LENDLEASE

Jordan Springs East Stage 3D

Traffic Impact Assessment

JUNE 2018

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Jordan Springs East Stage 3D
Traffic Impact Assessment

Lendlease

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1 INTRODUCTION

1.1 BACKGROUND

WSP has been engaged by the Maryland Development Company to prepare a Traffic Impact Assessment report for the proposed Stage 3D development comprising of a Village Centre including residential terraces and apartments, shopping and retail, medical centre and a childcare centre.

As depicted in Figure 1.1, Jordan Springs East is located within the Penrith City Council Local Government Area (LGA) and forms part of the Central Precinct of the St Marys Development site. It is bounded by existing residential development in the suburbs of Werrington County and Werrington Downs to the south, land zoned for Regional Open Space to the east and land zoned for Regional Park to the north and west. There is also an area zoned for drainage that adjoins the northern boundary of the precinct.

Figure 1.1 St Marys development site showing precinct locations

The Jordan Springs East site covers an area of approximately 133.1 hectares and is envisaged to consist of 1,436 residential dwellings to accommodate a population of between 3,900 and 4,300. It is also proposed to consist of approximately 38 hectares of employment land use to accommodate approximately 760 jobs in light industrial and light manufacturing sectors.

The delivery of the Jordan Springs East master plan is staged with 768 residential dwellings proposed under Stages 1, 2 and 3A. The approval of these stages had been obtained with consideration of all trips being assigned to The Northern Road via the internal roads in Jordan Springs (shown as Western Precinct in Figure 1.1).

Approval has also been sought for a further 143 residential lots under Stage 4A/4B, 52 residential lots under Stage 3B1. These lots are proposed to accommodate approximately 215 low-density dwellings in total (163 low-density dwellings under Stage 4A/4B and 52 low-density dwellings under Stage 3B1). More recently, approval has been sought for Stage 3B2 of development comprising of four super-lots within Jordan Springs East with each lot measuring at 1,790 m^2, 2,685 m^2, 1,362 m^2, and 1,511 m^2.

According to Maryland Development Company's construction schedule, the occupation of Stage 4A/4B and 3B1 are scheduled to occur following the opening of the East-West Connector Road. The opening of the East-West Connector Road will vastly change the distribution of trips made into/out of Jordan Springs East, and is likely to align with the trip distribution found in the ultimate year of the development, where 55 per cent and 53 per cent of trips are made towards the east in the respective AM and PM peak.

This Traffic Impact Assessment (TIA) has been prepared to consider the in-principle impact of the Stage 3D development and associated road layouts proposed. The assessment takes into consideration the existing traffic volumes and growth in Jordan Springs, trips generated from the approved Stages in Jordan Springs East and distribution of trips made with consideration of the opening of the East-West Connector Road.

WSP has been advised that the dwelling development proposed on the adjacent super-lots within Stage 3B2 are not finalised at this stage and any dwelling that are proposed at the sites will be subject to a separate Development Application and supporting Traffic Impact Assessment in the future. At this stage, these lots are assumed to be non-traffic generating sites.

It is noted that based on the construction schedule developed by the Maryland Development Company, construction works of Stage 3D are planned to occur post Stages 3B1, 3B2 and 4A/4B.

The extent and location of Stages 3D in relation to the other stages of Jordan Springs East are further detailed in section 5.

1.2 OBJECTIVES

This Traffic Impact Assessment report seeks to outline the following:

- Undertake an assessment of peak hour trip demand by the Jordan Springs East precinct up to the latest proposed Stage 3D, in line with the trip generation rates published in Roads and Maritime's Guide to Traffic Generating Developments.
- Examine and analyse the existing intersection performance and mid-block volumes of the internal road network within Jordan Springs that are likely to be impacted by the latest proposed development in Jordan Springs East Stage 3D.
- Assess the cumulative impact of the development in corresponding stages within Jordan Springs East, Jordan Springs and Ropes Crossing at key intersections and mid-block road capacity within the confines of the St Marys development site.
- Provide recommendation of remedial works (if any) to address the impact of the proposed Stages 3D development.
- Assess the accessibility of the proposed development to the existing public transport services in the vicinity of the proposed development.

1.3 ASSUMPTIONS

The following assumptions apply to this report:

- Trip generation rates are as per the Roads and Traffic Authority *Guide to Traffic Generating Development* v2.2 and those agreed to by the Steering Committee in the Technical Memo.
- Assumption of traffic growth generated by developments in Jordan Springs to reflect the status of occupied dwellings (as surveyed by Lendlease and provided to Council on 24 November 2016) with respect to the ultimate number of dwellings proposed for Jordan Springs. This assumption is further detailed in section 4.2.1 of this report.
- Assumption that traffic growth on The Northern Road is consistent with the Roads and Maritime EMME strategic model.

1.4 EXCLUSION

The following exclusions apply to this report:

- Any assessment of the road network outside of the St Marys Development site. A separate study is currently being undertaken to determine the holistic impact of the St Marys development to the external road network.
- This report excludes any assessment of site on-street and off-street parking requirements.
- This report excludes any assessments of turning path assessments as these assessments have been undertaken as part of the road design prepared by others.

1.5 REFERENCE DOCUMENTS

The following documents were reviewed and referenced in this report:

- *Guide to Traffic Generating Developments* v2.2 (2002) and TDT 2013/04a (Roads and Traffic Authority)
- St Marys Jordan Springs East Plan – Traffic and Transport Report, May 2009 (SKM)
- Stage 3A: Jordan Springs East – Traffic Impact Assessment, January 2016 (Cardno)
- Central Precinct Plan and Development Control Strategy Amendment No.1, May 2016 (JBA)
- Jordan Springs East Stage 3B1 – Civil Works Development Application, June 2017 (Cardno)
- Proposed Traffic Modelling Methodology for St Marys Development Site, 27 March 2017 (WSP)
- Civil Engineering and Infrastructure Report Stage 3B1: Jordan Springs East, July 2017 (Cardno).

2 MEASURE OF PERFORMANCE AND CAPACITY

2.1 INTERSECTION PERFORMANCE

Level of Service (LoS) and Degree of Saturation (DoS) are both basic performance parameters used to describe the operation of an intersection. The LoS range from A to F based on the operational performance primarily determined by the average traffic delay at the signalised intersections and roundabouts as indicated in Table 2.1.

Table 2.1 Level of service criteria for signalised intersections

Level of Service	Average delay (seconds per vehicle)	Traffic signals
A	Less than 14	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At capacity and incident would cause excessive delays
F	Greater than 71	Unsatisfactory with excessive queuing

Source: Roads and Traffic Authority *2002 Guide to Traffic Generating Developments*

2.2 MID-BLOCK CAPACITY

Extracted from Austroads *Guide to Traffic Management Part 3*, Table 2.2 sets out typical mid-block capacities for various types of urban roads with interrupted flow, with unflared major intersections and with interruptions from cross and turning traffic at minor intersections.

Table 2.2 Typical mid-block capacities for urban roads with interrupted flow

Type of Lane	One-Way Mid-Block Capacity (pc/h)
Median or inner lane	
Divided road	1000
Undivided road	900
Middle lane (of a three-lane carriageway)	
Divided road	900
Undivided road	1000
Kerb lane	
Adjacent to parking lane	900
Occasional parked vehicles	600
Clearway conditions	900

Sources: Austroads *Guide to Traffic Management Part 3: Traffic Studies and Analysis*

3 EXISTING CONDITIONS

3.1 SITE LOCATION

The location of Stage 3D relative to the greater Jordan Springs East development site area is presented in Figure 3.1 below.

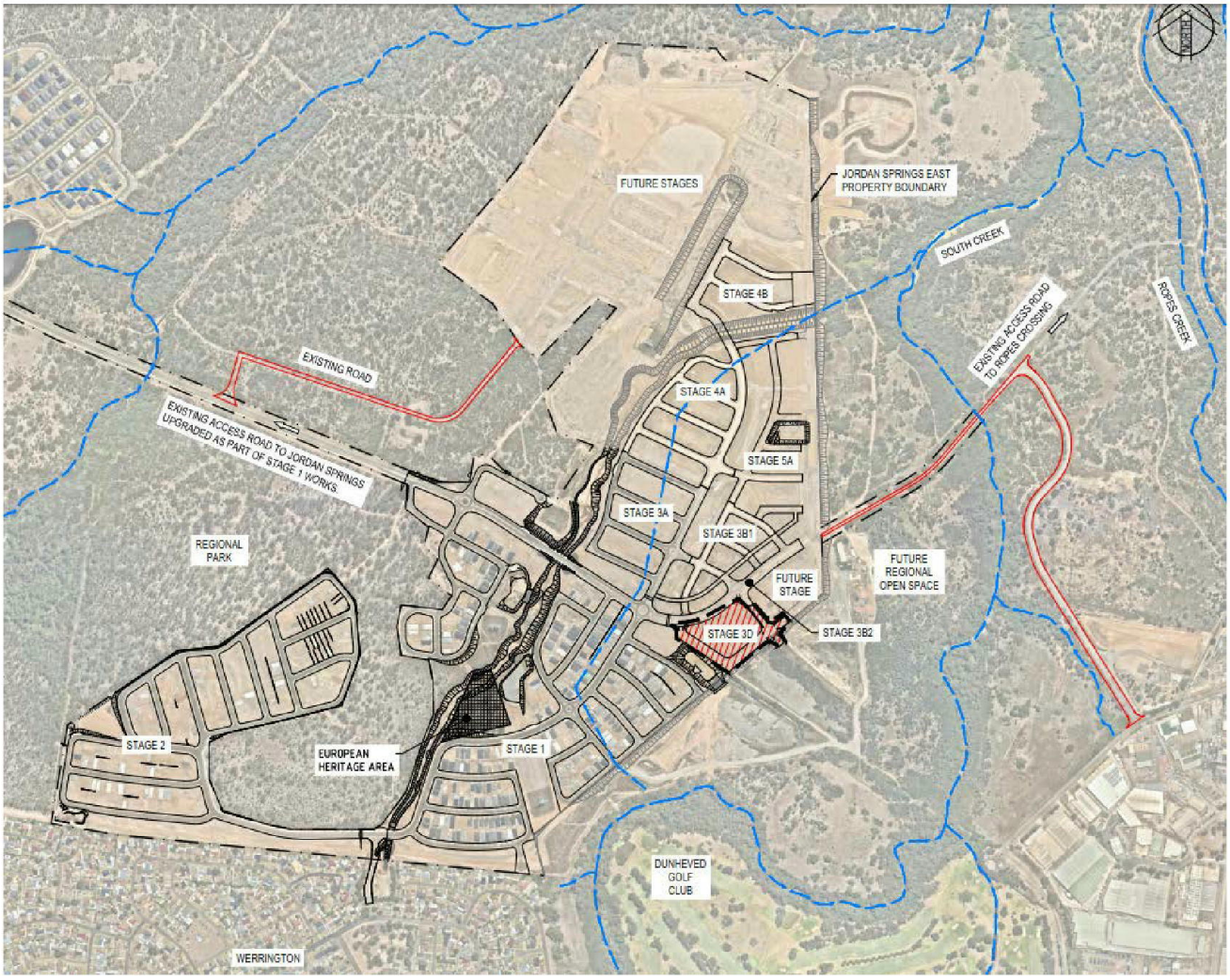


Figure 3.1 Location of Stage 3D in Jordan Springs East

3.2 ROAD NETWORK

The existing (external) road network impacted by the proposed development of Stage 3D are listed below. The operation of the relevant internal road network is further assessed in section 4 of this report. This considers the traffic volumes likely to be generated from the approved stages, which we note, were not constructed at the time that this report was prepared.

Figure 3.2 Road Network Adjoining Jordan Springs

3.2.1 THE NORTHERN ROAD

The Northern Road is a State Road (Road Number 154) which travels in a north-south direction between Bringelly and Windsor. The Northern Road is located west of the St Marys development site, with direct available via Jardine Way (priority controlled left-in/left-out), Greenwood Parkway (signalised cross intersection), Watkin Street (priority controlled left-in/left-out) and Jordan Springs Boulevarde (signalised T-intersection) in the north to south direction.

North of Greenwood Parkway, The Northern Road is generally an undivided two-lane/two-way rural type road with approximately 3 metres wide travel lanes and 2 metres wide shoulders in each direction. This section of The Northern Road has a posted speed limit of 70 km/h.

South of Greenwood Parkway, The Northern Road is generally a divided four-lane/two-way urban type road with localised intersection flaring treatments commonplace at all major intersections. On-street bicycle lanes measuring approximately 2 metres wide are available along the kerbside in both direction. Off-street shared paths are generally available along the eastern kerbside of the Northern Road. This section of The Northern Road has a posted speed limit of 70 km/h.

A survey undertaken at the intersection of The Northern Road/Jordan Springs Boulevarde in October 2016 revealed a mid-block traffic volume south of Jordan Springs Boulevarde of approximately 1,000 vehicles travelling northbound and 1,400 vehicles travelling southbound during the AM peak. The survey undertaken during the PM peak revealed 1,350 vehicles northbound and 1,300 southbound.

3.2.2 JORDAN SPRINGS BOULEVARDE

Jordan Springs Boulevarde is a collector road located south of the Jordan Springs development which travels east-west between The Northern Road and Lakeside Parade. For the most part, it is a divided four-lane/two-way road measuring approximately 17.5 metres kerb to kerb with a 4-metre-wide median island dividing the carriageway. Kerb narrowing treatments exist at its intersection with Tyler Street, reducing the travel lane to one-lane eastbound. Similar narrowing treatment also exist at its intersection with Lakeside Parade, reducing the travel lane at this intersection to one-lane westbound.

Jordan Springs Boulevarde consist of a shared path along the northern kerbside and a footpath network along the southern kerbside. Access to properties and on-street parking are generally restricted along the road, which maximises the operational capacity of the road. Jordan Springs Boulevarde is subjected to a posted speed limit of 50 km/h throughout.

3.2.3 LAKESIDE PARADE

Lakeside Parade is a two-way/two-lane undivided collector road in Jordan Springs which travels north-south between Greenwood Parkway and Jordan Springs Boulevarde, and east-west between Jordan Springs Boulevarde and Jubilee Drive. Lakeside Parade is measured at approximately 11.8 metres wide kerb to kerb with unrestricted on-street parking permitted, with the exception of the on-street parking at the Jordan Springs village centre where 1-hour parking restriction applies.

In the section between Jordan Springs Boulevarde and Jubilee Drive (east), pedestrian refuges have been installed at each intersection to Lakeside Parade to provide a staged crossing for pedestrians. A shared path of approximately 2.5 metres wide has been provided along the southern kerbside of Lakeside Parade. Similarly, a footpath of approximately 1.5 metres wide have been provided along the northern kerbside.

Lakeside Parade is subjected to a posted speed limit of 50 km/h throughout.

3.2.4 WIANAMATTA PARKWAY

Wianamatta Parkway is an extension of Lakeside Parade of the same road function which is as a collector road in the east-west direction connecting Jordan Springs East with Jordan Springs. Currently, it is partially under construction with ongoing works in the verge area observed during a site visit in September. The road however is trafficable in both direction and the ongoing road construction work is expected to have minimal impact to provide continued accessibility to Jordan Springs East from Jordan Springs.

3.3 PUBLIC TRANSPORT

3.3.1 RAIL

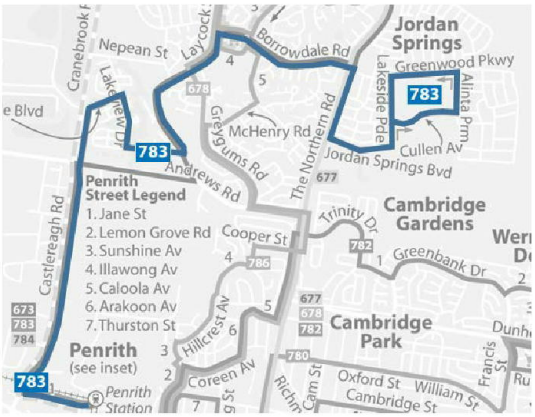
Kingswood Station is the closest train station, which is located approximately 8 km from the location of Stage 3D in Jordan Springs East.

Penrith interchange is located approximately 9 km from the location of Stage 3D.

Both train stations are serviced by the T1 Western Line (Emu Plains to the City). Penrith interchange provides access to the regional train network for the train line between Bathurst and the City, and an interchange for the local buses servicing suburbs surrounding Penrith.

3.3.2 BUS

Route 783 currently provides services between Jordan Springs and Penrith Station via Borrowdale Road and Castlereagh Road. Future planning of bus routes within Jordan Springs East are further detailed in section 6.3 of this report.



4 APPROVED DEVELOPMENTS

4.1 JORDAN SPRINGS EAST: STAGES 1, 2 AND 3A

It is understood that at the time of writing, Lendlease has obtained approval for a combined total of 768 residential lots across the development of Stages 1, 2 and 3A. These stages have been approved with all development traffic proposed to access to The Northern Road only via Wianamatta Parkway and Lakeside Parade in Jordan Springs. It should be noted that, there had been no other types of land uses (i.e. retail, child care) included in any part of the approved stages of the development to attract any supplementary trips to the Jordan Springs East development other than those generated by the residential developments.

It is further noted that Stages 3B1, 4A and 4B are approved however not yet occupied (refer to Table 5.1 and section 5.3 for further detail). Stages 4A and 4B have been approved with all development traffic proposed to access to The Northern Road only via Wianamatta Parkway and Lakeside Parade in Jordan Springs. Under Stage 3B1, trips have been distributed to both the west (to The Northern Road via Wianamtta Parkway and Lakeside Parade) and to the east (via the East-West Connector Road).

The proposed East-West Connector Roads with access to Forrester Road is currently closed to the public as it still serves as construction access for Stage 1, 2 and 3A. This is to ensure that the impact of construction vehicles during the development of various stages of Jordan Springs East would not adversely impact the established residential developments including those in Jordan Springs.

Stages 1, 2, and 3A combined will generate 584 trips and 745 trips in the respective weekday AM and PM peak hours. Table 4.1 below provides a breakdown of the combined trip generation for the approved stages in Jordan Springs East.

Table 4.1 Trip Generation of Committed Developments in Jordan Springs East

	Number of low-density residential dwellings	AM peak – Trip generation rate	Total trips	PM peak – Trip generation rate	Total trips
Stage 1	400	0.76 trips/dwelling	304 trips	0.97 trips/dwelling	388 trips
Stage 2	278		211 trips		270 trips
Stage 3A	90		69 trips		87 trips
TOTAL	**768**		**584 trips**		**745 trips**

Using an in/out trip distribution assumption of 20/80 in the AM peak and conversely 80/20 in the PM peak for residential developments, the resulting number of trips above are separated into the following inbound and outbound traffic trips.

Table 4.2 Inbound/outbound trips of Committed Developments in Jordan Springs East

	Inbound	Outbound
AM peak – 584 trips	117 trips	467 trips
PM peak – 745 trips	596 trips	149 trips

4.2 JORDAN SPRINGS

Jordan Springs is a residential suburb which forms part of the western precinct of the St Marys Development Site. In brief, Jordan Springs consists of over 3,400 dwellings, apartments, retail and community facilities such as a school, childcare and medical centre.

The development and occupation of Jordan Springs is ongoing with the most current known progress detailed in Table 4.3 below. The development of Jordan Springs is envisaged to be completed and occupied prior to the occupation of Stages 3D of Jordan Springs East development.

This section aims to analyse the impact of growth in Jordan Springs to the road network in Jordan Springs before any Jordan Springs East traffic are added to the intersection.

4.2.1 GROWTH

At the time of the survey, construction of Jordan Springs had been ongoing with the status of the development summarised as follows:

Table 4.3 Land use and resulting trips in Jordan Springs

Land use	Occupied land use November 2016	Ultimate land use	Trip generating rates (AM/PM)	2016 resulting AM trips	2016 resulting PM trips	Ultimate resulting AM trips	Ultimate resulting PM trips
Residential dwellings	1,897	3,437	AM: 0.76 trips/dwelling PM: 0.97 trips/dwelling	1441.72	1840.09	2612.12	3333.89
Apartments	0	599	AM and PM: 0.5 trips/apartment	0	0	299.5	299.5
Retail (m^2) GFA	4,920	8,200	(<10,000 m^2 GLFA): AM: ½ of PM trips. PM: 12.3 trips/100 m^2	302.58	605.16	504.3	1008.6
Childcare	60	200	AM: 1.4 trips per child PM: 0.8 trips per child	84	48	280	160
Medical Centre	3	3	AM and PM: 5.8 movements/practitioner	17.4	17.4	17.4	17.4
School (children)	0	460	AM: 0.8 trips per child	0	0	368	0
School Staff	0	15	AM and PM: 1 trip per 30 children	0	0	15	0
			TOTAL	1846	2511	4097	4819
			Proportion of 2016 resulting trip to 2021 (ultimate) resulting trip	1,846/4,097 45.1%	2,511/4,819 52.1%	-	-

Based on the above assessment, it is therefore estimated that the traffic volumes surveyed in October 2016 which also corresponds with the total of occupied developments in Jordan Springs account for approximately 45.1 per cent and 52.1 per cent of the respective AM and PM traffic volumes envisaged to be experienced in the ultimate completion year of 2021.

4.2.2 LAKESIDE PARADE/JORDAN SPRINGS BOULEVARDE

4.2.2.1 INTERSECTION COUNT

An intersection count undertaken in October 2016 revealed the following volumes for the intersection of Lakeside Parade/Jordan Springs Boulevarde.

Table 4.4 October 2016 Intersection Count at Lakeside Parade/Jordan Springs Boulevarde

2016	Lakeside Parade (North)		Lakeside Parade (South)		Jordan Springs Boulevarde	
Peak hour	T	R	L	T	L	R
AM (7.45–8.45)	10	92	143	16	61	54
PM (5.00–6.00)	22	125	97	8	168	155

Based on the growth of 45.1 per cent and 52.1 per cent in the respective AM and PM peak calculated in section 4.2.1 above, the following traffic volumes are calculated.

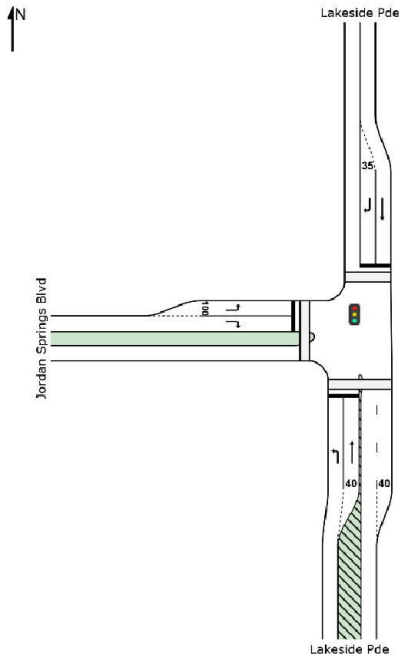
Table 4.5 Lakeside Parade/Jordan Springs Boulevarde predicted intersection volume at completion of Jordan Springs

2021	Lakeside Parade (North)		Lakeside Parade (South)		Jordan Springs Boulevarde	
Peak hour	T	R	L	T	L	R
AM (with 45.1% growth) (7.45–8.45)	22	204	317	35	135	120
PM (with 52.1% growth) (5.00–6.00)	42	240	186	15	322	298

4.2.2.2 INTERSECTION PERFORMANCE

The performance of Lakeside Parade/Jordan Springs Boulevarde intersection based on the October 2016 counts and the predicted volume at the completion of Jordan Springs is summarised below.

Table 4.6 Lakeside Parade/Jordan Spring Boulevarde Performance Summary with Jordan Springs Traffic Only

Lakeside Parade/Jordan Springs Boulevarde Performance summary	
	
2016 AM peak Total Vehicle: 376 veh/h Degree of Saturation: 0.132 Average Delay: 17.2 Level of Service: B 95% Back of Queue: 16.7 metres (west approach)	**2021 AM peak with ultimate Jordan Springs Development** Total Vehicle: 833 veh/h Degree of Saturation: 0.340 Average Delay: 18.6 Level of Service: B 95% Back of Queue: 40.6 metres (west approach)
2016 PM peak Total Vehicle: 575 veh/h Degree of Saturation: 0.228 Average Delay: 21.3 Level of Service: C 95% Back of Queue: 38.7 metres (west approach)	**2021 PM peak with ultimate Jordan Springs Development** Total Vehicle: 1,103 veh/h Degree of Saturation: 0.460 Average Delay: 23.8 Level of Service: C 95% Back of Queue: 85.2 metres (west approach)

Based on the assessment above, it is determined that the estimated traffic volumes upon the ultimate completion of Jordan Springs can be satisfactorily accommodated with the current layout of Jordan Springs Boulevarde/Lakeside Parade. The worst performing Level of Service "C" was assessed at the intersection during the PM peak for 2016 and 2021 conditions with the Degree of Saturation (volume/capacity) observed to be reduced from 0.228 to 0.460.

The SIDRA output of the above assessments are attached in Appendix A.

4.2.3 THE NORTHERN ROAD/JORDAN SPRINGS BOULEVARDE

4.2.3.1 INTERSECTION COUNT

An intersection count undertaken in October 2016 revealed the following volumes for the intersection of The Northern Road/Jordan Springs Boulevarde

Table 4.7 October 2016 Intersection Count at Lakeside Parade/Jordan Springs Boulevarde

2016	The Northern Road (North)		The Northern Road (South)		Jordan Springs Boulevarde	
Peak hour	T	L	R	T	L	R
AM (7.45–8.45)	1189	37	174	844	261	32
PM (5.00–6.00)	1050	63	455	895	281	50

A check in the Roads and Maritime EMME strategic model revealed an annual growth in the Northern Road as follows:

Table 4.8 The Northern Road Annual Growth Rate from 2016 to 2021

	The Northern Road – North of Jordan Springs Boulevarde		The Northern Road – South of Jordan Springs Boulevarde	
	Northbound	Southbound	Northbound	Southbound
AM	0.8% p.a.	1.0% p.a.	1.6% p.a.	2.8% p.a.
PM	0.1% p.a.	0.8% p.a.	1.9% p.a.	2.4% p.a.

Applying the growth subjected to The Northern Road as detailed above and the growth of trips generated from the Jordan Springs development, being 45.1% and 52.1% in the respective AM and PM peak calculated in section 4.2.1 above, the following traffic volumes are calculated.

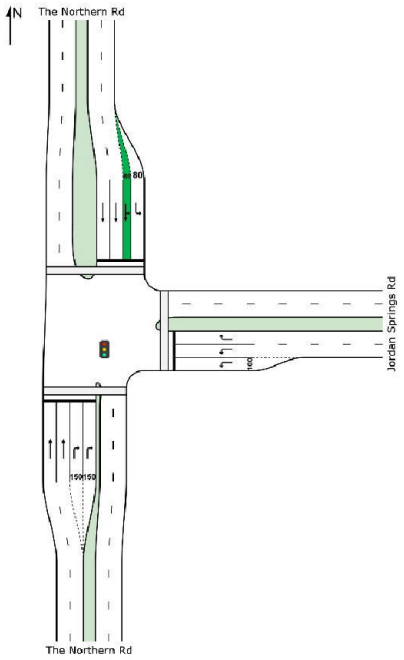
Table 4.9 Lakeside Parade/Jordan Springs Boulevarde predicted intersection volume at completion of Jordan Springs

2021	The Northern Road (North)		The Northern Road (South)		Jordan Springs Boulevarde	
Peak hour	T	L	R	T	L	R
AM (7.45–8.45)	1247	82	386	915	579	71
PM (5.00–6.00)	1091	121	873	982	539	96

4.2.3.2 INTERSECTION PERFORMANCE

The performance of The Northern Road/Jordan Springs Boulevarde intersection based on the October 2016 counts and the predicted volume at the completion of Jordan Springs is summarised below.

Table 4.10 The Northern Road/Jordan Springs Boulevarde Performance Summary with Jordan Springs Traffic Only

The Northern Road/Jordan Springs Boulevarde Performance Summary	
	
2016 AM peak Total Vehicle: 2,540 veh/h Degree of Saturation: 0.508 Average Delay: 14.9 Level of Service: B 95% Back of Queue: 121.7 metres (North approach)	**2021 AM peak with ultimate Jordan Springs Development** Total Vehicle: 3,280 veh/h Degree of Saturation: 0.618 Average Delay: 21.1 Level of Service: B 95% Back of Queue: 160.3 metres (North approach)
2016 PM peak Total Vehicle: 2,796 veh/h Degree of Saturation: 0.573 Average Delay: 20.4 Level of Service: B 95% Back of Queue: 133.9 metres (north approach)	**2021 PM peak with ultimate Jordan Springs Development** Total Vehicle: 3,702 veh/h Degree of Saturation: 0.747 Average Delay: 24.5 Level of Service: B 95% Back of Queue: 170.6 metres (north approach)

Based on the assessment above, it is determined that the estimated traffic volumes upon the ultimate completion of Jordan Springs can be satisfactorily accommodated with the current layout of Jordan Springs Boulevarde/The Northern Road. The worst performing Level of Service "B" was assessed at the intersection during both AM and PM peak for 2016 and 2021 conditions.

The SIDRA output of the above assessments are attached in Appendix B.

5 PROPOSED DEVELOPMENT

5.1 DESCRIPTION

The proposed Stage 3D developments are located towards the south-east of the Jordan Springs East precinct. Stage 3D is located abutting Road 001 to the north which is the main collector road connecting Jordan Springs East with Jordan Springs and Ropes Crossing. It also abuts Road 013 to the east and Road 027 to the west. The extent and location of Stage 3D in relation to the other stages of Jordan Springs East are shown in Figure 5.1 below.

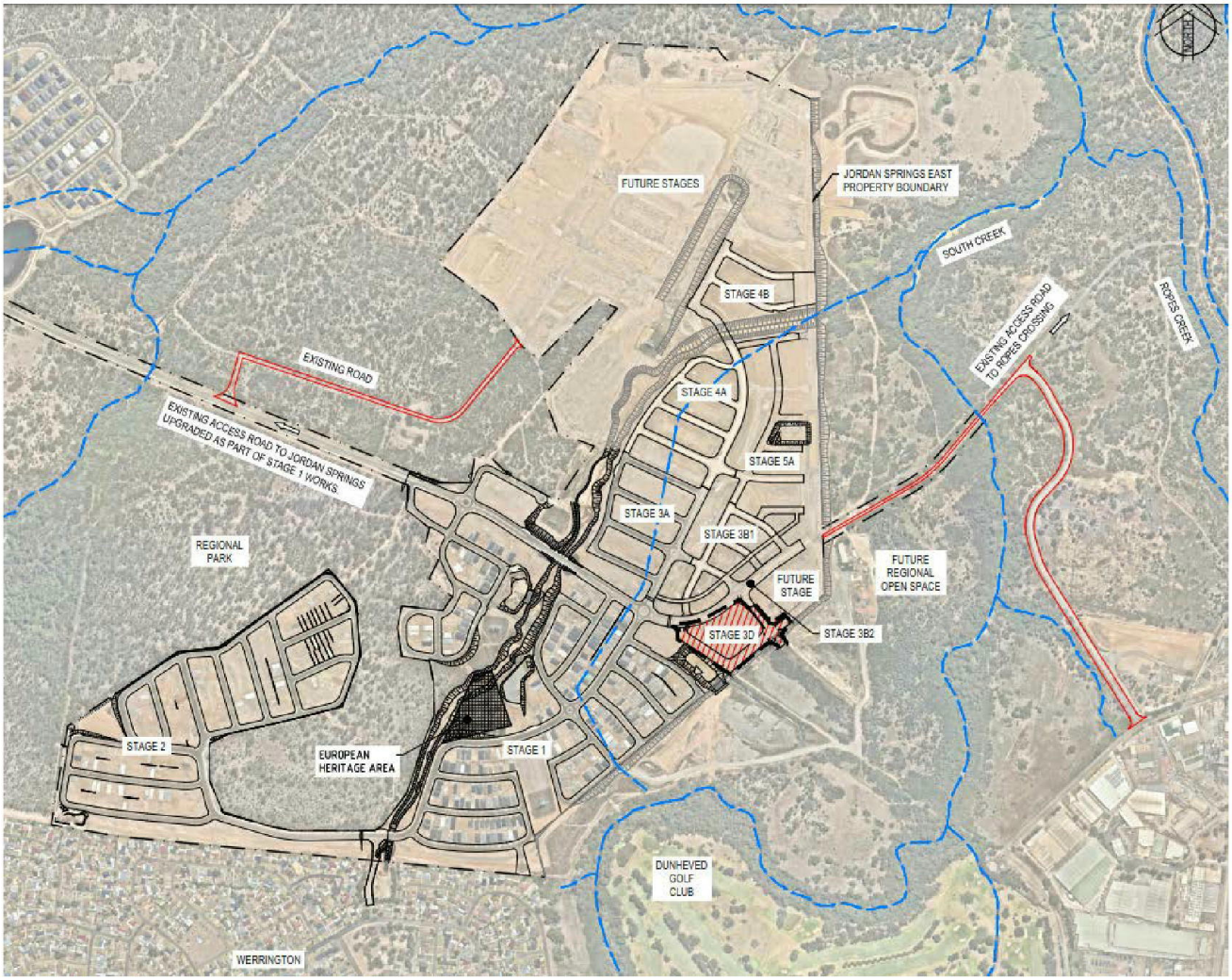


Figure 5.1 Stage 3D Location with Jordan Springs East

5.2 CONSTRUCTION PROGRAM

The civil construction program detailed in the *Civil Engineering and Infrastructure Report Stage 3B2: Jordan Springs East* (Cardno, September 2017) revealed the following key program dates:

Table 5.1 Jordan Springs East Construction Program Key Dates

Stages	Description	Anticipated Start Date	Anticipated End Date
Precinct wide	Fill	June 2015	July 2017
Stage 1	Civil Works	May 2016	May 2017
	Lot Registration	May 2017	July 2017
	Occupation	February 2018	-
Stage 2	Civil Works	December 2016	May 2017
	Lot Registration	July 2017	July 2017
	Occupation	March 2018	
Stage 3A	Civil Works	July 2017	October 2017
	Lot Registration	November 2017	December 2017
	Occupation	October 2018	
Stage 4A and 4B	Civil Works	October 2017	April 2018
	Lot Registration	May 2018	June 2018
	Occupation	March 2019	
Stage 3B1	Civil Works	November 2017	May 2018
	Lot Registration	May 2018	June 2018
	Occupation	March 2019	
Stage 3B2	Civil Works	July 2018	October 2018
	Lot Registration	October 2018	November 2018
	Occupation	N/A	

Source: Cardno and ADW Johnson

A Development Application (DA) for the East-West Connector Road is currently being assessed by Penrith City and Blacktown City Councils with construction proposed to be commenced promptly upon approval. Should the further residential development and occupation of Stage 3B1, 3B2, 4A and 4B occur prior to the completion of the East-West Connector Road, the internal road network west of Jordan Springs East is expected to have reduced capacity temporarily over a short duration.

It has also been assumed that the development of Stage 3D will occur post Stages 3B1 and 3B2 with the East-West Connector Road open to traffic east of Jordan Spring East.

5.3 PROPOSED TRIP GENERATION

As detailed in Stage 4A and 4B Traffic Impact Assessment report, Stages 4A and 4B have been estimated to generate 125 trips and 159 trips in the respective AM and PM peak. The proposed 52 dwellings in Stage 3B1 will generate 40 trips and 51 trips in the respective AM and PM peak. With regards to Stage 3B2 development, the four super-lots are assumed to be non-traffic generating at this stage. Future developments on these lots are subject to future Development Application and supporting Traffic Impact Assessment to be submitted to Council for consideration.

Stage 3D has been assessed based upon two development scenarios, a low-density scenario and a medium density scenario. Both these scenarios have been assessed with their land use types and yields detailed below in Table 5.2.

Stage 3D is estimated to generate 518 trips in the and 625 trips in the respective AM and PM peak under the low-density scenario and generate 505 trips in the and 560 trips under the medium density scenario.

Table 5.2 Trip Generation of Stage 3D for Low and Medium Density Scenarios

Land use	Yield (Unit)	Unit type	AM peak trip rate	Total AM trips	PM peak trip rate	Total PM trips
Low Density Scenario						
Residential – Terraces	6	Dwellings	0.76 per dwelling	5	0.97 per dwelling	6
Residential – Shoptop	12	Dwellings	0.5 per dwelling	6	0.5 per dwelling	6
Residential – Apartments	24	Dwellings	0.5 per dwelling	12	0.5 per dwelling	12
Shopping Centre/ Retail	3,485	m^2	Per m^2	214	Per m^2	429
Childcare	180	Children	Per child	252	Per child	144
Medical Centre	5	Doctors	Per doctor	30	Per doctor	30
			TOTALS	**518**		**625**
Medium Density Scenario						
Residential – Terraces	6	Dwellings	0.76 per dwelling	5	0.97 per dwelling	6
Residential – Shoptop	24	Dwellings	0.5 per dwelling	12	0.5 per dwelling	12
Residential – Apartments	90	Dwellings	0.5 per dwelling	45	0.5 per dwelling	45
Shopping Centre/ Retail	2,635	m^2	Per m^2	162	Per m^2	324
Childcare	180	Children	Per child	252	Per child	144
Medical Centre	5	Doctors	Per doctor	30	Per doctor	30
			TOTALS	**505**		**560**

Table 5.3 below provides a breakdown of the combined trip generation in addition to the approved stages in Jordan Springs East.

Table 5.3 Trip Generation of Committed and Proposed Developments in Jordan Springs East

	Number of low-density residential dwellings	AM peak – Trip generation rate	Total AM trips	PM peak – Trip generation rate	Total PM trips
Stage 1	400	0.76 trips/ dwelling	304 trips	0.97 trips/ dwelling	388 trips
Stage 2	278		211 trips		270 trips
Stage 3A	90		69 trips		87 trips
Subtotal	*768*		*584 trips*		*745 trips*
Stage 4A and 4B	163		125 trips		159 trips
Stage 3B1	52		40 trips		51 trips
Subtotal	*983*		*749 trips*		*955 trips*
Stage 3B2	0		0 trips		0 trips
Subtotal	*983*		*749 trips*		*955 trips*
Stage 3D – low density			*518 trips*		*625 trips*
Stage 3D – medium density			*505 trips*		*560 trips*
TOTAL			***1,267 trips#***		***1,580 trips#***

utilising the higher trip generation between Stage 3D low and medium density scenarios

Using an in/out trip distribution assumption of 20/80 in the AM peak and conversely 80/20 in the PM peak for residential developments, the resulting number of trips above are separated into the following inbound and outbound traffic.

Table 5.4 Inbound/outbound trips of Committed and Proposed Developments in Jordan Springs East

		Inbound	Outbound
Trips Generated from Approved Stages 1, 2 and 3A	AM peak – 584 trips	117 trips	468 trips
	PM peak – 745 trips	596 trips	149 trips
Trips Generated from Approved Stages 1, 2 and 3A + Proposed Stages 4A, 4B, 3B1 and 3B2	AM peak – 749 trips	150 trips	599 trips
	PM peak – 955 trips	764 trips	191 trips
Trips Generated from Proposed Stage 3D #	AM peak – 518 trips	274 trips	244 trips
	PM peak – 625 trips	320 trips	305 trips

utilising the higher trip generation between Stage 3D low and medium density scenarios

No trips will be generated from Stage 3B2 as it will require further development before residential lots and dwellings are delivered.

5.4 IMPACT OF PROPOSED DEVELOPMENT TO JORDAN SPRINGS INTERNAL ROAD

5.4.1 LAKESIDE PARADE/JORDAN SPRINGS BOULEVARDE

For the purpose of this study, the following route option assumptions are made at the intersection of Jordan Springs Boulevarde and Lakeside Parade with regards to the turning movements made by the combined trips out of Jordan Springs East of the approved Stages 1, 2 and 3A, committed Stages 4A and 4B and proposed Stages 3B1, 3B2 and 3D.

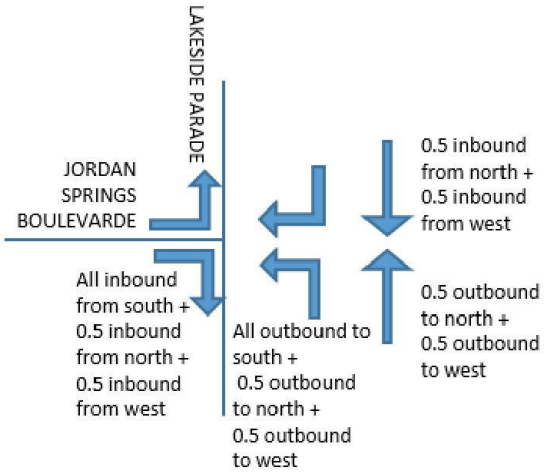


Figure 5.2 Route Option Lakeside Parade/Jordan Springs Boulevarde

5.4.1.1 JORDAN SPRINGS BOULEVARDE/LAKESIDE PARADE INTERSECTION VOLUMES UNDER PROPOSED CONDITIONS

The resulting traffic volume at the intersection of Jordan Springs Boulevarde and Lakeside Parade is summarised in Table 5.5 below, taking into account of the traffic growth in Jordan Springs as calculated in section 4.2.1 and the trips generated from Jordan Springs East approved and proposed developments as detailed in section 5.3.

Table 5.5 Lakeside Parade/Jordan Springs Boulevarde – Estimated intersection volumes with inclusion of Jordan Springs East Development Traffic in 2021

		Lakeside Parade (north)		**Lakeside Parade (south)**		**Jordan Springs Boulevarde**	
	Peak hour	T	R	L	T	L	R
Trips Generated from Approved Stage 1, 2 and 3A Submitted Stages 4A +4B and Proposed Stages 3B1 and 3B2 Proposed Stage 3D	AM peak	40	204	559	84	135	172
	PM peak	134	240	274	33	322	574

Table 5.6 below summarises the mid-block traffic volume envisaged in the ultimate completion year of Stage 3D.

Table 5.6 Lakeside Parade and Jordan Springs Boulevarde – Estimated mid-block volumes including Stage 3D

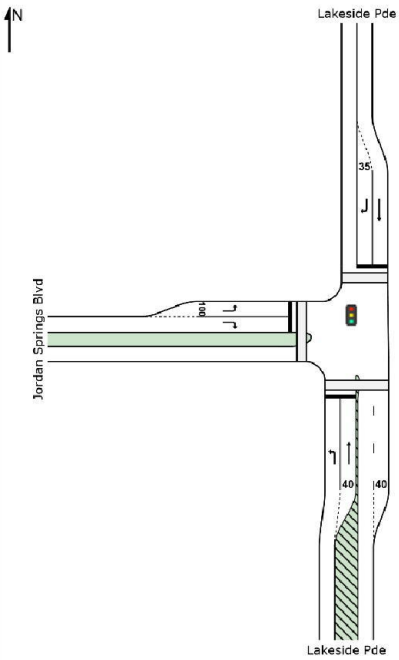
	AM peak		PM peak	
Lakeside Parade (North)	NB: 219	SB: 244	NB: 355	SB: 374
Lakeside Parade (South)	NB: 643	SB: 212	NB: 307	SB: 708
Jordan Springs Boulevarde	EB: 307	WB: 763	EB: 896	WB: 514

Based on the above, the traffic volumes assessed at the approaches to Lakeside Parade and Jordan Springs Boulevarde intersection will be within the typical mid-block capacities recommended in the Austroads *Guide to Traffic Management Part 3*.

5.4.1.2 SIDRA ASSESSMENT

The resulting trips as shown in Table 5.5 were modelled in SIDRA using the existing layout of the intersection of Jordan Springs Boulevarde and Lakeside Parade. As shown in the performance summary Table 5.7 the intersection has been assessed to be performing satisfactorily. The worst performing condition has been assessed at a Level of Service (LoS) "C" during the PM peak under the proposed condition.

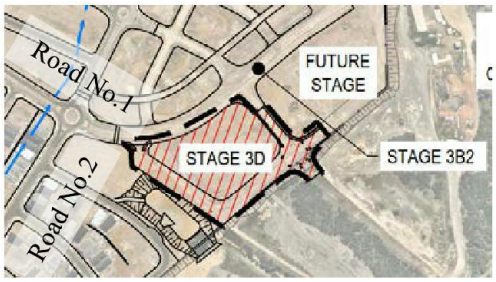
Table 5.7 Lakeside Parade/Jordan Springs Boulevarde Performance Summary with inclusion of Jordan Springs East Development Traffic in 2021

Lakeside Parade/Jordan Springs Boulevarde Performance Summary		
	**AM peak conditions with all trips from Stage 1, 2, 3A, 4A and 4B to The Northern Road only**	**AM peak conditions with proposed Stage 3B1, 3B2, 3D and opening of the East-West Connector Road**
	Total Vehicle: 1,542 veh/h Degree of Saturation: 0.662 Average Delay: 17.3 Level of Service: B 95% Back of Queue: 74.2 metres (west approach)	Total Vehicle: 1,194 veh/h Degree of Saturation: 0.465 Average Delay: 17.1 Level of Service: B 95% Back of Queue: 53.0 metres (west approach)
	PM peak conditions with all trips from Stage 1, 2, 3A, 4A and 4B to The Northern Road only	**PM peak conditions with proposed Stage 3B1, 3B2, 3D and opening of the East-West Connector Road**
	Total Vehicle: 2,007 veh/h Degree of Saturation: 0.965 Average Delay: 43.2 Level of Service: D 95% Back of Queue: 377 metres (west approach)	Total Vehicle: 1,577 veh/h Degree of Saturation: 0.666 Average Delay: 22.8 Level of Service: C 95% Back of Queue: 150.2 metres (west approach)

The SIDRA output of the above assessments are attached in Appendix C.

5.5 DEVELOPMENT IMPACT TO JORDAN SPRINGS EAST INTERNAL ROAD

Assessment of the internal road in Jordan Springs East has been undertaken for the intersection of Road No. 1 (collector road east-west) and Road No. 2 (collector road north-south). This intersection provides direct access to Stage 1 and 2 to the south and Stages 3A, 4A, 4B, 3B1 and 3B2 to the north. Stage 3D is to the east of this intersection.



Internal roads proposed to be connected to Road No. 1 that are located to the east of Road No. 2 are understood to be connected to Road No.1 under the development in future stages of Jordan Springs East.

With the development of Stages 1, 2, 3A 4A, 4B, 3B1, 3B2 and 3D the intersection of Road No.1 and No. 2 will generate the traffic volume shown in Table 5.8 below.

This intersection is controlled by a single lane roundabout with an inscribed radius of approximately 20 metres. Concrete median island is proposed along Road Number 1 which would prohibit any right turn movements into and out of side streets and property accesses.

Table 5.8 Traffic Volume Intersection Road No.1 and No.2

	Road No. 2 (south)			Road No. 1 (east)			Road No. 2 (north)			Road No. 1 (west)		
	L	T	R	L	T	R	L	T	R	L	T	R
AM	185	0	268	43	46	85	168	0	59	51	8	26
PM	59	0	114	131	24	262	122	0	19	261	37	131

The intersection has been modelled in SIDRA Intersections and was found to be performing satisfactorily. The result is summarised below:

Table 5.9 Intersection Road No.1 and No.2 Performance Summary

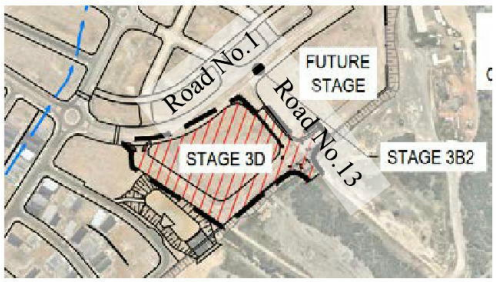
	Intersection performance with all trips from Stage 1, 2, 3A, 4A and 4B to The Northern Road only		Intersection performance with proposed Stage 3B1, 3B2, 3D and opening of the East-West Connector Road	
	AM peak	PM peak	AM peak	PM peak
Total Volume	717 vehicles	912 vehicles	941 vehicles	1,162 vehicles
Degree of Saturation	0.339 (Road No. 2 south approach)	0.427 (Road No. 1 west approach)	0.383 (Road No 2. south approach)	0.442 (Road No. 1 west approach)
Average Delay	9.1 seconds (Road No. 2 north approach)	11.3 seconds (Road No. 2 north approach)	8.0 seconds (Road No. 2 north approach)	8.7 seconds (Road No. 1 west approach)
Level of Service	LoS A	LoS A	LoS A	LoS A
95% Back of Queue	15.7 metres (Road No. 2 south approach)	23.1 metres (Road No. 1 west approach)	18.0 metres (Road No. 2 south approach)	21.6 metres (Road No. 1 west approach)

For priority (sign) and roundabout controlled intersections, Level of Service is based upon the traffic movement with the worst vehicle average delay.

Based on the above performance it is considered that the intersection of Road 001 and Road 002 will be performing satisfactorily with trips from approved Stages 1, 2 and 3A, committed Stages 4A and 4B and proposed Stage 3B1, 3B2 and 3D being distributed to the east and west of Jordan Springs East development.

The mid-block volume will be within the maximum of 900 passenger car unit (pcu) per lane per hour with a maximum of 444 vehicles/hour observed in the AM peak in the eastbound direction east of Road 1/Road 2 intersection. A maximum of 416 vehicles/hour observed in the PM peak in the westbound direction east of Road 1/Road 2 intersection. The SIDRA output of the above assessments are attached in Appendix D.

Assessment of the internal road in Jordan Springs East has been undertaken for the intersection of Road No. 1 (collector road east-west) and Road No. 13 (village centre local street). This intersection provides direct access to Stage 3D to the south and Stage 3B1 and 3B2 to the north. Stage 3D is to the south-west of this intersection.



Internal roads proposed to be connected to Road No. 1 that are located to the east of Road No. 13 are understood to be connected to Road No.1 under the development in future stages of Jordan Springs East.

With the development of Stages 1, 2, 3A 4A, 4B, 3B1, 3B2 and 3D the intersection of Road No.1 and No. 13 will generate the traffic volume shown in Table 5.10 below.

This intersection is controlled by a single lane roundabout with an inscribed radius of approximately 20 metres. Concrete median island is proposed along Road Number 1 which would prohibit any right turn movements into and out of side streets and property accesses.

Table 5.10 Traffic Volume Intersection Road No.1 and No.13

	Road No. 13 (south)			Road No. 1 (east)			Road No. 13 (north)			Road No. 1 (west)		
	L	T	R	L	T	R	L	T	R	L	T	R
AM	73	20	122	82	168	5	31	6	25	6	322	137
PM	81	25	171	107	439	24	10	2	8	29	68	141

The intersection has been modelled in SIDRA Intersections and was found to be performing satisfactorily. The result is summarised below:

Table 5.11 Intersection Road No.1 and No.13 Performance Summary

	Intersection performance with all trips from Stage 1, 2, 3A, 4A, 4B, 3B1, 3B2, 3D and opening of the East-West Connector Road	
	AM peak	PM peak
Total Volume	997 vehicles	1,105 vehicles
Degree of Saturation	0.376 (Road No. 1 west approach)	0.459 (Road No. 1 east approach)
Average Delay	9.1 seconds (Road No. 13 north approach)	9.9 seconds (Road No. 13 south approach)
Level of Service	LoS A	LoS A
95% Back of Queue	18.7 metres (Road No. 1 west approach)	25.3 metres (Road No. 1 east approach)

For priority (sign) and roundabout controlled intersections, Level of Service is based upon the traffic movement with the worst vehicle average delay.

Based on the above performance it is considered that the intersection of Road 001 and Road 013 will be performing satisfactorily with trips from approved Stages 1, 2 and 3A, committed Stages 4A and 4B and proposed Stage 3B1, 3B2 and 3D being distributed to the east and west of Jordan Springs East development.

The mid-block volume will be within the maximum of 900 passenger car unit (pcu) per lane per hour with a maximum of 475 vehicles/hour observed in the AM peak in the eastbound direction east of Road 1/Road 13 intersection. A maximum of 570 vehicles/hour observed in the PM peak in the westbound direction east of Road 1/Road 13 intersection. The SIDRA output of the above assessments are attached in Appendix E.

6 JORDAN SPRINGS EAST PRECINCT PLAN

6.1 ROAD LAYOUT

The internal road layout and functions planned for Jordan Springs East is shown in Figure 6.1 below. Stage 3D, located toward the eastern side of the Jordan Springs East development will be predominantly serviced by Road 001 and Road 013.

The East-West Connector Road is currently being assessed by Penrith City and Blacktown City Councils with construction proposed to be commenced promptly upon approval. The opening of the East-West Connector Road will vastly change trip distribution for Jordan Springs East, where 55 per cent and 53 per cent of trips are made towards the east in the respective AM and PM peak. This trip redistribution will consequently reduce the traffic impact in the Jordan Springs road network.

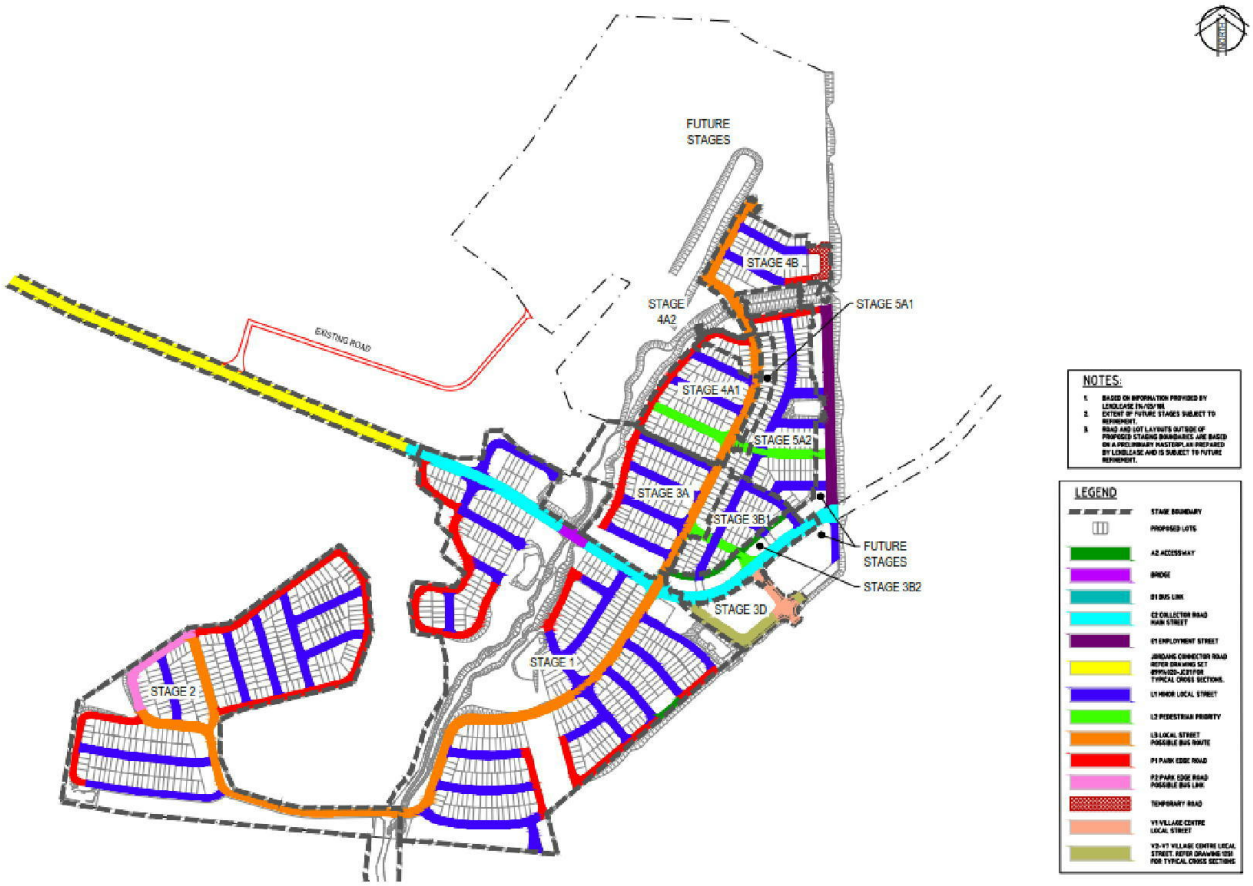


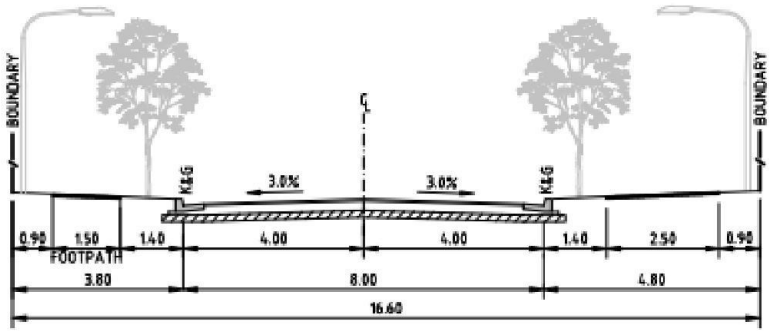
Figure 6.1 Road layout and functions Jordan Springs East

6.2 PROPOSED ROAD CROSS SECTIONS

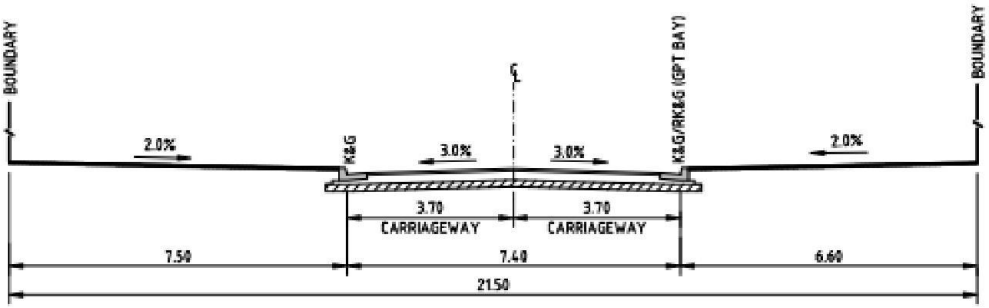
Stage 3D consists of the road types listed in this section. The design of the road cross section takes into consideration of the function of each road and the road users that are likely to utilise the road space which include cars, buses, pedestrians and cyclists.

6.2.1 VILLAGE CENTRE LOCAL STREET LAYOUTS

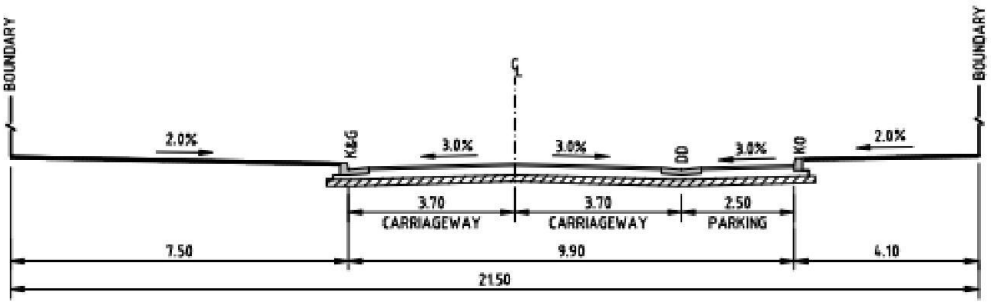
Several road cross section layouts are proposed for the Village Centre. These are shown below.



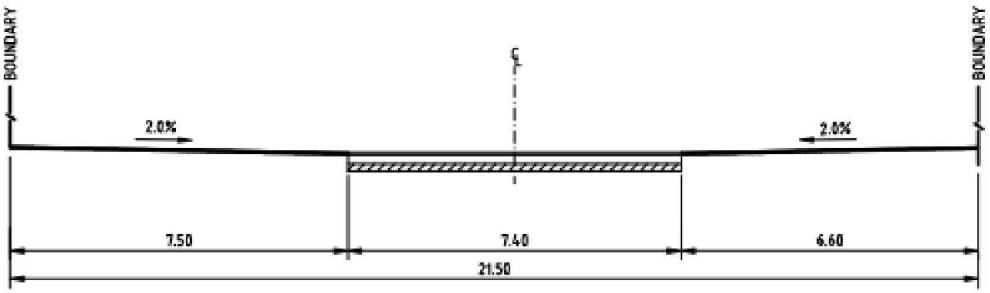
V1 VILLAGE CENTRE LOCAL STREET
PAVEMENT TYPE 1 ROADS: 013
SCALE 1:100



V2 VILLAGE CENTRE LOCAL STREET
PAVEMENT TYPE 1 ROADS: 027 (CH0-30, CH48-60, CH141-167)
SCALE 1:100



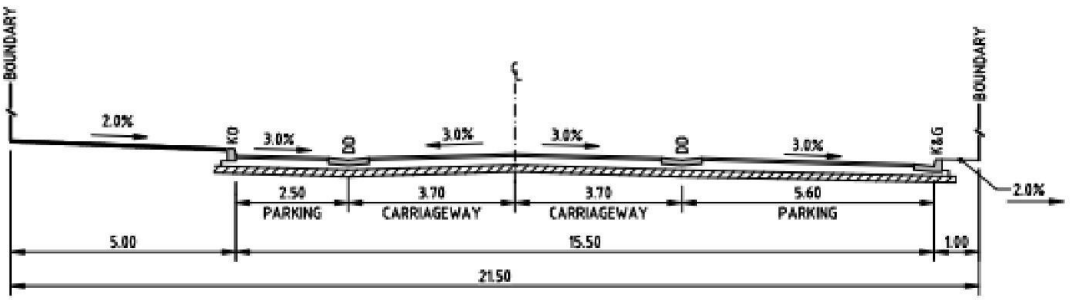
V3 VILLAGE CENTRE LOCAL STREET
PAVEMENT TYPE 1 ROADS: 027 (CH30-48)
SCALE 1:100



V4 VILLAGE CENTRE LOCAL STREET

PAVEMENT TYPE 10 ROADS: 027 (CH60-68, CH199-208)

SCALE 1:100

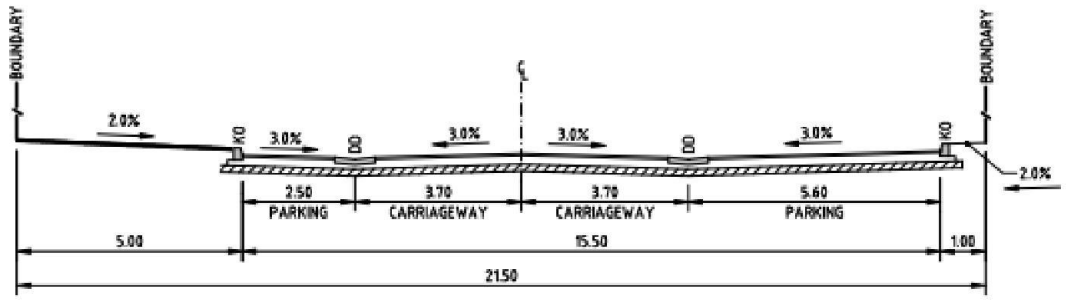


V5 VILLAGE CENTRE LOCAL STREET

(PARKING ON BOTH SIDES)

PAVEMENT TYPE 1 ROADS: 027 (CH70-141)

SCALE 1:100

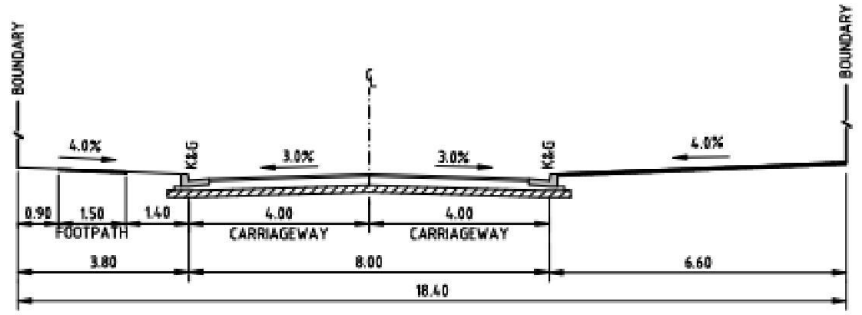


V6 VILLAGE CENTRE LOCAL STREET

(PARKING ON BOTH SIDES)

PAVEMENT TYPE 1 ROADS: 027 (CH167-198, CH209-235)

SCALE 1:100



V7 VILLAGE CENTRE LOCAL STREET

PAVEMENT TYPE 1 ROADS: 027 (CH293-310)

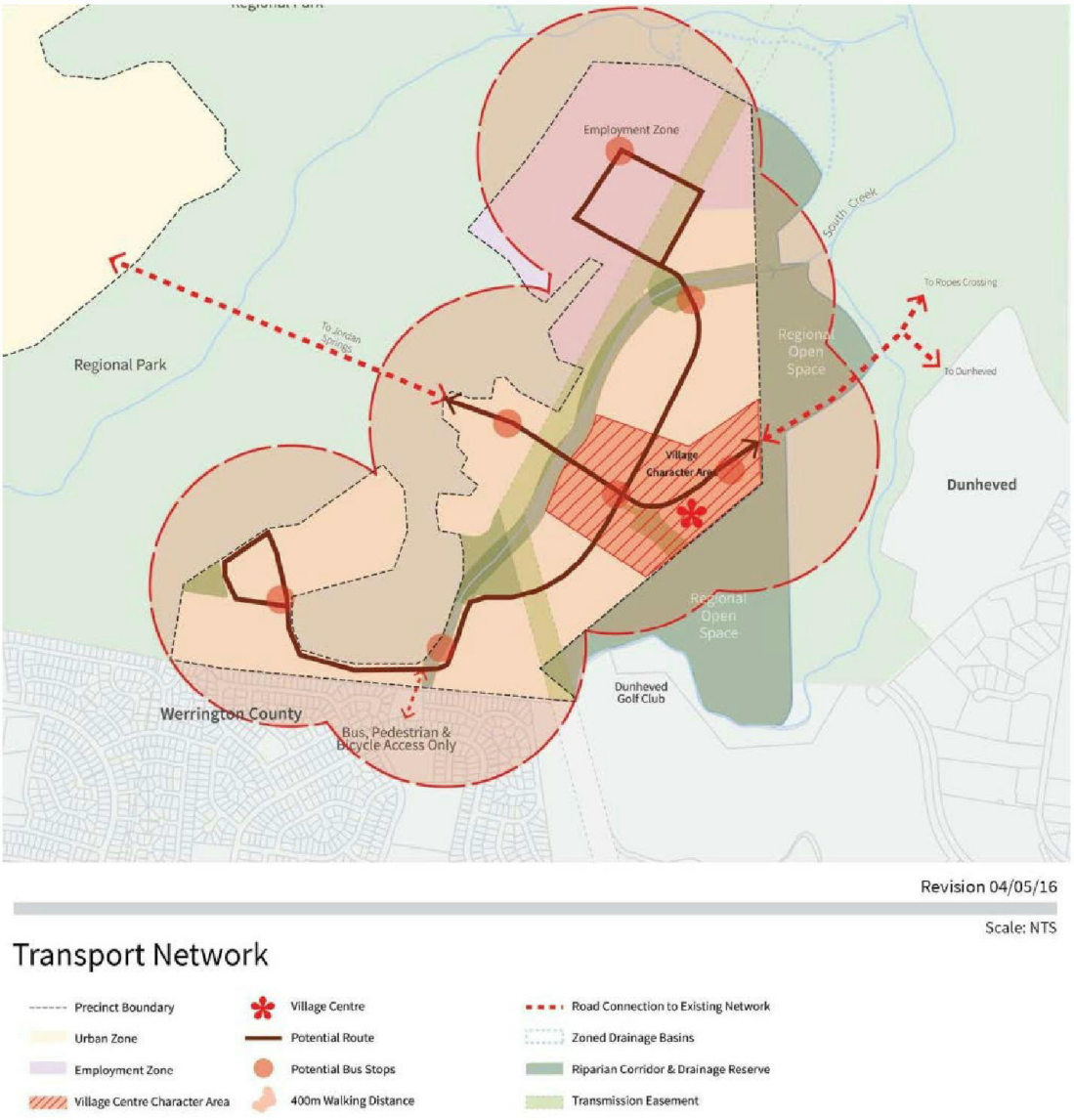
SCALE 1:100

Source: Cardno (2018)

6.3 PUBLIC TRANSPORT

In the JBA Jordan Springs East Precinct Plan 1 May 2016 (Amendment No 1), it is envisaged that the various character areas (including urban area/neighbourhood character, village centre, parkland node, bushland edge and employment zone) within Jordan Springs East will be within 5–10 minutes of walking distance of a bus stop.

Figure 6.2 below depicts the proposed bus services and bus stop locations in Jordan Springs East, which will be mainly servicing both the north-south and east-west collector roads. As indicated in section 6.1 above, wider road widths apply to roads that are indicated to be part of the bus routes.

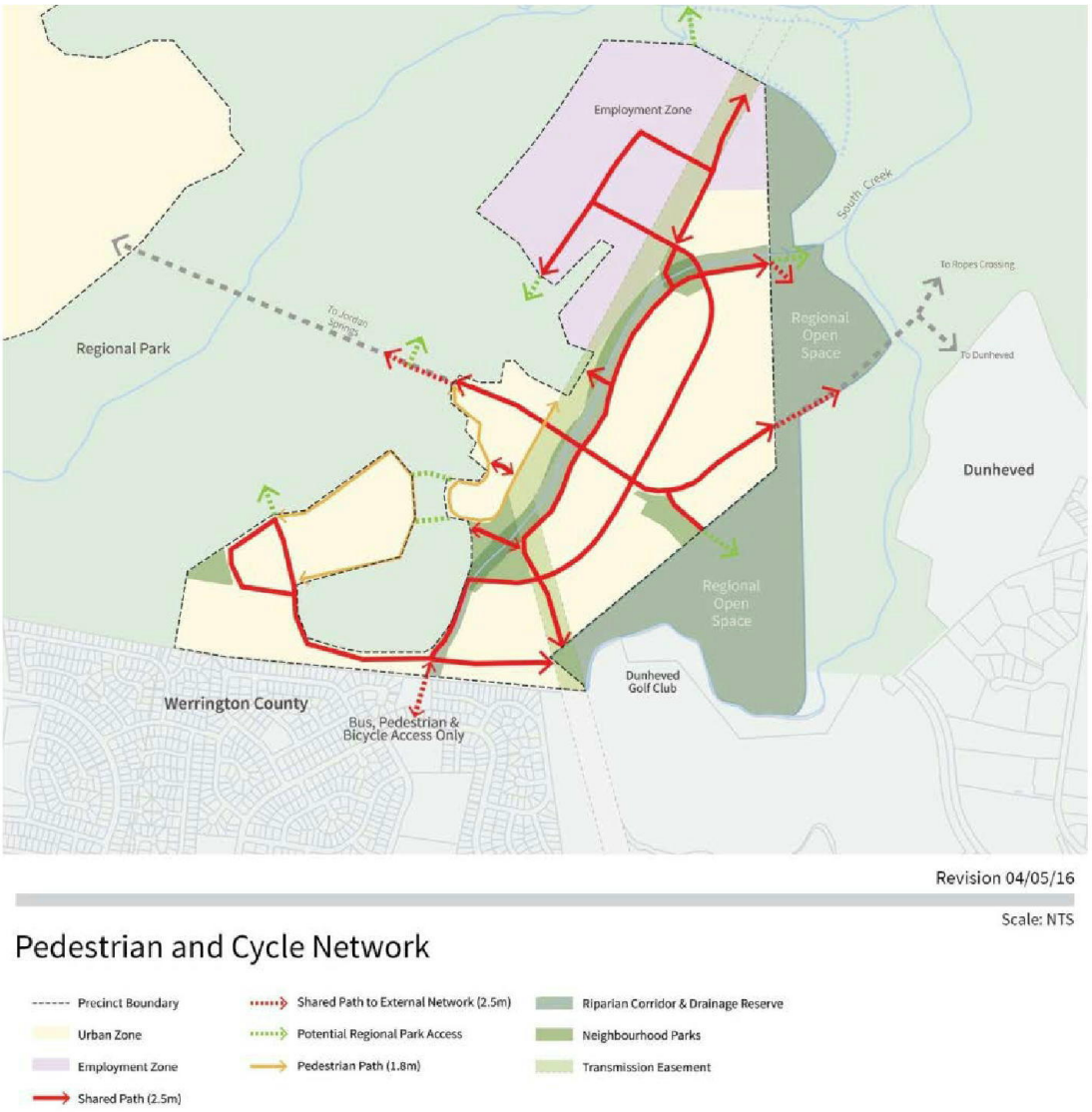


Source: JBA, May 2016, Jordan Springs East Precinct Plan

Figure 6.2 Proposed Bus Services and Bus Stops in Jordan Springs East

6.4 PEDESTRIAN AND CYCLE NETWORK

As shown in section 6.2 – Road Cross Section, it is proposed that all roads within Stage 3D of Jordan Springs East to consist of pedestrian paths in every street and shared paths along the major collector roads, including Road 001. Figure 6.3 below shows the extent of the shared path network in Jordan Springs East.



Source: JBA, May 2016, Jordan Springs East Precinct Plan

Figure 6.3 Pedestrian and Cycle Network in Jordan Springs East

7 CONCLUSIONS

This report has been undertaken to consider the traffic impact of the proposed Stage 3D of Jordan Springs East, taking into consideration the existing traffic volumes and growth in Jordan Springs, trips generated from the approved Stages in Jordan Springs East and distribution of trips made with consideration of the opening of the East-West Connector Road. Stage 3D is located approximately to the east of Jordan Springs East development that abuts the East-West Collector Road to the north.

The occupation of Stage 3D is scheduled to be undertaken after the opening of East-West Connector Road which will significantly alter the trip distribution out of Jordan Springs East. It is expected that 55 per cent and 53 per cent of trips out of Jordan Springs East will utilise the East-West Connector Road during the respective AM and PM peak periods.

Assessments have been undertaken to investigate the performance of the affected intersections and mid-block capacity on Lakeside Parade in Jordan Springs. The following concludes the findings of the assessment:

1. The intersection of Lakeside Parade/Jordan Springs Boulevarde and The Northern Road/Jordan Springs Boulevarde have been assessed to be performing with a satisfactory Level of Service (LoS) with the inclusion of Jordan Springs East Stages 3B1, 3B2 and 3D development traffic in addition to approved Stage 1, 2, 3A and committed Stages 4A, and 4B.
2. The cross-section details of the roads within Stage 3D designed by others have been checked to take into consideration of the function of each road and the road users that are likely to utilise the road space which include cars, buses, pedestrians and cyclists.
3. It is considered that the Stage 3D development will not have an adverse impact to the road network.

APPENDIX A

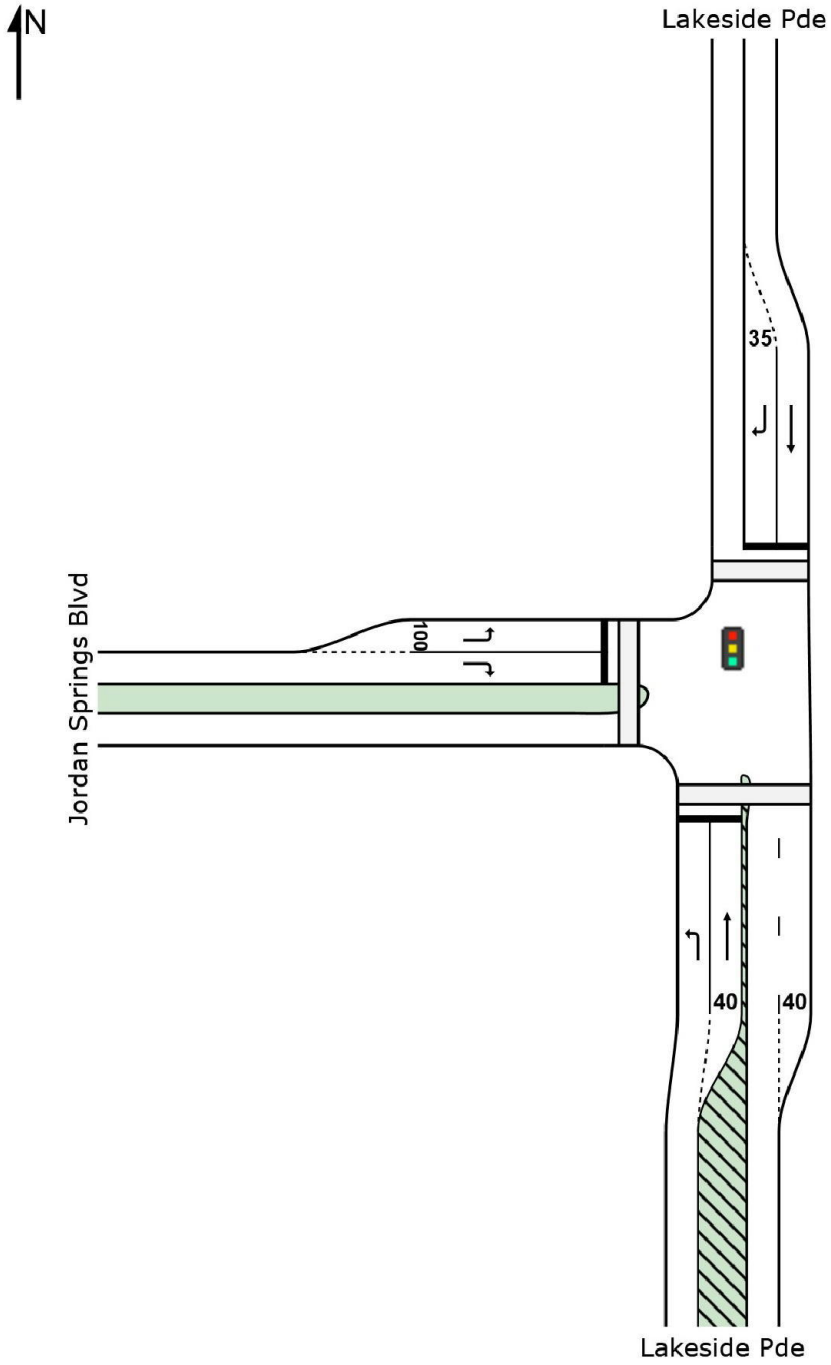
SIDRA OUTPUT – JORDAN SPRINGS BOULEVARDE/LAKESIDE PARADE

Intersection performance summary of trips generated by Jordan Springs precinct only

SITE LAYOUT

Site: 101 [I-28JordanSpringsBlvd-LakesideParade-AM - 2021 - Existing - Growth Only]

Jordan Springs Blvd-Lakeside Parade
Signals - Fixed Time Isolated



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Project: \\APSYDFIL03\proj\M\MARYLAND_DVLPMNT_CO\2197037A_Central_Precinct_Traffic_Mode\05_WrkPapers\WP\Draft\TIA STAGES 4A & 4B\SIDRA\internal road.sip7

LANE SUMMARY

Site: 101 [I-28JordanSpringsBlvd-LakesideParade-AM - 2016 - Existing]

Jordan Springs Blvd-Lakeside Parade
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Lakeside Pde													
Lane 1	143	0.3	1575	0.091	100	5.2	LOS A	0.7	4.7	Full	240	0.0	0.0
Lane 2	16	0.0	1151	0.014	100	8.8	LOS A	0.3	2.2	Short	40	0.0	NA
Approach	159	0.3		0.091		5.6	LOS A	0.7	4.7				
North: Lakeside Pde													
Lane 1	10	1.3	1141	0.009	100	8.8	LOS A	0.2	1.4	Full	160	0.0	0.0
Lane 2	92	1.1	698	0.132	100	15.8	LOS B	2.1	15.0	Short	35	0.0	NA
Approach	102	1.2		0.132		15.1	LOS B	2.1	15.0				
West: Jordan Springs Blvd													
Lane 1	61	5.0	466	0.131	100	35.2	LOS D	2.3	16.7	Short	100	0.0	NA
Lane 2	54	1.9	477	0.113	100	35.0	LOS C	2.0	14.3	Full	130	0.0	0.0
Approach	115	3.5		0.131		35.1	LOS D	2.3	16.7				
Intersection	376	1.5		0.132		17.2	LOS B	2.3	16.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
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.

PHASING SUMMARY

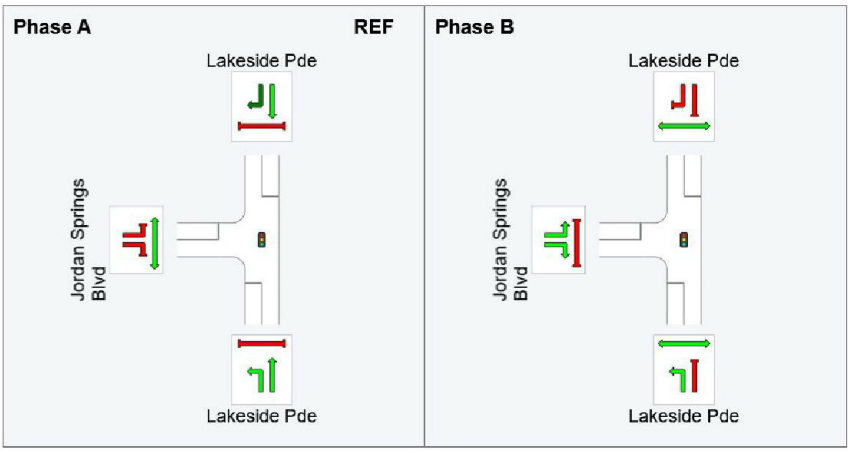
Site: 101 [I-28JordanSpringsBlvd-LakesideParade-AM - 2016 - Existing]

Jordan Springs Blvd-Lakeside Parade
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Movement Class: All Movement Classes
Input Sequence: A, B
Output Sequence: A, B

Phase Timing Results

Phase	A	B
Reference Phase	Yes	No
Phase Change Time (sec)	0	65
Green Time (sec)	59	29
Yellow Time (sec)	4	4
All-Red Time (sec)	2	2
Phase Time (sec)	65	35
Phase Split	65%	35%



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LANE SUMMARY

Site: 101 [I-28JordanSpringsBlvd-LakesideParade-PM - 2016 - Existing]

Jordan Springs Blvd-Lakeside Parade
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Lakeside Pde													
Lane 1	97	0.3	1575	0.062	100	5.2	LOS A	0.4	3.1	Full	240	0.0	0.0
Lane 2	8	0.0	858	0.009	100	16.5	LOS B	0.2	1.5	Short	40	0.0	NA
Approach	105	0.3		0.062		6.1	LOS A	0.4	3.1				
North: Lakeside Pde													
Lane 1	22	1.3	851	0.026	100	16.7	LOS B	0.6	4.2	Full	160	0.0	0.0
Lane 2	125	1.1	547	0.228	100	25.3	LOS C	4.0	28.2	Short	35	0.0	NA
Approach	147	1.2		0.228		24.0	LOS C	4.0	28.2				
West: Jordan Springs Blvd													
Lane 1	168	5.0	735	0.228	100	25.2	LOS C	5.3	38.7	Short	100	0.0	NA
Lane 2	155	1.9	751	0.206	100	24.9	LOS C	4.8	34.4	Full	130	0.0	0.0
Approach	323	3.5		0.228		25.0	LOS C	5.3	38.7				
Intersection	575	2.3		0.228		21.3	LOS C	5.3	38.7				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
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.

PHASING SUMMARY

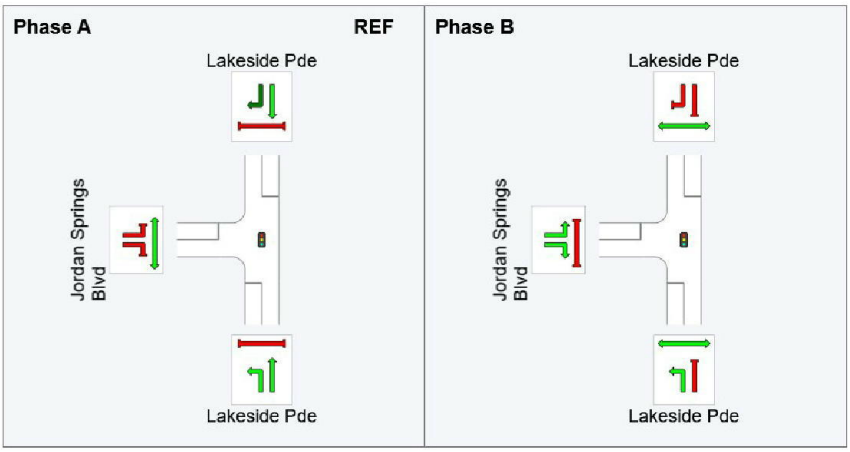
Site: 101 [I-28JordanSpringsBlvd-LakesideParade-PM - 2016 - Existing]

Jordan Springs Blvd-Lakeside Parade
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Movement Class: All Movement Classes
Input Sequence: A, B
Output Sequence: A, B

Phase Timing Results

Phase	A	B
Reference Phase	Yes	No
Phase Change Time (sec)	0	50
Green Time (sec)	44	44
Yellow Time (sec)	4	4
All-Red Time (sec)	2	2
Phase Time (sec)	50	50
Phase Split	50%	50%



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LANE SUMMARY

Site: 101 [I-28JordanSpringsBlvd-LakesideParade-AM - 2021 - Existing - Growth Only]

Jordan Springs Blvd-Lakeside Parade
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Lakeside Pde													
Lane 1	317	0.3	1575	0.201	100	5.3	LOS A	1.7	11.6	Full	240	0.0	0.0
Lane 2	35	0.0	1209	0.029	100	7.7	LOS A	0.6	4.5	Short	40	0.0	NA
Approach	352	0.3		0.201		5.6	LOS A	1.7	11.6				
North: Lakeside Pde													
Lane 1	22	1.3	1199	0.018	100	7.6	LOS A	0.4	2.8	Full	160	0.0	0.0
Lane 2	204	1.1	600	0.340	100	16.5	LOS B	5.2	37.0	Short	35	0.0	NA
Approach	226	1.2		0.340		15.6	LOS B	5.2	37.0				
West: Jordan Springs Blvd													
Lane 1	135	5.0	413	0.327	100	39.6	LOS D	5.6	40.6	Short	100	0.0	NA
Lane 2	120	1.9	422	0.285	100	39.1	LOS D	4.9	34.7	Full	130	0.0	0.0
Approach	255	3.5		0.327		39.4	LOS D	5.6	40.6				
Intersection	833	1.5		0.340		18.6	LOS B	5.6	40.6				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
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.

PHASING SUMMARY

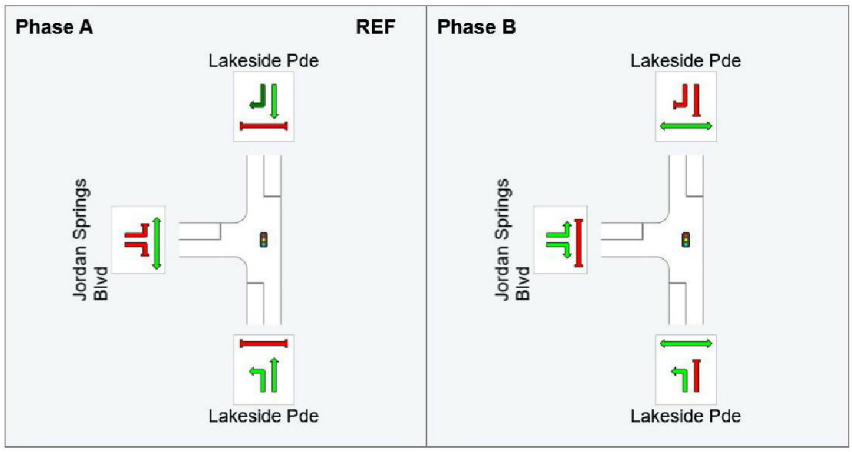
Site: 101 [I-28JordanSpringsBlvd-LakesideParade-AM - 2021 - Existing - Growth Only]

Jordan Springs Blvd-Lakeside Parade
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Movement Class: All Movement Classes
Input Sequence: A, B
Output Sequence: A, B

Phase Timing Results

Phase	A	B
Reference Phase	Yes	No
Phase Change Time (sec)	0	68
Green Time (sec)	62	26
Yellow Time (sec)	4	4
All-Red Time (sec)	2	2
Phase Time (sec)	68	32
Phase Split	68%	32%



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LANE SUMMARY

Site: 101 [I-28JordanSpringsBlvd-LakesideParade-PM - 2021 - Existing - Growth Only]

Jordan Springs Blvd-Lakeside Parade
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Lakeside Pde													
Lane 1	186	0.3	1575	0.118	100	5.3	LOS A	0.9	6.3	Full	240	0.0	0.0
Lane 2	15	0.0	897	0.017	100	15.4	LOS B	0.4	2.7	Short	40	0.0	NA
Approach	201	0.3		0.118		6.0	LOS A	0.9	6.3				
North: Lakeside Pde													
Lane 1	42	1.3	889	0.047	100	15.7	LOS B	1.1	7.8	Full	160	0.0	0.0
Lane 2	240	1.1	521	0.460	100	27.3	LOS C	8.5	60.2	Short	35	0.0	NA
Approach	282	1.2		0.460		25.6	LOS C	8.5	60.2				
West: Jordan Springs Blvd													
Lane 1	322	5.0	700	0.460	100	29.0	LOS C	11.7	85.2	Short	100	0.0	NA
Lane 2	298	1.9	715	0.417	100	28.5	LOS C	10.6	75.2	Full	130	0.0	0.0
Approach	620	3.5		0.460		28.8	LOS C	11.7	85.2				
Intersection	1103	2.3		0.460		23.8	LOS C	11.7	85.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
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.

PHASING SUMMARY

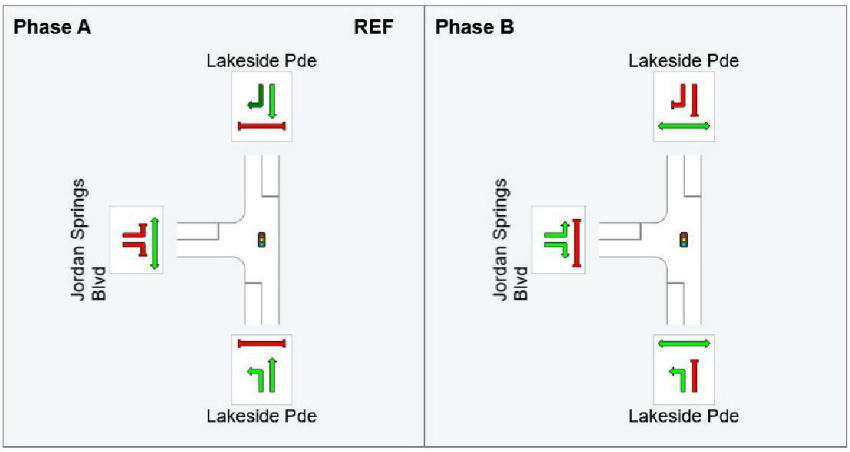
Site: 101 [I-28JordanSpringsBlvd-LakesideParade-PM - 2021 - Existing - Growth Only]

Jordan Springs Blvd-Lakeside Parade
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Two-Phase
Movement Class: All Movement Classes
Input Sequence: A, B
Output Sequence: A, B

Phase Timing Results

Phase	A	B
Reference Phase	Yes	No
Phase Change Time (sec)	0	52
Green Time (sec)	46	42
Yellow Time (sec)	4	4
All-Red Time (sec)	2	2
Phase Time (sec)	52	48
Phase Split	52%	48%



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APPENDIX B

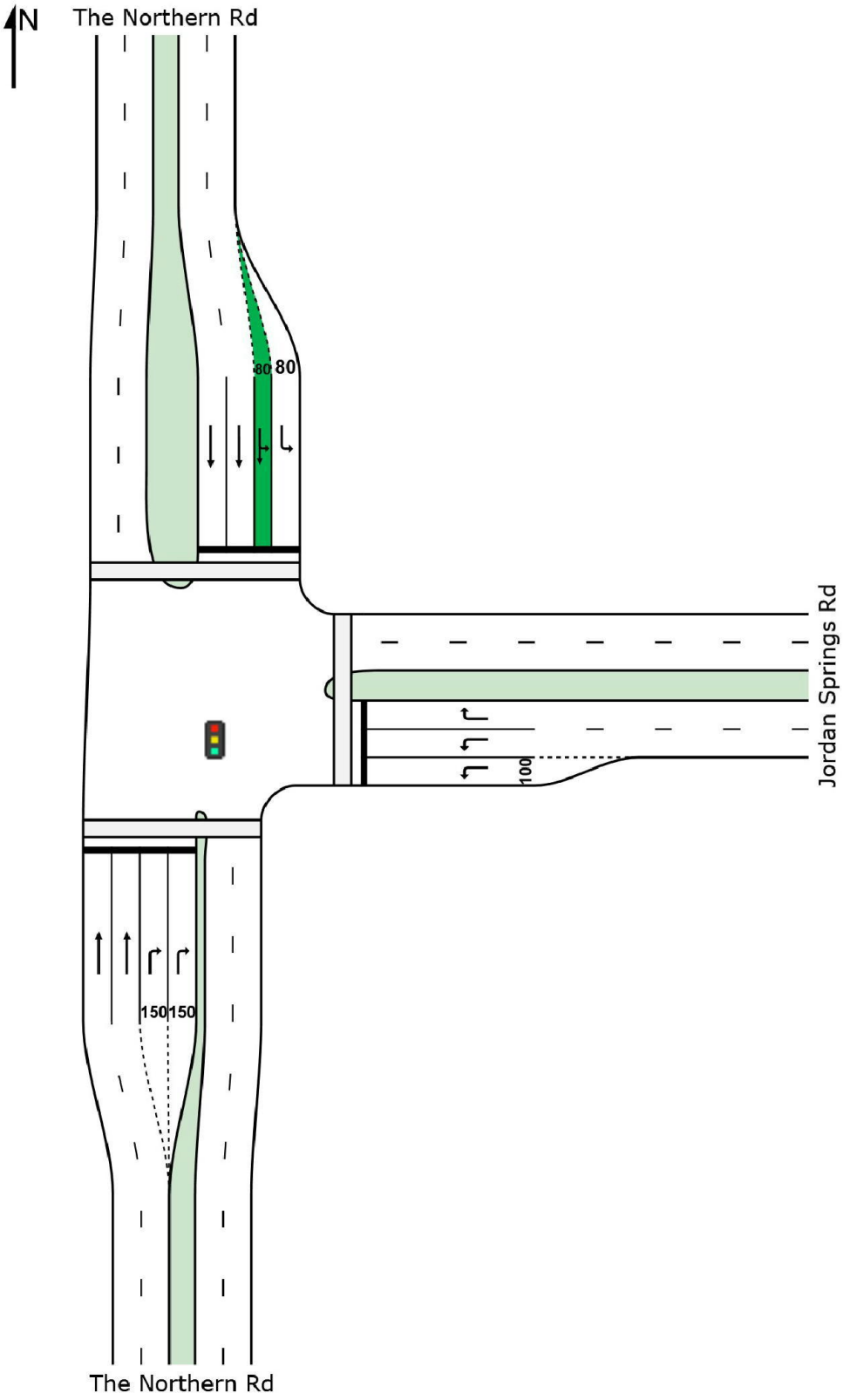
SIDRA OUTPUT – THE NORTHERN ROAD/JORDAN SPRINGS BOULEVARDE

Intersection performance summary of trips generated by Jordan Springs precinct only

SITE LAYOUT

Site: 1 [I-05TheNorthernRd-JordanSpringsBlvd-am - 2016 Existing]

The Northern Rd/Jordan Springs Blvd
Signals - Fixed Time Isolated



LANE SUMMARY

Site: 1 [I-05TheNorthernRd-JordanSpringsBlvd-am - 2016 Existing]

The Northern Rd/Jordan Springs Blvd
Signals - Fixed Time Isolated Cycle Time = 105 seconds (User-Given Phase Times)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: The Northern Rd													
Lane 1	422	7.9	1466	0.288	100	3.1	LOS A	5.7	42.9	Full	300	0.0	0.0
Lane 2	422	7.9	1466	0.288	100	3.1	LOS A	5.7	42.9	Full	300	0.0	0.0
Lane 3	87	4.6	223	0.391	100	53.8	LOS D	4.3	31.0	Short	150	0.0	NA
Lane 4	87	4.6	223	0.391	100	53.8	LOS D	4.3	31.0	Short	150	0.0	NA
Approach	1018	7.4		0.391		11.8	LOS A	5.7	42.9				
East: Jordan Springs Rd													
Lane 1	131	1.5	525	0.249	100	35.7	LOS C	5.2	36.5	Short	100	0.0	NA
Lane 2	131	1.5	525	0.249	100	35.7	LOS C	5.2	36.5	Full	151	0.0	0.0
Lane 3	32	3.1	156	0.206	100	54.8	LOS D	1.6	11.5	Full	151	0.0	0.0
Approach	293	1.7		0.249		37.8	LOS C	5.2	36.5				
North: The Northern Rd													
Lane 1	37	10.8	1018	0.036	100	16.0	LOS B	0.8	5.9	Short	80	0.0	NA
Lane 2	2	0.0	3603	0.001	100	11.7	LOS A	0.0	0.1	Short	80	0.0	NA
Lane 3	595	4.8	1171	0.508	100	11.8	LOS A	16.7	121.7	Full	500	0.0	0.0
Lane 4	595	4.8	1171	0.508	100	11.8	LOS A	16.7	121.7	Full	500	0.0	0.0
Approach	1229	5.0		0.508		11.9	LOS A	16.7	121.7				
Intersection	2540	5.6		0.508		14.9	LOS B	16.7	121.7				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
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.

PHASING SUMMARY

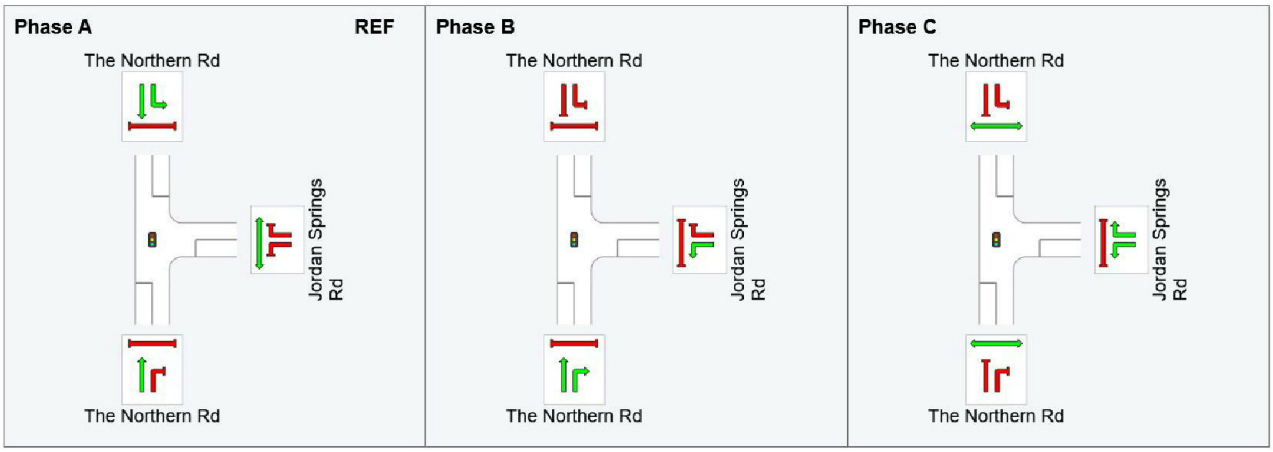
Site: 1 [I-05TheNorthernRd-JordanSpringsBlvd-am - 2016 Existing]

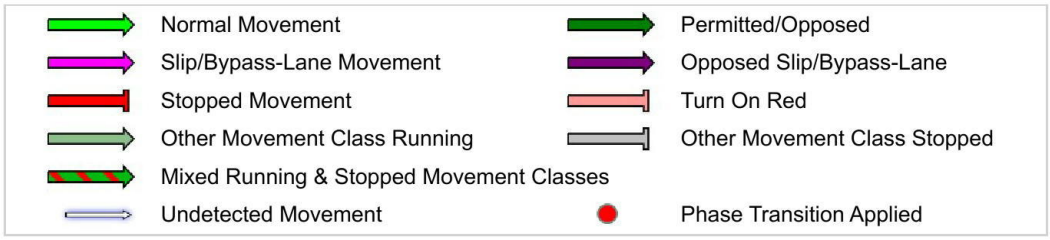
The Northern Rd/Jordan Springs Blvd
Signals - Fixed Time Isolated Cycle Time = 105 seconds (User-Given Phase Times)

Phase times specified by the user
Sequence: TCS 4396
Movement Class: All Movement Classes
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Reference Phase	Yes	No	No
Phase Change Time (sec)	0	70	88
Green Time (sec)	65	13	12
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	70	18	17
Phase Split	67%	17%	16%





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LANE SUMMARY

Site: 1 [I-05TheNorthernRd-JordanSpringsBlvd-pm - 2016 Existing]

The Northern Rd/Jordan Springs Blvd
Signals - Fixed Time Isolated Cycle Time = 102 seconds (User-Given Phase Times)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: The Northern Rd													
Lane 1	448	3.0	1425	0.314	100	4.6	LOS A	7.3	52.1	Full	300	0.0	0.0
Lane 2	448	3.0	1425	0.314	100	4.6	LOS A	7.3	52.1	Full	300	0.0	0.0
Lane 3	228	0.2	400	0.569	100	45.7	LOS D	10.3	72.3	Short	150	0.0	NA
Lane 4	228	0.2	400	0.569	100	45.7	LOS D	10.3	72.3	Short	150	0.0	NA
Approach	1350	2.1		0.569		18.4	LOS B	10.3	72.3				
East: Jordan Springs Rd													
Lane 1	141	1.1	777	0.181	100	24.3	LOS B	4.3	30.6	Short	100	0.0	NA
Lane 2	141	1.1	777	0.181	100	24.3	LOS B	4.3	30.6	Full	151	0.0	0.0
Lane 3	50	6.0	227	0.220	100	48.9	LOS D	2.3	17.0	Full	151	0.0	0.0
Approach	331	1.8		0.220		28.0	LOS B	4.3	30.6				
North: The Northern Rd													
Lane 1	63	4.8	810	0.078	100	23.3	LOS B	1.8	12.8	Short	80	0.0	NA
Lane 2	2	0.0	2760	0.001	100	18.3	LOS B	0.1	0.1	Short	80	0.0	NA
Lane 3	525	3.3	917	0.573	100	20.3	LOS B	18.6	133.9	Full	500	0.0	0.0
Lane 4	525	3.3	917	0.573	100	20.3	LOS B	18.6	133.9	Full	500	0.0	0.0
Approach	1115	3.4		0.573		20.5	LOS B	18.6	133.9				
Intersection	2796	2.6		0.573		20.4	LOS B	18.6	133.9				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
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.

PHASING SUMMARY

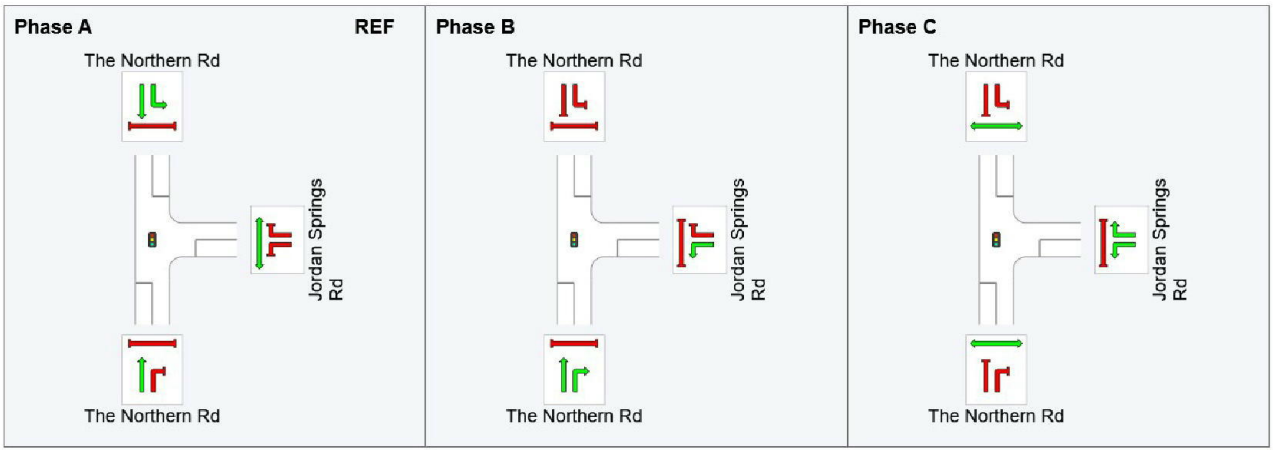
Site: 1 [I-05TheNorthernRd-JordanSpringsBlvd-pm - 2016 Existing]

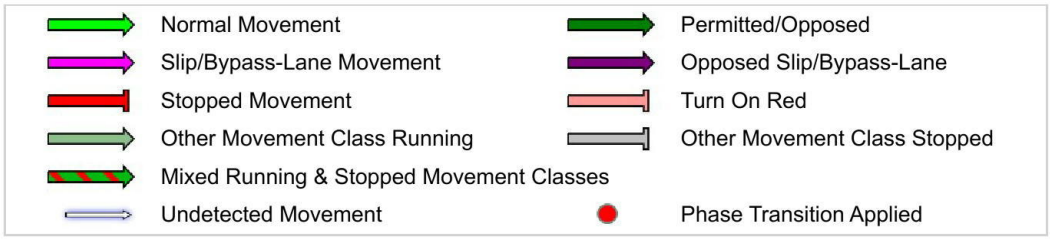
The Northern Rd/Jordan Springs Blvd
Signals - Fixed Time Isolated Cycle Time = 102 seconds (User-Given Phase Times)

Phase times specified by the user
Sequence: TCS 4396
Movement Class: All Movement Classes
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Reference Phase	Yes	No	No
Phase Change Time (sec)	0	54	81
Green Time (sec)	49	22	16
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	54	27	21
Phase Split	53%	26%	21%





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LANE SUMMARY

Site: 1 [I-05TheNorthernRd-JordanSpringsBlvd-am - 2021 - Growth Only]

The Northern Rd/Jordan Springs Blvd
Signals - Fixed Time Isolated Cycle Time = 105 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: The Northern Rd													
Lane 1	458	7.9	1413	0.324	100	4.2	LOS A	7.3	54.2	Full	300	0.0	0.0
Lane 2	458	7.9	1413	0.324	100	4.2	LOS A	7.3	54.2	Full	300	0.0	0.0
Lane 3	193	4.6	325	0.593	100	50.1	LOS D	9.3	67.7	Short	150	0.0	NA
Lane 4	193	4.6	325	0.593	100	50.1	LOS D	9.3	67.7	Short	150	0.0	NA
Approach	1301	6.9		0.593		17.8	LOS B	9.3	67.7				
East: Jordan Springs Rd													
Lane 1	290	1.5	682	0.424	100	31.0	LOS C	11.0	78.4	Short	100	0.0	NA
Lane 2	290	1.5	682	0.424	100	31.0	LOS C	11.0	78.4	Full	151	0.0	0.0
Lane 3	71	3.1	208	0.342	100	52.5	LOS D	3.5	25.0	Full	151	0.0	0.0
Approach	650	1.7		0.424		33.4	LOS C	11.0	78.4				
North: The Northern Rd													
Lane 1	80	10.8	870	0.092	100	20.8	LOS B	2.1	16.0	Short	80	0.0	NA
Lane 2	3	0.0	3042	0.001	100	16.9	LOS B	0.1	0.2	Short	80	0.0	NA
Lane 3	623	4.8	1008[1]	0.618	100	18.2	LOS B	22.0	160.3	Full	500	0.0	0.0
Lane 4	623	4.8	1009	0.618	100	18.2	LOS B	22.0	160.3	Full	500	0.0	0.0
Approach	1329	5.1		0.618		18.3	LOS B	22.0	160.3				
Intersection	3280	5.2		0.618		21.1	LOS B	22.0	160.3				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
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.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the adjacent full-length lanes. Some upstream delays at entry to short lanes are not included.

PHASING SUMMARY

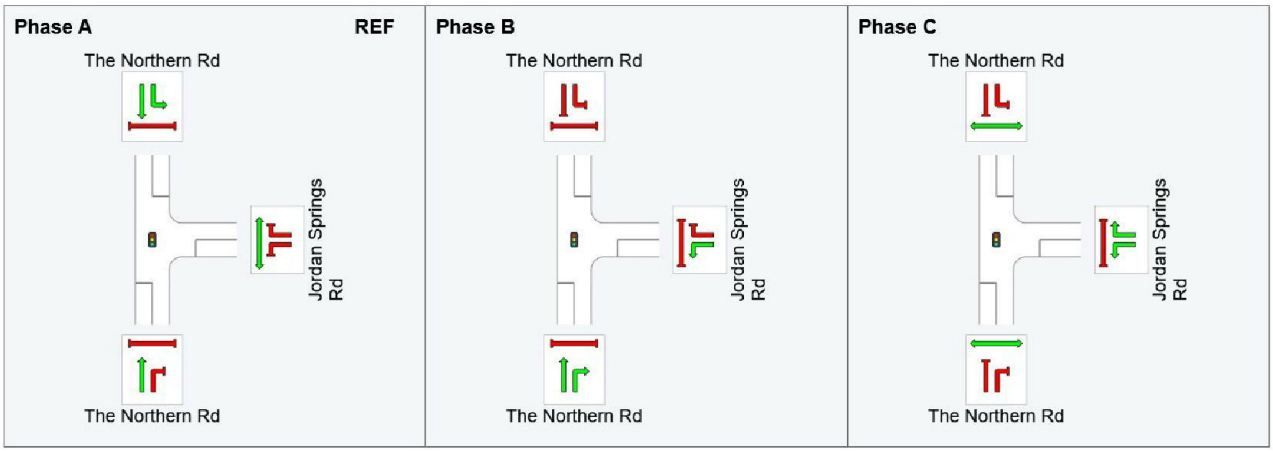
Site: 1 [I-05TheNorthernRd-JordanSpringsBlvd-am - 2021 - Growth Only]

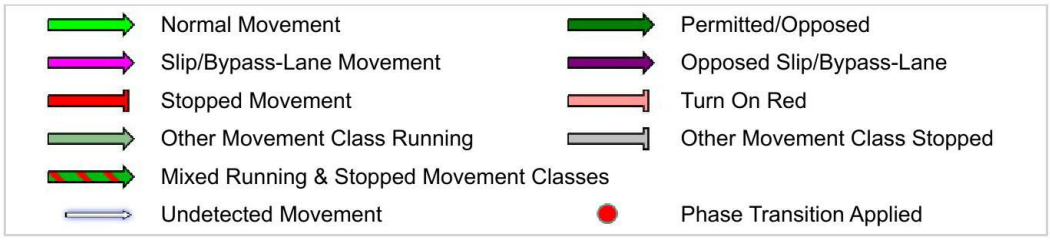
The Northern Rd/Jordan Springs Blvd
Signals - Fixed Time Isolated Cycle Time = 105 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: TCS 4396
Movement Class: All Movement Classes
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Reference Phase	Yes	No	No
Phase Change Time (sec)	0	61	85
Green Time (sec)	56	19	15
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	61	24	20
Phase Split	58%	23%	19%





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LANE SUMMARY

Site: 1 [I-05TheNorthernRd-JordanSpringsBlvd-pm - 2021 - Growth Only]

The Northern Rd/Jordan Springs Blvd
Signals - Fixed Time Isolated Cycle Time = 102 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: The Northern Rd													
Lane 1	491	3.0	1444	0.340	100	4.3	LOS A	7.9	56.7	Full	300	0.0	0.0
Lane 2	491	3.0	1444	0.340	100	4.3	LOS A	7.9	56.7	Full	300	0.0	0.0
Lane 3	437	0.2	600	0.728	100	40.1	LOS C	19.6	137.3	Short	150	0.0	NA
Lane 4	437	0.2	600	0.728	100	40.1	LOS C	19.6	137.3	Short	150	0.0	NA
Approach	1855	1.7		0.728		21.2	LOS B	19.6	137.3				
East: Jordan Springs Rd													
Lane 1	270	1.1	958	0.281	100	19.2	LOS B	7.5	52.7	Short	100	0.0	NA
Lane 2	270	1.1	958	0.281	100	19.2	LOS B	7.5	52.7	Full	151	0.0	0.0
Lane 3	96	6.0	210	0.458	100	51.7	LOS D	4.6	34.2	Full	151	0.0	0.0
Approach	635	1.8		0.458		24.1	LOS B	7.5	52.7				
North: The Northern Rd													
Lane 1	119	4.8	634	0.188	100	30.9	LOS C	4.1	29.8	Short	80	0.0	NA
Lane 2	3	0.0	2138	0.001	100	25.3	LOS B	0.1	0.2	Short	80	0.0	NA
Lane 3	545	3.3	730[1]	0.747	100	29.8	LOS C	23.7	170.5	Full	500	0.0	0.0
Lane 4	545	3.3	730	0.747	100	29.8	LOS C	23.7	170.6	Full	500	0.0	0.0
Approach	1212	3.5		0.747		29.9	LOS C	23.7	170.6				
Intersection	3702	2.3		0.747		24.5	LOS B	23.7	170.6				

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
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.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the adjacent full-length lanes. Some upstream delays at entry to short lanes are not included.

PHASING SUMMARY

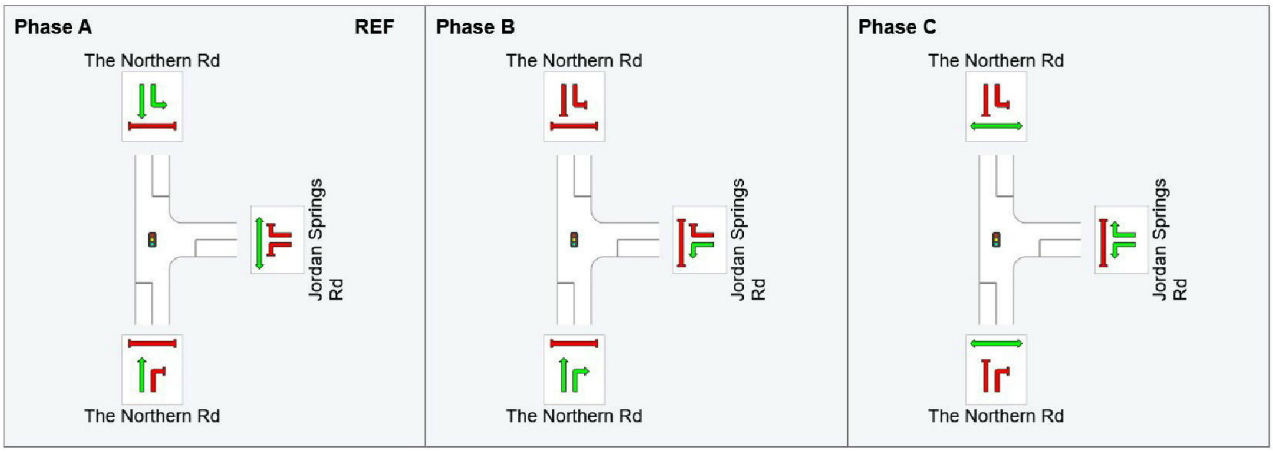
Site: 1 [I-05TheNorthernRd-JordanSpringsBlvd-pm - 2021 - Growth Only]

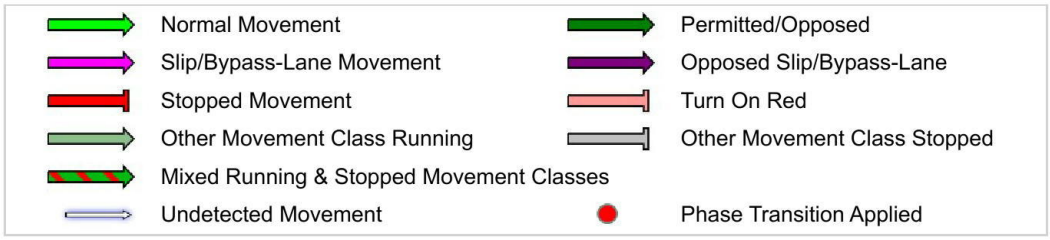
The Northern Rd/Jordan Springs Blvd
Signals - Fixed Time Isolated Cycle Time = 102 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: TCS 4396
Movement Class: All Movement Classes
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Reference Phase	Yes	No	No
Phase Change Time (sec)	0	44	82
Green Time (sec)	39	33	15
Yellow Time (sec)	3	3	3
All-Red Time (sec)	2	2	2
Phase Time (sec)	44	38	20
Phase Split	43%	37%	20%





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APPENDIX C

SIDRA OUTPUT – JORDAN SPRINGS BOULEVARDE/LAKESIDE PARADE

Intersection performance summary of trips generated by Jordan Springs and Jordan Springs East precinct

MOVEMENT SUMMARY

Site: 101 [I-28JordanSpringsBlvd-LakesideParade-AM - 2021 - Existing with 3D Low]

Jordan Springs Blvd-Lakeside Parade
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Lakeside Pde											
1	L2	559	0.3	0.355	5.5	LOS A	3.5	24.4	0.23	0.61	40.8
2	T1	84	0.0	0.067	7.1	LOS A	1.5	10.5	0.40	0.32	40.4
Approach		643	0.3	0.355	5.7	LOS A	3.5	24.4	0.25	0.57	40.7
North: Lakeside Pde											
8	T1	40	1.3	0.032	6.9	LOS A	0.7	4.9	0.38	0.29	40.6
9	R2	204	1.1	0.465	17.9	LOS B	5.9	41.4	0.62	0.75	26.7
Approach		244	1.2	0.465	16.1	LOS B	5.9	41.4	0.58	0.67	28.8
West: Jordan Springs Blvd											
10	L2	135	5.0	0.358	41.6	LOS D	5.7	41.8	0.90	0.78	17.1
12	R2	172	1.9	0.447	42.3	LOS D	7.5	53.0	0.92	0.80	19.4
Approach		307	3.2	0.447	42.0	LOS D	7.5	53.0	0.91	0.79	18.5
All Vehicles		1194	1.2	0.465	17.1	LOS B	7.5	53.0	0.49	0.65	29.7

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	37.9	LOS D	0.1	0.1	0.87	0.87
P3	North Full Crossing	50	34.5	LOS D	0.1	0.1	0.83	0.83
P4	West Full Crossing	50	10.6	LOS B	0.1	0.1	0.46	0.46
All Pedestrians		150	27.7	LOS C			0.72	0.72

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 [I-28JordanSpringsBlvd-LakesideParade-PM - 2021 - Existing with 3D Low]

Jordan Springs Blvd-Lakeside Parade
Signals - Fixed Time Isolated Cycle Time = 100 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Lakeside Pde											
1	L2	274	0.3	0.174	5.3	LOS A	1.4	9.9	0.19	0.59	41.0
2	T1	33	0.0	0.046	21.4	LOS C	1.0	7.1	0.67	0.50	29.1
Approach		307	0.3	0.174	7.0	LOS A	1.4	9.9	0.24	0.58	39.1
North: Lakeside Pde											
8	T1	134	1.3	0.187	22.8	LOS C	4.4	31.1	0.71	0.58	28.3
9	R2	240	1.1	0.666	36.6	LOS D	10.4	73.2	0.90	0.84	18.3
Approach		374	1.2	0.666	31.7	LOS C	10.4	73.2	0.84	0.75	21.6
West: Jordan Springs Blvd											
10	L2	322	5.0	0.374	22.2	LOS C	9.9	72.2	0.68	0.76	24.4
12	R2	574	1.9	0.652	25.7	LOS C	21.1	150.2	0.81	0.83	25.4
Approach		896	3.0	0.652	24.4	LOS C	21.1	150.2	0.77	0.80	25.1
All Vehicles		1577	2.0	0.666	22.8	LOS C	21.1	150.2	0.68	0.75	26.1

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	18.0	LOS B	0.1	0.1	0.60	0.60
P3	North Full Crossing	50	15.7	LOS B	0.1	0.1	0.56	0.56
P4	West Full Crossing	50	26.7	LOS C	0.1	0.1	0.73	0.73
All Pedestrians		150	20.2	LOS C			0.63	0.63

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.

APPENDIX D

SIDRA OUTPUT – INTERSECTION OF ROAD NO.1 AND ROAD NO.2 IN JORDAN SPRINGS EAST

Intersection performance summary of trips generated by Jordan Springs East precinct

MOVEMENT SUMMARY

Site: I-Int_2 [AM_Road No.1, No.2 - With 3D Low]

Intersection of Road No.1, No.2
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Road No.2											
1	L2	185	3.0	0.383	5.1	LOS A	2.5	18.0	0.46	0.63	51.4
2	T1	1	3.0	0.383	5.3	LOS A	2.5	18.0	0.46	0.63	49.7
3	R2	268	3.0	0.383	9.9	LOS A	2.5	18.0	0.46	0.63	50.3
Approach		454	3.0	0.383	8.0	LOS A	2.5	18.0	0.46	0.63	50.8
East: Road No.1											
4	L2	43	3.0	0.136	4.3	LOS A	0.7	5.4	0.26	0.55	50.2
5	T1	46	3.0	0.136	4.4	LOS A	0.7	5.4	0.26	0.55	50.9
6	R2	85	3.0	0.136	9.1	LOS A	0.7	5.4	0.26	0.55	27.6
Approach		174	3.0	0.136	6.7	LOS A	0.7	5.4	0.26	0.55	40.0
North: Road No.2											
7	L2	168	3.0	0.223	5.6	LOS A	1.3	9.4	0.52	0.64	41.4
8	T1	1	3.0	0.223	5.8	LOS A	1.3	9.4	0.52	0.64	51.1
9	R2	59	3.0	0.223	10.4	LOS A	1.3	9.4	0.52	0.64	49.8
Approach		228	3.0	0.223	6.9	LOS A	1.3	9.4	0.52	0.64	44.3
West: Road No.1											
10	L2	51	3.0	0.086	5.7	LOS A	0.5	3.3	0.50	0.62	47.8
11	T1	8	3.0	0.086	5.8	LOS A	0.5	3.3	0.50	0.62	50.5
12	R2	26	3.0	0.086	10.5	LOS A	0.5	3.3	0.50	0.62	53.4
Approach		85	3.0	0.086	7.2	LOS A	0.5	3.3	0.50	0.62	50.3
All Vehicles		941	3.0	0.383	7.4	LOS A	2.5	18.0	0.44	0.62	47.9

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: I-Int_2 [PM_Road No.1, No.2 - With 3D Low]

Intersection of Road No.1, No.2
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Road No.2											
1	L2	59	3.0	0.171	5.6	LOS A	1.0	6.9	0.50	0.66	51.0
2	T1	1	3.0	0.171	5.7	LOS A	1.0	6.9	0.50	0.66	49.2
3	R2	114	3.0	0.171	10.4	LOS A	1.0	6.9	0.50	0.66	49.8
Approach		174	3.0	0.171	8.7	LOS A	1.0	6.9	0.50	0.66	50.3
East: Road No.1											
4	L2	131	3.0	0.344	4.8	LOS A	2.4	17.1	0.43	0.61	49.0
5	T1	24	3.0	0.344	4.9	LOS A	2.4	17.1	0.43	0.61	49.5
6	R2	262	3.0	0.344	9.6	LOS A	2.4	17.1	0.43	0.61	26.8
Approach		417	3.0	0.344	7.8	LOS A	2.4	17.1	0.43	0.61	36.0
North: Road No.2											
7	L2	122	3.0	0.137	5.4	LOS A	0.7	5.4	0.47	0.59	42.5
8	T1	1	3.0	0.137	5.5	LOS A	0.7	5.4	0.47	0.59	51.9
9	R2	19	3.0	0.137	10.2	LOS A	0.7	5.4	0.47	0.59	50.7
Approach		142	3.0	0.137	6.0	LOS A	0.7	5.4	0.47	0.59	44.1
West: Road No.1											
10	L2	261	3.0	0.442	6.6	LOS A	3.0	21.6	0.66	0.73	46.9
11	T1	37	3.0	0.442	6.8	LOS A	3.0	21.6	0.66	0.73	49.6
12	R2	131	3.0	0.442	11.4	LOS A	3.0	21.6	0.66	0.73	52.7
Approach		429	3.0	0.442	8.1	LOS A	3.0	21.6	0.66	0.73	49.4
All Vehicles		1162	3.0	0.442	7.8	LOS A	3.0	21.6	0.53	0.66	44.4

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.

APPENDIX E

SIDRA OUTPUT – INTERSECTION OF ROAD NO.1 AND ROAD NO.13 IN JORDAN SPRINGS EAST

Intersection performance summary of trips generated by Jordan Springs East precinct

MOVEMENT SUMMARY

Site: I-Int_2 [AM_Road No.1, No.13 - With 3D Low]

Intersection of Road No.1, No.13
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Road No.13											
1	L2	73	3.0	0.192	5.0	LOS A	1.1	7.8	0.41	0.61	51.6
2	T1	20	3.0	0.192	5.1	LOS A	1.1	7.8	0.41	0.61	50.0
3	R2	122	3.0	0.192	9.8	LOS A	1.1	7.8	0.41	0.61	50.5
Approach		215	3.0	0.192	7.7	LOS A	1.1	7.8	0.41	0.61	50.9
East: Road No.1											
4	L2	82	3.0	0.219	4.8	LOS A	1.3	9.1	0.39	0.50	51.3
5	T1	168	3.0	0.219	5.0	LOS A	1.3	9.1	0.39	0.50	52.3
6	R2	5	3.0	0.219	9.6	LOS A	1.3	9.1	0.39	0.50	28.0
Approach		255	3.0	0.219	5.0	LOS A	1.3	9.1	0.39	0.50	51.5
North: Road No.13											
7	L2	31	3.0	0.076	7.1	LOS A	0.4	3.0	0.63	0.69	38.9
8	T1	6	3.0	0.076	7.2	LOS A	0.4	3.0	0.63	0.69	49.0
9	R2	25	3.0	0.076	11.9	LOS A	0.4	3.0	0.63	0.69	47.6
Approach		62	3.0	0.076	9.1	LOS A	0.4	3.0	0.63	0.69	44.2
West: Road No.1											
10	L2	6	3.0	0.376	4.8	LOS A	2.6	18.7	0.42	0.55	47.9
11	T1	322	3.0	0.376	5.0	LOS A	2.6	18.7	0.42	0.55	50.6
12	R2	137	3.0	0.376	9.6	LOS A	2.6	18.7	0.42	0.55	53.4
Approach		465	3.0	0.376	6.3	LOS A	2.6	18.7	0.42	0.55	51.6
All Vehicles		997	3.0	0.376	6.5	LOS A	2.6	18.7	0.42	0.56	51.1

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: I-Int_2 [PM_Road No.1, No.13 - With 3D Low]

Intersection of Road No.1, No.13
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Road No.13											
1	L2	81	3.0	0.315	6.9	LOS A	2.0	14.4	0.67	0.76	50.3
2	T1	25	3.0	0.315	7.1	LOS A	2.0	14.4	0.67	0.76	48.2
3	R2	171	3.0	0.315	11.7	LOS A	2.0	14.4	0.67	0.76	48.9
Approach		277	3.0	0.315	9.9	LOS A	2.0	14.4	0.67	0.76	49.3
East: Road No.1											
4	L2	107	3.0	0.459	5.0	LOS A	3.5	25.3	0.47	0.52	50.7
5	T1	439	3.0	0.459	5.1	LOS A	3.5	25.3	0.47	0.52	51.6
6	R2	24	3.0	0.459	9.7	LOS A	3.5	25.3	0.47	0.52	27.7
Approach		570	3.0	0.459	5.3	LOS A	3.5	25.3	0.47	0.52	50.5
North: Road No.13											
7	L2	10	3.0	0.021	5.7	LOS A	0.1	0.7	0.49	0.59	40.7
8	T1	2	3.0	0.021	5.8	LOS A	0.1	0.7	0.49	0.59	50.4
9	R2	8	3.0	0.021	10.5	LOS A	0.1	0.7	0.49	0.59	49.1
Approach		20	3.0	0.021	7.6	LOS A	0.1	0.7	0.49	0.59	45.9
West: Road No.1											
10	L2	29	3.0	0.220	5.2	LOS A	1.3	9.6	0.46	0.62	46.6
11	T1	68	3.0	0.220	5.3	LOS A	1.3	9.6	0.46	0.62	49.2
12	R2	141	3.0	0.220	9.9	LOS A	1.3	9.6	0.46	0.62	52.4
Approach		238	3.0	0.220	8.0	LOS A	1.3	9.6	0.46	0.62	51.1
All Vehicles		1105	3.0	0.459	7.1	LOS A	3.5	25.3	0.52	0.61	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.