TRAFFIC IMPACT ASSESSMENT

REPORT

PREPARED FOR Glenmore Holdings (Aust) Pty Ltd

12 DECEMBER 2014
R12394
ORIGINAL
CIVIL

calibre CONSULTING

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/84-2014

Dated: 15 September 2015

COMMERCIAL IN CONFIDENCE

Calibre Consulting
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ROCKHAMPTON QLD 4700

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DOCUMENT CONTROL

R12394

Issue	Date	Issue Details	Author	Checked	Approved
A	12 DEC 2014	RRC IRR	LM	GS	GRAHAM SCOTT – RPEQ 2412

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

This report has been prepared for Glenmore Holdings (Aust.) Pty Ltd in response to the Rockhampton Regional Council (RRC) Information Request dated 22 May 2014. The notice has been issued in relation to Riverside Estate Stages 9-16 Material Change of Use (MCU) and Reconfiguring of Lot (ROL) application D/84-2014. This Traffic Impact Assessment (TIA) aims to assess specific conditions 9.2 of the Information Request, providing an intersection analysis of the Belmont Road / Birkbeck Drive / Alexandra Street Intersection.

2 BACKGROUND

The proposed development, Riverside Estate – Stages 9-16, is located upon Belmont Road, Parkhurst (shown below).

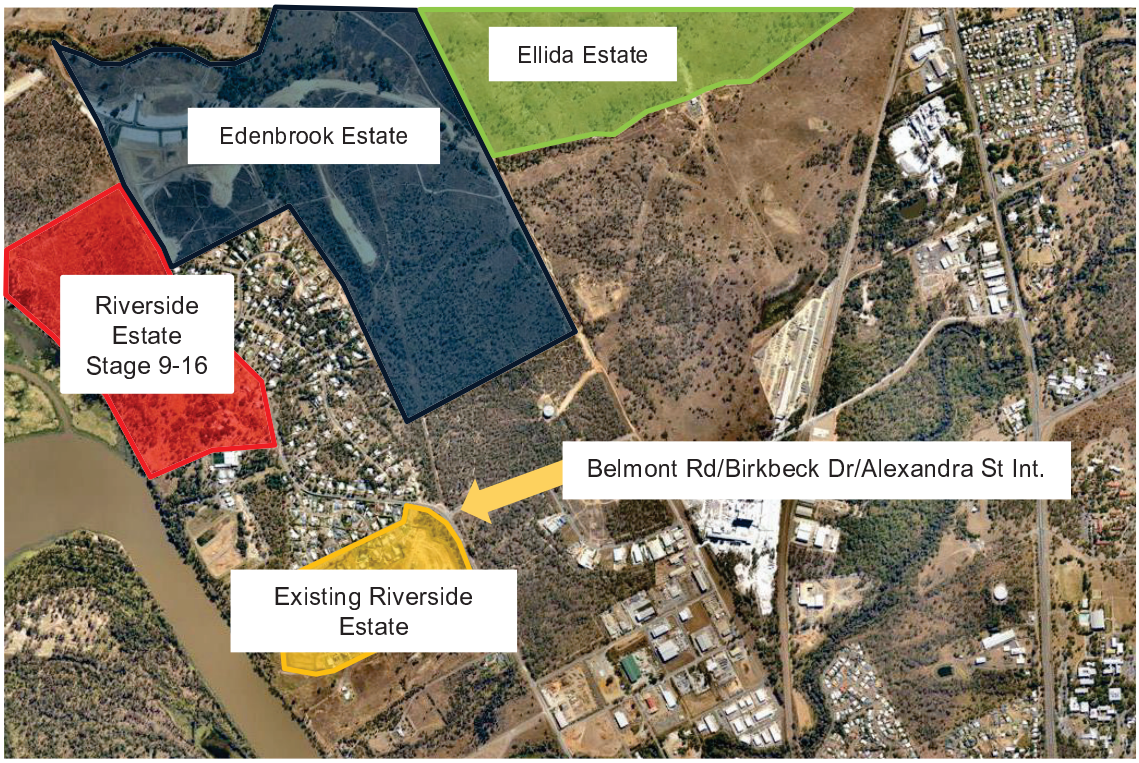


Figure 2-1: Locality Plan

The proposal includes the creation of 201 residential allotments plus Public Use Land (PUL), as shown on Capricorn Survey Group Drawing 5892-01-CPT (G), attached in Appendix A. In addition to the future Riverside Estate Stages 9-16, two additional nearby subdivisions (Edenbrook Estate and Ellida Estate) are likely to contribute a portion of their traffic towards the subject intersection.

3 TRAFFIC GENERATION & ASSUMPTIONS

3.1 EXISTING TRAFFIC GENERATION

Existing traffic generation for the Belmont Road/ Birkbeck Road/ Alexandra Street Intersection was established through an onsite traffic count completed by Calibre Consulting on the afternoon and morning of 2nd and 3rd December (respectively).

Utilising the aforementioned traffic count data, the following existing peak hours were established:

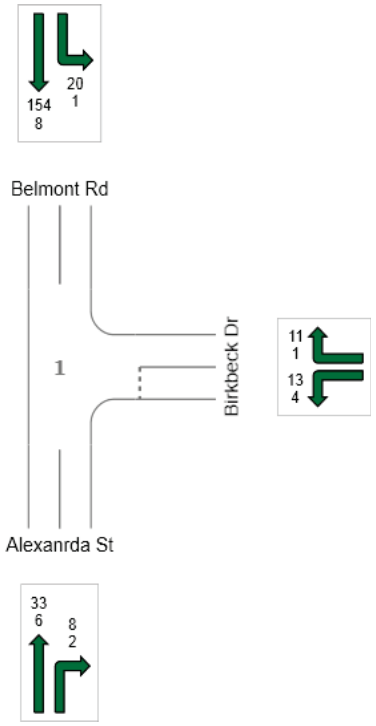


Figure 3-1: AM Peak Hour Traffic Volumes.

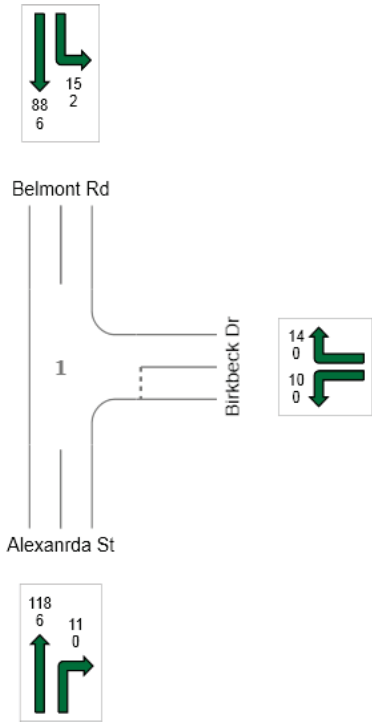


Figure 3-2: PM Peak Hour Traffic Volumes.

As per the Item 9.2 of the Rockhampton Regional Council Information Request, the additional volumes generated by the development of Edenbrook and Ellida Estates are to be considered within this analysis. Due to the unavailability of the traffic analysis associated with these two developments an overly conservative growth factor of 5% per year (compounding) has been assumed. This equates to approximately 9% per year lineal growth.

3.2 DEVELOPMENT TRAFFIC GENERATION

Traffic generation from the proposed developments (Riverside Estate Stages 9-16) have been calculated through the adoption of the following yields, in accordance with the RTA Guide to Traffic Generating Developments. Assumptions include:

Low Density Residential

- Single dwelling per allotment
- 0.85 vehicle movements per dwelling during peak hour
- Daily traffic generation of 10 movements per dwelling
- 2% Heavy Vehicles (HV)

From the above assumptions, a maximum of 171 peak hour movements have been created. Of the peak hour movements created, the following assumptions have been assumed in establishing intersection splits:

- 94% of generated traffic will utilise Alexandra Street to reach their peak hour destination with 6% travelling along Birkbeck Drive.
- 70% of generated traffic movements will exit the proposed estate during the AM peak hour with 30% returning. This assumption will be mirrored during the PM peak hour.

Utilising the above assumptions, the peak hour movements in **Table 3-1** were established.

Time	Belmont Road				Birkbeck Drive		Alexandra Street	
	Left		Thru		Right		Thru	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
AM Peak	7.03	0.14	110.17	2.25	3.01	0.06	47.22	0.96
PM Peak	3.01	0.06	47.22	0.96	7.03	0.14	110.17	2.25

Table 3-1: Generated Traffic Splits

4 ANALYSIS

The following intersections have been analysed to assess the impacts upon the existing road infrastructure network by the introduction of traffic generated through the proposed development. The impact upon all intersections have been analysed using SIDRA Traffic Engineering Software Version 6.0.

4.1 EXISTING INTERSECTION – BELMONT RD / BIRKBECK DR / ALEXANDRA STREET INTERSECTION

The existing intersection in question, located in Parkhurst, will provide for the majority of all generated traffic. The layout is made up of the major legs heading approximately North/South with a secondary leg from the East, controlled by give way.

The speed environment of the intersection 60km/h on all legs with 3.5m wide lanes (one each way) on the major legs and approximately 6.0m (average) lanes on the secondary leg (Birkbeck Drive).

The intersection layout adopted for the SIDRA intersection analysis is presented below.

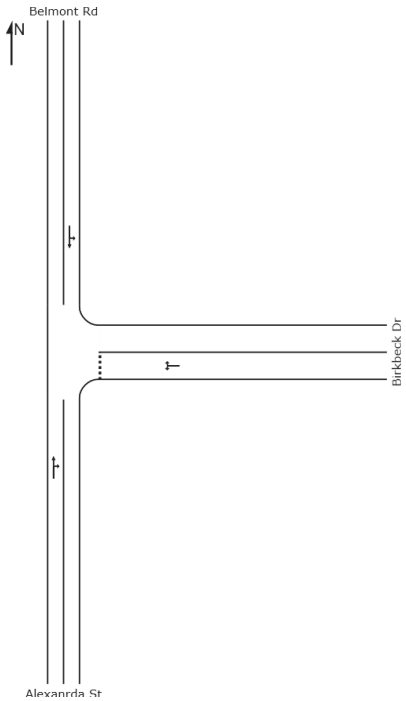


Figure 4-1: Adopted Intersection Layout

4.2 Sidra Input & Development Assumptions

In order to appropriately assess the impact of the proposed development upon the existing road network, the following assumptions have been made:

- The first stage will not be delivered until 2017 with the last stage being delivered in 2025 (approximately 25 lots per year).
- A final year analysis has been completed for the year 2035 (final year plus 10 years).
- A compound growth rate of 5% (compounding) has been assumed and applied against the existing traffic, to account for nearby development.

From the above assumptions, the following scenarios were analysed:

1) AM Peak – 2017 (3 Years Background Growth, No Development Generated Traffic)
2) AM Peak – 2015 (11 Years Background Growth Plus Development Generated Traffic)
3) AM Peak – 2035 (21 Years Background Growth Plus Development Generated Traffic)

4) PM Peak – 2017 (3 Years Background Growth, No Development Generated Traffic)
5) PM Peak – 2025 (11 Years Background Growth Plus Development Generated Traffic)
6) PM Peak – 2035 (21 Years Background Growth Plus Development Generated Traffic)

Traffic volumes utilised in the above scenarios are attached in Appendix B.

5 RESULTS

Standard SIDRA Intersection Analysis is commonly utilised to evaluate an intersections degree of saturation, Level of Service (LOS), queues and average delays. Under a standard sign controlled intersection, the desired ultimate practical degree of saturation is 0.75 with a minimum LOS of D.

A SIDRA 6.0 intersection analysis has been conducted upon the Belmont Road/ Birkbeck Drive/ Alexandra Street intersection. Analysis results have been tabulated below with complete lane summaries attached in Appendix C.

Scenario	DOS	LOS	Average Queue (m)
AM Peak 2017 (Background)	0.118	B	1.6
AM Peak 2025 (Background + Generated)	0.239	B	4.8
AM Peak 2035 (Background + Generated)	0.348	B	9.0
PM Peak 2017 (Background)	0.088	A	3.5
PM Peak 2025 (Background + Generated)	0.192	B	9.5
PM Peak 2035 (Background + Generated)	0.278	B	16.6

Table 5-1: SIDRA Intersection Analysis Output Summary

As shown above, the subject intersection is expected to accept the proposed development generated traffic without any significant impacts to the existing intersection's performance.

6 TURN WARRANT ANALYSIS

A turn warrant analysis has been completed for the above mentioned peak hours. A summary of the required treatments are summarised below:

Scenario	Required Treatment	Peak Hour Required
2014 BASELINE	BAR, BAL	Both, Both
2017 (BACKGROUND GROWTH)	BAR, BAL	Both, Both
2025 (BACKGROUND GROWTH)	CHR(S), AUL(S)	Both, AM
2025 (BACKGROUND + GROWTH)	CHR(S), AUL(S)	Both, AM
2035 (BACKGROUND GROWTH)	CHR, AUL(S)	PM, Both
2035 (BACKGROUND + GENERATED)	CHR, AUL	Both, AM

Table 6-1: Turn Warrant Summary

From the above, it can be determined that:

- The existing turn treatments are unsatisfactory at 2014 traffic levels with no basic turn treatments being installed.
- Turn treatments will be required to be upgraded to include CHR(S) and AUL(S) auxiliary lanes for both 2025 scenarios. Therefore, the addition of development generated traffic has not triggered an upgrade under this scenario.
- Under the 2035 scenarios, a difference within the required turn treatments for pre and post development is identified. However, it is noted that the existing background traffic with 21 years growth is exceptionally close to requiring an AUL treatment. Back calculation has indicated that the addition of a single left turning movement during the base count would equate to an AUL treatment being required in the 2035 scenario. Given the influence of the other nearby estates (Edenbrook and Ellida Estates), it is reasonable to accept that the proposed development (Riverside Estate Stage 9-16) will not solely, if at all, trigger a requirement to upgrade the left turn treatment to Birkbeck Drive in the future.

7 DISCUSSION

7.1 TRUNK INFRASTRUCTURE

As per Rockhampton Regional Council Transport Network Infrastructure Map 86-3, dated December 2012, the proposed development is located outside of the Priority Infrastructure Area (PIA). It has been identified by RRC that Alexandra Street will be upgraded to varying degrees, including 'upgrade Alexandra Street between Wade Street and Birkbeck Drive to two lane Urban Sub Arterial' by 2031.

7.2 TRAFFIC GROWTH

As previously discussed, no traffic impact assessments were available for use to assess the impact of their development upon the Belmont Road / Birkbeck Drive / Alexandra Street Intersection. Therefore, to account for unforseen growth an annual growth rate of 5% (Compounding) was adopted. This equates to a lineal growth rate of approximately 9% between 2017 and 2035, which is considered overly conservative. Utilising the above rates, an increase in vehicle movements between the count year and final year of 466 movements was identified (excluding the proposed development generated traffic). At 0.85 peak hour trip per lot this equates to 548 Lots.

8 CONCLUSION

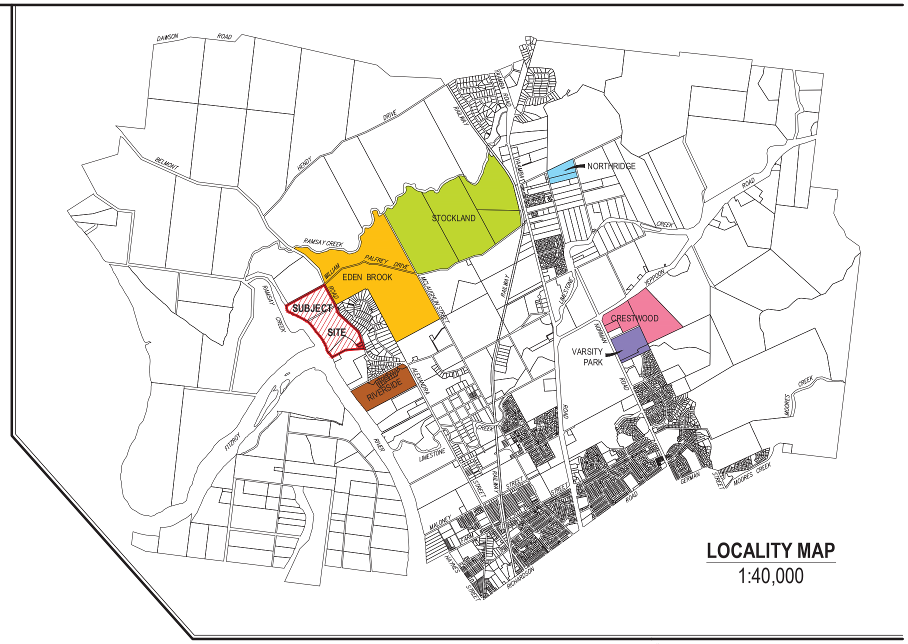
In conclusion, the intersection of Belmont Road, Birkbeck Drive and Alexandra Street has been analysed using SIDRA intersection analysis software. Incorporating an overly conservative growth factor it has been shown that the intersection can efficiently function beyond the year 2035 with the addition of the proposed development.

A turn warrant analysis has been undertaken and whilst the addition of development generated traffic has meant the upgrade from an AUL(S) to a AUL in the 2035 scenario, it would be unreasonable to attribute the entirety of this trigger towards the proposed development, if at all.

APPENDICES

APPENDIX A CAPRICORN SURVEY GROUP CONCEPT PLAN

Denotes Area Below Approximate Flood Level



LOCALITY MAP
1:40,000

IMPORTANT NOTE

This plan was prepared exclusively for M. Birkbeck for discussion purposes only and should not be used for any other purpose.

The areas shown hereon are subject to field survey and also to the requirements of council and any other authority which may have requirements under any relevant legislation.

In particular, no reliance should be placed on the information on this plan for any financial dealings involving the land.

This note is an integral part of this plan.

client
M. Birkbeck

project
**Belmont Road
Parkhurst
Riverside Estate
Stages 9-16**

plan of
**Concept Plan
(201 Lots + Public Use Land)**

rpd
**Lot 102 on RP860099,
Lot 129 on PL4021 & Lot 2 on RP609985
Parish of Murchison
County of Livingstone**

lga
Rockhampton Regional Council

rev	date	details	authorised
A	16-05-2013	Initial Issue	RJKF
B	13-08-2013	Image underlay added	RJKF
C	30-08-2013	Layout amended, underlay removed	RJKF
D	12-10-2013	Whole lot layout amended	RJKF
E	13-11-2013	Stage boundaries added	RJKF
F	6-12-2013	Layout and stage boundaries amended	RJKF
G	10-12-2013	Staging amended	RJKF

created

CSG capricorn survey group (cq)

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rockhampton qld 4700
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ABN 22 154 830 565

scale	datum
1:2500 @ A1	RRC 0.5m Contours
sheet no.	cad file
1 of 1	5892-01-CPT-G
plan no.	revision
5892-01-CPT	G

APPENDIX B INTERSECTION ANALYSIS TRAFFIC VOLUMES

Traffic Analysis

	Belmont Road				Birkbeck Drive				Alexandra Street			
	Left		Thru		Left		Right		Thru		Right	
Time	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
AM Peak												
2014 Baseline	20	1	154	8	13	4	11	1	33	6	8	2
2017 (Background Growth)	23.2	1.2	178.3	9.3	15.0	4.6	12.7	1.2	38.2	6.9	9.3	2.3
2025 (Background Growth)	34.2	1.7	263.4	13.7	22.2	6.8	18.8	1.7	56.4	10.3	13.7	3.4
Ultimate Development Generated Traffic	7.0	0.1	110.2	2.2	0.0	0.0	3.0	0.1	47.2	1.0	0.0	0.0
2025 (Background + Generated)	41.2	1.9	373.6	15.9	22.2	6.8	21.8	1.8	103.7	11.2	13.7	3.4
2035 (Background Growth)	55.7	2.8	429.0	22.3	36.2	11.1	30.6	2.8	91.9	16.7	22.3	5.6
2035 (Background + Generated)	62.8	2.9	539.2	24.5	36.2	11.1	33.7	2.8	139.2	17.7	22.3	5.6

	Belmont Road				Birkbeck Drive				Alexandra Street			
	Left		Thru		Left		Right		Thru		Right	
Time	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy
PM Peak												
2014 Baseline	15	2	88	6	10	0	14	0	118	6	11	0
2017 (Background Growth)	17.4	2.3	101.9	6.9	11.6	0.0	16.2	0.0	136.6	6.9	12.7	0.0
2025 (Background Growth)	25.7	3.4	150.5	10.3	17.1	0.0	23.9	0.0	201.8	10.3	18.8	0.0
Ultimate Development Generated Traffic	3.0	0.1	47.2	1.0	0.0	0.0	7.0	0.1	110.2	2.2	0.0	0.0
2025 (Background + Generated)	28.7	3.5	197.7	11.2	17.1	0.0	31.0	0.1	312.0	12.5	18.8	0.0
2035 (Background Growth)	41.8	5.6	245.2	16.7	27.9	0.0	39.0	0.0	328.7	16.7	30.6	0.0
2035 (Background + Generated)	44.8	5.6	292.4	17.7	27.9	0.0	46.0	0.1	438.9	19.0	30.6	0.0

APPENDIX C SIDRA OUTPUT

LANE SUMMARY

Site: AM Peak - 2017 Background

New Site
Giveway / Yield (Two-Way)

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: Alexanrda St													
Lane 1	60	16.2	1642	0.036	100	2.8	LOS A	0.2	1.6	Full	500	0.0	0.0
Approach	60	16.2		0.036		2.8	NA	0.2	1.6				
East: Birkbeck Dr													
Lane 1	35	17.3	1084	0.033	100	10.1	LOS B	0.1	0.9	Full	500	0.0	0.0
Approach	35	17.3		0.033		10.1	LOS B	0.1	0.9				
North: Belmont Rd													
Lane 1	223	5.0	1897	0.118	100	1.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	223	5.0		0.118		1.1	NA	0.0	0.0				
Intersection	318	8.4		0.118		2.4	NA	0.2	1.6				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road 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.

SIDRA INTERSECTION 6

LANE SUMMARY

Site: AM Peak - 2025 Background + Generation

New Site
Giveway / Yield (Two-Way)

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: Alexanrda St													
Lane 1	139	11.1	1639	0.085	100	3.5	LOS A	0.6	4.8	Full	500	0.0	0.0
Approach	139	11.1		0.085		3.5	NA	0.6	4.8				
East: Birkbeck Dr													
Lane 1	55	16.3	798	0.069	100	11.6	LOS B	0.2	1.9	Full	500	0.0	0.0
Approach	55	16.3		0.069		11.6	LOS B	0.2	1.9				
North: Belmont Rd													
Lane 1	455	4.1	1909	0.239	100	0.9	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	455	4.1		0.239		0.9	NA	0.0	0.0				
Intersection	650	6.6		0.239		2.4	NA	0.6	4.8				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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SIDRA INTERSECTION 6

LANE SUMMARY

Site: AM Peak - 2035 Background + Generation

New Site
Giveway / Yield (Two-Way)

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: Alexanrda St													
Lane 1	195	12.6	1463	0.133	100	6.0	LOS A	1.2	9.0	Full	500	0.0	0.0
Approach	195	12.6		0.133		6.0	NA	1.2	9.0				
East: Birkbeck Dr													
Lane 1	117	12.5	637	0.183	100	13.5	LOS B	0.7	5.1	Full	500	0.0	0.0
Approach	117	12.5		0.183		13.5	LOS B	0.7	5.1				
North: Belmont Rd													
Lane 1	663	4.4	1906	0.348	100	1.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	663	4.4		0.348		1.0	NA	0.0	0.0				
Intersection	974	7.0		0.348		3.5	NA	1.2	9.0				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
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HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6

LANE SUMMARY

Site: PM Peak - 2017 Background

New Site
Giveway / Yield (Two-Way)

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: Alexanrda St													
Lane 1	164	4.4	1877	0.088	100	1.2	LOS A	0.5	3.5	Full	500	0.0	0.0
Approach	164	4.4		0.088		1.2	NA	0.5	3.5				
East: Birkbeck Dr													
Lane 1	29	0.0	1149	0.025	100	9.0	LOS A	0.1	0.6	Full	500	0.0	0.0
Approach	29	0.0		0.025		9.0	LOS A	0.1	0.6				
North: Belmont Rd													
Lane 1	135	7.2	1866	0.072	100	1.4	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	135	7.2		0.072		1.4	NA	0.0	0.0				
Intersection	329	5.2		0.088		2.0	NA	0.5	3.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
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HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6

LANE SUMMARY

Site: PM Peak - 2025 Background + Generation

New Site
Giveway / Yield (Two-Way)

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: Alexanrda St													
Lane 1	361	3.6	1883	0.192	100	1.6	LOS A	1.3	9.5	Full	500	0.0	0.0
Approach	361	3.6		0.192		1.6	NA	1.3	9.5				
East: Birkbeck Dr													
Lane 1	51	0.2	850	0.060	100	11.3	LOS B	0.2	1.4	Full	500	0.0	0.0
Approach	51	0.2		0.060		11.3	LOS B	0.2	1.4				
North: Belmont Rd													
Lane 1	254	6.1	1881	0.135	100	1.2	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	254	6.1		0.135		1.2	NA	0.0	0.0				
Intersection	666	4.3		0.192		2.2	NA	1.3	9.5				

Level of Service (LOS) Method: Delay (HCM 2000).
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SIDRA INTERSECTION 6

LANE SUMMARY

Site: PM Peak - 2035 Background + Generation

New Site
Giveway / Yield (Two-Way)

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: Alexanrda St													
Lane 1	514	3.9	1851	0.278	100	2.6	LOS A	2.3	16.6	Full	500	0.0	0.0
Approach	514	3.9		0.278		2.6	NA	2.3	16.6				
East: Birkbeck Dr													
Lane 1	78	0.1	640	0.122	100	13.1	LOS B	0.4	2.8	Full	500	0.0	0.0
Approach	78	0.1		0.122		13.1	LOS B	0.4	2.8				
North: Belmont Rd													
Lane 1	379	6.5	1876	0.202	100	1.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	379	6.5		0.202		1.3	NA	0.0	0.0				
Intersection	972	4.6		0.278		2.9	NA	2.3	16.6				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
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HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6

APPENDIX D TURN WARRANT TRAFFIC VOLUMES

Traffic Analysis

Turn Warrant Check (60km/h)	$Q_{M\,(R)}$	Q_R	Required Treatment	$Q_{M\,(L)}$	Q_L	Required Treatment
AM Peak						
2014 Baseline	222	10	BAR	162	21	BAL
2017 (Background Growth)	257	12	BAR	188	24	BAL
2025 (Background Growth)	380	17	CHR(S)	277	36	AUL(S)
2025 (Background + Generated)	547	17	CHR(S)	389	43	AUL(S)
2035 (Background Growth)	618	28	CHR(S)	451	59	AUL(S)
2035 (Background + Generated)	786	28	CHR	564	66	AUL
PM Peak						
2014 Baseline	235	11	BAR	94	17	BAL
2017 (Background Growth)	272	13	BAR	109	20	BAL
2025 (Background Growth)	402	19	CHR(S)	161	29	BAL
2025 (Background + Generated)	566	19	CHR(S)	209	32	BAL
2035 (Background Growth)	655	31	CHR	262	47	AUL(S)
2035 (Background + Generated)	818	31	CHR	310	50	AUL(S)