange and Mackillop rive) operate with acceptable Level of Service and spare capacity.

3.3 Existing Public Transport Services

3.3.1 Current Mode Share

Below is a summary of various modes of transport used by workers and residents in the selected Travel Zone (TZ 4518). The JTW data also highlighted that most of the residents in the surrounding locality travel to 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 resident's travel to and from these areas for work.

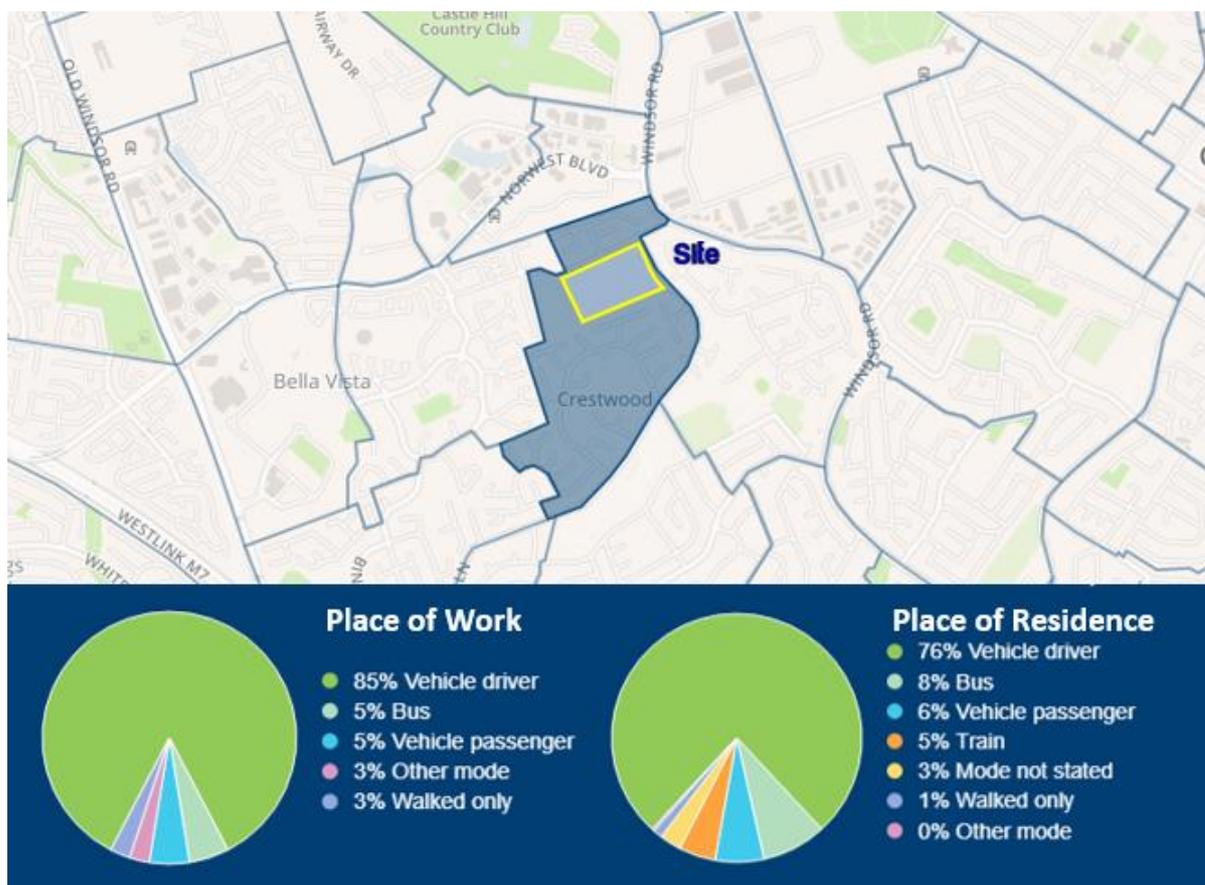


Figure 4: Journey to Work Summary

A number of residents and employees do use train services as part of multi-modal trips, however these are likely to involve another mode as part of a multi-modal trip involving either a bus or private vehicle noting that no train station is currently provided in the immediate locality. This data also demonstrates a comparatively high level of bus use, particularly by residents.

It is evident that the majority of existing residents rely on private vehicles (as 'vehicle driver') as their primary mode of travel. The data highlights the heavy dependence on single driver vehicle use within The Hills Shire Council LGA more generally. This high dependence also translates into the North West having the highest private vehicle ownership within Sydney.

The introduction of the Sydney Metro Northwest line in close proximity to this area would be expected to alter these travel patterns and increase the proportion of trips made by public transport. Furthermore, improved pedestrian and cyclist connections throughout the local area, including Norwest, as part of The Hills Corridor Strategy (2015) would also assist in a mode shift away from private vehicle usage. Section 3 of the strategy outlines that it is anticipated that the proportion of employed residents to catch public transport to work will increase from 15% to as high as 45%.

3.3.2 Bus Services

The bus network in the immediate vicinity of the site is currently serviced by several bus routes, which can be seen in Figure 5. The local area is currently serviced by the following routes:

- Route 614 (Crestwood to the City via Reston Grange)
- Routes T60 (Castle Hill to Parramatta via Old Windsor Road)

The Integrated Public Transport Service Planning Guidelines (2013) states that bus services influence the travel mode choices of sites within 400 metres (approximately 5 minutes) of a bus stop. Accordingly, the Site is considered to be well served by public transport services in the area.

3.4 Active Transport Connections

Cyclists are legal road users entitled to utilise any public road unless otherwise stated (some freeways and motorways prohibit cyclist access). As can be seen in Figure 5, there are shared paths between the Norwest Station and the site. These shared paths reduce the distances between the station and site, further increasing the amenity of the site.

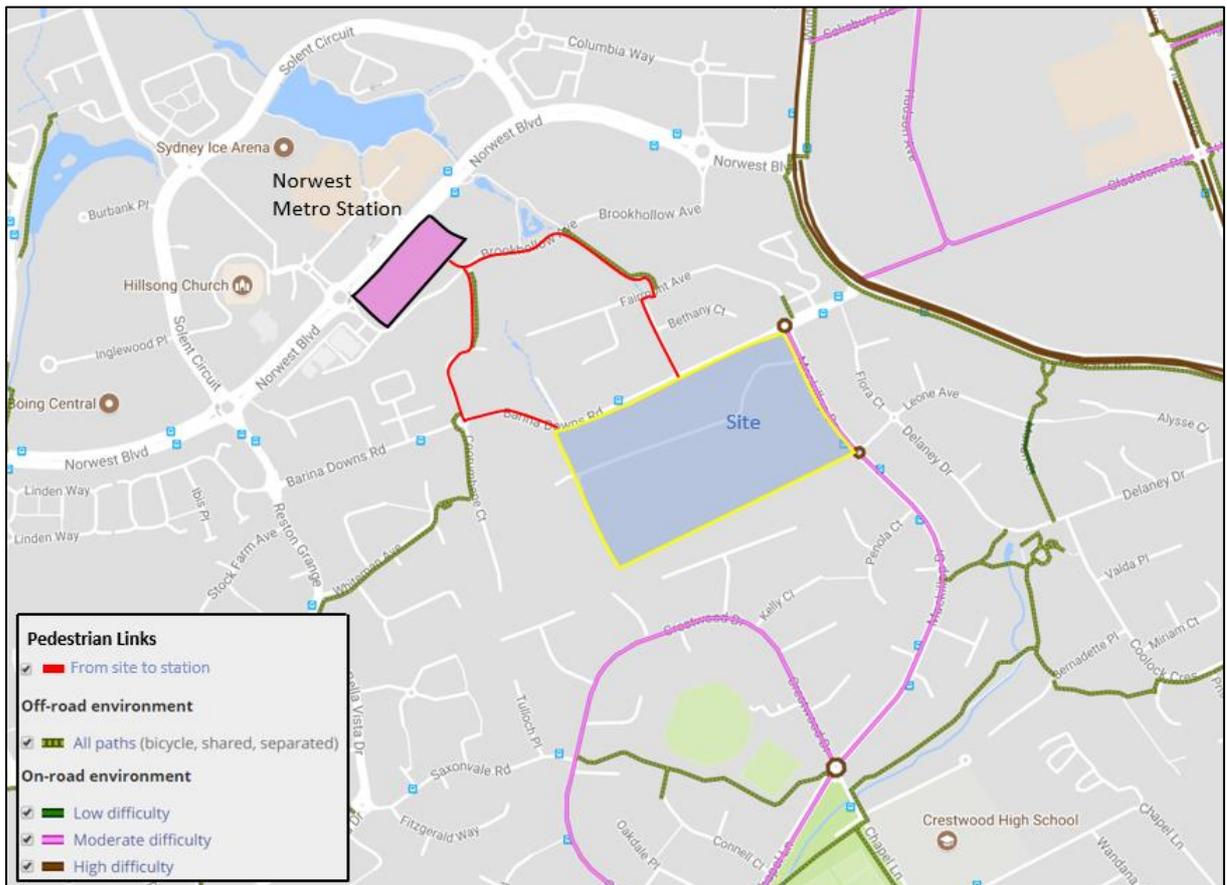


Figure 6: Active Transport Connections

The prevalence of footpaths allows for an increased accessibility for the public to and from the Site, promoting an active lifestyle and reducing the dependence on vehicles as the sole mode of transportation throughout the network. In recent years, The Hills Shire Council has been building a network of footpaths and cycleways throughout the Shire on at least one side of road, with the aim to build footpath or cycleway on every road within The Shire.

Built concrete footpaths are located in all streets surrounding the Site except for Fairmont Avenue and Hillsborough Way, with multiple direct routes for residents of the Site to access the planned Norwest Station through laneways and local streets.

4 Strategic Context

4.1 Sydney Metro Northwest (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 Sydney. To support the project, DP&E has identified a number of Priority Precincts, including the Norwest Station Precinct, with the aim to provide housing and jobs in centres with good existing or planned transport services.

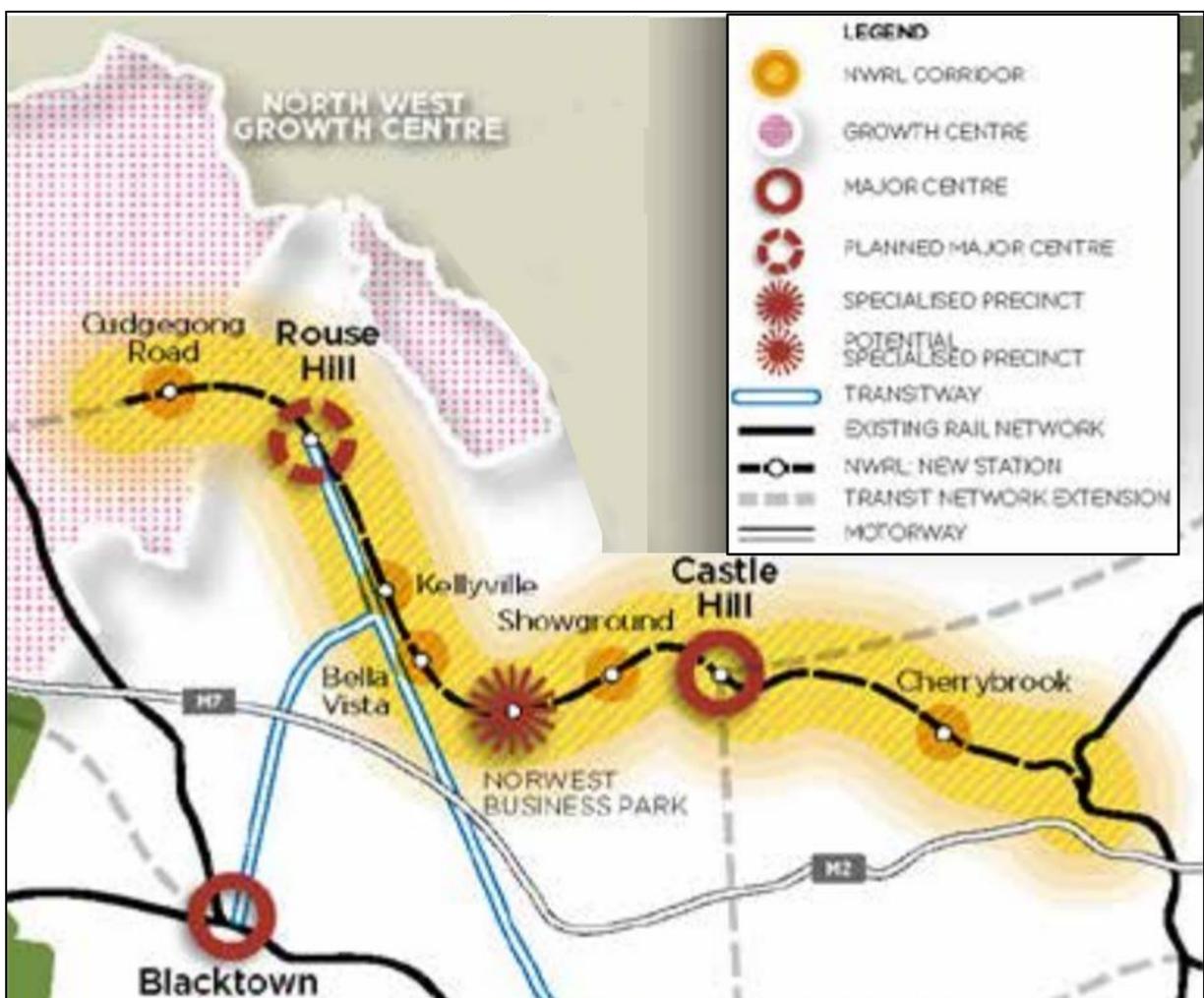


Figure 7: North West Rail Link Corridor Centres

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.

4.2 The Hills Corridor Strategy

This Strategy's guiding principles addresses the objective, that a 20-year plan for traffic and transport in The Hills Shire Councils LGA be developed. By 2036, it is expected that the Norwest Station Precinct will be transformed into a major specialised employment centre – the largest employment centre in the North West. There is expected to be a commercial core, retail and mixed-use hub, a business park and higher residential densities surrounding the precinct.

The construction of the Norwest Station, and the subsequent changes in land-use will result in approximately 6,000 new homes and 14,000 jobs created over the next 20 years. These new homes and jobs will have convenient access to the Norwest Station, jobs, shops, cafés and open spaces.

A varied built form is planned for the Precinct to reflect the new opportunities. The built form ranges from 4 -22 stories for 'landmark buildings'. Suitable locations for High density will range from 7-12 stories, with mixed use and medium density buildings having an allowance of 3-6 stories. Within the local centre, there is a plan to accommodate shops, cafes, and restaurants, with "shop-top" residential buildings above.

Work will be undertaken before the new Norwest Station opens in the first half of 2019 and will provide immediate actions to cater for growth in the area and deliver longer term planning solutions to meet the needs of the future.

4.3 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.

The Site is located within 800 metres of the future Norwest Station and, accordingly, the above provisions would apply to any residential apartment buildings on the Site.

4.4 Mayoral Minute No.9/2016

The Mayoral Minute No.9/2016 – Methodology for Providing Housing Mix and Diversity within the Sydney Metro Northwest Corridor proposes amendment to development strategies so they are specific to The Hills Shire Council. The proposed strategy stipulates the following;

- Land within a Sydney Metro Northwest Corridor station precinct is also assigned with an “incentivised” floor space ratio through either the planning proposal or precinct planning process. The “incentivised” floor space ratio would be determined by Council on a site-by-site basis and would represent the maximum development scenario permissible on the land.
- Alternatively, a higher “incentivised” floor space ratio could be achieved if the following requirements are met:
 - Maximum of 25% of all dwellings to be studio or one-bedroom apartments;
 - Minimum of 20% of all dwellings to be three or more-bedroom apartments;
 - 40% of all two and three-bedroom apartments to comply with a minimum apartment size set by Council (110m² for two bedrooms and 135m² for three bedrooms);
 - Parking rates to be 1 space per apartment and 1 visitor space per 5 apartments.

5 Parking Requirements

5.1 Car Parking

Car parking provisions are a detailed matter to be addressed during subsequent Development Application submissions.

The Hills DCP Part B, Section C5 outlines site specific DCP controls for the site. It outlines that as a minimum, 1 space must be required for each dwelling and it must be located within a garage.

Part C of The Hills DCP outlines provisional parking rates, and a summary of relevant parking controls is provided in Table 5 below.

Table 5: Car Parking Requirements Summary

Land Use	Type	The Hills DCP 2012
Residential	1 Bedroom Unit	1 space / unit
	2 Bedroom Unit	2 spaces / unit
	3 Bedroom Unit	2 spaces / unit
	Dwelling (Medium and Low Density)	1 space / dwelling
	Visitors	1 spaces / 2.5 units (rounded up to the nearest whole number)

Notwithstanding, there may be scope to reduce parking requirements on the basis of SEPP 65 requirements and having regard for the Mayoral Minute with respect to development within the Sydney Metro Northwest corridor. Notwithstanding, as discussed above, car parking provision is a detailed matter for assessment during Development Application.

5.2 Servicing

Having regard for the number of units envisaged for residential apartment blocks, it is anticipated that an on-site service area will be provided for each of the apartment super lots. Again, this is a detailed matter for consideration as part of a subsequent Development Application.

Servicing within the medium and low-density areas will be undertaken from on-street within the new public roads. In this regard, swept paths have been undertaken by Calibre Consulting to confirm the roads can accommodate service vehicles as part of the road design process.

6 Traffic Assessment

6.1 Traffic Generation

6.1.1 Existing Traffic Generation

The site currently generates approximately 100 vehicles per day, with the majority of movements occurring during the morning and afternoon peaks. With the exception of a small bus, and a large delivery van, all traffic to and from site are standard light vehicles.

It is expected that these trips will be retained such that any future development will represent a net increase above existing levels.

6.1.2 Adopted Trip Generation Rates

Norwest is described as a specialised centre by TfNSW and is considered an important destination along the future Sydney Metro Northwest. It is estimated that more than half of the passengers on the rail line will depart from the train at Norwest Station. Considering that the NSW *Department of Planning and Infrastructure State Significant Infrastructure Assessment: North West Rail Link – Stations, Rail Infrastructure and Systems (2013)* (DP&I) report estimates that approximately 15,600 patrons an hour will utilise the rail line on an average day, it can be estimated that in 2021, there will be a reduction of approximately 7,800 vehicles heading into the Norwest precinct.

The NWRL corridor strategy report identified and supported a change in travel behaviour as a result of the construction of the rail line. The project will reduce private vehicle usage and create further possibilities to promote sustainable transport alternatives with a focus on Transit Oriented Developments (TODs) which generally provide facilities that “*makes it convenient and attractive to walk, cycle or use public transport*”.

Traffic generation rates for high-density residential apartments are provided within the RMS *Guide to Traffic Generating Developments – Updated traffic surveys* Technical Direction (04a), with values ranging between 0.07 – 0.32 vehicle trips per hour during the critical AM peak. Rates for medium-density dwelling typically range from 0.4 – 0.65 vehicle trips per dwelling. Prior to completion of the Sydney Metro Northwest, these medium density rates would have been nominally applied to all medium density units on-site.

However, the Site is located within walking distance of not just Norwest Station but also the extensive employment opportunities afforded by the Norwest more generally as a Strategic Centre. With plans to upgrade pedestrian and cycle amenities within the area, it is considered that a lower trip generation than 0.32 trips per hour is appropriate for the proposed apartment buildings.

Trip generation for the proposed medium density dwellings, as well as the low-density housing have been adopted from The RMS Guide in recognition of the site topography and increased distance from Norwest Station at the south-east corner of the Site.

Having regard for the above, the traffic generation rates adopted by this assessment are presented in Table 6.

Table 6: Trip Generation Rates

Land-use	AM Peak (veh/hr/dwelling)	PM Peak (veh/hr/dwelling)
Low Density Dwellings	0.95	0.99
Medium Density Attached / Detached Housing	0.65	0.65
Residential Apartments	0.24	0.24

It is noted that the transport study supporting the Riverstone East Precinct, further along the Sydney Metro Northwest line, adopts an apartment traffic generation rate of 0.19 vehicle trips per hour per unit. As such, the following analysis is deemed a conservative assessment.

6.1.3 Future Traffic Generation

The traffic generated by the proposed development has been calculated using the Roads and Maritime Services (RMS), *Guide to Traffic Generating Developments* (RMS Guide) and has been based off a development of 408 units. The trip generation and the comparison to the approved Traffix report is outlined below in Table 7 below

Table 7: Traffic Generation Comparison

Land-use	No. of Units	AM Peak (veh/hr)	PM Peak (veh/hr)
Approved ¹	191	157	157
Proposed	408	173	174
Difference	+217	+16	+17

Notes 1) Approved traffic generation based on values documented in Traffix report, supporting original submission.

2) Proposed values adopt traffic generation rates outlined in Table 6

It can be seen from above that the proposed development could result in an increase of up to 16 and 17 vehicle trips per hour during weekday morning and evening peak periods. This is a moderate increase and will not have a significant impact on the regional road network. Accordingly, a localised assessment of traffic impacts is expected to be required.

6.1.4 Sensitivity Analysis for Future Traffic Generation

At the request of Council, sensitivity analysis has been undertaken to explore the impact of the future Norwest Station on adopted traffic volumes. As discussed in Section 6.1.2, the traffic generation rates for the proposed apartments and medium-density units would be higher in the event that the Norwest Station were not to be provided. As the Station is currently under construction, this a purely academic exercise for sensitivity testing purposes only.

6.2 Traffic Distribution & Assignment

It is expected that vehicles heading east will initially travel to the south along Mackillop Drive before turning off to Windsor Road. This is primarily due to the intersection of Barina Downs Road and Windsor Road being limited to left-in-left-out arrangements (with the exceptions of buses which are permitted to turn right from Windsor Road into Barina Downs Road).

A review of current (2011) Journey-to-Work data indicates the following distribution of traffic onto the surrounding road network approximately as follows:

- North 3% (via Windsor Road)
- East 0%
- South 49% (via Mackillop Drive)
- West 48% (via Norwest Boulevard)

6.3 Network Performance

For the purpose of this TIA report, an assessment of the Proposal has been undertaken for the following scenarios:

- Existing plus Approved Yield – which consists of 2017 existing (surveyed) volumes plus the previously approved development yield. This assumes a development traffic of 157 veh/hr for modelling purposes.
- Existing plus Proposed Yield – which consists of 2017 existing (surveyed) volumes, plus the proposed development yield associated with the current proposal, NOT accounting for the future Norwest Station. This assumes a development traffic of some 256-257 veh/hr for sensitivity purposes.
- Existing plus Proposed Yield (with Norwest Station) – which consists of 2017 existing (surveyed), plus forecast development traffic associated with the Proposal, when considering the future proximity of the site to Sydney Metro Northwest. This scenario adopts a development traffic generation of 173-174 veh/hr associated with the subject development.

Having regard for the moderate increase in traffic, an assessment of 4 key local intersections has been adopted as the study area for this assessment. These intersections have been assessed using SIDRA Intersection, with the results summarised in Table 8.

Table 8: Intersection Operation Summary – Standard Assessment

Intersection	Control Type	Period	Design Scenario	Average Vehicle Delay (AVD)	Level of Service (LOS)
1 Windsor Road x Barina Downs Road T-Intersection	Priority	AM	2017 Approved	302.8	F
			2017 Proposed	306.2	F
			2017 Proposed with Station	21.9	B
		PM	2017 Approved	26.0	B
			2017 Proposed	26.1	B
			2017 Proposed with Station	19.1	B
2 Mackillop Drive x Barina Downs Road	Roundabout	AM	2017 Approved	11.0	A
			2017 Proposed	11.2	A
			2017 Proposed with Station	11.1	A
		PM	2017 Approved	11.3	A
			2017 Proposed	11.9	A
			2017 Proposed with Station	11.4	A
3 Reston Grange x Barina Downs Road	Roundabout	AM	2017 Approved	13.2	A
			2017 Proposed	13.6	A
			2017 Proposed with Station	13.3	A
		PM	2017 Approved	12.4	A
			2017 Proposed	12.5	A
			2017 Proposed with Station	12.4	A
4 Norwest Boulevard x Reston Grange	Roundabout	AM	2017 Approved	190.7	F
			2017 Proposed	248.0	F
			2017 Proposed with Station	202.5	F
		PM	2017 Approved	116.3	F
			2017 Proposed	114.1	F
			2017 Proposed with Station	113.9	F

The results indicate that the intersection of Barina Downs Road and Windsor Road will continue to exceed capacity in the AM peak, similar to that of the approved scenario. Delays and associated queues are primarily due to queuing on approach to the Windsor Road / Norwest Boulevard intersection. Ultimately, this is a network blockage created by vehicles turning left on to Norwest Boulevard from Windsor Road.

Patronage rates for the Norwest Station are projected to be quite high as a result of the demand to access the Norwest Business Park. Indeed, the North-West Rail Link Operational Traffic and Transport Report suggests that it is expected that just over 50% of all commuters utilising the rail line will have Norwest Station as a destination. This mode shift for Norwest employees generally is expected to reduce traffic demands accessing Norwest Boulevard which may ultimately eliminate the network blockage that reduced the efficiency of the intersection of Barina Downs Road and Windsor Road from vehicles turning left from Windsor Road. In this regard, the modelled results for the “with Station” scenario have assumed that downstream blockage has been alleviated as a result of the changes to travel patterns expected to occur as a result of the Metro more generally. Notwithstanding, the relative increase in delays at the intersection of Barina Downs Road / Windsor Road even without the station are relatively minor. For that reason, works to the Windsor Road / Barina Downs Road are not considered necessary.

The intersections of Mackillop Drive / Barina Downs Road and Reston Grange / Barina Downs Road operates within acceptable thresholds with a LOS A maintained throughout all scenarios.

Norwest Boulevard with Reston Grange currently operates under the control of a roundabout. Under this arrangement, the intersection is at or above capacity with considerable delays in all scenarios during both AM and PM peaks.

With the construction of the Norwest Station and since Norwest Boulevard is now under the care and control of the RMS, there are planned upgrades along Norwest Boulevard. The upgrades are to include; widening Norwest Boulevard to 3 lanes in each direction with ancillary turning bays, as well as the conversion of all roundabouts along Norwest Boulevard to signalised intersections.

SIDRA analysis of the upgraded Norwest Boulevard / Reston Grange intersection with traffic signals has been undertaken with the results found below in Table 9.

Table 9: Intersection Operation Summary – Upgraded Intersection Assessment

Intersection	Period	Control Type	Design Scenario	Average Vehicle Delay (AVD)	Level of Service (LOS)
Norwest Boulevard x Reston Grange (UPGRADED)	AM	Roundabout	2017 Proposed with Station	202.5	F
		Signals	2017 Proposed with Station	42.4	C
	PM	Roundabout	2017 Proposed with Station	113.9	F
		Signals	2017 Proposed with Station	52.3	D

The SIDRA modelling results summarised in the table above indicate that the signalised intersection performs considerably better than the existing roundabout. Average delays more than halve under the signalised intersection, and the Level of Service (LoS) improving from an F to an D.

In addition to increasing effective traffic capacity, the proposed upgrades would also benefit pedestrians crossing Norwest Boulevard, Reston Grange, and/or Solent Circuit. Currently, there is no provision for pedestrian to cross any leg of the roundabout at the intersection of Norwest Boulevard and Reston Grange, with pedestrians often running across the road between vehicles in peak times. The introduction of signals at this intersection will give pedestrians an opportunity to safely cross Norwest Boulevard, Reston Grange and/or Solent Circuit, eliminating any existing potential conflicts between vehicles and pedestrians.

7 Design Commentary

7.1 Relevant Design Standards

The site access, car park and loading areas (and access thereto) shall be designed to comply with relevant Australian Standards (AS2890 series). It is expected that any detailed designs in relation to car park or site access driveways would comply with these Standards. Indeed, compliance with the above Standards would be expected to form a standard condition of consent to any development approval.

7.2 Site Access Arrangements

The Hills Shire Council DCP, Part B Section 2.C.5.3.1(b) restricts site access to site to 4 predetermined locations. These 4 locations are outlined in Figure 8 and are consistent with the Council DCP.



Figure 8: Site Access Arrangements Extracted from Council DCP

Upon review of road gradients, it is recommended that the intersection of Road 02 with Mackillop Drive be restricted to left-in, left-out movements only. Vehicles accessing Road 02 will have the opportunity to circulate via the other internal community roads, or via the roundabouts available within Mackillop Drive. Accordingly, this restriction will have minimal impact.

7.3 Internal Design Commentary

The proposed development has been designed having regard for the Standards set out in Section 7.1 of this report. An indicative road layout is shown in Figure 9 which provides an appreciation of the future road hierarchy proposed for the site. The road hierarchy is consistent with the requirements outlined in the Hills Shire Council DCP which requires the future road network be constructed providing:

- Access Roads with a 15.5m road reserve and a carriageway width of 8.5m, and
- Roadways and lanes providing access to 30 dwelling or less, be constructed with a road reserve of 14.5m with a carriageway width of 7.5m.

Further details regarding the geometric design of these roads will be undertaken with any future DA for the site.



Figure 9: Indicative Internal Road Design

7.4 Internal Pedestrian Commentary

The site is located within 800m walking distance to the future Norwest Metro station, and as discussed above, it is anticipated that a significant number of walking trips will be generated by future residents of the site accessing the Station and Norwest Business Park. The design of the through-site links has been proposed to increase and indeed encourage accessibility and permeability of the site for both future and existing residents of the area.

It is proposed that links will be provided within site that will be accessible to public and private users, providing a pedestrian and cycle connection between new roads, Mackillop Drive, Salamander Grove (Road directly south of the site) and Barina Downs Road.

Figure 10 below outlines the proposed pedestrian routes and highlights the major north / south connections that result from the proposal. Further investigations in relation to upgrades to existing pedestrian and cycle infrastructure, linking the site and the Norwest Metro and Business Park will be undertaken as part of any future Development Applications.



Figure 10: Indicative Internal Pedestrian Design

8 Conclusions

The key findings of this Traffic Impact Assessment are:

- The Site lies within the Norwest Station Precinct which is planned for significant uplift in development in response to the Sydney Metro Northwest and associated new Norwest Station located in close proximity northwest of the site.
- In this regard, an increased residential development yield on the site seeks to capitalise on this proximity, to maximise the benefits arising from the Government's investment in infrastructure, namely the Sydney Metro Northwest.
- Car parking provisions will ultimately be subject to further consideration during Development Application design development. However, it is understood that car parking will be provided as specified by The Hills DCP. Further detailed assessment of final car parking numbers will be undertaken during the future DA stage(s).
- It is envisaged that site access will be provided via four (4) new road connections which is consistent with the site specific DCP for the subject site, following previous master plan approval.
- The proposed development is expected to generate in the order of 173 and 174 veh/hr during the AM and PM peak periods, respectively. This represents an increase of only 16-17 veh/hr above that previously assessed (157 veh/hr) in relation to the approved concept plan.
- Sensitivity analysis has also been undertaken to assess the impact of the uplift without considering the reduced mode share to private vehicles as a result of the Norwest Station. This test of higher traffic generation rates is an academic exercise to provide Council comfort that the impacts of the development have been adequately assessed.
- Under all modelled scenarios, local intersections of Barina Downs Road with Mackillop Drive and Reston Grange operate well, with a Level of Service A.
- Barina Downs Road with Windsor Road experience considerable delays and queuing under "existing" and "without Station" scenarios. However, the relative increase in delay as a result of the development is minimal and not considered to require remedial works. Indeed, the changes to transport patterns on the wider road network as a result of the Sydney Metro Northwest, such as reduced vehicular traffic to Norwest from Windsor Road generally, are expected to alleviate delays within Barina Downs Road by removing downstream blockage effects.

- The existing roundabout at Norwest Boulevard / Reston Grange exceeds capacity under all modelled scenarios. However, the planned upgrade of Norwest Boulevard including signalisation of that intersection will improve performance with a modelled Level of Service C/D during peak periods. It is noted that conversion from a roundabout to signals will not only increase intersection capacity but will also have pedestrian safety and amenity benefits for those pedestrian and cyclists crossing the intersection.

It is therefore concluded that the Proposal is supportable on traffic planning grounds.

Appendix A

SIDRA Modelling Outputs

MOVEMENT SUMMARY

▽ Site: 2 [RA_AM Peak - Windsor and Barina Downs - No Through Traffic]

Windsor and Barina Downs
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
SouthEast: Windsor Road East												
4	L2	264	0.0	0.142	5.6	LOS A	0.0	0.0	0.00	0.58	50.7	
5	T1	1532	0.0	0.542	0.1	LOS A	0.0	0.0	0.00	0.00	59.9	
Approach		1796	0.0	0.542	0.9	NA	0.0	0.0	0.00	0.08	58.8	
NorthWest: Windsor Road West												
12	R2	4	100.0	0.028	23.0	LOS B	0.1	0.8	0.85	0.94	36.7	
Approach		4	100.0	0.028	23.0	NA	0.1	0.8	0.85	0.94	36.7	
SouthWest: Barina Downs Road												
1	L2	338	0.0	1.159	182.7	LOS F	37.3	260.8	1.00	3.43	10.5	
Approach		338	0.0	1.159	182.7	LOS F	37.3	260.8	1.00	3.43	10.5	
All Vehicles		2138	0.2	1.159	29.7	NA	37.3	260.8	0.16	0.62	38.5	

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: 1 [RA_AM Peak - Mackillop and Barina Downs]

Mackillop and Barina Downs
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Mackillop Drive											
1	L2	139	0.0	0.315	5.6	LOS A	2.0	13.9	0.43	0.63	51.6
3	R2	225	0.0	0.315	9.2	LOS A	2.0	13.9	0.43	0.63	48.9
Approach		364	0.0	0.315	7.8	LOS A	2.0	13.9	0.43	0.63	50.2
NorthEast: Barina Downs Road East											
4	L2	99	0.0	0.217	5.0	LOS A	1.5	10.4	0.31	0.49	50.2
5	T1	179	0.0	0.217	5.3	LOS A	1.5	10.4	0.31	0.49	51.6
Approach		278	0.0	0.217	5.2	LOS A	1.5	10.4	0.31	0.49	51.1
SouthWest: Barina Downs West											
11	T1	148	0.0	0.204	5.6	LOS A	0.9	6.6	0.36	0.60	50.2
12	R2	82	0.0	0.204	8.9	LOS A	0.9	6.6	0.36	0.60	52.8
Approach		231	0.0	0.204	6.8	LOS A	0.9	6.6	0.36	0.60	51.4
All Vehicles		873	0.0	0.315	6.7	LOS A	2.0	13.9	0.37	0.58	50.8

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.

Roundabout Capacity Model: SIDRA Standard.

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: 3 [AM Peak - Barina Downs and Reston Grange]

Barina Downs and Reston Grange
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Reston Grange South											
1	L2	7	0.0	0.363	5.9	LOS A	2.4	16.8	0.58	0.62	47.6
2	T1	348	0.0	0.363	6.1	LOS A	2.4	16.8	0.58	0.62	48.4
3	R2	29	0.0	0.363	10.7	LOS A	2.4	16.8	0.58	0.62	52.7
Approach		385	0.0	0.363	6.5	LOS A	2.4	16.8	0.58	0.62	48.9
East: Barina Downs East											
4	L2	74	0.0	0.312	4.9	LOS A	1.9	13.4	0.41	0.63	50.1
5	T1	4	0.0	0.312	5.1	LOS A	1.9	13.4	0.41	0.63	50.3
6	R2	307	0.0	0.312	9.8	LOS A	1.9	13.4	0.41	0.63	37.2
Approach		385	0.0	0.312	8.8	LOS A	1.9	13.4	0.41	0.63	39.6
North: Reston Grange											
7	L2	179	0.0	0.232	4.1	LOS A	1.4	9.9	0.21	0.44	52.1
8	T1	145	0.0	0.232	4.4	LOS A	1.4	9.9	0.21	0.44	52.0
9	R2	11	0.0	0.232	9.0	LOS A	1.4	9.9	0.21	0.44	49.7
Approach		335	0.0	0.232	4.4	LOS A	1.4	9.9	0.21	0.44	52.0
West: Goldfinch Crescent											
10	L2	23	0.0	0.065	7.6	LOS A	0.4	2.6	0.67	0.71	40.1
11	T1	2	0.0	0.065	7.8	LOS A	0.4	2.6	0.67	0.71	49.5
12	R2	26	0.0	0.065	12.5	LOS A	0.4	2.6	0.67	0.71	46.8
Approach		52	0.0	0.065	10.1	LOS A	0.4	2.6	0.67	0.71	44.4
All Vehicles		1157	0.0	0.363	6.8	LOS A	2.4	16.8	0.42	0.58	45.3

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.

Roundabout Capacity Model: SIDRA Standard.

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: 4 [AM Peak - Norwest and Reston Grange]

Norwest and Reston Grange
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Reston Grange											
1	L2	174	0.0	0.975	64.3	LOS E	13.3	92.9	1.00	1.81	23.0
2	T1	236	0.0	0.975	66.8	LOS E	13.3	92.9	0.99	1.76	22.9
3	R2	155	0.0	0.975	78.4	LOS F	9.9	69.2	0.96	1.65	21.7
Approach		564	0.0	0.975	69.2	LOS E	13.3	92.9	0.98	1.74	22.6
East: Norwest Boulevard East											
4	L2	59	0.0	0.902	12.8	LOS A	14.5	101.8	0.96	1.23	45.6
5	T1	1663	0.0	0.902	13.6	LOS A	14.5	101.8	0.97	1.25	50.4
6	R2	113	0.0	0.902	20.3	LOS B	14.0	98.3	0.97	1.28	49.8
Approach		1835	0.0	0.902	14.0	LOS A	14.5	101.8	0.97	1.25	50.3
North: Solent Circuit											
7	L2	66	0.0	0.534	10.1	LOS A	1.6	11.4	0.76	0.92	51.5
8	T1	104	0.0	0.534	10.0	LOS A	1.6	11.4	0.76	0.92	50.1
9	R2	321	0.0	0.745	17.8	LOS B	3.2	22.5	0.80	1.10	48.5
Approach		492	0.0	0.745	15.1	LOS B	3.2	22.5	0.78	1.03	49.1
West: Norwest Boulevard West											
10	L2	243	0.0	0.615	6.5	LOS A	5.0	34.7	0.73	0.72	53.1
11	T1	867	0.0	0.615	6.7	LOS A	5.0	34.7	0.73	0.76	54.2
12	R2	158	0.0	0.615	12.6	LOS A	4.8	33.8	0.74	0.79	47.2
Approach		1268	0.0	0.615	7.4	LOS A	5.0	34.7	0.73	0.75	53.3
All Vehicles		4159	0.0	0.975	19.6	LOS B	14.5	101.8	0.88	1.14	45.6

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.

Roundabout Capacity Model: SIDRA Standard.

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: 2 [PM Peak - Windsor and Barina Downs - No Through Traffic]

Windsor and Barina Downs
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total	Flows 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	
SouthEast: Windsor Road East												
4	L2	300	0.0	0.162	5.6	LOS A	0.0	0.0	0.00	0.58	50.7	
5	T1	1335	0.0	0.489	0.1	LOS A	0.0	0.0	0.00	0.00	59.9	
Approach		1635	0.0	0.489	1.1	NA	0.0	0.0	0.00	0.11	58.6	
NorthWest: Windsor Road West												
12	R2	5	100.0	0.026	18.5	LOS B	0.1	0.7	0.80	0.92	39.5	
Approach		5	100.0	0.026	18.5	NA	0.1	0.7	0.80	0.92	39.5	
SouthWest: Barina Downs Road												
1	L2	245	0.0	0.669	22.0	LOS B	3.6	25.1	0.89	1.16	37.5	
Approach		245	0.0	0.669	22.0	LOS B	3.6	25.1	0.89	1.16	37.5	
All Vehicles		1885	0.3	0.669	3.8	NA	3.6	25.1	0.12	0.24	55.6	

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.

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: 1 [PM Peak - Mackillop and Barina Downs]

Mackillop and Barina Downs
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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
SouthEast: Mackillop Drive											
1	L2	66	0.0	0.197	5.7	LOS A	1.1	8.0	0.43	0.64	51.4
3	R2	146	0.0	0.197	9.2	LOS A	1.1	8.0	0.43	0.64	48.6
Approach		213	0.0	0.197	8.1	LOS A	1.1	8.0	0.43	0.64	49.7
NorthEast: Barina Downs Road East											
4	L2	136	0.0	0.314	6.1	LOS A	2.2	15.4	0.52	0.58	49.3
5	T1	202	0.0	0.314	6.4	LOS A	2.2	15.4	0.52	0.58	50.6
Approach		338	0.0	0.314	6.3	LOS A	2.2	15.4	0.52	0.58	50.1
SouthWest: Barina Downs West											
11	T1	124	0.0	0.265	5.3	LOS A	1.3	9.0	0.30	0.61	49.7
12	R2	204	0.0	0.265	8.6	LOS A	1.3	9.0	0.30	0.61	52.5
Approach		328	0.0	0.265	7.4	LOS A	1.3	9.0	0.30	0.61	51.6
All Vehicles		879	0.0	0.314	7.1	LOS A	2.2	15.4	0.41	0.61	50.6

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.

Roundabout Capacity Model: SIDRA Standard.

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.

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MOVEMENT SUMMARY

Site: 3 [PM Peak - Barina Downs and Reston Grange]

Barina Downs and Reston Grange
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Reston Grange South											
1	L2	8	0.0	0.158	4.9	LOS A	0.9	6.4	0.42	0.55	48.1
2	T1	124	0.0	0.158	5.1	LOS A	0.9	6.4	0.42	0.55	48.9
3	R2	49	0.0	0.158	9.7	LOS A	0.9	6.4	0.42	0.55	53.1
Approach		182	0.0	0.158	6.4	LOS A	0.9	6.4	0.42	0.55	50.4
East: Barina Downs East											
4	L2	82	0.0	0.292	7.4	LOS A	1.8	12.9	0.69	0.78	49.1
5	T1	5	0.0	0.292	7.6	LOS A	1.8	12.9	0.69	0.78	49.1
6	R2	167	0.0	0.292	12.2	LOS A	1.8	12.9	0.69	0.78	36.4
Approach		255	0.0	0.292	10.6	LOS A	1.8	12.9	0.69	0.78	40.6
North: Reston Grange											
7	L2	309	0.0	0.579	4.3	LOS A	5.6	39.4	0.33	0.44	51.3
8	T1	536	0.0	0.579	4.6	LOS A	5.6	39.4	0.33	0.44	51.0
9	R2	31	0.0	0.579	9.2	LOS A	5.6	39.4	0.33	0.44	48.5
Approach		876	0.0	0.579	4.6	LOS A	5.6	39.4	0.33	0.44	51.0
West: Goldfinch Crescent											
10	L2	16	0.0	0.024	5.4	LOS A	0.1	0.9	0.46	0.54	44.3
11	T1	5	0.0	0.024	5.6	LOS A	0.1	0.9	0.46	0.54	52.7
12	R2	4	0.0	0.024	10.2	LOS A	0.1	0.9	0.46	0.54	50.7
Approach		25	0.0	0.024	6.2	LOS A	0.1	0.9	0.46	0.54	48.0
All Vehicles		1338	0.0	0.579	6.0	LOS A	5.6	39.4	0.41	0.52	48.0

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.

Roundabout Capacity Model: SIDRA Standard.

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: 4 [PM Peak - Norwest and Reston Grange]

Norwest and Reston Grange
Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Reston Grange												
1	L2	133	0.0	0.351	8.0	LOS A	1.9	13.3	0.86	0.89	49.3	
2	T1	93	0.0	0.351	8.4	LOS A	1.9	13.3	0.85	0.91	49.9	
3	R2	108	0.0	0.351	15.0	LOS B	1.7	11.8	0.84	0.96	47.4	
Approach		334	0.0	0.351	10.4	LOS A	1.9	13.3	0.85	0.92	48.8	
East: Norwest Boulevard East												
4	L2	300	0.0	0.978	29.8	LOS C	25.0	174.9	1.00	1.79	34.5	
5	T1	1171	0.0	0.978	32.2	LOS C	25.0	174.9	0.97	1.77	40.4	
6	R2	39	0.0	0.978	40.5	LOS C	17.8	124.8	0.94	1.75	39.5	
Approach		1509	0.0	0.978	31.9	LOS C	25.0	174.9	0.98	1.77	39.4	
North: Solent Circuit												
7	L2	76	0.0	0.958	43.0	LOS D	8.8	61.5	0.96	1.58	35.5	
8	T1	248	0.0	0.958	42.9	LOS D	8.8	61.5	0.96	1.58	29.9	
9	R2	308	0.0	1.055	101.3	LOS F	19.7	137.7	1.00	2.22	23.6	
Approach		633	0.0	1.055	71.4	LOS F	19.7	137.7	0.98	1.89	26.4	
West: Norwest Boulevard West												
10	L2	188	0.0	1.023	42.4	LOS C	40.7	284.6	1.00	1.68	35.7	
11	T1	1244	0.0	1.023	43.4	LOS D	40.7	284.6	1.00	1.70	35.8	
12	R2	325	0.0	1.023	50.7	LOS D	38.0	265.7	1.00	1.71	27.5	
Approach		1758	0.0	1.023	44.6	LOS D	40.7	284.6	1.00	1.70	34.5	
All Vehicles		4234	0.0	1.055	41.4	LOS C	40.7	284.6	0.98	1.69	35.1	

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.

Roundabout Capacity Model: SIDRA Standard.

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: 2 [RA_AM Peak - Windsor and Barina Downs - No Through Traffic]

Windsor and Barina Downs
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
SouthEast: Windsor Road East												
4	L2	292	3.0	0.160	5.6	LOS A	0.0	0.0	0.00	0.58	50.5	
5	T1	1532	5.0	0.559	0.1	LOS A	0.0	0.0	0.00	0.00	59.9	
Approach		1823	4.7	0.559	1.0	NA	0.0	0.0	0.00	0.09	58.7	
NorthWest: Windsor Road West												
12	R2	4	100.0	0.031	25.2	LOS B	0.1	0.9	0.86	0.94	35.5	
Approach		4	100.0	0.031	25.2	NA	0.1	0.9	0.86	0.94	35.5	
SouthWest: Barina Downs Road												
1	L2	341	3.0	1.300	302.8	LOS F	56.2	403.6	1.00	4.35	6.8	
Approach		341	3.0	1.300	302.8	LOS F	56.2	403.6	1.00	4.35	6.8	
All Vehicles		2168	4.6	1.300	48.5	NA	56.2	403.6	0.16	0.76	31.4	

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: 1 [RA_AM Peak - Mackillop and Barina Downs]

Mackillop and Barina Downs
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Mackillop Drive											
1	L2	151	3.0	0.347	5.8	LOS A	2.2	16.1	0.46	0.65	51.4
3	R2	226	3.0	0.347	9.4	LOS A	2.2	16.1	0.46	0.65	48.5
3u	U	12	0.0	0.347	11.0	LOS A	2.2	16.1	0.46	0.65	52.7
Approach		388	2.9	0.347	8.1	LOS A	2.2	16.1	0.46	0.65	50.0
NorthEast: Barina Downs Road East											
4	L2	115	3.0	0.246	5.2	LOS A	1.7	12.3	0.34	0.50	49.9
5	T1	191	3.0	0.246	5.5	LOS A	1.7	12.3	0.34	0.50	51.3
Approach		305	3.0	0.246	5.4	LOS A	1.7	12.3	0.34	0.50	50.8
SouthWest: Barina Downs West											
11	T1	149	3.0	0.211	5.7	LOS A	1.0	7.1	0.38	0.61	49.9
12	R2	82	3.0	0.211	9.0	LOS A	1.0	7.1	0.38	0.61	52.6
Approach		232	3.0	0.211	6.9	LOS A	1.0	7.1	0.38	0.61	51.1
All Vehicles		925	3.0	0.347	6.9	LOS A	2.2	16.1	0.40	0.59	50.5

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.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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.

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Project: C:\Users\James Laidler\Desktop\0463m02 - Mackillop Modelling - 2017 Existing+Approved.sip7

MOVEMENT SUMMARY

Site: 3 [AM Peak - Barina Downs and Reston Grange]

Barina Downs and Reston Grange
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Reston Grange South											
1	L2	7	2.0	0.391	6.4	LOS A	2.6	18.8	0.64	0.67	46.9
2	T1	348	2.0	0.391	6.7	LOS A	2.6	18.8	0.64	0.67	47.8
3	R2	31	2.0	0.391	11.3	LOS A	2.6	18.8	0.64	0.67	52.3
Approach		386	2.0	0.391	7.0	LOS A	2.6	18.8	0.64	0.67	48.3
East: Barina Downs East											
4	L2	74	2.0	0.364	5.0	LOS A	2.4	16.8	0.43	0.64	49.8
5	T1	4	2.0	0.364	5.2	LOS A	2.4	16.8	0.43	0.64	49.8
6	R2	371	2.0	0.364	9.9	LOS A	2.4	16.8	0.43	0.64	44.5
Approach		448	2.0	0.364	9.0	LOS A	2.4	16.8	0.43	0.64	45.5
North: Reston Grange											
7	L2	182	2.0	0.237	4.2	LOS A	1.5	10.4	0.22	0.45	51.9
8	T1	145	2.0	0.237	4.4	LOS A	1.5	10.4	0.22	0.45	51.9
9	R2	11	2.0	0.237	9.0	LOS A	1.5	10.4	0.22	0.45	49.2
Approach		338	2.0	0.237	4.4	LOS A	1.5	10.4	0.22	0.45	51.9
West: Goldfinch Crescent											
10	L2	23	2.0	0.071	8.3	LOS A	0.4	3.0	0.71	0.73	39.1
11	T1	2	2.0	0.071	8.6	LOS A	0.4	3.0	0.71	0.73	48.8
12	R2	26	2.0	0.071	13.2	LOS A	0.4	3.0	0.71	0.73	45.6
Approach		52	2.0	0.071	10.8	LOS A	0.4	3.0	0.71	0.73	43.3
All Vehicles		1224	2.0	0.391	7.2	LOS A	2.6	18.8	0.45	0.60	47.7

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.

Roundabout Capacity Model: SIDRA Standard.

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: 4 [AM Peak - Norwest and Reston Grange]

Norwest and Reston Grange
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Reston Grange											
1	L2	237	2.0	1.152	177.9	LOS F	41.2	293.7	1.00	3.27	10.9
2	T1	236	2.0	1.152	180.7	LOS F	41.2	293.7	1.00	3.05	11.0
3	R2	156	2.0	1.152	190.7	LOS F	28.4	202.1	1.00	2.72	11.0
Approach		628	2.0	1.152	182.1	LOS F	41.2	293.7	1.00	3.05	11.0
East: Norwest Boulevard East											
4	L2	59	3.0	0.927	15.2	LOS B	16.9	121.3	0.99	1.34	43.5
5	T1	1663	3.0	0.927	16.1	LOS B	16.9	121.3	0.99	1.36	48.8
6	R2	113	3.0	0.927	23.1	LOS B	16.2	116.4	1.00	1.39	48.0
Approach		1835	3.0	0.927	16.5	LOS B	16.9	121.3	0.99	1.36	48.6
North: Solent Circuit											
7	L2	66	3.0	0.545	10.3	LOS A	1.7	11.9	0.75	0.92	51.3
8	T1	104	3.0	0.545	10.2	LOS A	1.7	11.9	0.75	0.92	49.6
9	R2	321	3.0	0.758	18.3	LOS B	3.3	23.6	0.80	1.11	48.1
Approach		492	3.0	0.758	15.5	LOS B	3.3	23.6	0.78	1.04	48.8
West: Norwest Boulevard West											
10	L2	243	3.0	0.610	6.3	LOS A	4.9	35.5	0.71	0.70	53.1
11	T1	867	3.0	0.610	6.5	LOS A	4.9	35.5	0.72	0.73	54.2
12	R2	161	3.0	0.610	12.5	LOS A	4.8	34.6	0.73	0.77	47.1
Approach		1272	3.0	0.610	7.3	LOS A	4.9	35.5	0.72	0.73	53.3
All Vehicles		4226	2.9	1.152	38.2	LOS C	41.2	293.7	0.89	1.39	36.5

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.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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: 2 [PM Peak - Windsor and Barina Downs - No Through Traffic]

Windsor and Barina Downs
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
SouthEast: Windsor Road East												
4	L2	393	3.0	0.216	5.6	LOS A	0.0	0.0	0.00	0.58	50.5	
5	T1	1335	5.0	0.505	0.1	LOS A	0.0	0.0	0.00	0.00	59.9	
Approach		1727	4.5	0.505	1.3	NA	0.0	0.0	0.00	0.13	58.2	
NorthWest: Windsor Road West												
12	R2	5	100.0	0.031	21.1	LOS B	0.1	0.9	0.83	0.93	37.8	
Approach		5	100.0	0.031	21.1	NA	0.1	0.9	0.83	0.93	37.8	
SouthWest: Barina Downs Road												
1	L2	246	3.0	0.734	26.0	LOS B	4.2	30.3	0.92	1.23	35.3	
Approach		246	3.0	0.734	26.0	LOS B	4.2	30.3	0.92	1.23	35.3	
All Vehicles		1979	4.6	0.734	4.4	NA	4.2	30.3	0.12	0.27	54.8	

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: 1 [PM Peak - Mackillop and Barina Downs]

Mackillop and Barina Downs
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Mackillop Drive											
1	L2	71	3.0	0.219	6.1	LOS A	1.3	9.4	0.50	0.67	51.1
3	R2	146	3.0	0.219	9.7	LOS A	1.3	9.4	0.50	0.67	48.2
3u	U	4	0.0	0.219	11.3	LOS A	1.3	9.4	0.50	0.67	52.4
Approach		221	2.9	0.219	8.5	LOS A	1.3	9.4	0.50	0.67	49.5
NorthEast: Barina Downs Road East											
4	L2	177	3.0	0.404	6.4	LOS A	3.1	22.2	0.57	0.61	48.9
5	T1	254	3.0	0.404	6.7	LOS A	3.1	22.2	0.57	0.61	50.2
Approach		431	3.0	0.404	6.6	LOS A	3.1	22.2	0.57	0.61	49.7
SouthWest: Barina Downs West											
11	T1	124	3.0	0.272	5.4	LOS A	1.4	9.7	0.32	0.61	49.4
12	R2	204	3.0	0.272	8.7	LOS A	1.4	9.7	0.32	0.61	52.3
Approach		328	3.0	0.272	7.4	LOS A	1.4	9.7	0.32	0.61	51.4
All Vehicles		980	3.0	0.404	7.3	LOS A	3.1	22.2	0.47	0.62	50.3

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.

Roundabout Capacity Model: SIDRA Standard.

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.

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Project: C:\Users\James Laidler\Desktop\0463m02 - Mackillop Modelling - 2017 Existing+Approved.sip7

MOVEMENT SUMMARY

Site: 3 [PM Peak - Barina Downs and Reston Grange]

Barina Downs and Reston Grange
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Reston Grange South											
1	L2	8	2.0	0.164	5.1	LOS A	1.0	6.8	0.45	0.56	47.6
2	T1	124	2.0	0.164	5.3	LOS A	1.0	6.8	0.45	0.56	48.6
3	R2	49	2.0	0.164	9.9	LOS A	1.0	6.8	0.45	0.56	52.8
Approach		182	2.0	0.164	6.5	LOS A	1.0	6.8	0.45	0.56	50.1
East: Barina Downs East											
4	L2	82	2.0	0.326	7.6	LOS A	2.1	14.9	0.71	0.80	48.8
5	T1	5	2.0	0.326	7.8	LOS A	2.1	14.9	0.71	0.80	48.7
6	R2	192	2.0	0.326	12.4	LOS A	2.1	14.9	0.71	0.80	43.4
Approach		279	2.0	0.326	10.9	LOS A	2.1	14.9	0.71	0.80	45.3
North: Reston Grange											
7	L2	321	2.0	0.593	4.4	LOS A	6.0	42.4	0.34	0.44	51.1
8	T1	536	2.0	0.593	4.6	LOS A	6.0	42.4	0.34	0.44	50.8
9	R2	31	2.0	0.593	9.2	LOS A	6.0	42.4	0.34	0.44	47.9
Approach		887	2.0	0.593	4.7	LOS A	6.0	42.4	0.34	0.44	50.9
West: Goldfinch Crescent											
10	L2	16	2.0	0.025	5.5	LOS A	0.1	0.9	0.49	0.55	44.0
11	T1	5	2.0	0.025	5.8	LOS A	0.1	0.9	0.49	0.55	52.5
12	R2	4	2.0	0.025	10.4	LOS A	0.1	0.9	0.49	0.55	50.0
Approach		25	2.0	0.025	6.4	LOS A	0.1	0.9	0.49	0.55	47.6
All Vehicles		1374	2.0	0.593	6.2	LOS A	6.0	42.4	0.43	0.53	49.2

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.

Roundabout Capacity Model: SIDRA Standard.

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: 4 [PM Peak - Norwest and Reston Grange]

Norwest and Reston Grange
Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Reston Grange												
1	L2	157	2.0	0.394	8.7	LOS A	2.2	15.5	0.87	0.93	48.8	
2	T1	93	2.0	0.394	9.2	LOS A	2.2	15.5	0.86	0.95	48.9	
3	R2	108	2.0	0.394	15.7	LOS B	1.9	13.7	0.85	0.97	46.9	
Approach		358	2.0	0.394	11.0	LOS A	2.2	15.5	0.86	0.95	48.2	
East: Norwest Boulevard East												
4	L2	300	3.0	1.006	42.3	LOS C	32.7	235.0	1.00	2.13	29.2	
5	T1	1171	3.0	1.006	45.2	LOS D	32.7	235.0	1.00	2.11	35.4	
6	R2	39	3.0	1.006	54.0	LOS D	23.8	171.2	1.00	2.08	34.5	
Approach		1509	3.0	1.006	44.8	LOS D	32.7	235.0	1.00	2.11	34.4	
North: Solent Circuit												
7	L2	76	3.0	0.974	48.6	LOS D	9.9	70.8	0.96	1.68	33.7	
8	T1	248	3.0	0.974	48.5	LOS D	9.9	70.8	0.96	1.68	27.9	
9	R2	309	3.0	1.077	116.3	LOS F	22.7	162.9	1.00	2.41	21.6	
Approach		634	3.0	1.077	81.6	LOS F	22.7	162.9	0.98	2.04	24.4	
West: Norwest Boulevard West												
10	L2	188	3.0	1.051	62.6	LOS E	52.5	376.8	1.00	2.16	29.9	
11	T1	1244	3.0	1.051	63.4	LOS E	52.5	376.8	1.00	2.15	30.1	
12	R2	337	3.0	1.051	70.4	LOS E	48.2	345.8	1.00	2.15	22.6	
Approach		1769	3.0	1.051	64.7	LOS E	52.5	376.8	1.00	2.15	28.8	
All Vehicles		4271	2.9	1.077	55.7	LOS D	52.5	376.8	0.99	2.02	30.5	

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.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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: 2 [RA_AM Peak - Windsor and Barina Downs - No Through Traffic]

Windsor and Barina Downs
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
SouthEast: Windsor Road East												
4	L2	307	3.0	0.169	5.6	LOS A	0.0	0.0	0.00	0.58	50.5	
5	T1	1532	5.0	0.559	0.1	LOS A	0.0	0.0	0.00	0.00	59.9	
Approach		1839	4.7	0.559	1.0	NA	0.0	0.0	0.00	0.10	58.6	
NorthWest: Windsor Road West												
12	R2	4	100.0	0.032	25.6	LOS B	0.1	0.9	0.87	0.95	35.3	
Approach		4	100.0	0.032	25.6	NA	0.1	0.9	0.87	0.95	35.3	
SouthWest: Barina Downs Road												
1	L2	342	3.0	1.304	306.2	LOS F	56.9	408.3	1.00	4.38	6.8	
Approach		342	3.0	1.304	306.2	LOS F	56.9	408.3	1.00	4.38	6.8	
All Vehicles		2185	4.6	1.304	48.8	NA	56.9	408.3	0.16	0.77	31.2	

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.

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: 1 [RA_AM Peak - Mackillop and Barina Downs]

Mackillop and Barina Downs
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Mackillop Drive											
1	L2	143	3.0	0.345	6.0	LOS A	2.2	15.9	0.49	0.66	51.3
3	R2	225	3.0	0.345	9.6	LOS A	2.2	15.9	0.49	0.66	48.4
3u	U	4	0.0	0.345	11.2	LOS A	2.2	15.9	0.49	0.66	52.6
Approach		373	3.0	0.345	8.3	LOS A	2.2	15.9	0.49	0.66	49.8
NorthEast: Barina Downs Road East											
4	L2	101	3.0	0.255	5.1	LOS A	1.8	12.9	0.33	0.49	49.9
5	T1	220	3.0	0.255	5.4	LOS A	1.8	12.9	0.33	0.49	51.3
Approach		321	3.0	0.255	5.3	LOS A	1.8	12.9	0.33	0.49	50.9
SouthWest: Barina Downs West											
11	T1	153	3.0	0.213	5.7	LOS A	1.0	7.2	0.37	0.61	49.9
12	R2	82	3.0	0.213	9.0	LOS A	1.0	7.2	0.37	0.61	52.7
Approach		235	3.0	0.213	6.8	LOS A	1.0	7.2	0.37	0.61	51.1
All Vehicles		928	3.0	0.345	6.9	LOS A	2.2	15.9	0.41	0.59	50.5

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.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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: 3 [AM Peak - Barina Downs and Reston Grange]

Barina Downs and Reston Grange
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Reston Grange South											
1	L2	7	2.0	0.404	6.7	LOS A	2.8	19.6	0.68	0.70	46.7
2	T1	348	2.0	0.404	7.0	LOS A	2.8	19.6	0.68	0.70	47.5
3	R2	29	2.0	0.404	11.6	LOS A	2.8	19.6	0.68	0.70	52.1
Approach		385	2.0	0.404	7.3	LOS A	2.8	19.6	0.68	0.70	48.0
East: Barina Downs East											
4	L2	74	2.0	0.395	5.1	LOS A	2.6	18.9	0.45	0.64	49.7
5	T1	4	2.0	0.395	5.3	LOS A	2.6	18.9	0.45	0.64	49.7
6	R2	411	2.0	0.395	9.9	LOS A	2.6	18.9	0.45	0.64	44.4
Approach		488	2.0	0.395	9.1	LOS A	2.6	18.9	0.45	0.64	45.3
North: Reston Grange											
7	L2	184	2.0	0.238	4.2	LOS A	1.5	10.5	0.22	0.44	51.9
8	T1	145	2.0	0.238	4.4	LOS A	1.5	10.5	0.22	0.44	51.9
9	R2	11	2.0	0.238	9.0	LOS A	1.5	10.5	0.22	0.44	49.2
Approach		340	2.0	0.238	4.4	LOS A	1.5	10.5	0.22	0.44	51.9
West: Goldfinch Crescent											
10	L2	23	2.0	0.074	8.7	LOS A	0.4	3.1	0.73	0.75	38.7
11	T1	2	2.0	0.074	9.0	LOS A	0.4	3.1	0.73	0.75	48.5
12	R2	26	2.0	0.074	13.6	LOS A	0.4	3.1	0.73	0.75	45.2
Approach		52	2.0	0.074	11.2	LOS A	0.4	3.1	0.73	0.75	42.9
All Vehicles		1265	2.0	0.404	7.4	LOS A	2.8	19.6	0.47	0.61	47.5

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.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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: 4 [AM Peak - Norwest and Reston Grange]

Norwest and Reston Grange
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Reston Grange											
1	L2	277	2.0	1.225	236.2	LOS F	55.6	395.9	1.00	3.91	8.6
2	T1	236	2.0	1.225	239.0	LOS F	55.6	395.9	1.00	3.57	8.7
3	R2	155	2.0	1.225	248.0	LOS F	37.9	269.8	1.00	3.19	8.8
Approach		667	2.0	1.225	239.9	LOS F	55.6	395.9	1.00	3.62	8.7
East: Norwest Boulevard East											
4	L2	59	3.0	0.928	15.3	LOS B	17.0	122.1	0.99	1.35	43.4
5	T1	1663	3.0	0.928	16.2	LOS B	17.0	122.1	0.99	1.37	48.7
6	R2	113	3.0	0.928	23.2	LOS B	16.3	117.1	1.00	1.39	47.9
Approach		1835	3.0	0.928	16.6	LOS B	17.0	122.1	0.99	1.37	48.5
North: Solent Circuit											
7	L2	66	3.0	0.540	10.2	LOS A	1.6	11.7	0.75	0.92	51.4
8	T1	104	3.0	0.540	10.1	LOS A	1.6	11.7	0.75	0.92	49.8
9	R2	322	3.0	0.754	18.1	LOS B	3.3	23.3	0.79	1.10	48.2
Approach		493	3.0	0.754	15.3	LOS B	3.3	23.3	0.78	1.04	48.9
West: Norwest Boulevard West											
10	L2	244	3.0	0.603	6.2	LOS A	4.8	34.8	0.70	0.68	53.2
11	T1	867	3.0	0.603	6.4	LOS A	4.8	34.8	0.71	0.71	54.3
12	R2	163	3.0	0.603	12.3	LOS A	4.7	34.1	0.71	0.75	47.2
Approach		1275	3.0	0.603	7.1	LOS A	4.8	34.8	0.71	0.71	53.4
All Vehicles		4269	2.8	1.225	48.5	LOS D	55.6	395.9	0.88	1.49	32.9

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.

Roundabout Capacity Model: SIDRA Standard.

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: 2 [PM Peak - Windsor and Barina Downs - No Through Traffic]

Windsor and Barina Downs
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
SouthEast: Windsor Road East												
4	L2	451	3.0	0.248	5.6	LOS A	0.0	0.0	0.00	0.58	50.4	
5	T1	1335	5.0	0.505	0.1	LOS A	0.0	0.0	0.00	0.00	59.9	
Approach		1785	4.5	0.505	1.5	NA	0.0	0.0	0.00	0.15	57.9	
NorthWest: Windsor Road West												
12	R2	5	100.0	0.034	22.6	LOS B	0.1	1.0	0.84	0.94	37.0	
Approach		5	100.0	0.034	22.6	NA	0.1	1.0	0.84	0.94	37.0	
SouthWest: Barina Downs Road												
1	L2	247	3.0	0.737	26.1	LOS B	4.3	30.6	0.92	1.23	35.2	
Approach		247	3.0	0.737	26.1	LOS B	4.3	30.6	0.92	1.23	35.2	
All Vehicles		2038	4.6	0.737	4.5	NA	4.3	30.6	0.11	0.28	54.7	

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: 1 [PM Peak - Mackillop and Barina Downs]

Mackillop and Barina Downs
Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
SouthEast: Mackillop Drive												
1	L2	67	3.0	0.232	6.7	LOS A	1.4	10.0	0.57	0.71	50.9	
3	R2	146	3.0	0.232	10.2	LOS A	1.4	10.0	0.57	0.71	47.8	
3u	U	1	0.0	0.232	11.9	LOS A	1.4	10.0	0.57	0.71	52.2	
Approach		215	3.0	0.232	9.1	LOS A	1.4	10.0	0.57	0.71	49.1	
NorthEast: Barina Downs Road East												
4	L2	144	3.0	0.453	6.4	LOS A	3.7	26.2	0.59	0.61	48.7	
5	T1	344	3.0	0.453	6.8	LOS A	3.7	26.2	0.59	0.61	50.0	
Approach		488	3.0	0.453	6.7	LOS A	3.7	26.2	0.59	0.61	49.6	
SouthWest: Barina Downs West												
11	T1	126	3.0	0.274	5.4	LOS A	1.4	10.0	0.32	0.61	49.4	
12	R2	204	3.0	0.274	8.7	LOS A	1.4	10.0	0.32	0.61	52.3	
Approach		331	3.0	0.274	7.4	LOS A	1.4	10.0	0.32	0.61	51.4	
All Vehicles		1034	3.0	0.453	7.4	LOS A	3.7	26.2	0.50	0.63	50.1	

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.

Roundabout Capacity Model: SIDRA Standard.

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.

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Project: C:\Users\James Laidler\Desktop\0463m02 - Mackillop Modelling - 2017 Existing+Proposed (NS).sip7

MOVEMENT SUMMARY

Site: 3 [PM Peak - Barina Downs and Reston Grange]

Barina Downs and Reston Grange
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Reston Grange South											
1	L2	8	2.0	0.166	5.1	LOS A	1.0	7.0	0.46	0.57	47.5
2	T1	124	2.0	0.166	5.4	LOS A	1.0	7.0	0.46	0.57	48.5
3	R2	49	2.0	0.166	10.0	LOS A	1.0	7.0	0.46	0.57	52.8
Approach		182	2.0	0.166	6.6	LOS A	1.0	7.0	0.46	0.57	50.0
East: Barina Downs East											
4	L2	82	2.0	0.344	7.6	LOS A	2.2	15.9	0.72	0.81	48.7
5	T1	5	2.0	0.344	7.9	LOS A	2.2	15.9	0.72	0.81	48.6
6	R2	206	2.0	0.344	12.5	LOS A	2.2	15.9	0.72	0.81	43.4
Approach		294	2.0	0.344	11.0	LOS A	2.2	15.9	0.72	0.81	45.1
North: Reston Grange											
7	L2	331	2.0	0.599	4.4	LOS A	6.1	43.4	0.35	0.44	51.1
8	T1	536	2.0	0.599	4.6	LOS A	6.1	43.4	0.35	0.44	50.8
9	R2	31	2.0	0.599	9.2	LOS A	6.1	43.4	0.35	0.44	47.9
Approach		897	2.0	0.599	4.7	LOS A	6.1	43.4	0.35	0.44	50.8
West: Goldfinch Crescent											
10	L2	16	2.0	0.025	5.6	LOS A	0.1	0.9	0.50	0.56	43.9
11	T1	5	2.0	0.025	5.8	LOS A	0.1	0.9	0.50	0.56	52.5
12	R2	4	2.0	0.025	10.5	LOS A	0.1	0.9	0.50	0.56	49.9
Approach		25	2.0	0.025	6.5	LOS A	0.1	0.9	0.50	0.56	47.5
All Vehicles		1398	2.0	0.599	6.3	LOS A	6.1	43.4	0.44	0.54	49.1

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.

Roundabout Capacity Model: SIDRA Standard.

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: 4 [PM Peak - Norwest and Reston Grange]

Norwest and Reston Grange
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Reston Grange											
1	L2	172	2.0	0.409	8.8	LOS A	2.3	16.3	0.88	0.94	48.7
2	T1	93	2.0	0.409	9.5	LOS A	2.3	16.3	0.86	0.96	48.5
3	R2	108	2.0	0.409	15.8	LOS B	2.0	14.4	0.85	0.97	47.0
Approach		373	2.0	0.409	11.0	LOS A	2.3	16.3	0.87	0.96	48.1
East: Norwest Boulevard East											
4	L2	300	3.0	1.011	44.9	LOS D	34.2	245.9	1.00	2.20	28.3
5	T1	1171	3.0	1.011	47.8	LOS D	34.2	245.9	1.00	2.17	34.6
6	R2	39	3.0	1.011	56.7	LOS E	24.8	178.3	1.00	2.14	33.7
Approach		1509	3.0	1.011	47.5	LOS D	34.2	245.9	1.00	2.18	33.5
North: Solent Circuit											
7	L2	76	3.0	0.980	51.1	LOS D	10.4	74.7	0.96	1.73	32.9
8	T1	251	3.0	0.980	51.0	LOS D	10.4	74.7	0.96	1.73	27.1
9	R2	308	3.0	1.074	114.1	LOS F	22.2	159.3	1.00	2.38	21.9
Approach		635	3.0	1.074	81.6	LOS F	22.2	159.3	0.98	2.05	24.4
West: Norwest Boulevard West											
10	L2	188	3.0	1.055	66.1	LOS E	54.7	392.8	1.00	2.23	29.1
11	T1	1244	3.0	1.055	66.9	LOS E	54.7	392.8	1.00	2.23	29.3
12	R2	344	3.0	1.055	73.9	LOS F	50.1	359.7	1.00	2.22	21.9
Approach		1777	3.0	1.055	68.2	LOS E	54.7	392.8	1.00	2.22	28.0
All Vehicles		4294	2.9	1.074	57.9	LOS E	54.7	392.8	0.99	2.07	29.9

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.

Roundabout Capacity Model: SIDRA Standard.

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: 2 [RA_AM Peak - Windsor and Barina Downs - No Through Traffic]

Windsor and Barina Downs
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
SouthEast: Windsor Road East												
4	L2	295	3.0	0.162	5.6	LOS A	0.0	0.0	0.00	0.58	50.5	
5	T1	1532	5.0	0.405	0.1	LOS A	0.0	0.0	0.00	0.00	59.9	
Approach		1826	4.7	0.405	1.0	NA	0.0	0.0	0.00	0.09	58.7	
NorthWest: Windsor Road West												
12	R2	4	100.0	0.026	21.9	LOS B	0.1	0.7	0.84	0.93	37.4	
Approach		4	100.0	0.026	21.9	NA	0.1	0.7	0.84	0.93	37.4	
SouthWest: Barina Downs Road												
1	L2	341	3.0	0.695	18.3	LOS B	4.6	33.0	0.85	1.19	39.8	
Approach		341	3.0	0.695	18.3	LOS B	4.6	33.0	0.85	1.19	39.8	
All Vehicles		2172	4.6	0.695	3.7	NA	4.6	33.0	0.13	0.27	55.6	

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.

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: 1 [RA_AM Peak - Mackillop and Barina Downs]

Mackillop and Barina Downs
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Mackillop Drive											
1	L2	143	3.0	0.338	5.9	LOS A	2.2	15.5	0.47	0.65	51.4
3	R2	225	3.0	0.338	9.5	LOS A	2.2	15.5	0.47	0.65	48.5
3u	U	4	0.0	0.338	11.1	LOS A	2.2	15.5	0.47	0.65	52.7
Approach		373	3.0	0.338	8.1	LOS A	2.2	15.5	0.47	0.65	49.9
NorthEast: Barina Downs Road East											
4	L2	107	3.0	0.246	5.1	LOS A	1.7	12.3	0.33	0.49	50.0
5	T1	201	3.0	0.246	5.4	LOS A	1.7	12.3	0.33	0.49	51.4
Approach		308	3.0	0.246	5.3	LOS A	1.7	12.3	0.33	0.49	50.9
SouthWest: Barina Downs West											
11	T1	152	3.0	0.212	5.7	LOS A	1.0	7.1	0.37	0.61	49.9
12	R2	82	3.0	0.212	9.0	LOS A	1.0	7.1	0.37	0.61	52.7
Approach		234	3.0	0.212	6.9	LOS A	1.0	7.1	0.37	0.61	51.1
All Vehicles		915	3.0	0.338	6.8	LOS A	2.2	15.5	0.40	0.59	50.5

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.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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: 3 [AM Peak - Barina Downs and Reston Grange]

Barina Downs and Reston Grange
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Reston Grange South											
1	L2	7	2.0	0.393	6.5	LOS A	2.7	18.9	0.65	0.68	46.9
2	T1	348	2.0	0.393	6.7	LOS A	2.7	18.9	0.65	0.68	47.7
3	R2	29	2.0	0.393	11.3	LOS A	2.7	18.9	0.65	0.68	52.3
Approach		385	2.0	0.393	7.1	LOS A	2.7	18.9	0.65	0.68	48.2
East: Barina Downs East											
4	L2	74	2.0	0.372	5.0	LOS A	2.4	17.3	0.44	0.64	49.8
5	T1	4	2.0	0.372	5.2	LOS A	2.4	17.3	0.44	0.64	49.8
6	R2	380	2.0	0.372	9.9	LOS A	2.4	17.3	0.44	0.64	44.5
Approach		458	2.0	0.372	9.1	LOS A	2.4	17.3	0.44	0.64	45.5
North: Reston Grange											
7	L2	183	2.0	0.238	4.2	LOS A	1.5	10.4	0.22	0.44	51.9
8	T1	145	2.0	0.238	4.4	LOS A	1.5	10.4	0.22	0.44	51.9
9	R2	11	2.0	0.238	9.0	LOS A	1.5	10.4	0.22	0.44	49.3
Approach		339	2.0	0.238	4.4	LOS A	1.5	10.4	0.22	0.44	51.9
West: Goldfinch Crescent											
10	L2	23	2.0	0.071	8.4	LOS A	0.4	3.0	0.72	0.74	39.1
11	T1	2	2.0	0.071	8.7	LOS A	0.4	3.0	0.72	0.74	48.7
12	R2	26	2.0	0.071	13.3	LOS A	0.4	3.0	0.72	0.74	45.6
Approach		52	2.0	0.071	10.9	LOS A	0.4	3.0	0.72	0.74	43.2
All Vehicles		1234	2.0	0.393	7.2	LOS A	2.7	18.9	0.46	0.60	47.7

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.

Roundabout Capacity Model: SIDRA Standard.

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: 4 [AM Peak - Norwest and Reston Grange]

Norwest and Reston Grange
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Reston Grange											
1	L2	246	2.0	1.167	190.0	LOS F	44.3	315.1	1.00	3.41	10.3
2	T1	236	2.0	1.167	192.8	LOS F	44.3	315.1	1.00	3.16	10.4
3	R2	155	2.0	1.167	202.5	LOS F	30.4	216.3	1.00	2.82	10.4
Approach		637	2.0	1.167	194.1	LOS F	44.3	315.1	1.00	3.17	10.4
East: Norwest Boulevard East											
4	L2	59	3.0	0.927	15.2	LOS B	16.9	121.5	0.99	1.34	43.5
5	T1	1663	3.0	0.927	16.1	LOS B	16.9	121.5	0.99	1.36	48.8
6	R2	113	3.0	0.927	23.1	LOS B	16.2	116.6	1.00	1.39	47.9
Approach		1835	3.0	0.927	16.5	LOS B	16.9	121.5	0.99	1.36	48.6
North: Solent Circuit											
7	L2	66	3.0	0.544	10.3	LOS A	1.6	11.8	0.75	0.92	51.3
8	T1	104	3.0	0.544	10.2	LOS A	1.6	11.8	0.75	0.92	49.7
9	R2	321	3.0	0.757	18.2	LOS B	3.3	23.6	0.80	1.11	48.1
Approach		492	3.0	0.757	15.5	LOS B	3.3	23.6	0.78	1.04	48.8
West: Norwest Boulevard West											
10	L2	245	3.0	0.610	6.3	LOS A	4.9	35.5	0.71	0.70	53.1
11	T1	867	3.0	0.610	6.5	LOS A	4.9	35.5	0.72	0.73	54.2
12	R2	162	3.0	0.610	12.5	LOS A	4.8	34.6	0.72	0.77	47.2
Approach		1275	3.0	0.610	7.2	LOS A	4.9	35.5	0.72	0.73	53.3
All Vehicles		4238	2.8	1.167	40.3	LOS C	44.3	315.1	0.89	1.41	35.7

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.

Roundabout Capacity Model: SIDRA Standard.

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: 4v [AM Peak - Norwest and Reston Grange - Conversion]

Norwest and Reston Grange

Signals - Fixed Time Isolated Cycle Time = 95 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	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Reston Grange											
1	L2	246	2.0	0.343	28.2	LOS B	8.1	57.9	0.76	0.78	33.9
2	T1	236	2.0	0.904	52.6	LOS D	21.5	153.1	1.00	1.09	25.2
3	R2	155	2.0	0.904	58.2	LOS E	21.5	153.1	1.00	1.09	25.0
Approach		637	2.0	0.904	44.5	LOS D	21.5	153.1	0.91	0.97	27.9
East: Norwest Boulevard East											
4	L2	59	3.0	0.887	51.4	LOS D	30.0	215.6	1.00	1.08	27.0
5	T1	1663	3.0	0.887	44.4	LOS D	30.1	215.9	1.00	1.07	34.8
6	R2	113	3.0	0.631	53.3	LOS D	5.4	38.6	1.00	0.81	31.9
Approach		1835	3.0	0.887	45.2	LOS D	30.1	215.9	1.00	1.05	34.4
North: Solent Circuit											
7	L2	66	3.0	0.746	47.5	LOS D	7.2	51.6	1.00	0.91	34.4
8	T1	104	3.0	0.746	41.9	LOS C	7.2	51.6	1.00	0.91	28.4
9	R2	321	3.0	0.809	56.7	LOS E	8.1	58.3	1.00	0.93	31.0
Approach		492	3.0	0.809	52.3	LOS D	8.1	58.3	1.00	0.93	31.1
West: Norwest Boulevard West											
10	L2	245	3.0	0.561	31.4	LOS C	14.3	102.9	0.85	0.79	39.7
11	T1	867	3.0	0.561	28.1	LOS B	14.3	102.9	0.87	0.76	40.9
12	R2	162	3.0	0.908	65.0	LOS E	9.0	64.4	1.00	1.05	22.4
Approach		1275	3.0	0.908	33.4	LOS C	14.3	102.9	0.89	0.80	38.0
All Vehicles		4238	2.8	0.908	42.4	LOS C	30.1	215.9	0.95	0.95	34.1

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	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	11	28.1	LOS C	0.0	0.0	0.77	0.77	
P2	East Full Crossing	11	41.7	LOS E	0.0	0.0	0.94	0.94	
P3	North Full Crossing	11	34.5	LOS D	0.0	0.0	0.85	0.85	
All Pedestrians		32	34.8	LOS D			0.85	0.85	

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: 2 [PM Peak - Windsor and Barina Downs - No Through Traffic]

Windsor and Barina Downs
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
SouthEast: Windsor Road East												
4	L2	406	3.0	0.223	5.6	LOS A	0.0	0.0	0.00	0.58	50.5	
5	T1	1335	5.0	0.353	0.0	LOS A	0.0	0.0	0.00	0.00	59.9	
Approach		1741	4.5	0.353	1.3	NA	0.0	0.0	0.00	0.13	58.1	
NorthWest: Windsor Road West												
12	R2	5	100.0	0.027	19.1	LOS B	0.1	0.8	0.80	0.92	39.1	
Approach		5	100.0	0.027	19.1	NA	0.1	0.8	0.80	0.92	39.1	
SouthWest: Barina Downs Road												
1	L2	246	3.0	0.424	12.3	LOS A	2.1	14.8	0.69	0.95	44.3	
Approach		246	3.0	0.424	12.3	LOS A	2.1	14.8	0.69	0.95	44.3	
All Vehicles		1993	4.6	0.424	2.7	NA	2.1	14.8	0.09	0.24	56.4	

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: 1 [PM Peak - Mackillop and Barina Downs]

Mackillop and Barina Downs
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Mackillop Drive											
1	L2	67	3.0	0.218	6.2	LOS A	1.3	9.3	0.52	0.68	51.1
3	R2	146	3.0	0.218	9.8	LOS A	1.3	9.3	0.52	0.68	48.1
3u	U	1	0.0	0.218	11.4	LOS A	1.3	9.3	0.52	0.68	52.4
Approach		215	3.0	0.218	8.7	LOS A	1.3	9.3	0.52	0.68	49.3
NorthEast: Barina Downs Road East											
4	L2	164	3.0	0.414	6.4	LOS A	3.2	23.0	0.57	0.61	48.8
5	T1	280	3.0	0.414	6.7	LOS A	3.2	23.0	0.57	0.61	50.2
Approach		444	3.0	0.414	6.6	LOS A	3.2	23.0	0.57	0.61	49.7
SouthWest: Barina Downs West											
11	T1	125	3.0	0.272	5.4	LOS A	1.4	9.8	0.31	0.61	49.4
12	R2	204	3.0	0.272	8.7	LOS A	1.4	9.8	0.31	0.61	52.3
Approach		329	3.0	0.272	7.4	LOS A	1.4	9.8	0.31	0.61	51.4
All Vehicles		988	3.0	0.414	7.3	LOS A	3.2	23.0	0.47	0.62	50.3

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.

Roundabout Capacity Model: SIDRA Standard.

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: 3 [PM Peak - Barina Downs and Reston Grange]

Barina Downs and Reston Grange
Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: Reston Grange South												
1	L2	8	2.0	0.164	5.1	LOS A	1.0	6.9	0.45	0.56	47.6	
2	T1	124	2.0	0.164	5.3	LOS A	1.0	6.9	0.45	0.56	48.6	
3	R2	49	2.0	0.164	9.9	LOS A	1.0	6.9	0.45	0.56	52.8	
Approach		182	2.0	0.164	6.5	LOS A	1.0	6.9	0.45	0.56	50.1	
East: Barina Downs East												
4	L2	82	2.0	0.330	7.6	LOS A	2.1	15.1	0.71	0.80	48.8	
5	T1	5	2.0	0.330	7.8	LOS A	2.1	15.1	0.71	0.80	48.6	
6	R2	195	2.0	0.330	12.4	LOS A	2.1	15.1	0.71	0.80	43.4	
Approach		282	2.0	0.330	11.0	LOS A	2.1	15.1	0.71	0.80	45.2	
North: Reston Grange												
7	L2	324	2.0	0.595	4.4	LOS A	6.0	42.7	0.34	0.44	51.1	
8	T1	536	2.0	0.595	4.6	LOS A	6.0	42.7	0.34	0.44	50.8	
9	R2	31	2.0	0.595	9.2	LOS A	6.0	42.7	0.34	0.44	47.9	
Approach		891	2.0	0.595	4.7	LOS A	6.0	42.7	0.34	0.44	50.9	
West: Goldfinch Crescent												
10	L2	16	2.0	0.025	5.6	LOS A	0.1	0.9	0.49	0.56	43.9	
11	T1	5	2.0	0.025	5.8	LOS A	0.1	0.9	0.49	0.56	52.5	
12	R2	4	2.0	0.025	10.4	LOS A	0.1	0.9	0.49	0.56	50.0	
Approach		25	2.0	0.025	6.4	LOS A	0.1	0.9	0.49	0.56	47.6	
All Vehicles		1380	2.0	0.595	6.2	LOS A	6.0	42.7	0.44	0.53	49.1	

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.

Roundabout Capacity Model: SIDRA Standard.

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: 4 [PM Peak - Norwest and Reston Grange]

Norwest and Reston Grange
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Reston Grange											
1	L2	160	2.0	0.397	8.7	LOS A	2.2	15.7	0.87	0.94	48.8
2	T1	93	2.0	0.397	9.3	LOS A	2.2	15.7	0.86	0.95	48.8
3	R2	108	2.0	0.397	15.7	LOS B	1.9	13.9	0.85	0.97	47.0
Approach		361	2.0	0.397	11.0	LOS A	2.2	15.7	0.86	0.95	48.2
East: Norwest Boulevard East											
4	L2	300	3.0	1.008	43.3	LOS D	33.3	239.0	1.00	2.16	28.9
5	T1	1171	3.0	1.008	46.2	LOS D	33.3	239.0	1.00	2.13	35.1
6	R2	39	3.0	1.008	55.0	LOS D	24.2	173.8	1.00	2.10	34.2
Approach		1509	3.0	1.008	45.8	LOS D	33.3	239.0	1.00	2.14	34.1
North: Solent Circuit											
7	L2	76	3.0	0.977	49.8	LOS D	10.1	72.7	0.96	1.71	33.3
8	T1	249	3.0	0.977	49.7	LOS D	10.1	72.7	0.96	1.71	27.5
9	R2	308	3.0	1.073	113.9	LOS F	22.2	159.1	1.00	2.38	21.9
Approach		634	3.0	1.073	81.0	LOS F	22.2	159.1	0.98	2.03	24.5
West: Norwest Boulevard West											
10	L2	188	3.0	1.052	63.6	LOS E	53.1	381.2	1.00	2.18	29.7
11	T1	1244	3.0	1.052	64.4	LOS E	53.1	381.2	1.00	2.17	29.9
12	R2	339	3.0	1.052	71.4	LOS F	48.7	349.6	1.00	2.17	22.4
Approach		1772	3.0	1.052	65.6	LOS E	53.1	381.2	1.00	2.17	28.5
All Vehicles		4276	2.9	1.073	56.3	LOS D	53.1	381.2	0.99	2.04	30.4

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.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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: 4v [PM Peak - Norwest and Reston Grange - Conversion]

Norwest and Reston Grange

Signals - Fixed Time Isolated Cycle Time = 98 seconds (User-Given Cycle Time)

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	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Reston Grange											
1	L2	160	2.0	0.230	28.5	LOS C	5.3	37.5	0.73	0.76	33.8
2	T1	93	2.0	0.923	62.3	LOS E	11.7	83.2	1.00	1.08	22.7
3	R2	108	2.0	0.923	67.9	LOS E	11.7	83.2	1.00	1.08	22.5
Approach		361	2.0	0.923	49.0	LOS D	11.7	83.2	0.88	0.94	26.4
East: Norwest Boulevard East											
4	L2	300	3.0	0.912	54.7	LOS D	27.1	194.6	1.00	1.11	25.2
5	T1	1171	3.0	0.912	52.2	LOS D	27.5	197.4	1.00	1.11	32.2
6	R2	39	3.0	0.107	41.0	LOS C	1.5	11.1	0.86	0.72	35.7
Approach		1509	3.0	0.912	52.4	LOS D	27.5	197.4	1.00	1.10	31.1
North: Solent Circuit											
7	L2	76	3.0	0.877	57.1	LOS E	17.2	123.1	1.00	1.05	31.8
8	T1	249	3.0	0.877	51.5	LOS D	17.2	123.1	1.00	1.05	25.8
9	R2	308	3.0	0.446	44.8	LOS D	6.7	48.2	0.94	0.79	34.5
Approach		634	3.0	0.877	48.9	LOS D	17.2	123.1	0.97	0.93	31.0
West: Norwest Boulevard West											
10	L2	188	3.0	0.901	55.7	LOS D	27.3	195.8	1.00	1.07	31.8
11	T1	1244	3.0	0.901	50.6	LOS D	27.3	195.8	1.00	1.08	32.7
12	R2	339	3.0	0.928	66.1	LOS E	20.2	145.2	1.00	1.06	22.2
Approach		1772	3.0	0.928	54.1	LOS D	27.3	195.8	1.00	1.07	30.7
All Vehicles		4276	2.9	0.928	52.3	LOS D	27.5	197.4	0.98	1.05	30.6

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	Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P1	South Full Crossing	11	33.5	LOS D	0.0	0.0	0.83	0.83	
P2	East Full Crossing	11	43.2	LOS E	0.0	0.0	0.94	0.94	
P3	North Full Crossing	11	40.4	LOS E	0.0	0.0	0.91	0.91	
All Pedestrians		32	39.0	LOS D			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.