2 MacArthur Drive Holsworthy
Traffic Impact Assessment

Prepared for:

Architectus Sydney

18 October 2018

The Transport Planning Partnership

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APPENDICES

1 Introduction

This traffic impact assessment (TIA) report has been prepared to support a Planning Proposal to Liverpool City Council for the development of the site at 2 MacArthur Drive, Holsworthy.

The proposal is for a mixed-use development comprising indicatively 350 residential apartment units and 8,804m^2 GLA of retail and basement level parking containing 842 car spaces.

The report assesses the traffic and parking implications of the proposed development and is set out as follows:

- Chapter 2 discusses the existing conditions including a description of the subject site
- Chapter 3 provides a brief description of the proposed development
- Chapter 4 assesses the proposed on-site parking provision and internal layout
- Chapter 5 examines the traffic generation and its impact, and
- Chapter 6 presents the conclusions of the assessment.

1.1 Project History

There is an existing development approval for the subject site. This 2005 approval has been the subject of several modifications. The most recent approval is DA-582/2009 and comprised the following land uses:

- Retail: 6,795m^2
- Commercial: 1,600m^2
- Petrol station: 90m^2
- McDonalds restaurant: 360m^2
- Residential: 10 apartment units

The approval included 416 off-street parking spaces with three vehicular access points into the site including an entry-only from Heathcote Road with a combined entry/exit from MacArthur Drive and additional exit-only access from MacArthur Drive.

We are instructed that Roads and Maritime Services (Roads and Maritime) have provided recent feedback on the subject Planning Proposal in that they will not support the provision of vehicular access from Heathcote Road, in line with the current practice to minimise the number of driveways along arterial roads.

2 Existing Conditions

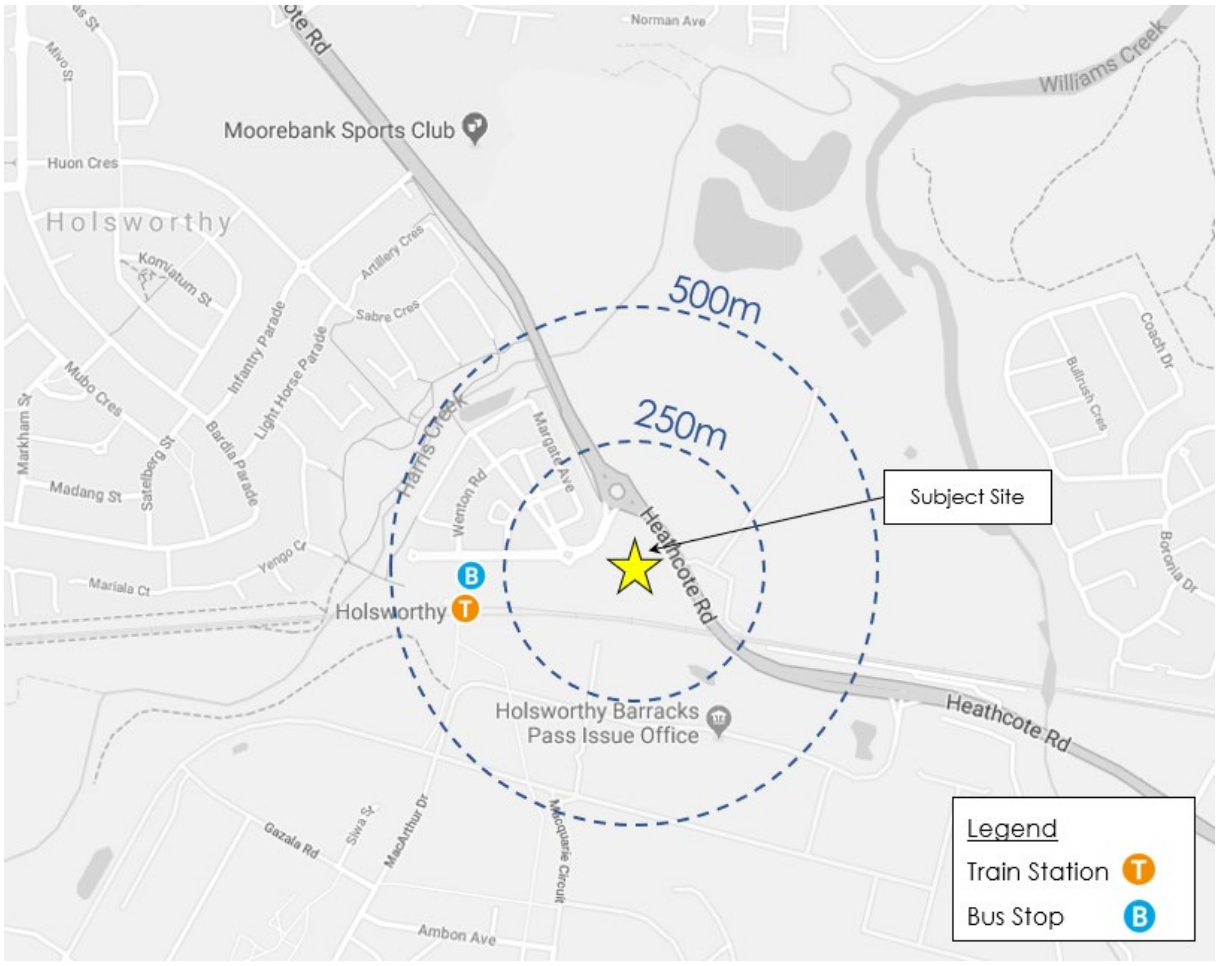
2.1 Site Description

The subject site is located at 2 MacArthur Drive, Holsworthy and falls within the local government area of Liverpool City Council. The site is bound by MacArthur Drive to the west, Heathcote Road to the east and the T8 – Airport & South Line rail corridor to the south.

At present, the site is unoccupied with no building structures present. Land uses surrounding the site comprise medium density residential to the west, natural vegetation to the east and the Holsworthy Army Barracks are located south of the rail corridor. Notably, Holsworthy Railway Station is located 300m west of the site.

The site location and its surrounds are shown in Figure 2.1

Figure 2.1: Site Locality



Basemap source: Google Maps Australia

2.2 Abutting Road Network

2.2.1 MacArthur Drive

MacArthur Drive is a two-way collector road that is aligned along the western boundary of the site. It is configured with a 14m carriageway with two-lanes in each direction plus a central median, within a 30m road reserve. No kerbside parking permitted.

MacArthur Drive intersects with Heathcote Road at the northern corner of the site and Morningside Parade and The Boulevard at the south-western corner of the site.

2.2.2 Heathcote Road

Heathcote Road is classified as a State Road and is therefore under the jurisdiction of the Roads and Maritime Services (Roads and Maritime). Heathcote road is aligned in a north-west to south-east direction and borders the eastern side of the site. In the vicinity of the site, the road is configured as one lane each in each direction with auxiliary lanes on approach to MacArthur Drive. No kerbside parking is permitted along Heathcote Road. Heathcote Road is due to be upgraded as explained in Section 2.5.

2.3 Public Transport

Holsworthy Railway Station is located within a four-minute walk of the site. The station includes both rail and bus services which provide connections to Liverpool, Campbelltown and the Sydney CBD. Holsworthy Station includes substantial parking facilities including a multi-storey commuter car park and bike parking racks and lockers to facilitate park and ride activities.

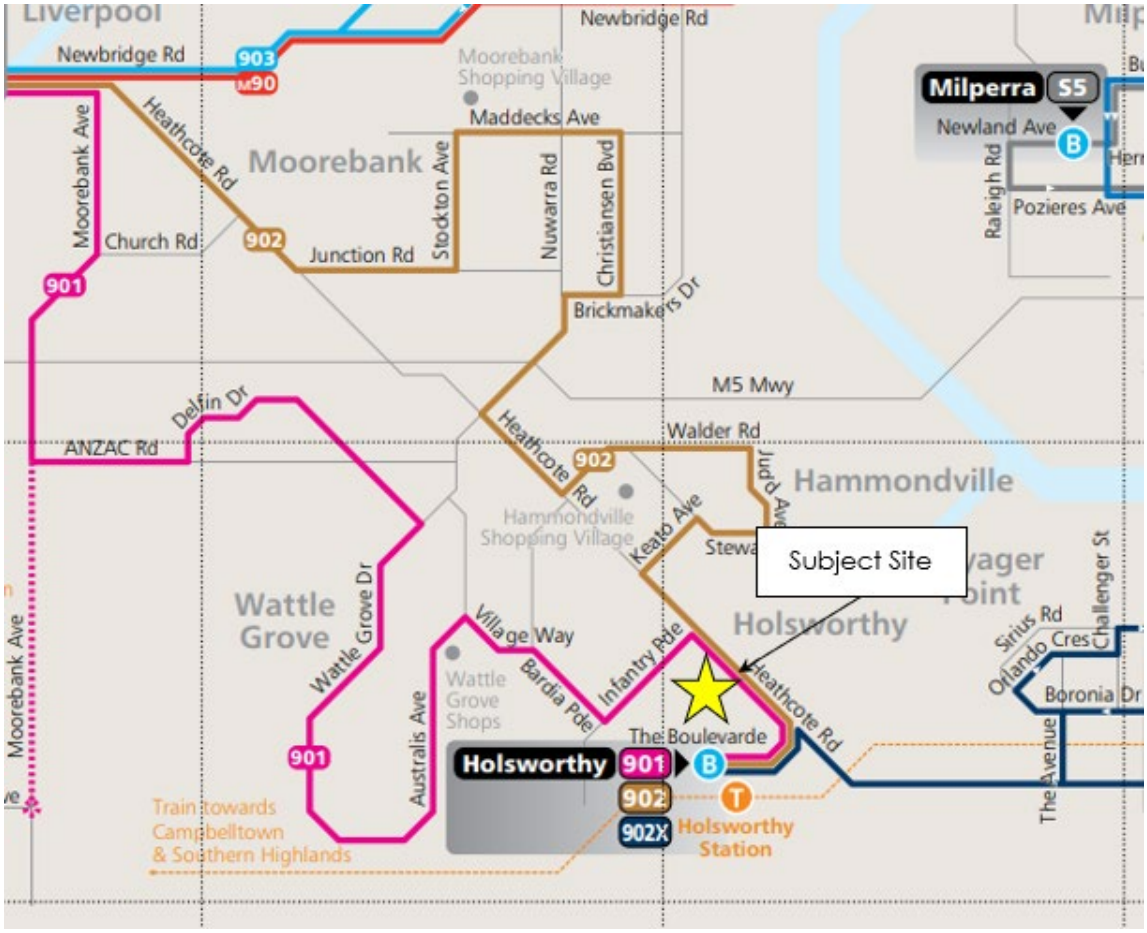
A summary of existing public transport services is shown in Table 2.1.

Table 2.1: Public Transport Services

Service	Route	Description	Proximity	Weekday Peak Frequency
Train	T8 – Airport & South Line	Macarthur to City via Airport or Sydenham	300m	5-15 minutes
Bus	901	Liverpool to Holsworthy		30 minutes
	902	Sandy Point to Holsworthy		30 minutes

The public transport network map of the area is illustrated in Figure 2.2.

Figure 2.2: Public Transport Network Map

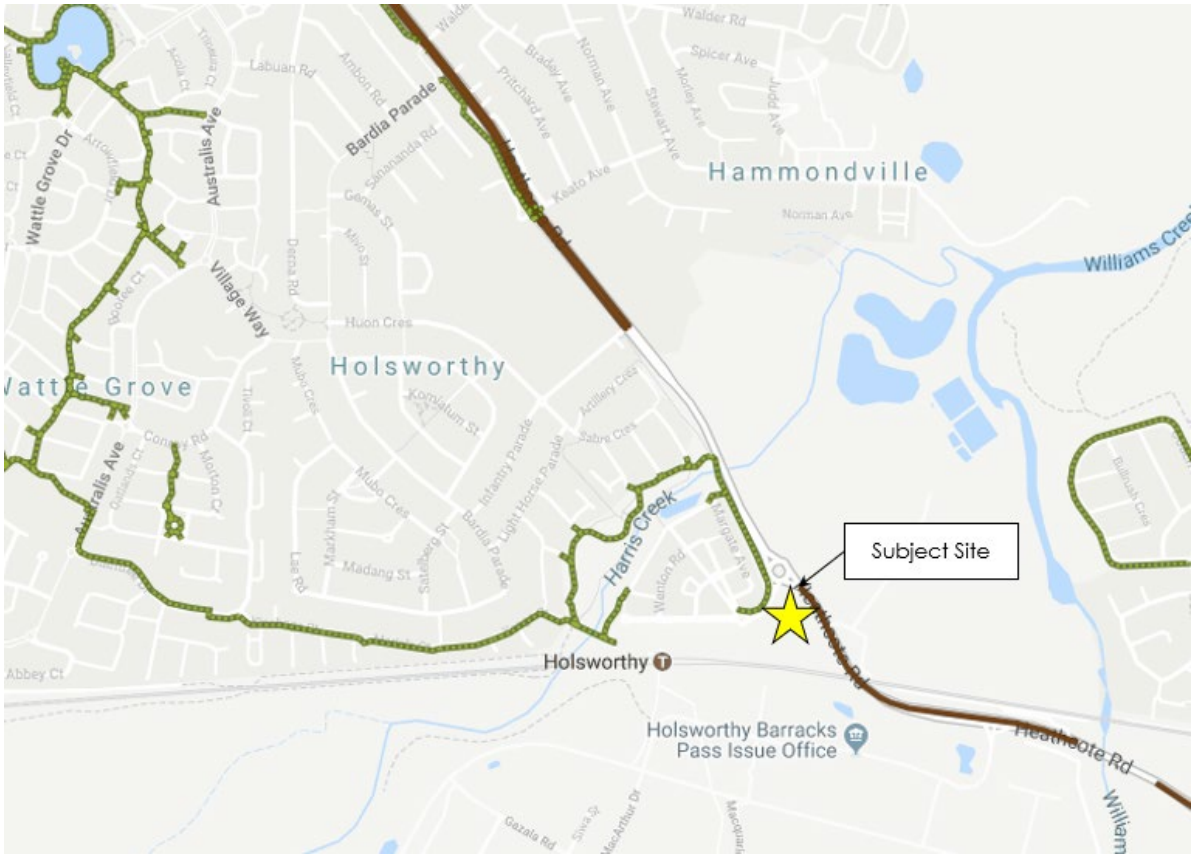


Source: Transdev NSW

2.4 Pedestrian and Cyclist Facilities

Pedestrian footpaths are generally provided on all streets surrounding the site. The exception to this is on the south side of MacArthur Drive where there is no development. In addition to this, cycling routes are provided in the vicinity of the site, comprising off-road and on-road cycleways, as shown in Figure 2.3.

Figure 2.3: Surrounding Cycleways



Source: Roads and Maritime Services Cycleway Finder 2018 (last updated 08/06/18)

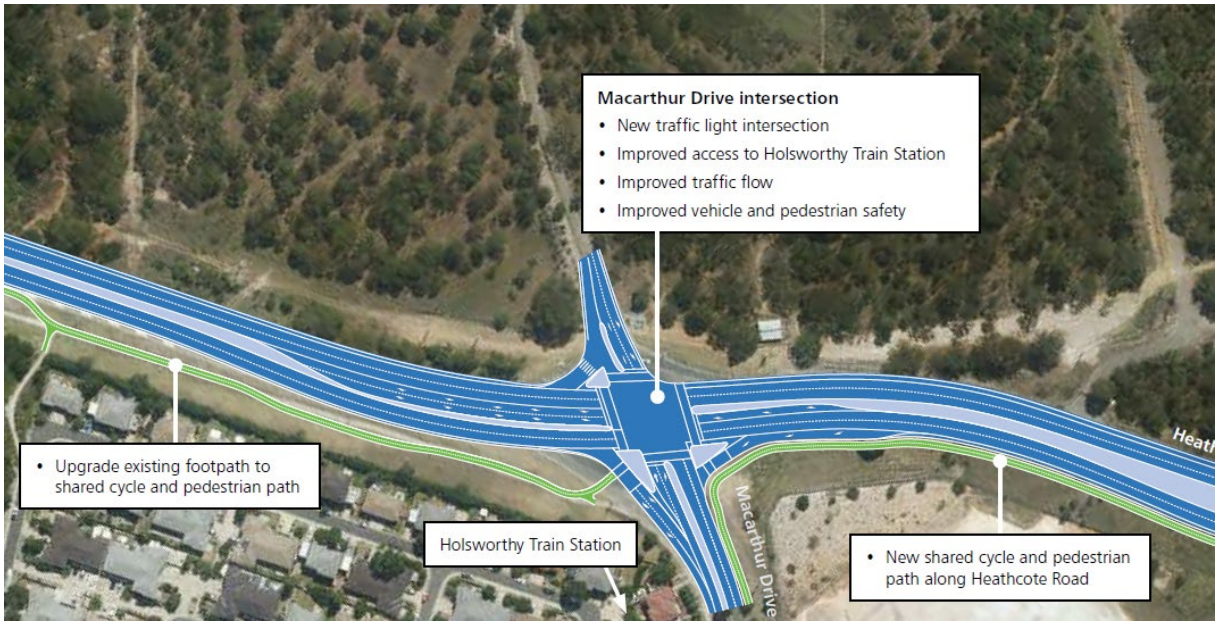
2.5 Heathcote Road Upgrade

The NSW Government is proposing to upgrade Heathcote Road, between Infantry Road and The Avenue. The upgrade aims to improve the capacity and efficiency of Heathcote Road and also to improve pedestrian and cycling connectivity to Holsworthy Railway Station and Hammondville Oval (located along Heathcote Road approximately 1km north of the site).

The upgrade includes converting Heathcote Road to a four-lane road and the upgrade of key intersections. This includes the upgrade of the intersection of Heathcote Road and MacArthur Drive into traffic signals. The intersection design includes two auxiliary right-turn bays into MacArthur Drive, two left-turn bays from MacArthur Drive into Heathcote Road to accommodate the heavy northbound traffic.

Investigative work is currently being undertaken to assist with the detailed design of the intersection. A concept layout of the intersection is shown in Figure 2.4.

Figure 2.4: Heathcote Road-MacArthur Drive Concept Plan



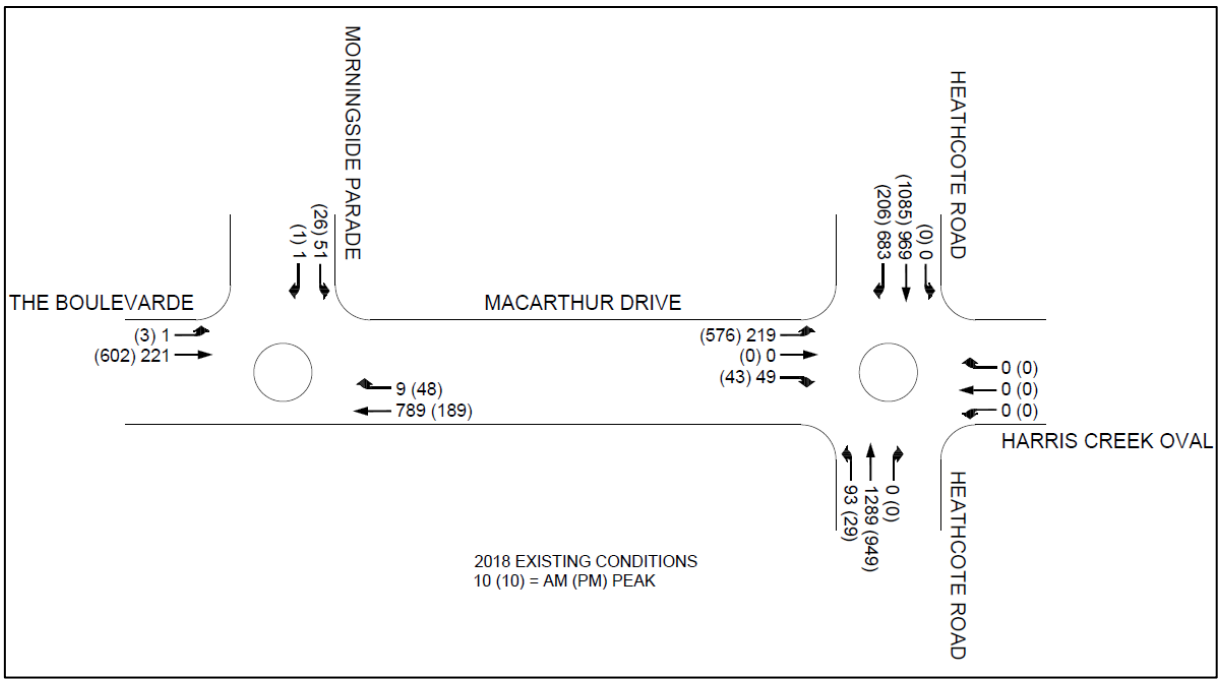
2.6 Traffic Volumes

Intersection traffic counts were undertaken on Friday 2 December 2016 at the following intersections:

- MacArthur Drive-Heathcote Road
- MacArthur Drive-The Boulevard-Morningside Parade.

The traffic counts show that peak traffic occurs during the hours of 7am to 8am and 5:30pm to 6:30pm. The existing traffic volumes are shown in Figure 2.5.

Figure 2.5: Existing Traffic Volumes



The raw data of the traffic counts are provided in **Appendix A.**

3 Planning Proposal

3.1 Development Description

The Planning Proposal consists of a mixed-use development including a small shopping centre with six residential towers situated above and basement level parking. The land use schedule for the development will comprise of the following:

- Retail = 8,804m^2 GLA
- Residential = 350 units
  - 81x 1-bedroom units
  - 175x 2-bedroom units
  - 94x 3-bedroom units.

3.2 Access Arrangements

The proposed development is to be accessed from a two-way access road which will intersect with MacArthur Drive, The Boulevard and Morningside Parade as a four-arm intersection.

The existing intersection of MacArthur Drive, The Boulevard and Morningside Parade is a three-arm intersection with roundabout control. It is noted that the intersection includes a fourth arm which was used to access the army barracks located to the south. This fourth arm is now closed to vehicles.

The intersection/site access is proposed to be signalised, to reduce delay and queue lengths of turning movements from the site and to assist pedestrian movement between the site and the railway station. A warrant assessment for the intersection has been undertaken and is summarised in Section 5.5.

The proposed access road will comprise three traffic lanes including one entry and two egress lanes.

The site access and layout is shown conceptually in Figure 3.1.

Figure 3.1: Site Access and Layout

Source: Architectus, 15/10/18

3.3 Loading Arrangements

Loading is to occur on ground level, adjacent to the back of house (BOH) areas located at the rear of the development site. The loading area comprises six loading bays including:

- two 19m long bays (accommodating vehicles up to an Australian Standard 19m long articulated vehicle)
- four 12.5m long bays (accommodating service vehicles up to an Australian Standard 12.5m long heavy rigid vehicle).

3.4 Pedestrian and Cycling Connectivity

A shared path is proposed along the frontage of the site to connect with the shared path proposed as part of the Heathcote Road upgrade by Roads and Maritime. The shared path provides access to/from the commuter car park and train station located to the west and Heathcote Road to the east.

4 Parking Assessment

4.1 Car Parking Requirements

4.1.1 DCP Requirement

Parking controls have been determined based on the existing controls in Council's *Development Control Plan 2008* (DCP), for site's outside the Liverpool City Centre.

An assessment of car parking requirements for the proposed development is demonstrated in Table 4.1 below.

Table 4.1: DCP Car Parking Requirements (outside City Centre)

Land Use	Dwelling Types	No. of Dwellings/ GLA	DCP Parking Rate	Required Parking Spaces
Residential	1 Bed Unit	81	1 space per two dwelling	
	2 Bed Units	175	1 space per dwelling	
	3 Bed Units	94	1 space per dwelling	
	Visitors	-	1.5 spaces per dwelling	
	Sub-Total	**350**	-	**432**
Retail		8,804	1 space per 20m² (LFA <12,000m²)	440
Total				**872**

Based on the DCP, the development is required a total parking provision of 872 spaces including 420 spaces for the residential component and 440 spaces for the retail component.

4.1.2 SEPP 65 Apartment Design Guide

To further assess the parking requirements for the subject site, it is noted that State Environmental Planning Policy No 65 (SEPP 65) amendment details minimum car parking requirements for residential development within 800 metres of a railway station or light rail stop. More specifically, Part 3J of the Apartment Design Guide (ADG) states:

"For development...on sites that are within 800 metres of a railway station or light rail stop…the minimum car parking requirement for residents and visitors is set out in the Guide to Traffic Generating Development, or the car parking requirement prescribed by the relevant council, whichever is less".

Holsworthy Railway Station is located within 300m from the site. On this basis, the requirements set out in the Roads and Maritime Guide is relevant and has been assessed in Table 4.2.

Table 4.2: ADG/ Roads and Maritime Parking Requirements

Land Use	Size	Car Parking Rate	Minimum Requirement
Residential			
1-bed	81	0.6 Spaces per unit	48.6
2-bed	175	0.9 spaces per unit	157.5
3-bed	94	1.4 spaces per unit	131.6
Visitor	-	1 space per 5 units	70.0
Total	**350**		**408**

Table 4.2 indicates that the residential component of the development is required a minimum of 409 spaces including 70 visitor spaces.

Based on the guidelines of the ADG, the lesser of the DCP and Roads and Maritime requirement would be the minimum requirement for the development. On this basis, the proposed development is required to provide a total minimum of 848 car parking spaces including 408 residential spaces and 440 retail spaces.

The proposed development will provide car parking in accordance with the minimum requirements of the ADG.

The current development layout indicatively provides 842 spaces within two basement car park levels. Subject to detailed design and eventual unit mix, the site is capable of accommodating the required number of car parking spaces.

4.2 Accessible Parking

The DCP stipulates the following parking rates for accessible parking provision:

- 2 spaces per 100 spaces for residential parking
- 1 space per 100 space for retail parking.

Based on the above, the proposed development is required a provision of eight accessible residential spaces to accommodate a minimum of 408 residential car spaces and four accessible retail spaces to accommodate a minimum of 440 retail spaces.

It is proposed to comply with the accessible parking requirements as stipulated by the DCP.

4.3 Service and Loading

The DCP indicates the following requirement for the proposed land uses:

- Retail developments of LFA < 4,400m^2 require service access for an articulated vehicle.

In addition, access for garbage collection and removalists is required for the residential apartment units.

The development has included six loading bays to accommodate up to:

- Two 19m semi-trailers to accommodate the two supermarkets
- Four 12.5m HRVs to accommodate loading requirements from the specialty retail stores and deliveries and waste collection for the residential component.

4.4 Access and Parking Layout

The access arrangements and basement car parking layout will be designed in accordance with Australian Standard AS2890. A detailed compliance assessment of the access and car parking arrangements will be undertaken during the DA stage.

5 Traffic Assessment

5.1 Traffic Generation

Typical traffic generation estimates for the proposed development have been sourced from Roads and Maritime Service's 'Guide to Traffic Generating Developments' (Guide) and in the technical direction TDT 2013/04a containing revised rates.

The traffic generating potential of the development has been assessed and is summarised in Table 5.1.

Table 5.1: Trip Generation

Land Use	Size	Traffic Generation Rate		Trips (vph)	
		AM	PM	AM	PM
Residential	350 units	0.19 trips per unit	0.15 trips per unit	67	53
Retail	8,804m²	6.25 trips per 100m² NLA	12.5 trips per 100m² NLA	550	1101
Total Development Traffic				**617**	**1154**
20% of retail trips from existing traffic flows				110	220
Net increase of traffic to road network				**507**	**933**

Table 5.1 indicates that the development would generate 581 vehicle trips per hour in the morning peak period and 1,080 trips per hour in the afternoon peak period.

It is expected that a portion of the vehicle trips to the retail shops would be existing traffic flows in the road network. Notably, the site's proximity to the railway station and Heathcote Road, would generate a proportion of vehicles that are passing by the shopping centre/site while commuting to work etc.

It is noted that the Roads and Maritime guidelines suggest an average discount of about 20 per cent for shopping centres, to account for linked and multi-purpose trips. This allowance has been included in the table above.

On this basis, it is estimated that the net increase of development related traffic generation to the road network, would be in the order of 507 vehicle trips per hour and 933 vehicle trips per hour in the morning and afternoon peak periods respectively.

5.2 Traffic Distribution

The distribution (i.e. inbound/ outbound) and direction (to the road network) of development traffic is based on many factors including the land use characteristics, the configuration of

the arterial road network, location of employment centres in relation to the site and access arrangements of the subject site.

The subject development traffic has been distributed based on generalised land use patterns and existing traffic flows on the road network. The existing traffic flows diverted from the road network into the site has been allocated as follows:

- 50 per cent from Holsworthy Railway Station and commuter car park
- 20 per cent from northbound traffic along Heathcote Road
- 20 per cent from southbound traffic along Heathcote Road
- 10 per cent from Morningside Parade.

The additional traffic generated by the proposed development has been assumed to have the following traffic distribution:

- Retail traffic distribution:
  - 50 per cent to and from the north on Heathcote Road
  - 40 per cent to and from the south on Heathcote Road
  - 10 per cent to and from Morningside Parade.
- Residential traffic distribution:
  - 60 per cent to and from the north on Heathcote Road
  - 40 per cent to and from the south on Heathcote Road.

In addition, the following typical inbound/ outbound splits have been assumed:

- Residential: 20 per cent inbound/ 80 per cent outbound in the morning peak, and vice versa in the afternoon peak
- Retail: 50 per cent inbound/ 50 per cent outbound.

5.3 Background Traffic Growth

Background growth factors have been applied to traffic along MacArthur Drive and Heathcote Road to assess the condition of the road network in 10 years in the future, with and without the development.

Background traffic growth has been adopted based on Sydney Traffic Forecasting Model (STFM) growth plots obtained from Roads and Maritime. The STFM growth plots provide growth rates (per cent per annum growth) from the year 2016 to a 10-year future (2026). Based on a base assessment year of 2018, the 2016-2026 growth rates have been similarly adopted by TTPP for the 10-year post development scenario (2028).

It is noted that the STFM model shows an anomaly along the road fronting the Holsworthy commuter car park (The Boulevard) with a growth rate of 13.9 to 16.3 per cent per annum to year 2026. It is believed that this significant increase in traffic relates to the additional traffic generated by the then proposed multi-storey commuter car park containing over 400 spaces. The multi-storey commuter car park in now built and operating.

On this basis, the traffic growth estimated in the STFM model is considered to be already included in the traffic counts used for this assessment. Instead the traffic growth rate of The Boulevard was assumed to match MacArthur Drive which includes a growth of 0.9 to 2.7 per cent per annum. The STFM plots are provided in **Appendix B** for reference.

5.4 Traffic Impact

The following intersections have been identified as the key intersections that may be impacted by the Planning Proposal:

- Macarthur Road – The Boulevarde – Morningside Parade
- Macarthur Road – Heathcote Road

The existing and future operating performance of the above key intersections has been assessed using SIDRA INTERSECTION 8 (SIDRA), a computer-based modelling package which calculates intersection performance characteristics, including the degree of saturation, average delays and levels of service.

The study intersections have been assessed in SIDRA, with inclusion of development traffic and the proposed signalisation of Heathcote Road-MacArthur Drive which is assumed to be in by place prior to the occupation of the proposed development.

The traffic impact of the development has been carried out under the following scenarios:

- 2018 Existing Conditions
- 2018 Existing + Development
- 2028 Base (10-year horizon without development)
- 2028 Base + Development (10-year horizon with development traffic).

The traffic turning movements for each of the above scenarios are shown in Figure 2.5, Figure 5.1, Figure 5.2 and Figure 5.4.

Figure 5.1: 2018 Existing + Development Volumes

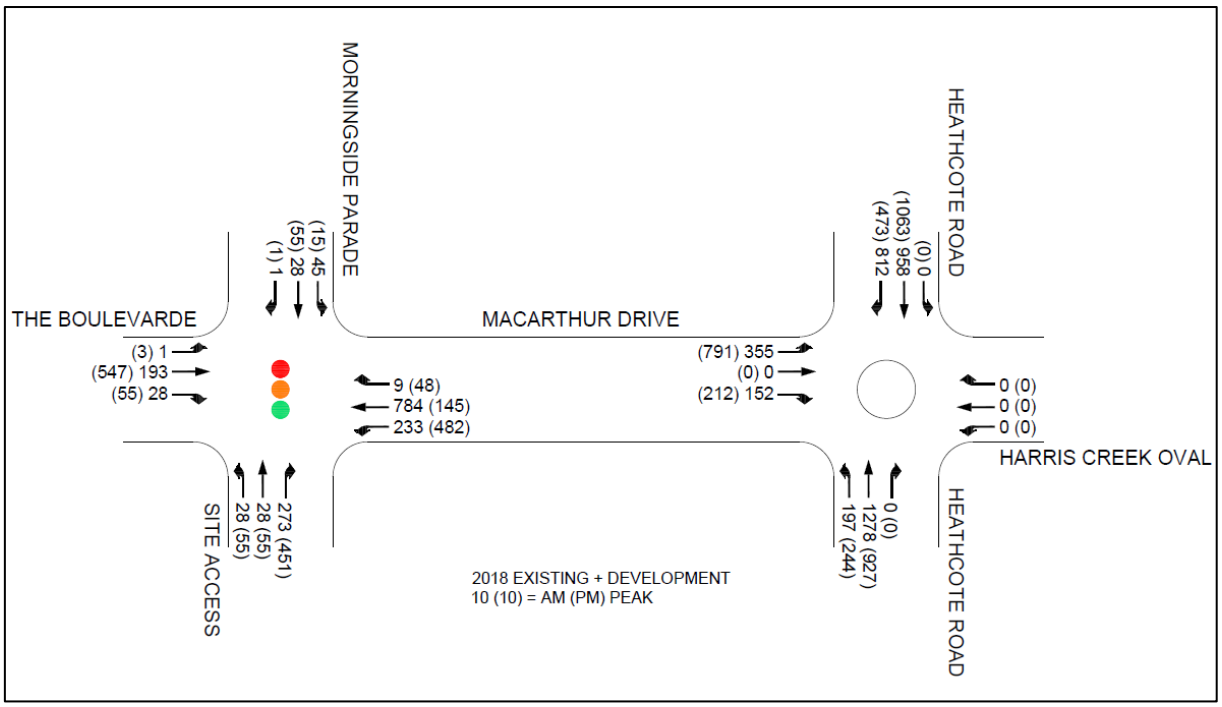


Figure 5.2: 2028 Base (10-year horizon without development)

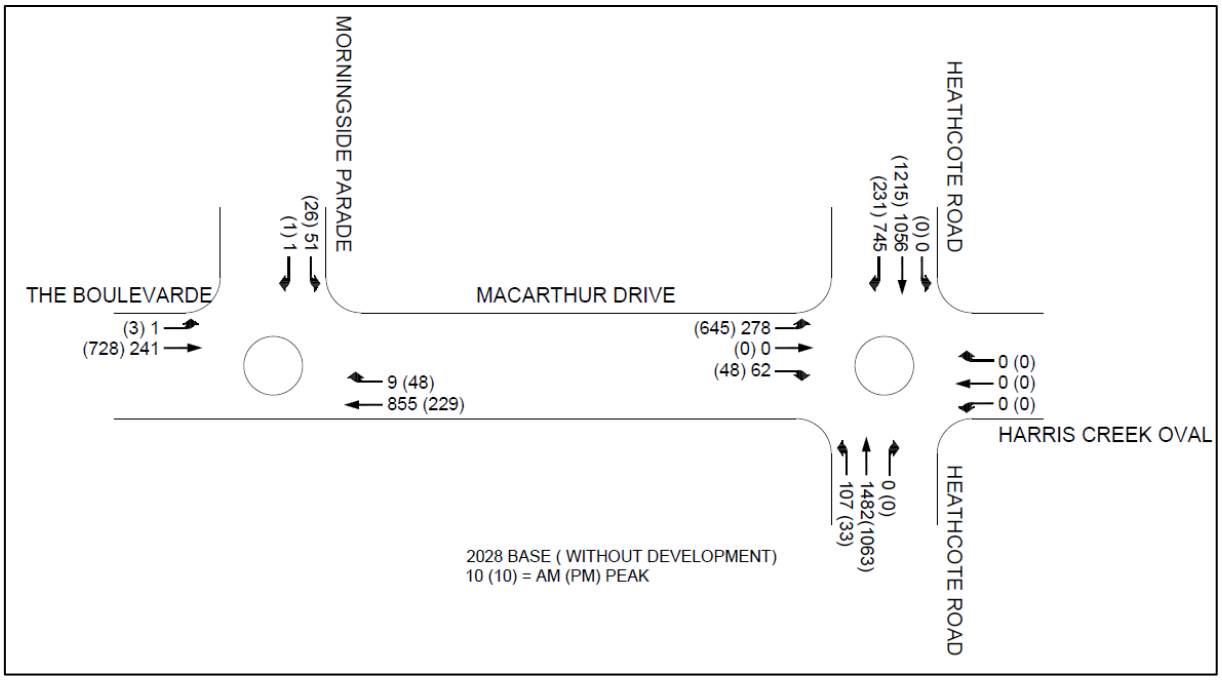
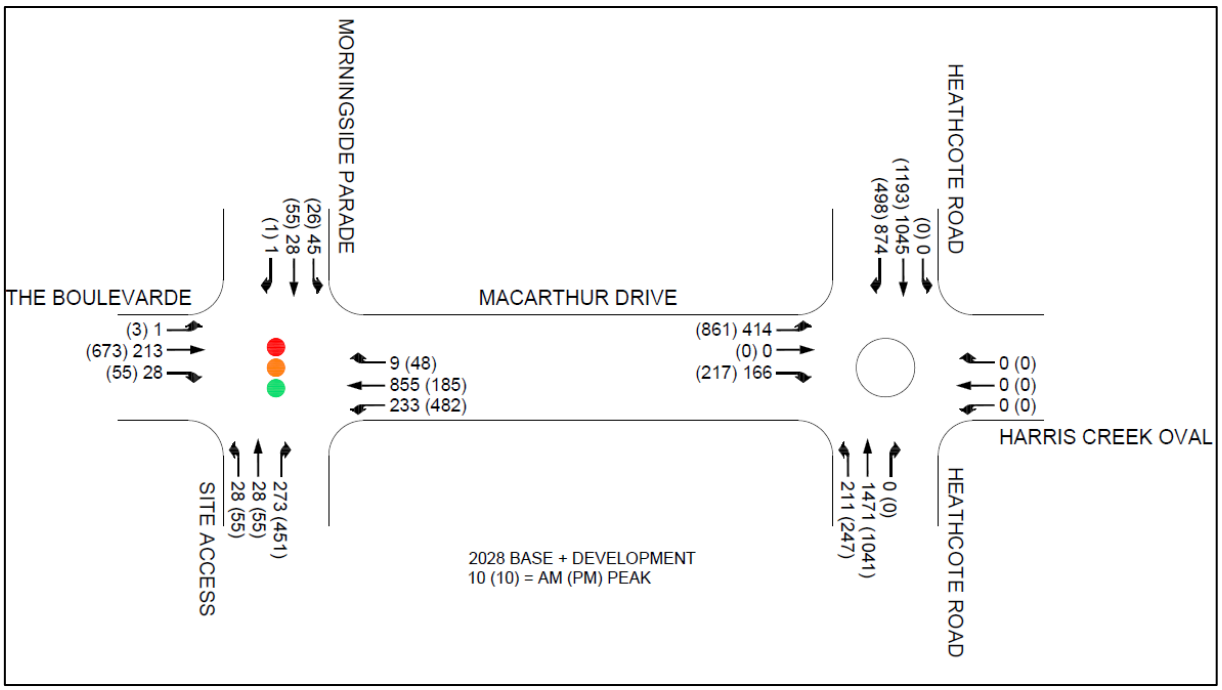


Figure 5.3: 2028 Base (10-year horizon with development)



5.4.1 Modelling Performance Indicators

SIDRA modelling provides several useful indicators to determine the level of intersection performance.

RMS uses the performance measure level of service (LoS), to determine how efficient an intersection/network is operating under given prevailing traffic conditions. Level of service is directly related to the delays experienced by traffic travelling through the intersection. SIDRA's level of service ranges from Los A to Los F, with LoS A indicating that the intersection is operating with spare capacity and LoS F indicating the intersection is operating over capacity. LoS D is the long-term desirable level of service.

The criteria that SIDRA intersection adopts in assessing the level of service is shown in Table 5.2.

Table 5.2: Level of Service

Level of Service	Average Delay (seconds per vehicle)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	Less than 14	good operation	good operation
B	15 to 28	good with acceptable delays and spare capacity	acceptable delays and spare capacity
C	29 to 42	satisfactory	satisfactory, but accident study required
D	43 to 56	operating near capacity	near capacity and accident study required

E	57 to 70	at capacity At signals, incidents will cause excessive delays.	at capacity, requires other control mode
F	Greater than 71	unsatisfactory with excessive queuing	unsatisfactory with excessive queuing; requires other control mode

Source: RMS Guide to Traffic Generating Developments, 2002

5.4.2 MacArthur Drive-The Boulevard & Site Access

The intersection of MacArthur Drive-The Boulevard-Morningside Parade has been assessed with and without the development (including site access) as a roundabout for the above scenarios. The results of the assessment are presented in Table 5.3.

Table 5.3: MacArthur Drive & Site Access (Roundabout) - Intersection Operation

Intersection	AM			PM		
	95% Queue (m)	Delay (sec/veh)	Level of Service	95% Queue (m)	Delay (sec/veh)	Level of Service
2018 Existing	17	9	A	17	11	A
2018 Existing + Development	26	15	A	63	17	B
2028 Base (No Development)	19	9	A	23	12	A
2028 Base + Development	29	17	B	142	28	B

The results in Table 5.3 indicate that the proposed development would increase vehicle delay however, the operation of the roundabout intersection with inclusion of an additional arm would continue to operate well with a LoS B.

In addition, notable vehicle queueing is anticipated from the site access, with results showing queue lengths of 142m exiting the site in the 2028 afternoon peak period.

5.4.3 Future operation of MacArthur Drive-Heathcote Road

The intersection of MacArthur Drive and Heathcote Road is proposed to be signalised as part of the Roads and Maritime upgrade of Heathcote Road. The actual operation of the signals in relation to phasing and timing is unavailable, however TTPP have undertaken an assessment of the potential operation of the future intersection to assess the impact of the proposed development to the intersection.

The results of the assessment are summarised in Table 5.4.

Table 5.4: Future MacArthur Drive-Heathcote Road Operation

Approach	AM			PM		
	95% Queue (m)	Delay (sec/veh)	Level of Service	95% Queue (m)	Delay (sec/veh)	Level of Service
2028 Base (No Development)	367	35	C	104	16	B
2028 Base + Development	466	50	D	149	22	B

Table 5.4 indicates that in year 2028, the signalised intersection of MacArthur Drive and Heathcote Road would operate satisfactorily with a LoS C in the morning peak period and LoS B in the afternoon peak period. However, it is noted that the assessment does not take into account any potential road coordination systems that may be applied along Heathcote Road by Roads and Maritime.

The inclusion of development related traffic would increase vehicle delay and queueing with the intersection operating near capacity in the morning peak period with a LoS D. In afternoon period, the intersection operates well with a LoS B.

Notwithstanding the increase in delay and queueing, the development impact is considered acceptable. The subject site is located along MacArthur Drive where further development projects are unlikely to occur in the near future. On this basis, no additional traffic generation is anticipated to MacArthur Drive beyond that generated by the proposed site.

In addition, given that the development site includes an existing DA approval, it is considered that Roads and Maritime Services would have included traffic generated by the development in its assessment of the Heathcote Road-MacArthur Drive intersection.

5.4.4 Signalised Access Option

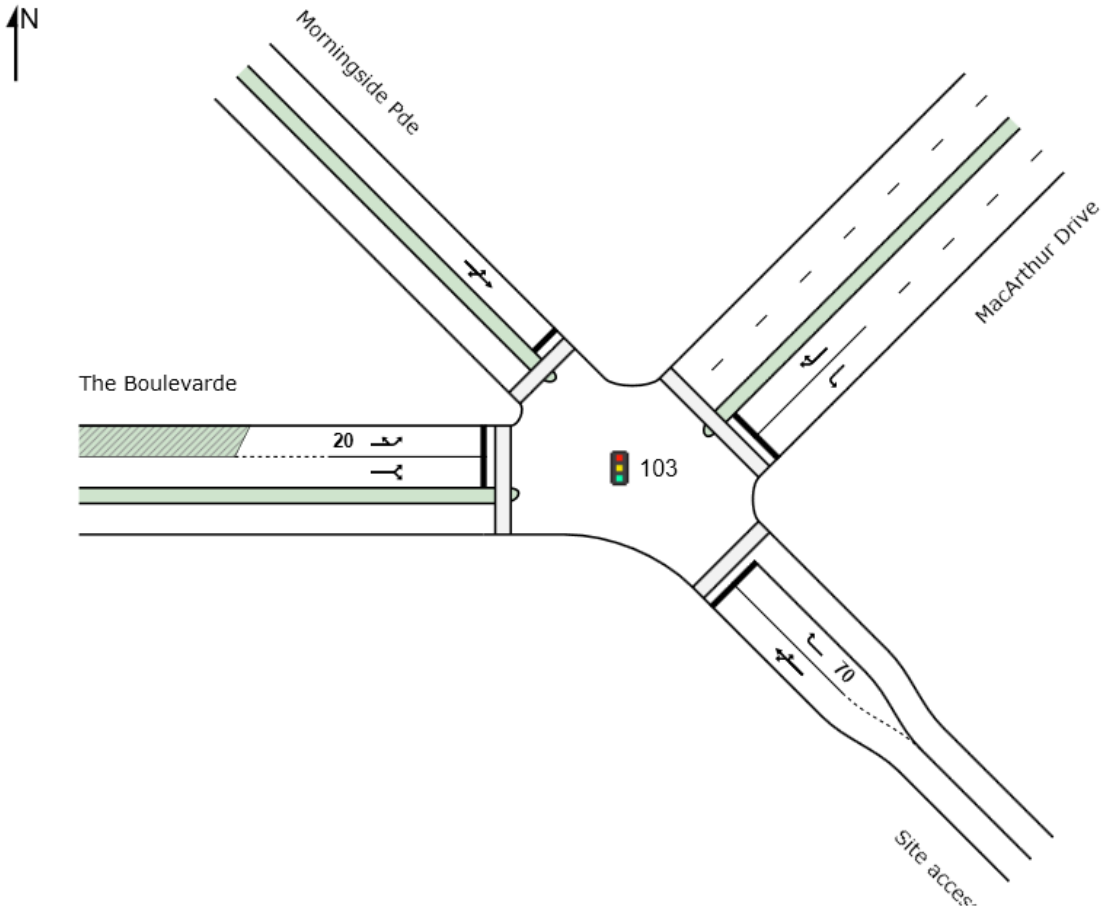
It is proposed to signalise the intersection of MacArthur Drive, The Boulevard, Morningside Parade and proposed site access.

The signalisation would prevent the potential for heavy delays to existing traffic from the site as a result of heavy through traffic along MacArthur Drive.

In addition, the provision of traffic signals provides a better outcome for cyclists and pedestrians who want to cross the road at this location.

The proposed signalised intersection layout is shown in Figure 5.4.

Figure 5.4: Signalised Access Configuration



The intersection has been designed to operate at a LoS B as shown in Table 5.5.

Table 5.5: MacArthur Drive & Site Access (Signalised) – Intersection Operation

Intersection	AM			PM		
	95% Queue (m)	Delay (sec/veh)	Level of Service	95% Queue (m)	Delay (sec/veh)	Level of Service
2018 Existing + Development	151	22	B	85	23	B
2028 Base + Development	177	22	B	85	23	B

5.4.5 Traffic Impact Summary

The proposed development is anticipated to generate a total of 581 vehicle trips per hour in the morning peak period and 1,080 trips per hour in the afternoon peak period. Approximately 20 per cent of this traffic generation would include diverted trips from existing traffic movements carrying out multi-purpose trips.

The impact of the development traffic to the local road network as assessed in SIDRA includes:

- Minor increase in delay and queueing to the intersection of MacArthur Drive, The Boulevard, Morningside Parade and the proposed site access. The overall operation of the intersection is anticipated to be satisfactory.
- Notwithstanding the above, it is proposed to signalise the intersection of MacArthur Drive, The Boulevard, Morningside Parade and the proposed site access to reduce potential delay to traffic movements exiting from the subject site and to assist with pedestrian / cyclists movements through the network.
- Increase in delay to the proposed signalised intersection of Heathcote Road and Macarthur Road. Based on assumed operating characteristics of the proposed intersection, it is assumed to operate at a LoS C by year 2028. Post development, the intersection is anticipated to operate nearing capacity with a LoS D. The development impact is considered acceptable noting that the traffic growth figures applied to the year 2028 intersection is likely to have included the approved development site. On this basis, the subject study is conservative with the proposed development included in addition to background growth figures.

Detailed outputs of the SIDRA assessment are provided in **Appendix C**.

5.5 Roads and Maritime Traffic Signal Warrants

Based on the Roads and Maritime Services *Traffic Signal Design* 2008 manual, a signalised intersection may be considered if warrants are met, either based on crash history, pedestrian safety, high speeds, or high traffic volumes.

Based on this, a traffic signal warrants assessment has been undertaken for the intersection of MacArthur Drive, The Boulevard, Morningside Parade and the proposed site access.

The relevant warrant has been reproduced and assessed within Table 5.6.

Table 5.6: Warrants Assessment for Proposed Site Access-MacArthur Drive

	Warrants Met? (Yes/No)
(a) Traffic demand: *For each of four one-hour periods of an average day:*	
(ii) the major road flow exceeds 600 vehicles/hour in each direction; and	Yes
(ii) the minor road flow exceeds 200 vehicles/hour in one direction.	Yes
Overall	**Yes**

The major road of the intersection is the MacArthur Drive and The Boulevard approaches. The site access and Morningside Parade is considered as the minor roads.

In the future scenario, that is, the year 2028 with development, the peak hour volumes on each major road approach of the intersection is estimated as follows:

- MacArthur Drive
  - 531 eastbound / 1,097 westbound vehicles per hour in the morning
  - 1,150 eastbound / 715 westbound vehicles per hour in the afternoon
- The Boulevard
  - 241 eastbound / 883 westbound vehicles per hour in the morning,
  - 731 eastbound / 241 westbound vehicles per hour in the afternoon.

Based on the above, MacArthur Road is anticipated to generate between 500 and 1100 vehicles per hour in any direction for two peak periods. Noting that each peak period would last around two to three hours, the warrant for a major road (>600 vehicles per hour for four one-hour periods in a day) is considered to be satisfied.

The minor road approach (site access) is estimated to generate the following volumes:

- Site Access
  - 228 inbound/ 328 outbound vehicles per hour in the morning
  - 592 inbound/ 561 outbound vehicles per hour in the afternoon.

Based on the above, the site access would generate around 300 and 600 vehicles per hour in each direction during the road network peak hours. The traffic signal warrant for a minor road requires traffic volumes to exceed 200 vehicles per hour for four one-hour periods in one direction. The above volumes indicate that the warrant is met for two directions in the afternoon and one direction in the morning.

Noting that the afternoon peak period is well above the warrant (>200 vehicles per hour), it is anticipated that the site would satisfy the warrant for another hour quite easily.

On this basis, the subject intersection is considered to meet the traffic signal warrants set by Roads and Maritime.

6 Conclusion

The key findings of the above traffic impact assessment are summarised in the following:

- A Planning Proposal is to be submitted for 2 MacArthur Drive, Holsworthy, for a mixed-use development. The development would include 350 residential units and 8,804m^2 GLA retail.
- There is an existing development approval for the subject site (DA-582/2009) for a mixed use site comprising 10 residential units, 6,795m^2 retail, 1,600m^2 commercial, a 90m^2 petrol station and a 360m^2 McDonalds restaurant.
- Based on Liverpool City Council development controls, the proposed development is required to provide 432 residential and 440 retail car spaces.
- The Apartment Design Guide stipulates a lower parking requirement for the residential component due to its proximity to Holsworthy Railway Station. On this basis, the development is considered to require a minimum of 408 residential and 440 retail car spaces.
- The development proposes to provide car parking in accordance with the minimum requirements of the ADG.
- The development is also required to provide a minimum of eight residential and four retail accessible parking spaces.
- The development is to provide six loading bays to accommodate vehicles up to an Australian Standard 19m long semi-trailer.
- The proposed development is estimated to generate 581 vehicle trips per hour in the morning peak period and 1,080 trips per hour in the afternoon peak period. Approximately 20 per cent of this traffic generation would include diverted trips from existing traffic movements carrying out multi-purpose trips.
- The proposed access into the site will include a two-way access road which will intersect with the existing roundabout controlled intersection of MacArthur Road, The Boulevard and Morningside Parade. It is proposed to convert the existing intersection to a signalised intersection to accommodate traffic to/from the site.
- SIDRA intersection modelling indicates that the development will increase vehicle delay and queuing to the local road network - however the operation of key intersections is anticipated to remain acceptable.

Appendix A

Traffic surveys

R.O.A.R. DATA

Reliable, Original & Authentic Results

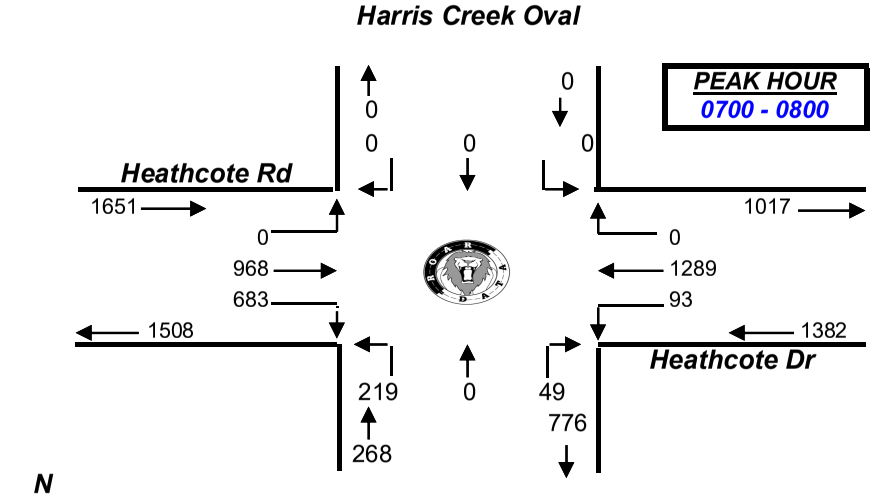
Ph.88196847, Mob.0418-239019

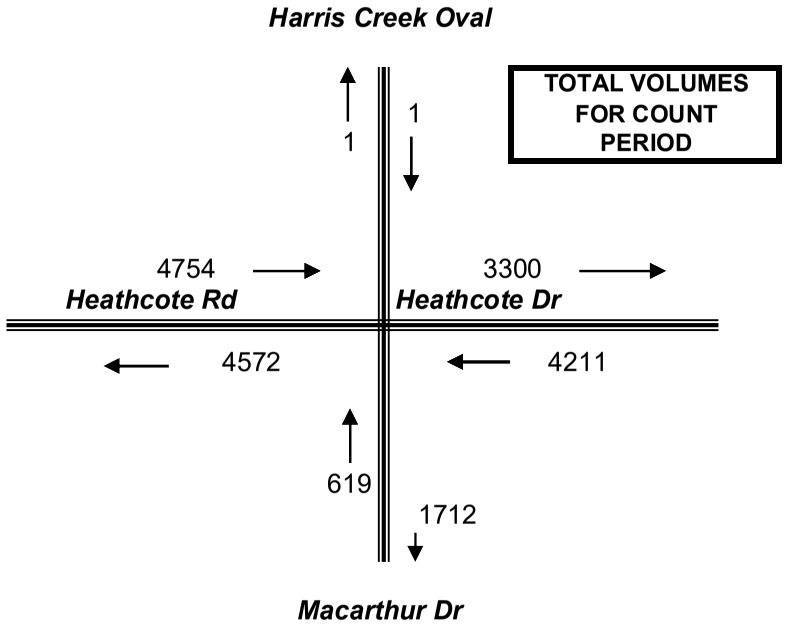
Client : Terraffic Pty. Ltd.
Job No/Name : 6317 HOLSWORTHY Macarthur Dr
Day/Date : Friday 2nd December 2016

All Vehicles	NORTH			WEST			SOUTH			EAST			
	Harris Creek			*Heathcote Rd*			*Macarthur Dr*			*Heathcote Dr*			
Time Per	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**TOT**
0600 - 0615	0	0	0	0	187	66	15	0	2	4	188	0	**462**
0615 - 0630	0	0	0	0	200	78	20	0	4	6	211	0	**519**
0630 - 0645	0	0	0	0	224	84	16	0	0	6	245	0	**575**
0645 - 0700	0	0	0	0	239	125	24	0	4	11	271	0	**674**
0700 - 0715	0	0	0	0	272	161	32	0	10	21	262	0	**758**
0715 - 0730	0	0	0	0	235	189	71	0	21	28	309	0	**853**
0730 - 0745	0	0	0	0	243	173	54	0	12	29	336	0	**847**
0745 - 0800	0	0	0	0	218	160	62	0	6	15	382	0	**843**
0800 - 0815	0	0	0	0	196	145	55	0	4	22	295	0	**717**
0815 - 0830	0	0	0	0	199	120	59	0	4	15	338	0	**735**
0830 - 0845	0	0	0	0	181	55	36	0	5	10	250	0	**537**
0845 - 0900	0	0	0	0	186	40	35	0	1	4	222	0	**488**
0900 - 0915	0	0	0	0	191	46	19	0	4	2	232	0	**494**
0915 - 0930	0	0	0	0	163	29	12	0	3	0	159	0	**366**
0930 - 0945	0	0	1	1	143	36	16	0	3	1	179	0	**380**
0945 - 1000	0	0	0	0	139	30	9	0	1	1	157	0	**337**
Period End	**0**	**0**	**1**	**1**	**3216**	**1537**	**535**	**0**	**84**	**175**	**4036**	**0**	**9585**

	NORTH			WEST			SOUTH			EAST			
	Harris Creek			*Heathcote Rd*			*Macarthur Dr*			*Heathcote Dr*			
Peak Time	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**TOT**
0600 - 0700	0	0	0	0	850	353	75	0	10	27	915	0	**2230**
0615 - 0715	0	0	0	0	935	448	92	0	18	44	989	0	**2526**
0630 - 0730	0	0	0	0	970	559	143	0	35	66	1087	0	**2860**
0645 - 0745	0	0	0	0	989	648	181	0	47	89	1178	0	**3132**
0700 - 0800	0	0	0	0	968	683	219	0	49	93	1289	0	**3301**
0715 - 0815	0	0	0	0	892	667	242	0	43	94	1322	0	**3260**
0730 - 0830	0	0	0	0	856	598	230	0	26	81	1351	0	**3142**
0745 - 0845	0	0	0	0	794	480	212	0	19	62	1265	0	**2832**
0800 - 0900	0	0	0	0	762	360	185	0	14	51	1105	0	**2477**
0815 - 0915	0	0	0	0	757	261	149	0	14	31	1042	0	**2254**
0830 - 0930	0	0	0	0	721	170	102	0	13	16	863	0	**1885**
0845 - 0945	0	0	1	1	683	151	82	0	11	7	792	0	**1728**
0900 - 1000	0	0	1	1	636	141	56	0	11	4	727	0	**1577**

PEAK HOUR	**0**	**0**	**0**	**0**	**968**	**683**	**219**	**0**	**49**	**93**	**1289**	**0**	**3301**





R.O.A.R. DATA

Reliable, Original & Authentic Results

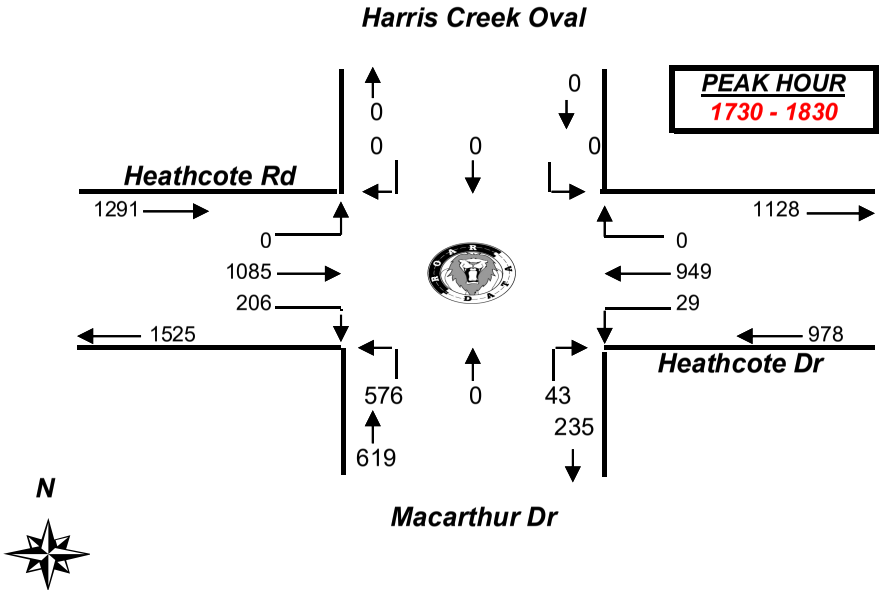
Ph.88196847, Mob.0418-239019

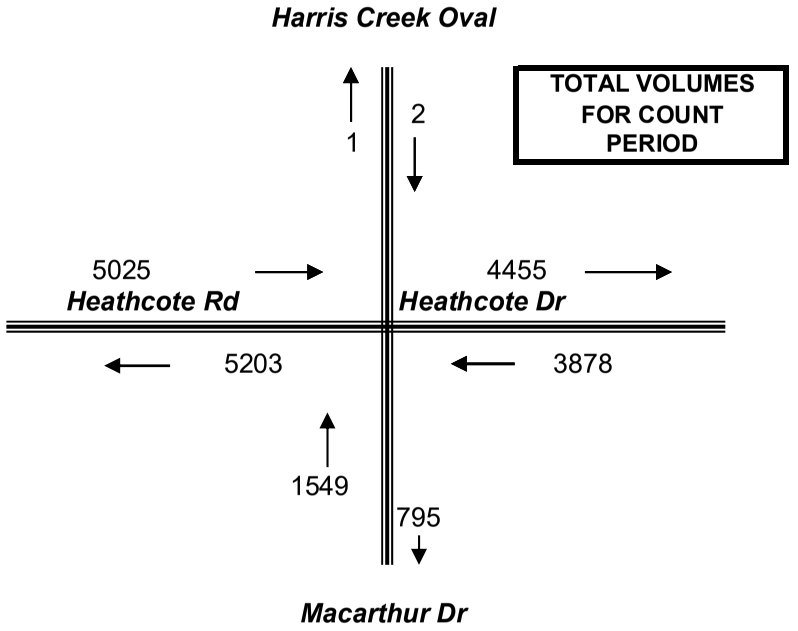
Client : Terraffic Pty. Ltd.
Job No/Name : 6317 HOLSWORTHY Macarthur Dr
Day/Date : Friday 2nd December 2016

All Vehicles	NORTH			WEST			SOUTH			EAST			
	Harris Creek			*Heathcote Rd*			*Macarthur Dr*			*Heathcote Dr*			
Time Per	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1515	0	0	1	0	190	17	11	0	3	3	223	0	**448**
1515 - 1530	0	0	0	0	253	46	29	0	6	6	244	0	**584**
1530 - 1545	0	0	0	0	266	38	91	0	10	7	245	0	**657**
1545 - 1600	1	0	0	1	240	55	61	0	11	10	263	0	**642**
1600 - 1615	0	0	0	0	331	39	66	0	10	7	276	0	**729**
1615 - 1630	0	0	0	0	313	45	71	0	3	3	246	0	**681**
1630 - 1645	0	0	0	0	320	47	70	0	7	5	228	0	**677**
1645 - 1700	0	0	0	0	290	45	52	0	2	7	256	0	**652**
1700 - 1715	0	0	0	0	254	49	115	0	10	2	223	0	**653**
1715 - 1730	0	0	0	0	281	55	106	0	14	7	199	0	**662**
1730 - 1745	0	0	0	0	282	53	90	0	6	9	229	0	**669**
1745 - 1800	0	0	0	0	309	71	174	0	15	8	233	0	**810**
1800 - 1815	0	0	0	0	234	37	150	0	13	4	236	0	**674**
1815 - 1830	0	0	0	0	260	45	162	0	9	8	251	0	**735**
1830 - 1845	0	0	0	0	259	37	101	0	7	4	221	0	**629**
1845 - 1900	0	0	0	0	241	22	69	0	5	4	211	0	**552**
Period End	**1**	**0**	**1**	**1**	**4323**	**701**	**1418**	**0**	**131**	**94**	**3784**	**0**	**10454**

	NORTH			WEST			SOUTH			EAST			
	Harris Creek			*Heathcote Rd*			*Macarthur Dr*			*Heathcote Dr*			
Peak Time	L	T	R	L	T	R	L	T	R	L	T	R	TOT
1500 - 1600	1	0	1	1	949	156	192	0	30	26	975	0	**2331**
1515 - 1615	1	0	0	1	1090	178	247	0	37	30	1028	0	**2612**
1530 - 1630	1	0	0	1	1150	177	289	0	34	27	1030	0	**2709**
1545 - 1645	1	0	0	1	1204	186	268	0	31	25	1013	0	**2729**
1600 - 1700	0	0	0	0	1254	176	259	0	22	22	1006	0	**2739**
1615 - 1715	0	0	0	0	1177	186	308	0	22	17	953	0	**2663**
1630 - 1730	0	0	0	0	1145	196	343	0	33	21	906	0	**2644**
1645 - 1745	0	0	0	0	1107	202	363	0	32	25	907	0	**2636**
1700 - 1800	0	0	0	0	1126	228	485	0	45	26	884	0	**2794**
1715 - 1815	0	0	0	0	1106	216	520	0	48	28	897	0	**2815**
1730 - 1830	0	0	0	0	1085	206	576	0	43	29	949	0	**2888**
1745 - 1845	0	0	0	0	1062	190	587	0	44	24	941	0	**2848**
1800 - 1900	0	0	0	0	994	141	482	0	34	20	919	0	**2590**

PEAK HOUR	**0**	**0**	**0**	**0**	**1085**	**206**	**576**	**0**	**43**	**29**	**949**	**0**	**2888**





R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Mob.0418-239019

Client : Terraffic Pty. Ltd.
Job No/Name : 6317 HOLSWORTHY Macarthur Dr
Day/Date : Friday 2nd December 2016

	NORTH			NORTHWEST			WEST			SOUTH			
	Macarthur Dr			*Mornington Pde*			*The Boulevarde*			*Macarthur Dr*			
Time Per	HR	R	T	HR	R	L	HL	L	R	HL	L	T	TOT
0600 - 0615	0	70		0		3	0	14					**87**
0615 - 0630	0	84		0		9	0	18					**111**
0630 - 0645	0	85		0		2	0	16					**103**
0645 - 0700	2	130		0		5	0	23					**160**
0700 - 0715	2	182		1		9	0	32					**226**
0715 - 0730	1	225		0		15	0	75					**316**
0730 - 0745	1	201		0		11	0	59					**272**
0745 - 0800	5	176		0		16	0	55					**252**
0800 - 0815	2	151		2		14	1	45					**215**
0815 - 0830	7	129		1		15	0	42					**194**
0830 - 0845	2	64		0		13	0	36					**115**
0845 - 0900	4	39		0		15	0	20					**78**
0900 - 0915	7	37		0		7	0	12					**63**
0915 - 0930	4	21		1		1	0	11					**38**
0930 - 0945	6	32		1		10	0	8					**57**
0945 - 1000	5	25		1		2	0	7					**40**
Period End	**48**	**1651**	**0**	**7**	**0**	**147**	**1**	**473**	**0**	**0**	**0**	**0**	**2327**

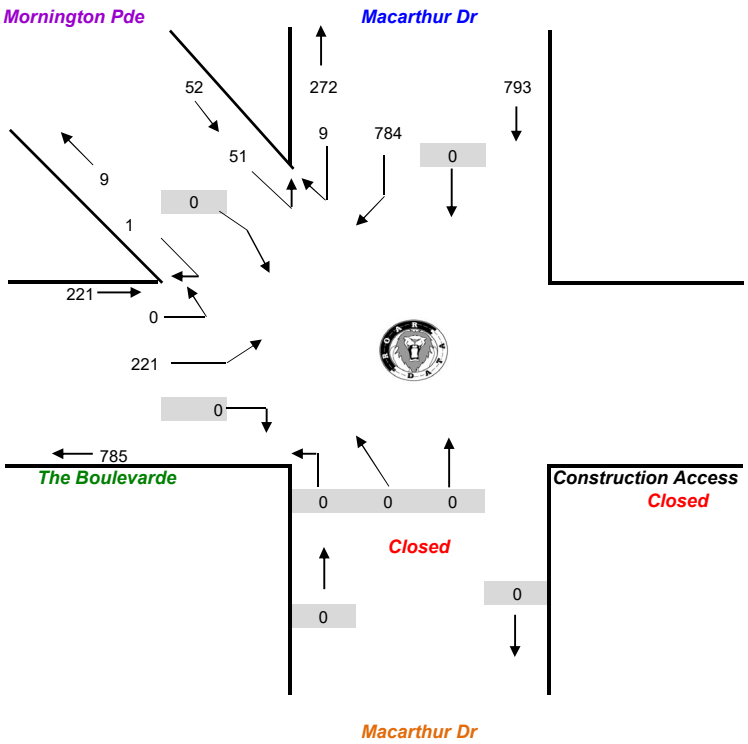
	NORTH			NORTHWEST			WEST			SOUTH			
	Macarthur Dr			*Mornington Pde*			*The Boulevarde*			*Macarthur Dr*			
Peak Time	HR	R	T	HR	R	L	HL	L	R	HL	L	T	TOT
0600 - 0700	2	369	0	0	0	19	0	71	0	0	0	0	**461**
0615 - 0715	4	481	0	1	0	25	0	89	0	0	0	0	**600**
0630 - 0730	5	622	0	1	0	31	0	146	0	0	0	0	**805**
0645 - 0745	6	738	0	1	0	40	0	189	0	0	0	0	**974**
0700 - 0800	9	784	0	1	0	51	0	221	0	0	0	0	**1066**
0715 - 0815	9	753	0	2	0	56	1	234	0	0	0	0	**1055**
0730 - 0830	15	657	0	3	0	56	1	201	0	0	0	0	**933**
0745 - 0845	16	520	0	3	0	58	1	178	0	0	0	0	**776**
0800 - 0900	15	383	0	3	0	57	1	143	0	0	0	0	**602**
0815 - 0915	20	269	0	1	0	50	0	110	0	0	0	0	**450**
0830 - 0930	17	161	0	1	0	36	0	79	0	0	0	0	**294**
0845 - 0945	21	129	0	2	0	33	0	51	0	0	0	0	**236**
0900 - 1000	22	115	0	3	0	20	0	38	0	0	0	0	**198**

PEAK HOUR	**9**	**784**	**0**	**1**	**0**	**51**	**0**	**221**	**0**	**0**	**0**	**0**	**1066**

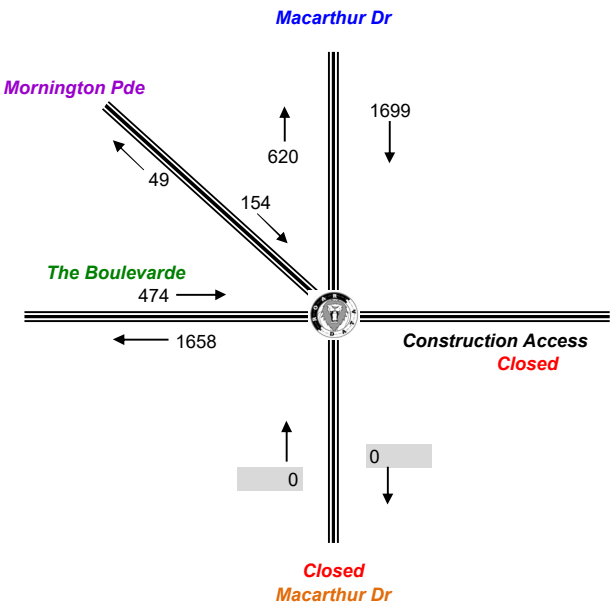
R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Mob.0418-239019

Client : Terraffic Pty. Ltd.
Job No/Name : 6317 HOLSWORTHY Macarthur Dr
Day/Date : Friday 2nd December 2016

AM PEAK HOUR
0700 - 0800



TOTAL VOLUMES FOR PERIODS COUNTED



R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Mob.0418-239019

Client : Terraffic Pty. Ltd.
Job No/Name : 6317 HOLSWORTHY Macarthur Dr
Day/Date : Friday 2nd December 2016

	NORTH			NORTHWEST			WEST			SOUTH			
	Macarthur Dr			Mornington Pde			The Boulevarde			Macarthur Dr			
Time Per	HR	R	T	HR	R	L	HL	L	R	HL	L	T	TOT
1500 - 1515	8	11		0		3	1	10					33
1515 - 1530	8	36		0		4	0	23					71
1530 - 1545	9	30		0		3	0	107					149
1545 - 1600	9	57		0		7	0	64					137
1600 - 1615	10	33		1		6	0	68					118
1615 - 1630	11	39		0		3	0	80					133
1630 - 1645	6	33		0		4	0	63					106
1645 - 1700	13	35		0		4	0	57					109
1700 - 1715	6	39		0		11	0	118					174
1715 - 1730	11	44		0		8	0	115					178
1730 - 1745	5	48		0		7	1	86					147
1745 - 1800	20	52		0		4	1	182					259
1800 - 1815	13	39		0		9	0	179					240
1815 - 1830	10	50		0		6	1	155					222
1830 - 1845	9	46		0		5	0	105					165
1845 - 1900	6	40		0		3	0	77					126
Period End	154	632	0	1	0	87	4	1489	0	0	0	0	2367

	NORTH			NORTHWEST			WEST			SOUTH			
	Macarthur Dr			Mornington Pde			The Boulevarde			Macarthur Dr			
Peak Time	HR	R	T	HR	R	L	HL	L	R	HL	L	T	TOT
1500 - 1600	34	134	0	0	0	17	1	204	0	0	0	0	390
1515 - 1615	36	156	0	1	0	20	0	262	0	0	0	0	475
1530 - 1630	39	159	0	1	0	19	0	319	0	0	0	0	537
1545 - 1645	36	162	0	1	0	20	0	275	0	0	0	0	494
1600 - 1700	40	140	0	1	0	17	0	268	0	0	0	0	466
1615 - 1715	36	146	0	0	0	22	0	318	0	0	0	0	522
1630 - 1730	36	151	0	0	0	27	0	353	0	0	0	0	567
1645 - 1745	35	166	0	0	0	30	1	376	0	0	0	0	608
1700 - 1800	42	183	0	0	0	30	2	501	0	0	0	0	758
1715 - 1815	49	183	0	0	0	28	2	562	0	0	0	0	824
1730 - 1830	48	189	0	0	0	26	3	602	0	0	0	0	868
1745 - 1845	52	187	0	0	0	24	2	621	0	0	0	0	886
1800 - 1900	38	175	0	0	0	23	1	516	0	0	0	0	753

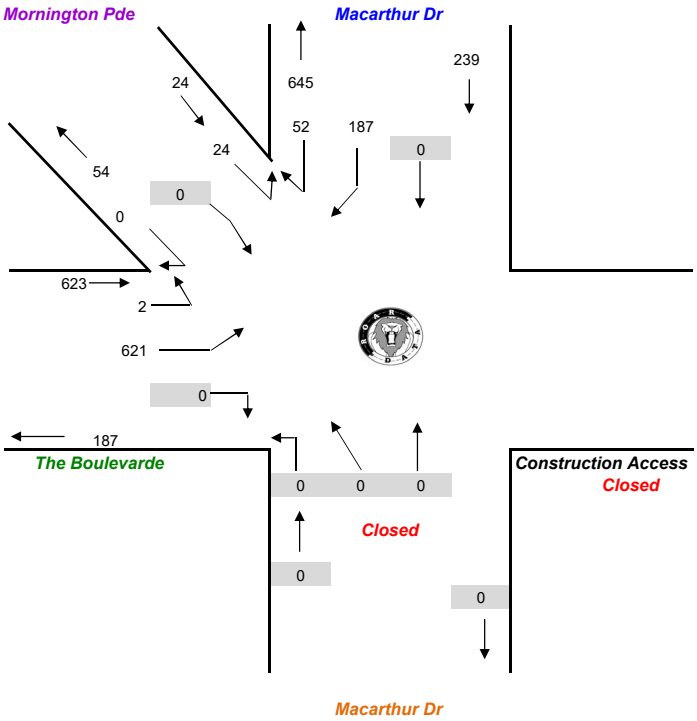
PEAK HOUR	52	187	0	0	0	24	2	621	0	0	0	0	886

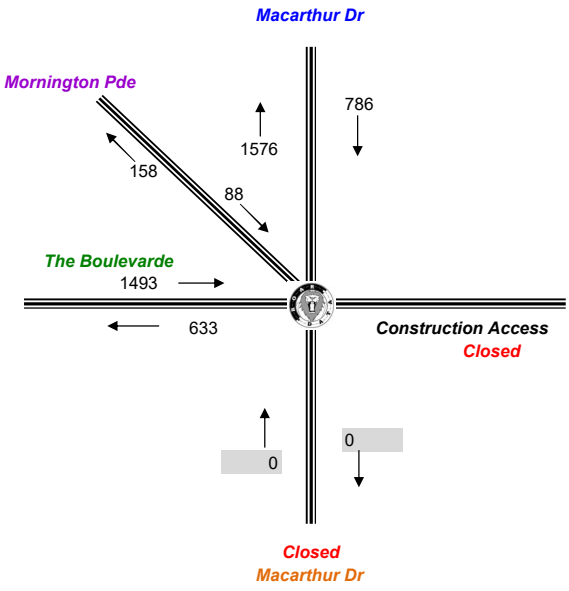
R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Mob.0418-239019

Client : Terraffic Pty. Ltd.
Job No/Name : 6317 HOLSWORTHY Macarthur Dr
Day/Date : Friday 2nd December 2016

PM PEAK HOUR
1745 - 1845

TOTAL VOLUMES FOR PERIODS COUNTED

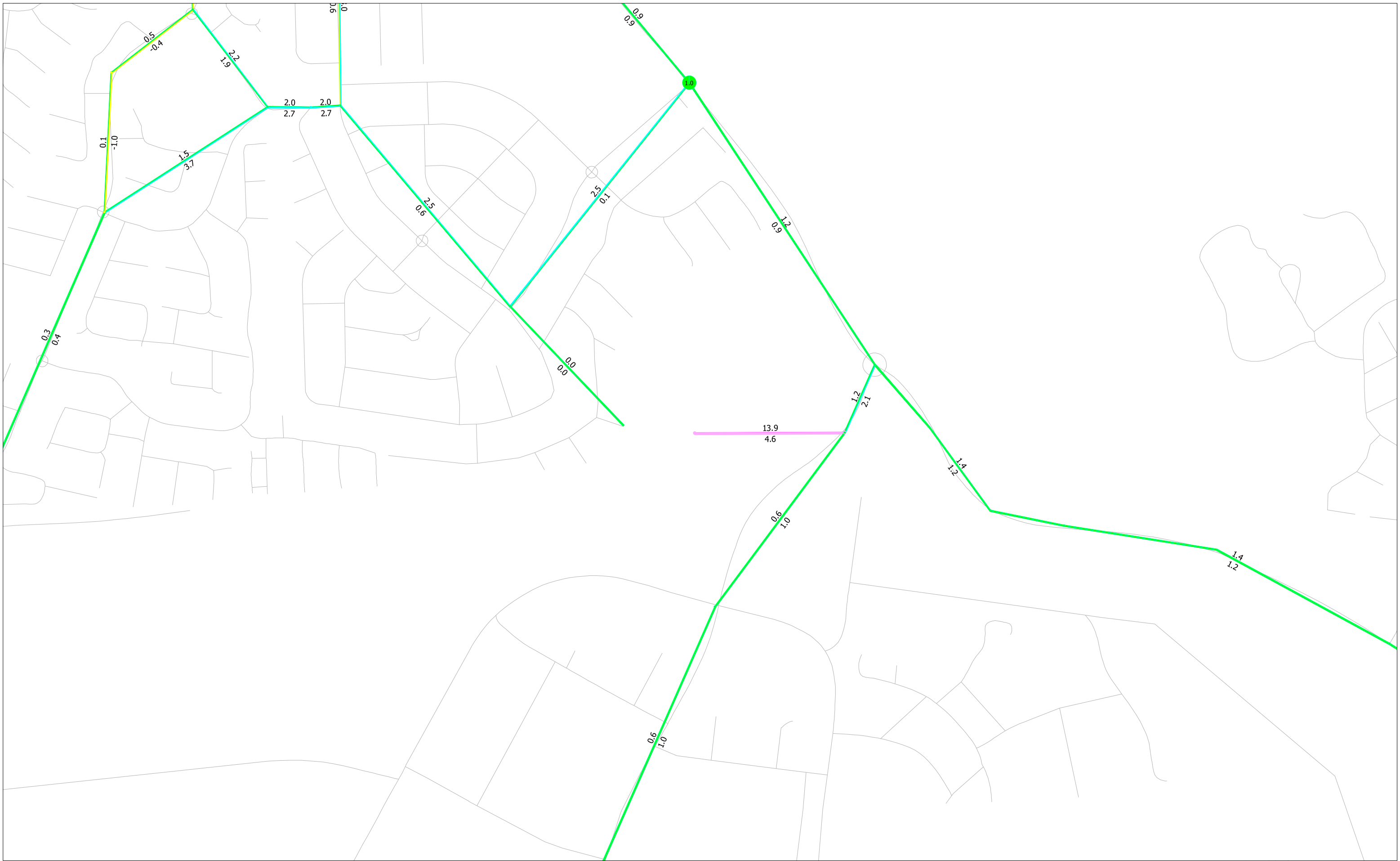




Appendix B

STFM Plots

ROAD TRAFFIC GROWTH (%YR, 2HRSPK) LINKS & INTERSECTIONS

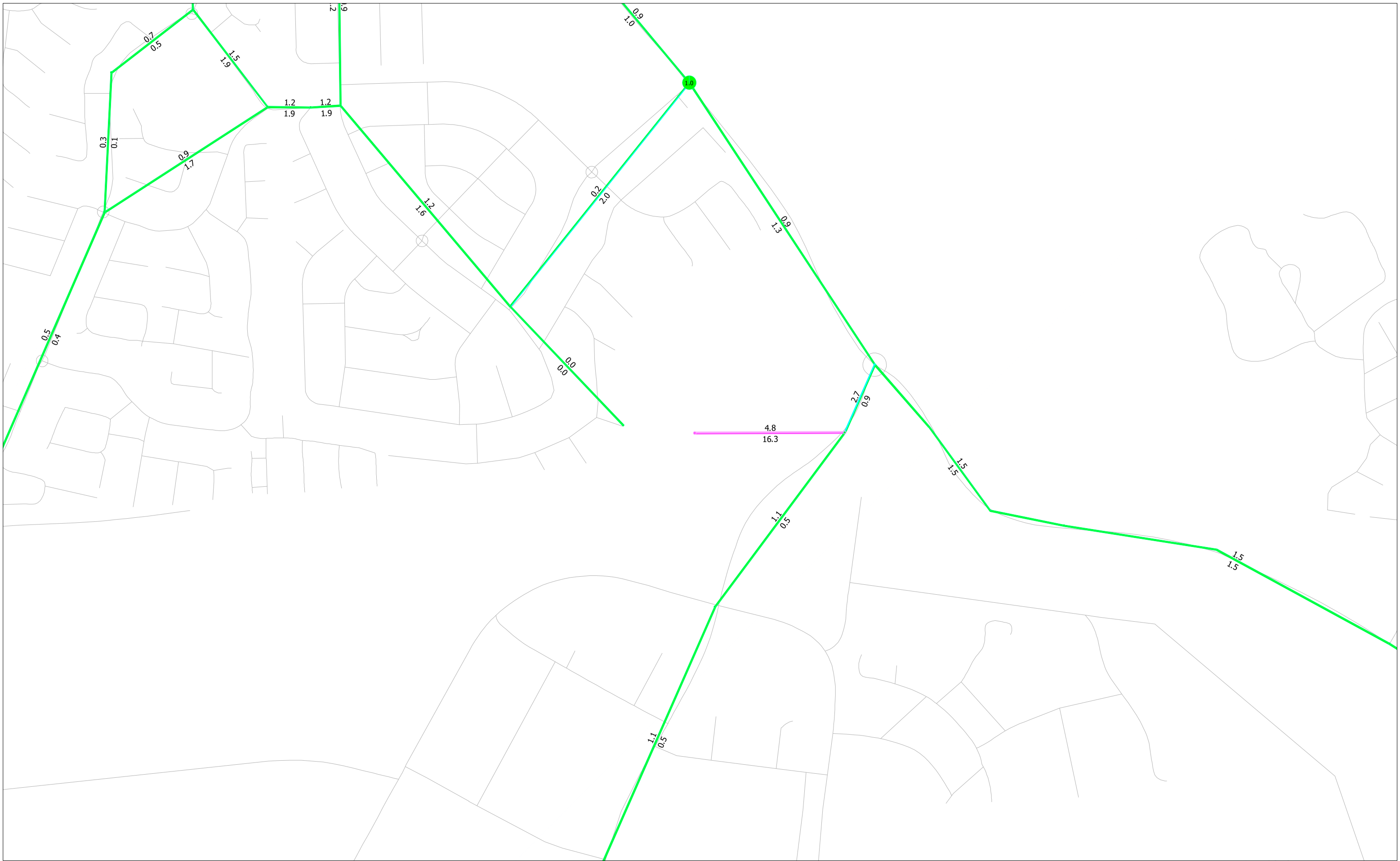


2011TZ SYDNEY GMA STRATEGIC TRAFFIC FORECASTING MODEL
Scenario 20260: 2026 SYDNEY TRAFFIC FORECASTING MODEL(LU2016V1.3)4-6PM(mf54)
2018-06-21 11:24

Growth(YR):

- <0
- <2.00
- 2.01-4.00
- 4.01-6.00
- >6.00
- New Links=999

ROAD TRAFFIC GROWTH (%YR, 2HRSPK) LINKS & INTERSECTIONS



2011TZ SYDNEY GMA STRATEGIC TRAFFIC FORECASTING MODEL
Scenario 2026: 2026 SYDNEY TRAFFIC FORECASTING MODEL(LU2016V1.3)7-9AM(mf34)
2018-06-21 11:24

Growth(YR):

<0
<2.00
2.01-4.00
4.01-6.00
>6.00
New Links=999

Appendix C

SIDRA Outputs

MOVEMENT SUMMARY

Site: 101 [MacArthur Drive, The Boulevarde and Morningside Pde - Existing AM Peak]

Existing AM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
NorthEast: MacArthur Drive												
26a	R1	784	2.0	0.401	6.4	LOS A	2.3	16.6	0.02	0.57	0.02	47.3
26	R2	9	2.0	0.401	7.4	LOS A	2.3	16.6	0.02	0.57	0.02	47.8
Approach		793	2.0	0.401	6.5	LOS A	2.3	16.6	0.02	0.57	0.02	47.3
NorthWest: Morningside Pde												
27	L2	51	2.0	0.049	3.4	LOS A	0.2	1.4	0.31	0.44	0.31	47.6
29b	R3	1	2.0	0.049	9.3	LOS A	0.2	1.4	0.31	0.44	0.31	50.0
Approach		52	2.0	0.049	3.5	LOS A	0.2	1.4	0.31	0.44	0.31	47.7
West: The Boulevarde												
10b	L3	1	2.0	0.147	2.8	LOS A	0.6	4.2	0.05	0.27	0.05	48.2
10a	L1	221	2.0	0.147	2.2	LOS A	0.6	4.2	0.05	0.27	0.05	49.6
Approach		222	2.0	0.147	2.2	LOS A	0.6	4.2	0.05	0.27	0.05	49.6
All Vehicles		1067	2.0	0.401	5.4	LOS A	2.3	16.6	0.04	0.50	0.04	47.8

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: 101 [MacArthur Drive, The Boulevarde and Morningside Pde - Existing PM Peak]

Existing PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
NorthEast: MacArthur Drive												
26a	R1	189	2.0	0.121	6.4	LOS A	0.6	4.2	0.02	0.57	0.02	47.2
26	R2	48	2.0	0.121	7.4	LOS A	0.6	4.2	0.02	0.58	0.02	47.7
Approach		237	2.0	0.121	6.6	LOS A	0.6	4.2	0.02	0.58	0.02	47.3
NorthWest: Morningside Pde												
27	L2	26	2.0	0.033	5.4	LOS A	0.2	1.1	0.55	0.57	0.55	46.7
29b	R3	1	2.0	0.033	11.2	LOS A	0.2	1.1	0.55	0.57	0.55	49.0
Approach		27	2.0	0.033	5.6	LOS A	0.2	1.1	0.55	0.57	0.55	46.8
West: The Boulevarde												
10b	L3	3	2.0	0.430	3.0	LOS A	2.4	17.4	0.18	0.30	0.18	47.7
10a	L1	602	2.0	0.430	2.4	LOS A	2.4	17.4	0.18	0.30	0.18	49.1
Approach		605	2.0	0.430	2.4	LOS A	2.4	17.4	0.18	0.30	0.18	49.1
All Vehicles		869	2.0	0.430	3.6	LOS A	2.4	17.4	0.15	0.38	0.15	48.5

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: 102 [MacArthur Drive, The Boulevarde and Morningside Pde - Existing with Dev AM Peak]

Existing with Dev AM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Site access												
21a	L1	28	2.0	0.483	9.5	LOS A	3.5	24.8	0.81	0.99	0.97	43.1
22	T1	28	2.0	0.483	9.8	LOS A	3.5	24.8	0.81	0.99	0.97	43.5
23	R2	273	2.0	0.483	14.8	LOS B	3.5	24.8	0.81	0.99	0.97	43.8
Approach		329	2.0	0.483	13.9	LOS A	3.5	24.8	0.81	0.99	0.97	43.7
NorthEast: MacArthur Drive												
24	L2	233	2.0	0.236	3.2	LOS A	1.1	7.6	0.20	0.40	0.20	47.9
26a	R1	784	2.0	0.537	6.7	LOS A	3.6	25.8	0.24	0.54	0.24	46.7
26	R2	9	2.0	0.537	7.7	LOS A	3.6	25.8	0.24	0.54	0.24	47.2
Approach		1026	2.0	0.537	5.9	LOS A	3.6	25.8	0.23	0.51	0.23	47.0
NorthWest: Morningside Pde												
27	L2	45	2.0	0.087	4.8	LOS A	0.4	3.0	0.54	0.57	0.54	46.9
28	T1	28	2.0	0.087	4.7	LOS A	0.4	3.0	0.54	0.57	0.54	48.2
29b	R3	1	2.0	0.087	10.7	LOS A	0.4	3.0	0.54	0.57	0.54	49.2
Approach		74	2.0	0.087	4.9	LOS A	0.4	3.0	0.54	0.57	0.54	47.4
West: The Boulevarde												
10b	L3	1	2.0	0.233	4.3	LOS A	1.3	9.1	0.51	0.51	0.51	46.4
10a	L1	193	2.0	0.233	3.7	LOS A	1.3	9.1	0.51	0.51	0.51	47.7
12a	R1	28	2.0	0.233	8.0	LOS A	1.3	9.1	0.51	0.51	0.51	48.0
Approach		222	2.0	0.233	4.2	LOS A	1.3	9.1	0.51	0.51	0.51	47.7
All Vehicles		1651	2.0	0.537	7.2	LOS A	3.6	25.8	0.40	0.61	0.43	46.4

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: 102 [MacArthur Drive, The Boulevarde and Morningside Pde - Existing with Dev PM Peak]

Existing with Dev PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Site access												
21a	L1	55	2.0	0.493	3.4	LOS A	3.2	22.5	0.46	0.62	0.46	46.0
22	T1	55	2.0	0.493	3.6	LOS A	3.2	22.5	0.46	0.62	0.46	46.4
23	R2	451	2.0	0.493	8.6	LOS A	3.2	22.5	0.46	0.62	0.46	46.7
Approach		561	2.0	0.493	7.6	LOS A	3.2	22.5	0.46	0.62	0.46	46.6
NorthEast: MacArthur Drive												
24	L2	482	2.0	0.359	3.3	LOS A	2.0	14.4	0.30	0.43	0.30	47.6
26a	R1	145	2.0	0.194	7.0	LOS A	0.9	6.3	0.28	0.57	0.28	46.4
26	R2	48	2.0	0.194	8.0	LOS A	0.9	6.3	0.28	0.57	0.28	47.0
Approach		675	2.0	0.359	4.4	LOS A	2.0	14.4	0.29	0.47	0.29	47.3
NorthWest: Morningside Pde												
27	L2	15	2.0	0.156	10.9	LOS A	1.0	6.9	0.86	0.85	0.86	43.9
28	T1	55	2.0	0.156	10.8	LOS A	1.0	6.9	0.86	0.85	0.86	45.0
29b	R3	1	2.0	0.156	16.8	LOS B	1.0	6.9	0.86	0.85	0.86	45.9
Approach		71	2.0	0.156	10.9	LOS A	1.0	6.9	0.86	0.85	0.86	44.8
West: The Boulevarde												
10b	L3	3	2.0	0.754	12.1	LOS A	8.9	63.1	0.90	1.10	1.31	42.9
10a	L1	547	2.0	0.754	11.4	LOS A	8.9	63.1	0.90	1.10	1.31	44.0
12a	R1	55	2.0	0.754	15.7	LOS B	8.9	63.1	0.90	1.10	1.31	44.3
Approach		605	2.0	0.754	11.8	LOS A	8.9	63.1	0.90	1.10	1.31	44.0
All Vehicles		1912	2.0	0.754	8.0	LOS A	8.9	63.1	0.56	0.73	0.69	45.9

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: 101 [MacArthur Drive, The Boulevarde and Morningside Pde - Future Base AM Peak]

Future Base AM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
NorthEast: MacArthur Drive												
26a	R1	855	2.0	0.437	6.4	LOS A	2.7	19.1	0.02	0.57	0.02	47.3
26	R2	9	2.0	0.437	7.4	LOS A	2.7	19.1	0.02	0.57	0.02	47.8
Approach		864	2.0	0.437	6.5	LOS A	2.7	19.1	0.02	0.57	0.02	47.3
NorthWest: Morningside Pde												
27	L2	51	2.0	0.050	3.5	LOS A	0.2	1.4	0.33	0.44	0.33	47.6
29b	R3	1	2.0	0.050	9.4	LOS A	0.2	1.4	0.33	0.44	0.33	49.9
Approach		52	2.0	0.050	3.6	LOS A	0.2	1.4	0.33	0.44	0.33	47.6
West: The Boulevarde												
10b	L3	1	2.0	0.159	2.8	LOS A	0.7	4.7	0.05	0.27	0.05	48.2
10a	L1	241	2.0	0.159	2.2	LOS A	0.7	4.7	0.05	0.27	0.05	49.6
Approach		242	2.0	0.159	2.2	LOS A	0.7	4.7	0.05	0.27	0.05	49.6
All Vehicles		1158	2.0	0.437	5.4	LOS A	2.7	19.1	0.04	0.50	0.04	47.8

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: 101 [MacArthur Drive, The Boulevarde and Morningside Pde - Future Base PM Peak]

Future Base PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
NorthEast: MacArthur Drive												
26a	R1	227	2.0	0.141	6.4	LOS A	0.7	5.1	0.02	0.57	0.02	47.2
26	R2	48	2.0	0.141	7.4	LOS A	0.7	5.1	0.02	0.58	0.02	47.7
Approach		275	2.0	0.141	6.6	LOS A	0.7	5.1	0.02	0.57	0.02	47.3
NorthWest: Morningside Pde												
27	L2	26	2.0	0.037	6.2	LOS A	0.2	1.3	0.61	0.61	0.61	46.2
29b	R3	1	2.0	0.037	12.1	LOS A	0.2	1.3	0.61	0.61	0.61	48.4
Approach		27	2.0	0.037	6.5	LOS A	0.2	1.3	0.61	0.61	0.61	46.3
West: The Boulevarde												
10b	L3	3	2.0	0.509	3.1	LOS A	3.3	23.2	0.21	0.30	0.21	47.6
10a	L1	722	2.0	0.509	2.4	LOS A	3.3	23.2	0.21	0.30	0.21	49.0
Approach		725	2.0	0.509	2.4	LOS A	3.3	23.2	0.21	0.30	0.21	49.0
All Vehicles		1027	2.0	0.509	3.6	LOS A	3.3	23.2	0.17	0.38	0.17	48.4

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: 102 [MacArthur Drive, The Boulevarde and Morningside Pde - Future Base with Dev AM Peak]

Future Base with Dev AM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Site access												
21a	L1	28	2.0	0.522	11.5	LOS A	4.1	28.9	0.85	1.04	1.09	42.2
22	T1	28	2.0	0.522	11.7	LOS A	4.1	28.9	0.85	1.04	1.09	42.5
23	R2	273	2.0	0.522	16.7	LOS B	4.1	28.9	0.85	1.04	1.09	42.8
Approach		329	2.0	0.522	15.9	LOS B	4.1	28.9	0.85	1.04	1.09	42.7
NorthEast: MacArthur Drive												
24	L2	233	2.0	0.243	3.2	LOS A	1.1	7.9	0.21	0.40	0.21	47.8
26a	R1	855	2.0	0.584	6.7	LOS A	4.2	30.1	0.25	0.54	0.25	46.6
26	R2	9	2.0	0.584	7.7	LOS A	4.2	30.1	0.25	0.54	0.25	47.2
Approach		1097	2.0	0.584	6.0	LOS A	4.2	30.1	0.24	0.51	0.24	46.9
NorthWest: Morningside Pde												
27	L2	45	2.0	0.089	4.9	LOS A	0.4	3.1	0.55	0.58	0.55	46.8
28	T1	28	2.0	0.089	4.8	LOS A	0.4	3.1	0.55	0.58	0.55	48.1
29b	R3	1	2.0	0.089	10.8	LOS A	0.4	3.1	0.55	0.58	0.55	49.1
Approach		74	2.0	0.089	5.0	LOS A	0.4	3.1	0.55	0.58	0.55	47.3
West: The Boulevarde												
10b	L3	3	2.0	0.258	4.4	LOS A	1.4	10.3	0.52	0.51	0.52	46.4
10a	L1	213	2.0	0.258	3.7	LOS A	1.4	10.3	0.52	0.51	0.52	47.7
12a	R1	28	2.0	0.258	8.0	LOS A	1.4	10.3	0.52	0.51	0.52	47.9
Approach		244	2.0	0.258	4.2	LOS A	1.4	10.3	0.52	0.51	0.52	47.7
All Vehicles		1744	2.0	0.584	7.6	LOS A	4.2	30.1	0.41	0.61	0.45	46.2

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: 102 [MacArthur Drive, The Boulevarde and Morningside Pde - Future Base with Dev PM Peak]

Future Base with Dev PM Peak
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Site access												
21a	L1	55	2.0	0.515	3.7	LOS A	3.3	23.8	0.52	0.65	0.52	45.8
22	T1	55	2.0	0.515	4.0	LOS A	3.3	23.8	0.52	0.65	0.52	46.2
23	R2	451	2.0	0.515	9.0	LOS A	3.3	23.8	0.52	0.65	0.52	46.6
Approach		561	2.0	0.515	8.0	LOS A	3.3	23.8	0.52	0.65	0.52	46.5
NorthEast: MacArthur Drive												
24	L2	482	2.0	0.360	3.3	LOS A	2.1	14.6	0.30	0.43	0.30	47.6
26a	R1	185	2.0	0.221	7.0	LOS A	1.0	7.5	0.29	0.57	0.29	46.5
26	R2	48	2.0	0.221	8.0	LOS A	1.0	7.5	0.29	0.57	0.29	47.0
Approach		715	2.0	0.360	4.5	LOS A	2.1	14.6	0.30	0.47	0.30	47.3
NorthWest: Morningside Pde												
27	L2	26	2.0	0.232	14.1	LOS A	1.5	11.0	0.94	0.95	0.94	42.3
28	T1	55	2.0	0.232	14.0	LOS A	1.5	11.0	0.94	0.95	0.94	43.3
29b	R3	1	2.0	0.232	20.0	LOS B	1.5	11.0	0.94	0.95	0.94	44.1
Approach		82	2.0	0.232	14.1	LOS A	1.5	11.0	0.94	0.95	0.94	43.0
West: The Boulevarde												
10b	L3	3	2.0	0.914	24.0	LOS B	19.9	141.8	1.00	1.57	2.21	37.8
10a	L1	673	2.0	0.914	23.3	LOS B	19.9	141.8	1.00	1.57	2.21	38.6
12a	R1	55	2.0	0.914	27.6	LOS B	19.9	141.8	1.00	1.57	2.21	38.8
Approach		731	2.0	0.914	23.7	LOS B	19.9	141.8	1.00	1.57	2.21	38.6
All Vehicles		2089	2.0	0.914	12.5	LOS A	19.9	141.8	0.63	0.92	1.05	43.5

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: 103 [MacArthur Drive, The Boulevarde and Morningside Pde - Existing with Dev AM Peak - Signal]

Existing with Dev AM Peak

Signal Option
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Site access												
21a	L1	28	2.0	0.753	40.4	LOS C	6.1	43.5	1.00	0.92	1.24	31.9
22	T1	28	2.0	0.753	36.6	LOS C	6.1	43.5	1.00	0.92	1.24	32.2
23	R2	273	2.0	0.753	41.2	LOS C	6.1	43.5	1.00	0.91	1.24	31.9
Approach		329	2.0	0.753	40.8	LOS C	6.1	43.5	1.00	0.91	1.24	31.9
NorthEast: MacArthur Drive												
24	L2	233	2.0	0.226	13.5	LOS A	4.1	29.4	0.55	0.70	0.55	41.9
26a	R1	784	2.0	0.748	17.1	LOS B	21.3	151.3	0.83	0.83	0.84	40.6
26	R2	9	2.0	0.748	18.3	LOS B	21.3	151.3	0.83	0.83	0.84	40.2
Approach		1026	2.0	0.748	16.3	LOS B	21.3	151.3	0.77	0.80	0.78	40.9
NorthWest: Morningside Pde												
27	L2	45	2.0	0.447	39.9	LOS C	2.6	18.5	0.99	0.75	0.99	32.7
28	T1	28	2.0	0.447	35.5	LOS C	2.6	18.5	0.99	0.75	0.99	32.9
29b	R3	1	2.0	0.447	40.7	LOS C	2.6	18.5	0.99	0.75	0.99	32.7
Approach		74	2.0	0.447	38.2	LOS C	2.6	18.5	0.99	0.75	0.99	32.8
West: The Boulevarde												
10b	L3	3	2.0	0.106	13.7	LOS A	1.8	13.1	0.51	0.63	0.51	43.0
10a	L1	193	2.0	0.106	11.7	LOS A	1.8	13.1	0.51	0.63	0.51	43.0
12a	R1	28	2.0	0.106	11.9	LOS A	1.8	13.1	0.51	0.63	0.51	42.7
Approach		224	2.0	0.106	11.8	LOS A	1.8	13.1	0.51	0.63	0.51	42.9
All Vehicles		1653	2.0	0.753	21.5	LOS B	21.3	151.3	0.79	0.80	0.84	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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P5	SouthEast Full Crossing	50	12.0	LOS B	0.1	0.1	0.59	0.59
P6	NorthEast Full Crossing	50	29.3	LOS C	0.1	0.1	0.92	0.92
P7	NorthWest Full Crossing	50	10.9	LOS B	0.1	0.1	0.56	0.56
P4	West Full Crossing	50	26.6	LOS C	0.1	0.1	0.87	0.87
All Pedestrians		200	19.7	LOS B			0.73	0.73

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: 103 [MacArthur Drive, The Boulevarde and Morningside Pde - Existing with Dev PM Peak - Signal]

Existing with Dev PM Peak

Signal Option
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Site access												
21a	L1	55	2.0	0.677	28.9	LOS C	8.1	58.0	0.97	0.86	1.05	35.6
22	T1	55	2.0	0.677	25.1	LOS B	8.1	58.0	0.97	0.86	1.05	35.9
23	R2	451	2.0	0.677	29.7	LOS C	8.1	58.0	0.97	0.86	1.05	35.5
Approach		561	2.0	0.677	29.1	LOS C	8.1	58.0	0.97	0.86	1.05	35.5
NorthEast: MacArthur Drive												
24	L2	482	2.0	0.663	21.5	LOS B	11.9	85.1	0.88	0.83	0.89	38.4
26a	R1	145	2.0	0.260	17.1	LOS B	3.9	27.9	0.72	0.72	0.72	40.4
26	R2	48	2.0	0.260	18.4	LOS B	3.9	27.9	0.72	0.72	0.72	40.1
Approach		675	2.0	0.663	20.3	LOS B	11.9	85.1	0.84	0.80	0.84	38.9
NorthWest: Morningside Pde												
27	L2	15	2.0	0.361	33.8	LOS C	2.1	14.9	0.97	0.74	0.97	35.2
28	T1	55	2.0	0.361	29.4	LOS C	2.1	14.9	0.97	0.74	0.97	35.5
29b	R3	1	2.0	0.361	34.6	LOS C	2.1	14.9	0.97	0.74	0.97	35.2
Approach		71	2.0	0.361	30.4	LOS C	2.1	14.9	0.97	0.74	0.97	35.4
West: The Boulevarde												
10b	L3	3	2.0	0.515	20.2	LOS B	6.6	46.8	0.78	0.75	0.78	39.9
10a	L1	547	2.0	0.515	18.2	LOS B	6.6	46.8	0.78	0.75	0.78	39.9
12a	R1	55	2.0	0.515	18.4	LOS B	6.6	46.8	0.77	0.75	0.77	39.6
Approach		605	2.0	0.515	18.2	LOS B	6.6	46.8	0.78	0.75	0.78	39.9
All Vehicles		1912	2.0	0.677	22.6	LOS B	11.9	85.1	0.86	0.80	0.88	38.0

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P5	SouthEast Full Crossing	50	17.7	LOS B	0.1	0.1	0.77	0.77
P6	NorthEast Full Crossing	50	20.1	LOS C	0.1	0.1	0.82	0.82
P7	NorthWest Full Crossing	50	16.2	LOS B	0.1	0.1	0.73	0.73
P4	West Full Crossing	50	17.7	LOS B	0.1	0.1	0.77	0.77
All Pedestrians		200	17.9	LOS B			0.77	0.77

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: 103 [MacArthur Drive, The Boulevarde and Morningside Pde - Future Base with Dev AM Peak - Signal]

Future Base with Dev AM Peak

Signal Option
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Site access												
21a	L1	28	2.0	0.765	45.5	LOS D	7.0	49.5	1.00	0.92	1.23	30.6
22	T1	28	2.0	0.765	41.8	LOS C	7.0	49.5	1.00	0.92	1.23	30.8
23	R2	273	2.0	0.765	46.4	LOS D	7.0	49.5	1.00	0.92	1.23	30.5
Approach		329	2.0	0.765	45.9	LOS D	7.0	49.5	1.00	0.92	1.23	30.5
NorthEast: MacArthur Drive												
24	L2	233	2.0	0.209	12.9	LOS A	4.2	30.1	0.50	0.69	0.50	42.2
26a	R1	855	2.0	0.753	16.4	LOS B	24.9	177.1	0.80	0.82	0.80	40.9
26	R2	9	2.0	0.753	17.7	LOS B	24.9	177.1	0.80	0.82	0.80	40.5
Approach		1097	2.0	0.753	15.7	LOS B	24.9	177.1	0.74	0.79	0.74	41.1
NorthWest: Morningside Pde												
27	L2	45	2.0	0.511	45.9	LOS D	3.0	21.3	1.00	0.76	1.00	31.0
28	T1	28	2.0	0.511	41.5	LOS C	3.0	21.3	1.00	0.76	1.00	31.2
29b	R3	1	2.0	0.511	46.7	LOS D	3.0	21.3	1.00	0.76	1.00	31.0
Approach		74	2.0	0.511	44.3	LOS D	3.0	21.3	1.00	0.76	1.00	31.1
West: The Boulevarde												
10b	L3	3	2.0	0.107	13.1	LOS A	2.1	14.7	0.46	0.62	0.46	43.3
10a	L1	213	2.0	0.107	11.1	LOS A	2.1	14.7	0.46	0.62	0.46	43.3
12a	R1	28	2.0	0.107	11.3	LOS A	2.1	14.7	0.46	0.62	0.46	42.9
Approach		244	2.0	0.107	11.2	LOS A	2.1	14.7	0.46	0.62	0.46	43.2
All Vehicles		1744	2.0	0.765	22.0	LOS B	24.9	177.1	0.76	0.79	0.80	38.4

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P5	SouthEast Full Crossing	50	11.0	LOS B	0.1	0.1	0.53	0.53
P6	NorthEast Full Crossing	50	33.4	LOS D	0.1	0.1	0.91	0.91
P7	NorthWest Full Crossing	50	10.0	LOS B	0.1	0.1	0.50	0.50
P4	West Full Crossing	50	30.7	LOS D	0.1	0.1	0.88	0.88
All Pedestrians		200	21.3	LOS C			0.70	0.70

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: 103 [MacArthur Drive, The Boulevarde and Morningside Pde - Future Base with Dev PM Peak - Signal]

Future Base with Dev PM Peak

Signal Option
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Site access												
21a	L1	55	2.0	0.677	28.9	LOS C	8.1	58.0	0.97	0.86	1.05	35.6
22	T1	55	2.0	0.677	25.1	LOS B	8.1	58.0	0.97	0.86	1.05	35.9
23	R2	451	2.0	0.677	29.7	LOS C	8.1	58.0	0.97	0.86	1.05	35.5
Approach		561	2.0	0.677	29.1	LOS C	8.1	58.0	0.97	0.86	1.05	35.5
NorthEast: MacArthur Drive												
24	L2	482	2.0	0.663	21.5	LOS B	11.9	85.1	0.88	0.83	0.89	38.4
26a	R1	185	2.0	0.313	17.5	LOS B	4.8	34.5	0.74	0.73	0.74	40.3
26	R2	48	2.0	0.313	18.7	LOS B	4.8	34.5	0.74	0.73	0.74	39.9
Approach		715	2.0	0.663	20.3	LOS B	11.9	85.1	0.84	0.80	0.84	39.0
NorthWest: Morningside Pde												
27	L2	26	2.0	0.419	34.0	LOS C	2.4	17.3	0.98	0.75	0.98	34.9
28	T1	55	2.0	0.419	29.6	LOS C	2.4	17.3	0.98	0.75	0.98	35.2
29b	R3	1	2.0	0.419	34.8	LOS C	2.4	17.3	0.98	0.75	0.98	34.9
Approach		82	2.0	0.419	31.1	LOS C	2.4	17.3	0.98	0.75	0.98	35.1
West: The Boulevarde												
10b	L3	3	2.0	0.711	22.5	LOS B	8.8	62.8	0.81	0.82	0.90	38.9
10a	L1	673	2.0	0.711	20.5	LOS B	8.8	62.9	0.81	0.82	0.90	38.9
12a	R1	55	2.0	0.711	20.8	LOS B	8.8	62.9	0.81	0.82	0.90	38.7
Approach		731	2.0	0.711	20.6	LOS B	8.8	62.9	0.81	0.82	0.90	38.9
All Vehicles		2089	2.0	0.711	23.2	LOS B	11.9	85.1	0.87	0.82	0.92	37.8

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P5	SouthEast Full Crossing	50	17.7	LOS B	0.1	0.1	0.77	0.77
P6	NorthEast Full Crossing	50	20.1	LOS C	0.1	0.1	0.82	0.82
P7	NorthWest Full Crossing	50	16.2	LOS B	0.1	0.1	0.73	0.73
P4	West Full Crossing	50	17.7	LOS B	0.1	0.1	0.77	0.77
All Pedestrians		200	17.9	LOS B			0.77	0.77

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

MOVEMENT SUMMARY

Site: 101 [Heathcote Rd-Macarthur Dr - Ex AM 2028 Base (No Dev)]

18181 2 Macarthur Dr, Holsworthy
Site Category: 2028 With Development Case
Signals - Fixed Time Isolated Cycle Time = 140 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Macarthur Drive-S												
1	L2	293	2.0	0.190	32.5	LOS C	6.2	43.9	0.67	0.73	0.67	38.8
2	T1	1	2.0	0.004	55.4	LOS D	0.1	0.4	0.88	0.53	0.88	31.5
3	R2	65	2.0	0.428	72.7	LOS F	4.4	31.2	0.99	0.77	0.99	27.2
Approach		359	2.0	0.428	39.9	LOS C	6.2	43.9	0.72	0.74	0.72	36.0
East: Heathcote Road-E												
4	L2	113	2.0	0.125	25.8	LOS B	4.1	28.9	0.57	0.70	0.57	41.8
5	T1	1560	2.0	0.866	37.1	LOS C	51.5	366.9	0.93	0.89	0.98	37.4
6	R2	1	2.0	0.005	32.1	LOS C	0.0	0.3	0.61	0.62	0.61	38.5
Approach		1674	2.0	0.866	36.3	LOS C	51.5	366.9	0.90	0.88	0.95	37.7
North: Macarthur Drive-N												
7	L2	1	2.0	0.006	67.5	LOS E	0.1	0.5	0.92	0.60	0.92	28.1
8	T1	1	2.0	0.004	55.4	LOS D	0.1	0.4	0.88	0.53	0.88	31.5
Approach		2	2.0	0.006	61.4	LOS E	0.1	0.5	0.90	0.56	0.90	29.7
West: Heathcote Road-W												
10	L2	1	2.0	0.371	10.8	LOS A	11.5	81.9	0.34	0.31	0.39	54.5
11	T1	1112	2.0	0.371	5.1	LOS A	11.5	81.9	0.34	0.31	0.36	55.4
12	R2	784	2.0	0.882	71.7	LOS F	29.2	207.6	1.00	0.96	1.19	27.4
Approach		1897	2.0	0.882	32.7	LOS C	29.2	207.6	0.61	0.57	0.71	39.0
All Vehicles		3932	2.0	0.882	34.9	LOS C	51.5	366.9	0.75	0.72	0.81	38.1

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	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	64.3	LOS F	0.2	0.2	0.96	0.96
P1B	South Slip/Bypass Lane Crossing	53	64.3	LOS F	0.2	0.2	0.96	0.96
P2	East Full Crossing	53	64.3	LOS F	0.2	0.2	0.96	0.96
P2B	East Slip/Bypass Lane Crossing	53	64.3	LOS F	0.2	0.2	0.96	0.96
P3	North Full Crossing	53	64.3	LOS F	0.2	0.2	0.96	0.96
P4	West Full Crossing	53	64.3	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		316	64.3	LOS F			0.96	0.96

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

MOVEMENT SUMMARY

Site: 101 [Heathcote Rd-Macarthur Dr - Ex PM 2028 Base (No Dev)]

18181 2 Macarthur Dr, Holsworthy
Site Category: 2028 With Development Case
Signals - Fixed Time Isolated Cycle Time = 50 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Macarthur Drive-S												
1	L2	679	2.0	0.463	17.8	LOS B	6.3	44.6	0.78	0.79	0.78	46.0
2	T1	1	2.0	0.003	19.3	LOS B	0.0	0.2	0.86	0.51	0.86	45.7
3	R2	51	2.0	0.391	33.6	LOS C	1.3	9.5	1.00	0.71	1.00	38.3
Approach		731	2.0	0.463	18.9	LOS B	6.3	44.6	0.80	0.78	0.80	45.3
East: Heathcote Road-E												
4	L2	35	2.0	0.053	17.0	LOS B	0.6	4.0	0.68	0.68	0.68	46.5
5	T1	1119	2.0	0.807	20.2	LOS B	14.5	103.5	0.96	0.97	1.17	45.2
6	R2	1	2.0	0.006	24.5	LOS B	0.0	0.2	0.84	0.60	0.84	41.9
Approach		1155	2.0	0.807	20.1	LOS B	14.5	103.5	0.96	0.96	1.16	45.2
North: Macarthur Drive-N												
7	L2	1	2.0	0.014	33.0	LOS C	0.0	0.2	0.98	0.58	0.98	38.2
8	T1	1	2.0	0.003	19.3	LOS B	0.0	0.2	0.86	0.51	0.86	45.7
Approach		2	2.0	0.014	26.1	LOS B	0.0	0.2	0.92	0.54	0.92	41.6
West: Heathcote Road-W												
10	L2	1	2.0	0.554	12.5	LOS A	9.5	67.4	0.64	0.58	0.78	53.2
11	T1	1279	2.0	0.554	6.7	LOS A	9.5	67.4	0.64	0.57	0.71	54.1
12	R2	243	2.0	0.553	30.1	LOS C	3.1	21.9	0.99	0.80	1.03	39.7
Approach		1523	2.0	0.554	10.5	LOS A	9.5	67.4	0.70	0.61	0.76	51.1
All Vehicles		3411	2.0	0.807	15.5	LOS B	14.5	103.5	0.81	0.76	0.90	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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P1B	South Slip/Bypass Lane Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P2	East Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P2B	East Slip/Bypass Lane Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P3	North Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P4	West Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
All Pedestrians		316	19.4	LOS B			0.88	0.88

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

MOVEMENT SUMMARY

Site: 101 [Heathcote Rd-Macarthur Dr - Fu AM 2028 Case (with Dev)]

18181 2 Macarthur Dr, Holsworthy
Site Category: 2028 With Development Case
Signals - Fixed Time Isolated Cycle Time = 110 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Macarthur Drive-S												
1	L2	436	2.0	0.267	26.1	LOS B	7.3	51.8	0.67	0.75	0.67	41.7
2	T1	1	2.0	0.004	41.8	LOS C	0.0	0.3	0.86	0.52	0.86	35.7
3	R2	175	2.0	1.030	118.0	LOS F	14.8	105.1	1.00	1.25	1.98	20.2
Approach		612	2.0	1.030	52.4	LOS D	14.8	105.1	0.76	0.89	1.04	32.0
East: Heathcote Road-E												
4	L2	222	2.0	0.273	27.4	LOS B	7.6	54.4	0.69	0.75	0.69	41.1
5	T1	1548	2.0	0.984	73.6	LOS F	65.4	465.8	0.98	1.25	1.44	27.3
6	R2	1	2.0	0.006	31.3	LOS C	0.0	0.3	0.67	0.62	0.67	38.9
Approach		1772	2.0	0.984	67.8	LOS E	65.4	465.8	0.94	1.19	1.34	28.5
North: Macarthur Drive-N												
7	L2	1	2.0	0.006	53.7	LOS D	0.1	0.4	0.92	0.59	0.92	31.4
8	T1	1	2.0	0.004	41.8	LOS C	0.0	0.3	0.86	0.52	0.86	35.7
Approach		2	2.0	0.006	47.8	LOS D	0.1	0.4	0.89	0.56	0.89	33.4
West: Heathcote Road-W												
10	L2	1	2.0	0.388	11.5	LOS A	10.7	76.0	0.40	0.36	0.46	54.0
11	T1	1100	2.0	0.388	5.7	LOS A	10.7	76.1	0.40	0.36	0.43	54.9
12	R2	920	2.0	0.916	66.5	LOS E	25.6	182.5	1.00	1.17	1.87	28.5
Approach		2021	2.0	0.916	33.4	LOS C	25.6	182.5	0.67	0.73	1.09	38.6
All Vehicles		4406	2.0	1.030	49.9	LOS D	65.4	465.8	0.79	0.94	1.18	33.0

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P1B	South Slip/Bypass Lane Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P2B	East Slip/Bypass Lane Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		316	49.3	LOS E			0.95	0.95

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

MOVEMENT SUMMARY

Site: 101 [Heathcote Rd-Macarthur Dr - Fu PM 2028 Case (with Dev)]

18181 2 Macarthur Dr, Holsworthy
Site Category: 2028 With Development Case
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Macarthur Drive-S												
1	L2	906	2.0	0.512	17.2	LOS B	9.2	65.7	0.73	0.79	0.73	46.3
2	T1	1	2.0	0.002	18.9	LOS B	0.0	0.2	0.78	0.47	0.78	45.9
3	R2	228	2.0	0.937	50.4	LOS D	9.1	64.8	1.00	1.17	1.85	32.6
Approach		1136	2.0	0.937	23.9	LOS B	9.2	65.7	0.79	0.86	0.96	42.7
East: Heathcote Road-E												
4	L2	260	2.0	0.467	25.3	LOS B	6.5	46.1	0.87	0.80	0.87	42.1
5	T1	1096	2.0	0.906	35.0	LOS C	20.9	148.7	1.00	1.15	1.46	38.2
6	R2	1	2.0	0.005	21.2	LOS B	0.0	0.2	0.70	0.61	0.70	43.6
Approach		1357	2.0	0.906	33.1	LOS C	20.9	148.7	0.98	1.09	1.34	38.9
North: Macarthur Drive-N												
7	L2	1	2.0	0.004	30.2	LOS C	0.0	0.2	0.88	0.59	0.88	39.3
8	T1	1	2.0	0.002	18.9	LOS B	0.0	0.2	0.78	0.47	0.78	45.9
Approach		2	2.0	0.004	24.5	LOS B	0.0	0.2	0.83	0.53	0.83	42.4
West: Heathcote Road-W												
10	L2	1	2.0	0.576	15.0	LOS B	11.9	84.8	0.69	0.62	0.81	51.3
11	T1	1256	2.0	0.576	9.2	LOS A	11.9	84.9	0.69	0.62	0.75	52.2
12	R2	524	2.0	0.647	19.1	LOS B	4.3	30.4	0.96	0.82	1.01	45.1
Approach		1781	2.0	0.647	12.1	LOS A	11.9	84.9	0.77	0.68	0.83	49.9
All Vehicles		4276	2.0	0.937	21.9	LOS B	20.9	148.7	0.84	0.86	1.03	44.0

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90
P1B	South Slip/Bypass Lane Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90
P2	East Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90
P2B	East Slip/Bypass Lane Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90
P3	North Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90
P4	West Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90
All Pedestrians		316	24.4	LOS C			0.90	0.90

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

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