CLAREMONT RESIDENTIAL DEVELOPMENT
CITY OF PICKERING

Transportation Study

Prepared For: Claremont Developments Inc.

July 2021 Submission

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1.0 INTRODUCTION & UPDATE

BA Group has been retained by Claremont Developments Inc. to provide traffic analysis in relation to the development of a residential subdivision located in the hamlet of Claremont within the City of Pickering. The residential development is located in the northeast area of Claremont, east of Old Brock Road and north of Central Street. The site location is shown in **Figure 1**.

The development consists of 71 single family detached residential units, with 70 new units, and one existing unit.

BA Group previously prepared a transportation considerations report for the development in March 2018. BA Group also prepared a prior transportation assessment for the site dated August 23rd, 2012.

This following updated report provides an assessment of the transportation impacts on the adjacent transportation network of the proposed residential development.

1.1 STUDY SCOPE

The following study transportation considerations have been reviewed as part of this report:

- an assessment of existing traffic volumes on the area road system surrounding the proposed development;
- a comprehensive review of traffic changes that may occur in the area with the development of area background development projects and general corridor traffic growth;
- an assessment of the trip generation characteristics of the proposed development; and,
- a review of weekday peak hour traffic operations under existing and future conditions and an assessment of the operational impacts of the proposed development at the following intersections:
    - Franklin Street / Central Street (unsignalized);
    - Old Brock Road / Lane Street / William Street (unsignalized);
    - Old Brock Road / New Street ‘A’ (unsignalized); and
    - Old Brock Road / New Street ‘C’ (unsignalized).

1.2 HORIZON YEAR

Buildout is expected to occur over a 5 year period and will be completed by 2026. Impacts of the development at the five year post-buildout horizon of 2031 was therefore analyzed for the purpose of this report.

FIGURE 1: SITE LOCATION

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SITE LOCATION

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Claremont Residential Development
6860-17 July 2021

Figure 1

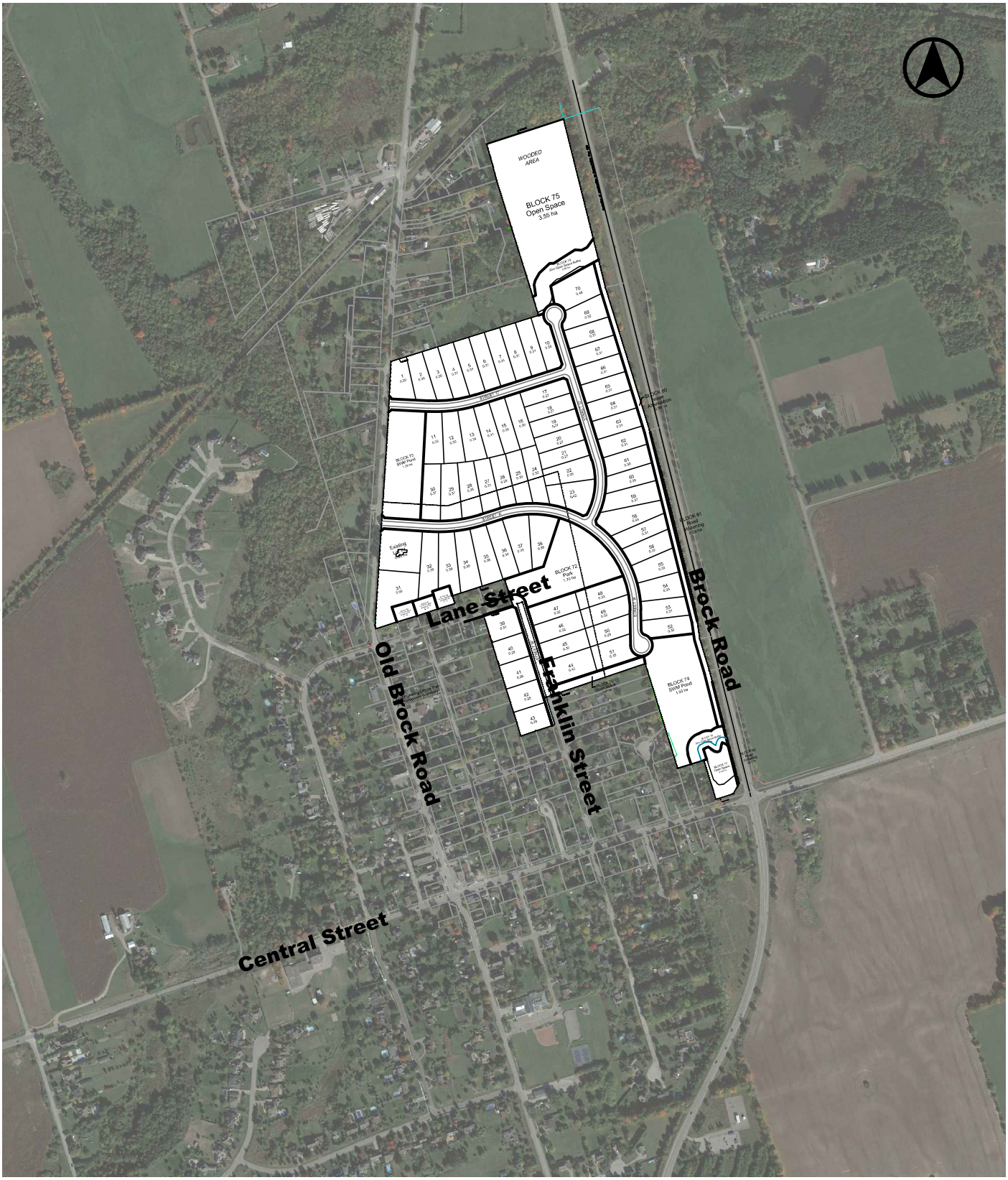
2.0 PROPOSED DEVELOPMENT

The proposed development was subject to prior applications. For a description of the history of the site applications, see the companion planning rationale report by Malone Given Parsons (MGP).

The proposed development will consist of the following streets:

- Street ‘A’ runs easterly off of Old Brock Road, then turns south and terminates in a cul-de-sac
- Street ‘B’ connects Lane Street and Franklin Street
- Street ‘C’ runs easterly off of Old Brock Road, north of Street ‘A’, and terminates at Street ‘D’
- Street ‘D’ runs north-south, and connects Street ‘A’ and Street ‘C’. The street starts at Street ‘A, runs north, and terminates in a cul-de-sac.

Figure 2 presents the site context and the draft plan of the subdivision.



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PROPOSED CONCEPT PLAN

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Figure 2

3.0 TRANSPORTATION CONTEXT

3.1 EXISTING AREA ROAD NETWORK

The existing road network and lane configuration in the proximity of the site is shown in **Figure 3.**

Central Street is an arterial east-west road under the jurisdiction of the Region of Durham in the area of the site. It extends from York Durham Line in the west, to Brock Road in the east, and continues as Concession Road 9. In the vicinity of the site, it is a two-lane road. The posted speed limit on Central Street in the vicinity of the site is 50 km/h.

Old Brock Road is a north-south collector road under the jurisdiction of the City of Pickering. It extends from a bend on Brock Road just south of Concession Road 9 to Uxbridge Pickering Townline in the north. In the vicinity of the site, it is a two-lane road. The posted speed limit on Old Brock Road is 40 km/h.

Lane Street is an east-west road under the jurisdiction of the City of Pickering. It extends eastward from its intersection with Old Brock Road for approximately 220 metres. It continues west of the intersection as **William Street**, which eventually bends to become a north-south road. In the area of the site, it is a two-lane road. The posted speed limit of Lane Street and William Street is 40 km/h.

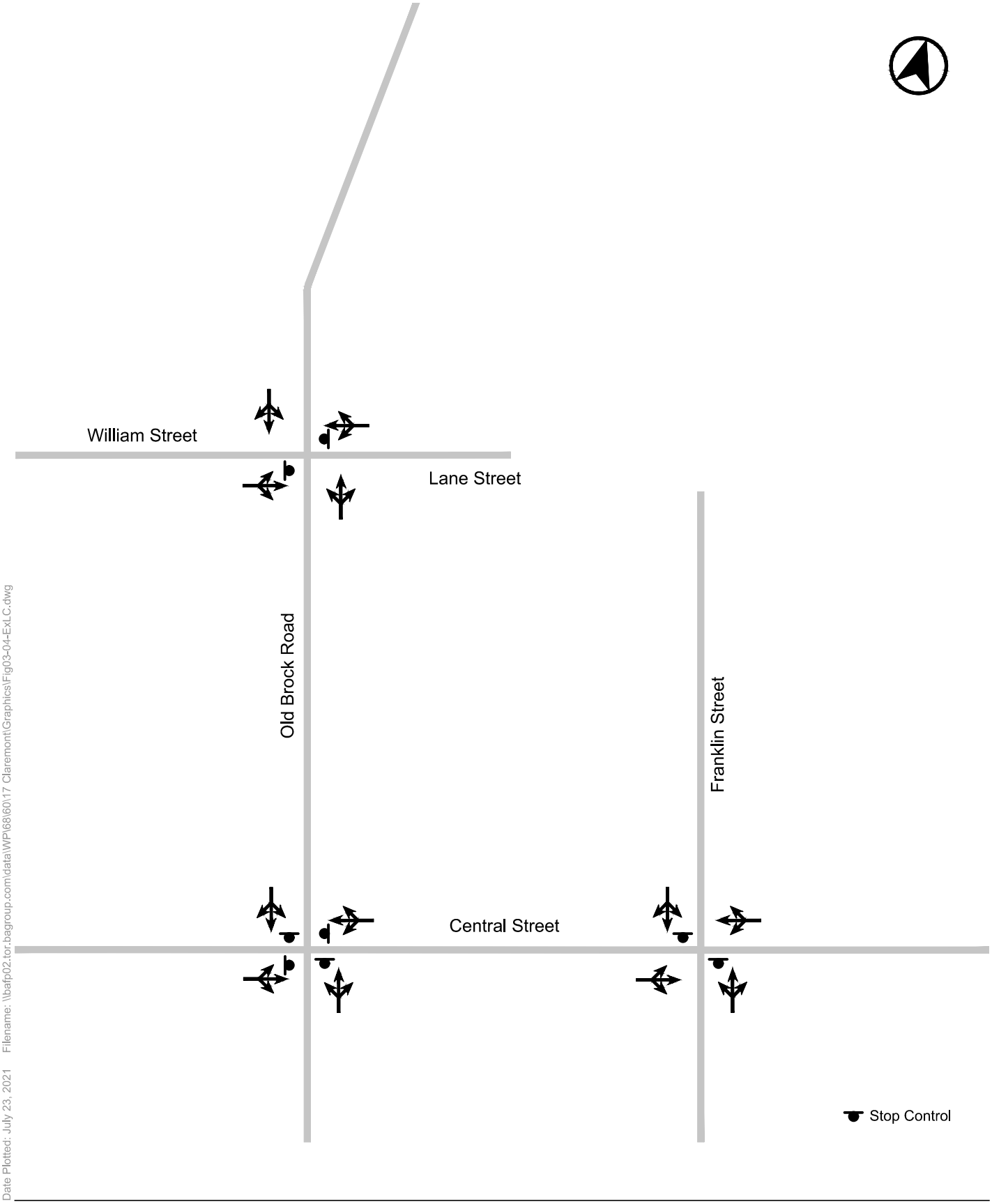
Franklin Street is a north-south road under the jurisdiction of the City of Pickering. It extends northward from its intersection with Central Street for approximately 270 metres. It continues south of the intersection as Livingston Street. In the area of the site, it is a two-lane road. The posted speed limit of Franklin Street is 40km/h.

3.2 ROAD NETWORK CHANGES

The following changes to the local road network are proposed:

- The connection of Lane Street and Franklin Street to become one continuous road labelled and shown as Street ‘B’;
- The addition of three proposed roads, Street ‘A’, Street ’C’, and Street ‘D’, east of Old Brock Road that will provide access for future residential units.

The future road network and lane configurations are shown in **Figure 4**.



EXISTING ROAD NETWORK AND LANE CONFIGURATIONS

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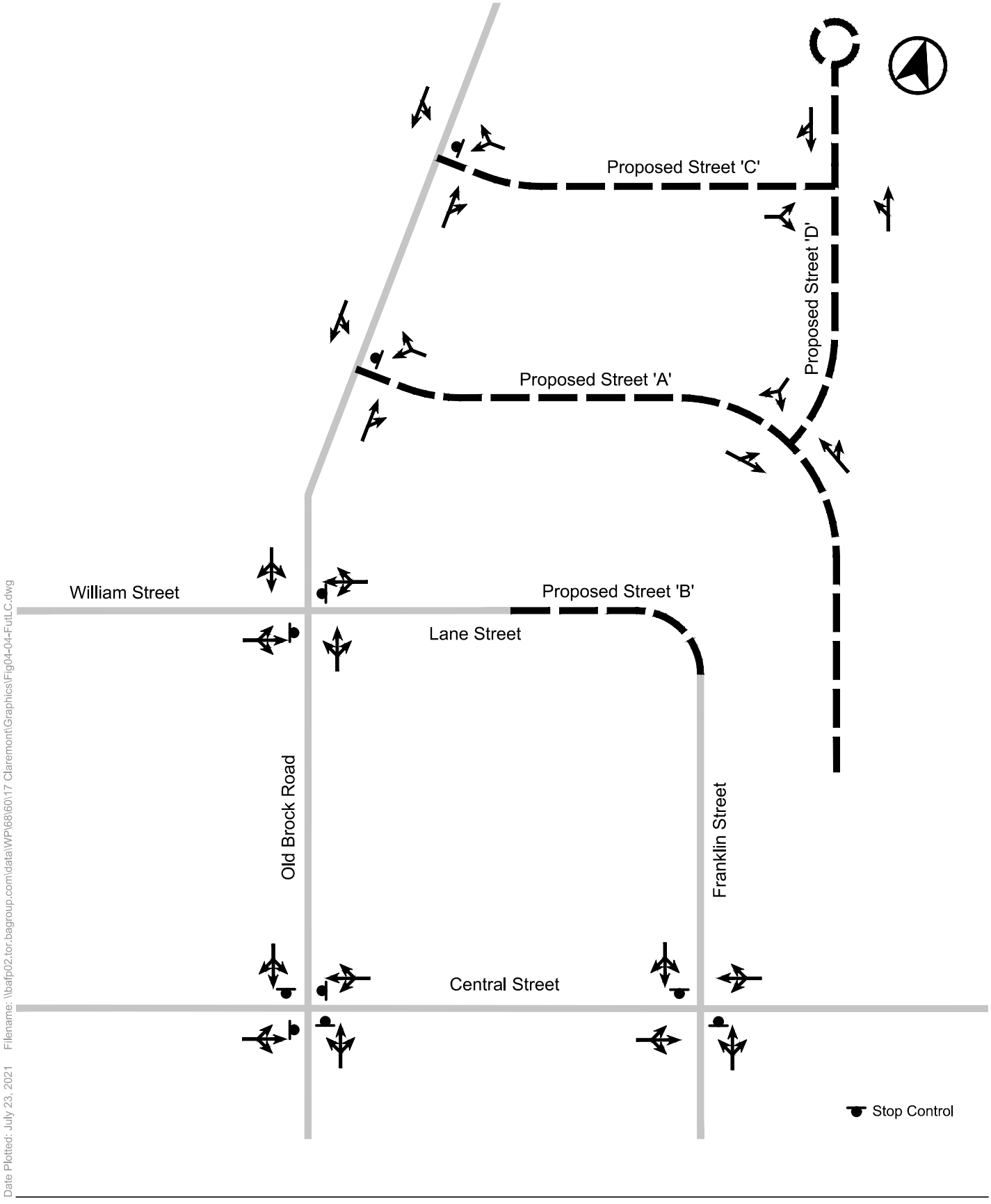
Figure 3



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FUTURE ROAD NETWORK AND LANE CONFIGURATIONS

BA Group

Claremont Residential Development
6860-17 July 2021

Figure 4

4.0 TRAFFIC VOLUMES

4.1 EXISTING TRAFFIC

Existing intersection counts were obtained for this study through traffic counts undertaken on October 5, 2017 at the following intersections:

- Old Brock Road / Lane Street / William Street (unsignalized);
- William Street / David Street (unsignalized); and
- Franklin Street / Central Street (unsignalized).

On June 24th 2021 the City of Pickering provided December 2017 traffic counts as being most recent available. These counts compared favourably with the traffic counts used by BA Group for the purposes of the 2018 assessment. Similarly forecasted Average Annual Daily Traffic (AADT) information was also provided by the Region of Durham on Thursday June 24th 2021.

Existing traffic counts were adjusted to in order to prorate traffic volumes to approximate an existing horizon year of 2021. With this in mind, an annual growth rate of 2% was applied to through-traffic volumes on Old Brock Road and Central Street over a 4-year period. A 2% growth rate is consistent with corridor growth rates as discussed in Section 4.2 below.

Existing weekday morning and afternoon peak hour balanced traffic volumes are presented in **Figure 5**.

4.2 FUTURE BACKGROUND TRAFFIC

We are not aware of any specific development plans in the area and as such no site specific traffic allowances were made. With respect to background corridor growth on Old Brock Road, analysis of automatic traffic recording (ATR) counts on Old Brock Road north of William Street / Lane Street from 2007 and 2010, and traffic counts in 2012 and 2017 was performed. The result is inconclusive growth rates; while northbound traffic volumes are recording a decline, southbound traffic volumes are recording a growth, as provided in Appendix A. Due to the lack of consensus of traffic volumes changes on Old Brock Road throughout the years, a conservative 2% increase in through traffic along Central Street and Old Brock Road was assumed for the 11 years time horizon from the 2017 traffic counts to obtain future background traffic volumes.

4.3 SITE TRAFFIC

4.3.1 Trip Generation

Site development traffic was generated using trip generation rates obtained from surveys of existing homes west of the study area on July 12, 2012. Two counts were conducted at the intersections of William Street / Lane Street / Old Brock Road and William Street / David Street. The residential units located along William Street between these two locations as well as the new residential development currently being constructed to the northwest off of William Street were counted to complete the trip generation for the area. Detailed trip generation data sheet from the survey is presented in Appendix B. In addition, trip rates from the ITE Trip Generation Manual were also consulted.

The trip generation rates and resulting site traffic volumes can be found in **Table 1**.

TABLE 1 SITE TRAFFIC TRIP GENERATION

Subject Site (71 units)	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
BA Group Survey Trip Rates[1]	0.41	0.81	1.22	0.66	0.75	1.41
ITE Land Use Code 210 Trip Rates (Single-Family Detached Housing)	0.21	0.62	0.83	0.69	0.40	1.09
Selected Rate	**0.41**	**0.81**	**1.22**	**0.66**	**0.75**	**1.41**
Number of Trips	**30**	**55**	**85**	**45**	**55**	**100**

1. Based upon a previous BA Group survey from July 12, 2012 of 32 houses on William St / David St.

The trip generation rates produced by the survey appear higher than the rates produced by ITE Land Use Code 210. As a result, the more conservative trip generation rates done by survey is used for analysis. Furthermore, the afternoon peak hour values producing slightly higher volumes than the morning peak hour.

4.3.2 Trip Distribution and Trip Assignment

Site traffic outline above was routed according to approximate directional splits observed during the adjacent trip generation surveys. The observed distribution is as follows:

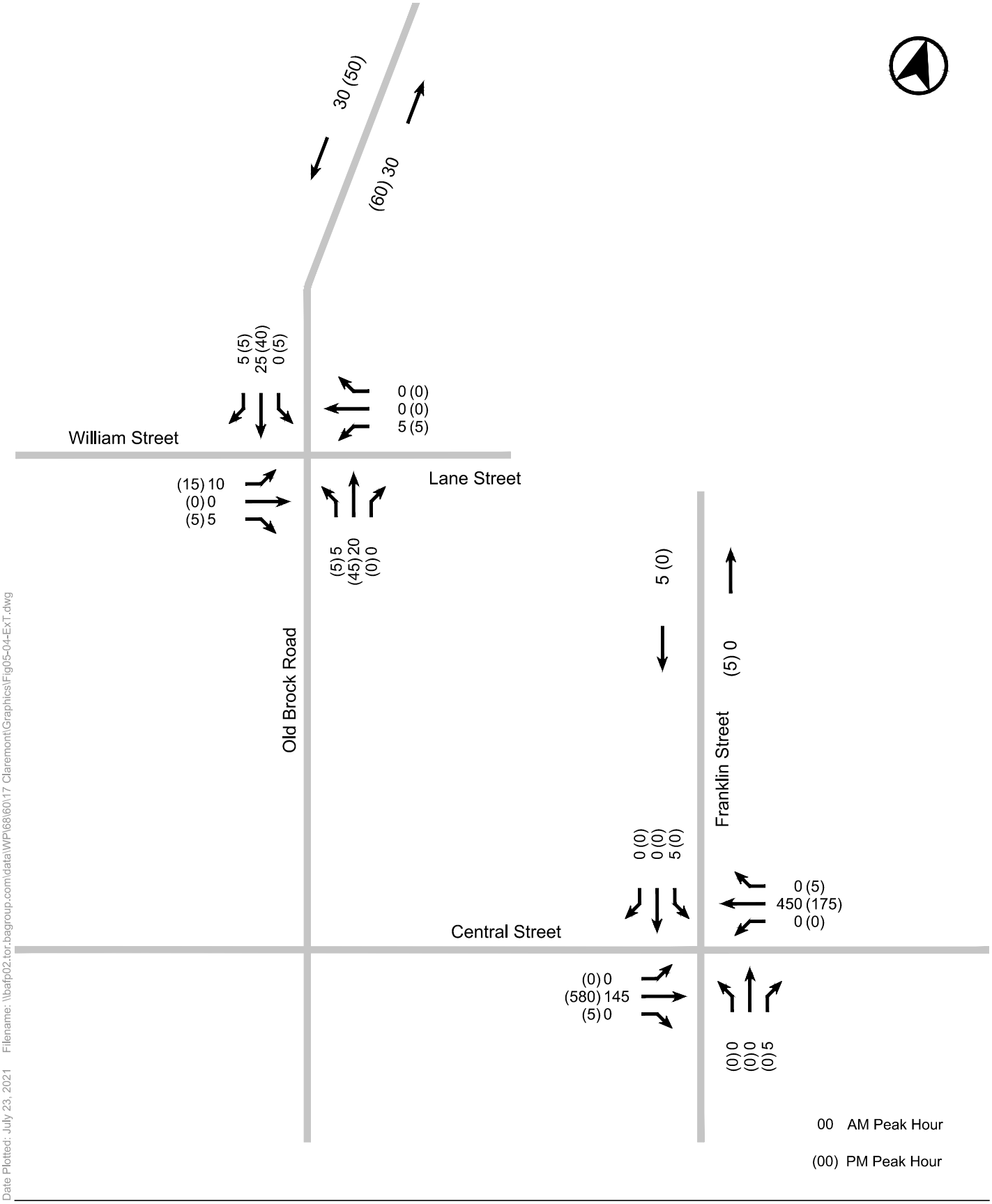
- Entering Site – AM (PM) Peak Hour:
  - 5% (10%) from westbound Central Street via Franklin Street
  - 5% (0%) from northbound Old Brock Road via Lane Street
  - 50% (50%) from northbound Old Brock Road via Street ‘A’
  - 40% (40%) from northbound Old Brock Road via Street ‘C’

- Exiting Site – AM (PM) Peak Hour:
  - 5% (5%) to eastbound Central Street via Franklin Street
  - 5% (5%) to northbound Old Brock Road via Lane Street
  - 40% (25%) to southbound Old Brock Road via Street ‘A’
  - 10% (25%) to northbound Old Brock Road via Street ‘A’
  - 30% (20%) to southbound Old Brock Road via Street ‘C’
  - 10% (20%) to northbound Old Brock Road via Street ‘C’

The resultant site traffic volumes are presented in **Figure 6**.

4.4 FUTURE TOTAL TRAFFIC

An estimate of future total traffic volumes which includes existing traffic volumes, background traffic growth, and the estimated site trips is shown in **Figure 7**.



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EXISTING TRAFFIC VOLUMES

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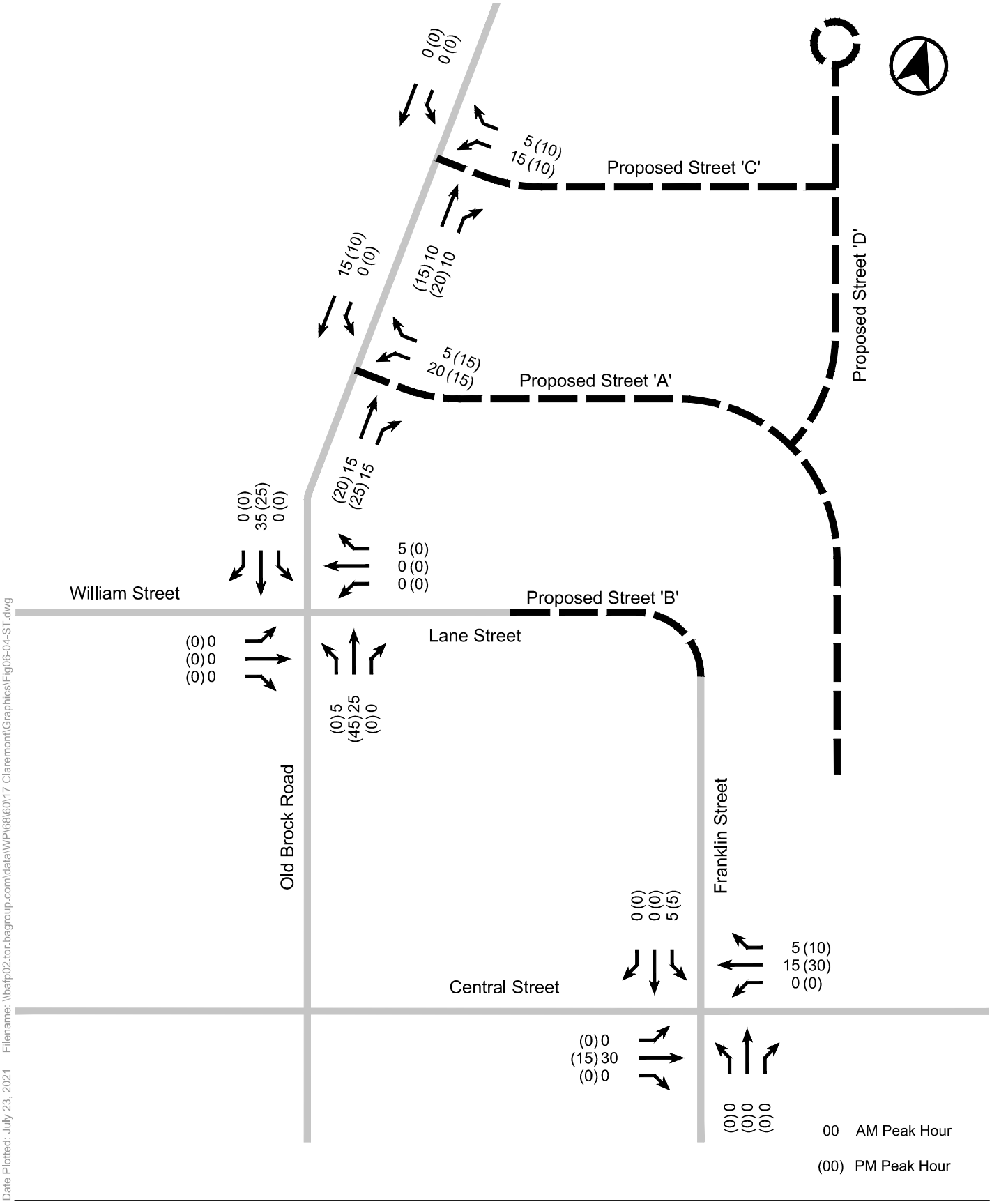
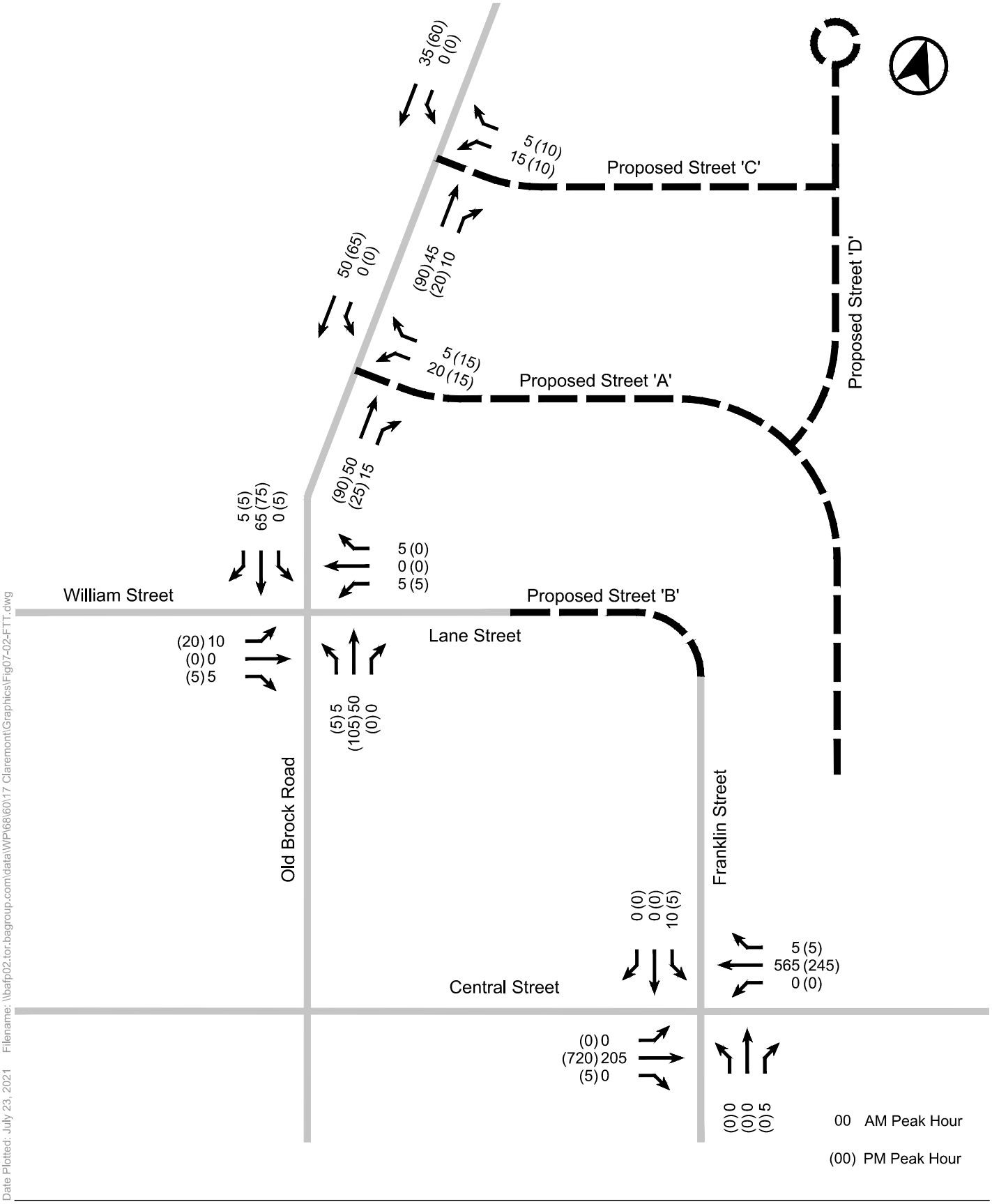
6860-17 July 2021

Figure 5



SITE TRAFFIC VOLUMES



FUTURE TOTAL TRAFFIC VOLUMES

BA Group

Claremont Residential Development
6860-17 July 2021

Figure 7

5.0 INTERSECTION OPERATIONS ANALYSIS

Traffic operations analyses undertaken at the area unsignalized (STOP controlled) intersections have been undertaken using the methodologies outlined in the Highway Capacity Manual (HCM) methodology and the HCS2010 software package. The product of this analysis is a level of service (LOS) designation which ranges between LOS A and LOS F and provides an understanding of the relative time that a motorist may have to wait to complete a turn at the intersection. LOS A reflects a condition where motorists experience little or no delay while LOS F reflects one in which motorists experience extended levels of delay.

In addition, a gap study was completed for the stretch of Old Brock Road north of William Street / Lane Street approximately at the potential future intersection with Street 'C'. Results from this study can be found in Appendix C. The gap study was used to calibrate the unsignalized analysis to ensure the capacity analysis for the future intersection best represents the future condition.

Intersection operations were analyzed under existing and future total conditions for both the morning and afternoon peak hour periods. Detailed capacity analysis calculation worksheets are attached in Appendix D.

Traffic operations analyses were undertaken at the following intersections:

- Old Brock Road / Lane Street / William Street (unsignalized);
- Old Brock Road / New Street 'A' (unsignalized);
- Old Brock Road / New Street 'C' (unsignalized), and;
- Franklin Street / Central Street (unsignalized).

For existing conditions, the turning movements at the area unsignalized intersections operate acceptably with levels of service typically of LOS C or better during the peak hours.

The unsignalized intersections in the area will continue to operate acceptably with the addition of background traffic (2% growth per annum on Old Brock Road and Central Street) and the future development traffic. Turning movement levels of service will continue to operate acceptably with a LOS C or better during the morning and afternoon peak hours in the future at the study area intersections.

The future analysis indicates that development traffic will have a minimal effect on the area transportation system. All intersections in the study area will continue to operate at the same, acceptable levels of service. In fact, almost all delays at intersections increase by less than two seconds, or even decrease. The new intersections will also operate well at LOS A, and will not effect the vehicular flow of the existing Old Brock Road. The results of the capacity analysis for the unsignalized intersections in the study area are summarized in **Table 2**.

TABLE 2 UNSIGNALIZED INTERSECTION ANALYSIS SUMMARY

Intersections	Existing Conditions		Future Total	
	Delay	LOS	Delay	LOS
Old Brock Road / William Street				
NB LTR	8.2 (10.0)	A (B)	8.3 (7.5)	A (A)
SB LTR	8.1 (8.2)	A (A)	8.2 (7.6)	A (A)
WB LTR	9.5 (13.3)	A (B)	9.3 (10.8)	A (B)
EB LTR	9.2 (13.1)	A (B)	9.6 (10.6)	A (B)
Franklin Street / Central Street				
NB LTR	9.1 (0.0)	A (A)	9.5 (0.0)	A (A)
SB LTR	14.9 (0.0)	B (A)	18.8 (2.0)	C (C)
WB LTR	7.5 (8.7)	A (A)	7.7 (9.2)	A (A)
EB LTR	8.4 (7.6)	A (A)	8.8 (7.7)	A (A)
Old Brock Road / Street 'A'				
SB LT	-	-	8.3 (8.5)	A (A)
WB LTR	-	-	9.5 (9.6)	A (A)
Old Brock Road / Street 'B'				
SB LT	-	-	8.2 (8.5)	A (A)
WB LTR	-	-	9.3 (9.6)	A (A)

Notes
1. 00 (00) – Morning Peak Hour (Afternoon Peak Hour)
2. LOS – Level of Service
   LOS A – control delay < 10 seconds
   LOS B – control delay > 10 seconds and < 15 seconds
   LOS C – control delay > 15 seconds and < 25 seconds
   LOS D – control delay > 25 seconds and < 35 seconds
   LOS E – control delay > 35 seconds and < 50 seconds
   LOS F – control delay > 50 seconds
3. LTR refers to a shared 'Left-Through-Right' approach lane to an intersection.

6.0 SIGHT DISTANCE REVIEW

A sight distance review was undertaken to determine the adequacy of the sight lines for vehicles exiting the proposed development site at the intersection of the planned Street ‘A’ and Old Brock Road. The sightlines review is necessary because of a curve in Old Brock Road just to the south of the proposed Street ‘A’ intersection. There are no sightline concerns to the north because Old Brock Road has a long tangent segment north of proposed Street ‘A’.

The sight distance review was undertaken for vehicles making a right turn from Street ‘A’ to Old Brock Road. The analysis used methodology taken from the Transportation Association of Canada (TAC) geometric design guidelines for sight distance review. The posted speed limit on Old Brock Road is 40 km/h and the design speed used for the analysis is 50 km/h. Based on the TAC manual the recommended minimum sight distance that should be maintained is 120 metres, which is the distance required for a right turning vehicle to get up to speed before being overtaken by a vehicle approaching from the left.

The travel path between the intersection of Street ‘A’ and Old Brock Road and the curve on Old Brock Road is approximately 216 metres, which is longer than the minimum sight distance. Hence, the review indicates that the curvature of Old Brock Road allows for adequate sight distance for vehicles entering and exiting the proposed Street ‘A’. The detailed analysis is shown in Appendix E.

7.0 CONCLUSIONS

BA Consulting Group Ltd. has completed a transportation impact study for the proposed residential subdivision comprising of 71 single family detached residential units. The proposed development, will be located east of Old Brock Road, north of Lane Street in the village of Claremont within the City of Pickering. Vehicular access will be provided via four public roads.

This report documents BA Group's assessment of transportation impact from the proposed development. Key findings are set out below:

Development Proposal

1. The proposed development consists of 71 single family detached residential units, with 70 new units, and one existing unit.

2. Vehicular access into the development will be provided by a new Street 'A' that intersects with Old Brock Road north of Lane Street, Street 'B' that connects the existing Lane Street and Franklin Street, a new Street 'C' that intersects with Old Brock Road north of Street 'A', and a new Street 'D' that connects Street 'A' and Street 'C'.

Transportation Context

3. The proposed development is afforded a high degree of road accessibility by virtue of its proximity to arterial roads, i.e., Central Street, and collector roads such as Old Brock Road, Lane Street, and Franklin Street.

Traffic Forecasting

4. Existing traffic data was obtained from updated traffic counts undertaken by BA Group from October 5, 2017. Existing traffic volumes were adjusted upwards to a 2021 horizon year using a 2% annual growth rate.

5. An annual corridor traffic growth rate of 2.0% was used to determine future background traffic.

6. The proposed development will generate approximately 85 and 100 two-way vehicle trips during the weekday morning and afternoon peak hours, respectively.

Traffic Operations Analysis

7. Under existing and future conditions, area intersections operate and will operate well at LOS A or B during weekday AM and PM peak hours, except for southbound traffic at Franklin Street and Central Street, which operates at LOS C.

8. Based on the traffic operations analyses, the study area intersections (including the proposed new public street intersection at Old Brock Road / Street 'A' and Old Brock Road / Street 'C') will operate

acceptably during the key peak hours under both existing and future total traffic operations. The proposed development will have minimal effect on the area transportation system and no improvements to existing roads are needed to accommodate forecast traffic volumes.

Sight Distance Review

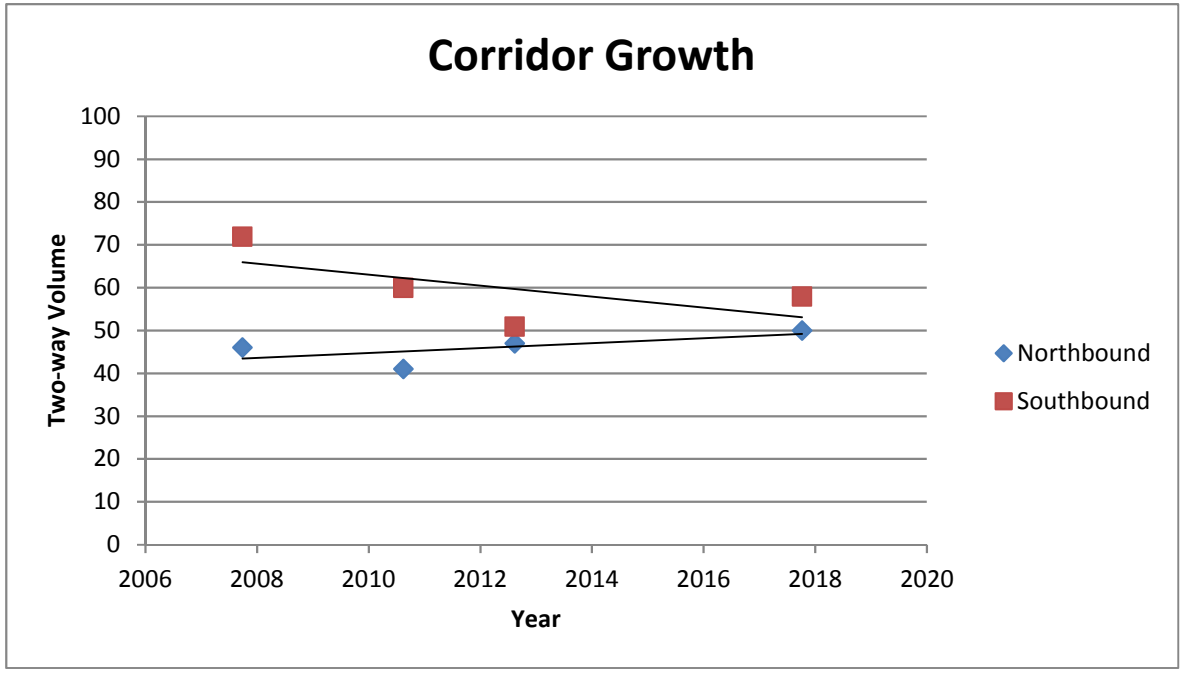
9. Based on a sight distance analysis, there are no sight line safety issues associated with the development of the proposed Street ‘A’ intersection with Old Brock Road.

Appendix A: Corridor Growth Analysis

Corridor Growth - Morning Peak Hour

Project Claremont
Project No 6860-17
Date 08/11/2017

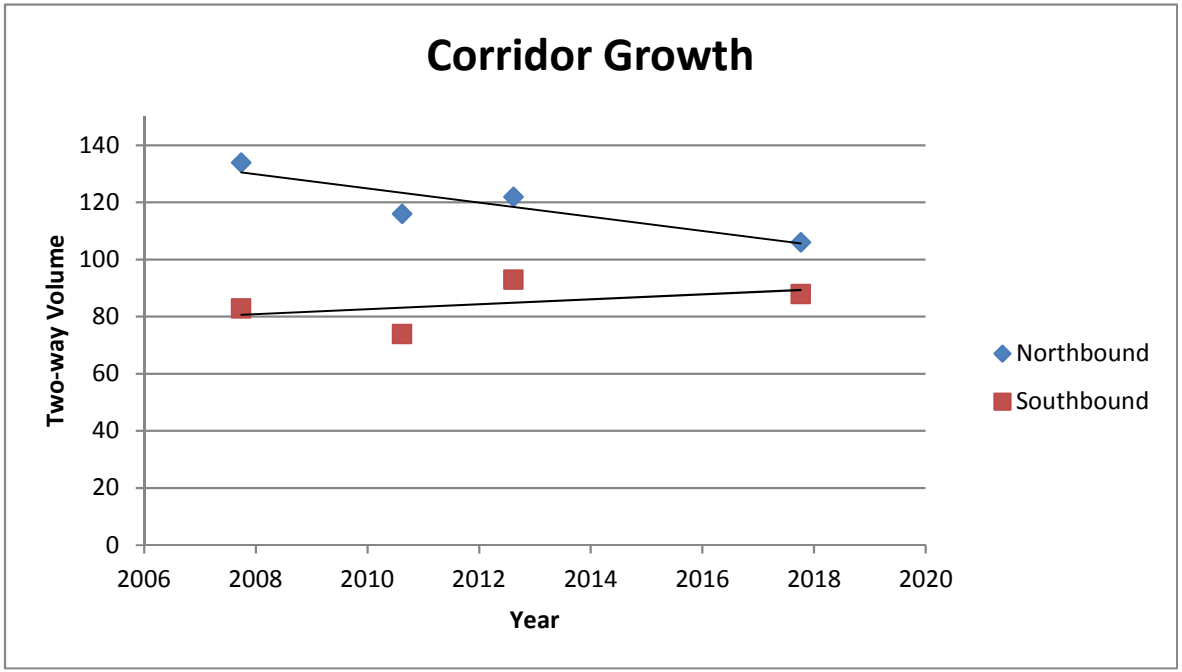
Location:	North of William St.	
Year	**NB**	**SB**
2007.739726	46	72
2010.619178	41	60
2012.614754	47	51
2017.761644	50	58
Slope	0.5713604	-1.27791
Rate	1.3%	-1.9%



Corridor Growth - Afternoon Peak Hour

Project Claremont
Project No 6860-17
Date 08/11/2017

Location:	North of William St.	
Year	**NB**	**SB**
2007.739726	134	83
2010.619178	116	74
2012.614754	122	93
2017.761644	106	88
Slope	-2.4896563	0.865117
Rate	-1.9%	1.1%



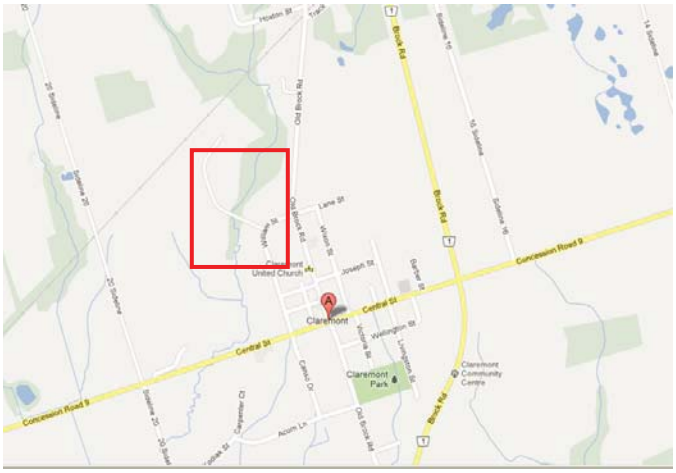
Appendix B: Trip Generation Analysis

BA GROUP TRIP GENERATION SURVEY

William St Development, Claremont

William St./Tom Thomson Court

ITE Land Use Code:	210 Single Family Residential



Major Intersection: (N-S / E-W)

Central St / Old Brock Road

Development Type:

Single Family Residential

Total Units / GFA: 39

Occupied Units / GFA: 32

Parking Type: Private Driveway

Number of Stalls: NA

Accessibility:

No Transit/

Comments:

Development under construction

Date Period Peak Hour	Thursday, July 12, 2012 7:00-9:00 AM 8:00-9:00 AM	Thursday, July 12, 2012 4:00 – 6:00 PM 4:45 – 5:45 PM
PEAK HOUR TRIPS		
Inbound	13	21
Outbound	26	24
Total Two-Way	39	45
TRIP RATE		
Inbound	0.41	0.66
Outbound	0.81	0.75
Total Two-Way	1.22	1.41

Appendix C: Gap Study

2-HOUR GAP SURVEY - GROSS GAP STUDY*

PROJECT: **Claremont**
JOB NO: **6860.17**
LOCATION: **Old Brock Rd. North of Lane St.**

DATE: Thursday July 12, 2012
AM
7:00 - 9:00

	LEFT IN				LEFT OUT		
2 HOUR TOTAL	2256				1580		
AVERAGE HOUR	1128				790		
LEAST GAP	1099				764		
LEAST GAP HOUR	7:10	-	8:10		7:00	-	8:00

PM
16:00 - 18:00

	LEFT IN				LEFT OUT		
2 HOUR TOTAL	2275				1562		
AVERAGE HOUR	1137.5				781		
LEAST GAP	1119				765		
LEAST GAP HOUR	16:45	-	17:45		16:15	-	17:15

LENGTH OF CRITICAL GAP (SECONDS)		
	LEFT IN	**LEFT OUT**
INITIAL	5	6
SUBSEQUENT	3	4

* EXISTING TURNS DID NOT BREAK THE GAPS BEING MEASURED

Appendix D: Unsignalized Intersection Analysis

HCS7 Two-Way Stop-Control Report

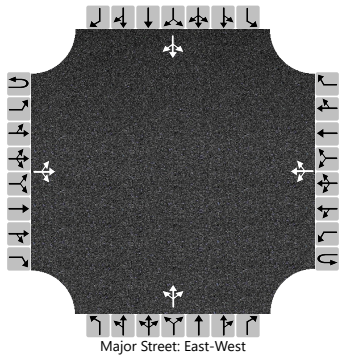
General Information

Analyst	MTC
Agency/Co.	BA Group
Date Performed	07/23/2021
Analysis Year	2021
Time Analyzed	
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Central / Franklin
Jurisdiction	
East/West Street	Central Street
North/South Street	Franklin Street
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		0	145	0		0	450	0		0	0	5		5	0	0
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				0					6				6	
Capacity, c (veh/h)		1069				1428					887				370	
v/c Ratio		0.00				0.00					0.01				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.0				0.0	
Control Delay (s/veh)		8.4				7.5					9.1				14.9	
Level of Service (LOS)		A				A					A				B	
Approach Delay (s/veh)	0.0				0.0				9.1				14.9			
Approach LOS									A				B			

HCS7 Two-Way Stop-Control Report

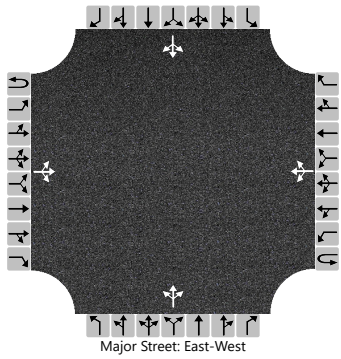
General Information

Analyst	MTC
Agency/Co.	BA Group
Date Performed	07/23/2021
Analysis Year	2021
Time Analyzed	
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Central / Franklin
Jurisdiction	
East/West Street	Central Street
North/South Street	Franklin Street
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		0	580	5		0	175	5		0	0	0		0	0	0
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				0					0				0	
Capacity, c (veh/h)		1397				974										
v/c Ratio		0.00				0.00										
95% Queue Length, Q_{95} (veh)		0.0				0.0										
Control Delay (s/veh)		7.6				8.7										
Level of Service (LOS)		A				A										
Approach Delay (s/veh)		0.0				0.0										
Approach LOS																

HCS7 Two-Way Stop-Control Report

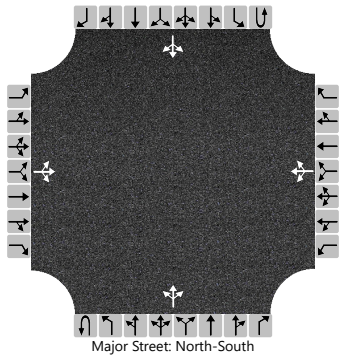
General Information

Analyst	MTC
Agency/Co.	BA Group
Date Performed	07/23/2021
Analysis Year	2021
Time Analyzed	
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	William/Lane/Old Brock
Jurisdiction	
East/West Street	William/Lane Street
North/South Street	Old Brock Road
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		10	0	5		5	0	0		5	20	0		0	25	5
Percent Heavy Vehicles (%)		0	0	0		0	0	0		0				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		6.0	6.5	6.2		6.0	6.5	6.2		5.0				5.0		
Critical Headway (sec)		6.00	6.50	6.20		6.00	6.50	6.20		5.00				5.00		
Base Follow-Up Headway (sec)		4.0	4.0	3.3		4.0	4.0	3.3		3.0				3.0		
Follow-Up Headway (sec)		4.00	4.00	3.30		4.00	4.00	3.30		3.00				3.00		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			19				6			6				0		
Capacity, c (veh/h)			879				814			1148				1169		
v/c Ratio			0.02				0.01			0.01				0.00		
95% Queue Length, Q_{95} (veh)			0.1				0.0			0.0				0.0		
Control Delay (s/veh)			9.2				9.5			8.2				8.1		
Level of Service (LOS)			A				A			A				A		
Approach Delay (s/veh)	9.2				9.5				1.7				0.0			
Approach LOS	A				A											

HCS7 Two-Way Stop-Control Report

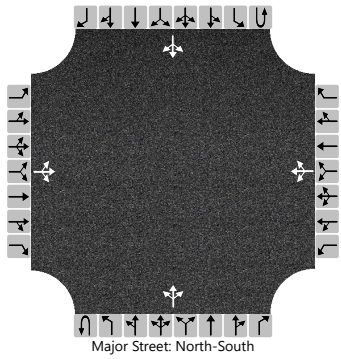
General Information

Analyst	MTC
Agency/Co.	BA Group
Date Performed	7/23/2021
Analysis Year	2021
Time Analyzed	
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	William/Lane/Old Brock
Jurisdiction	
East/West Street	William/Lane Street
North/South Street	Old Brock Road
Peak Hour Factor	0.68
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		15	0	5		5	0	0		5	45	0		5	340	5
Percent Heavy Vehicles (%)		0	0	0		0	0	0		0				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		6.0	6.5	6.2		6.0	6.5	6.2		5.0				5.0		
Critical Headway (sec)		6.00	6.50	6.20		6.00	6.50	6.20		5.00				5.00		
Base Follow-Up Headway (sec)		4.0	4.0	3.3		4.0	4.0	3.3		3.0				3.0		
Follow-Up Headway (sec)		4.00	4.00	3.30		4.00	4.00	3.30		3.00				3.00		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			29				7			7				7		
Capacity, c (veh/h)			473				439			727				1123		
v/c Ratio			0.06				0.02			0.01				0.01		
95% Queue Length, Q_{95} (veh)			0.2				0.1			0.0				0.0		
Control Delay (s/veh)			13.1				13.3			10.0				8.2		
Level of Service (LOS)			B				B			B				A		
Approach Delay (s/veh)	13.1				13.3				1.1				0.2			
Approach LOS	B				B											

HCS7 Two-Way Stop-Control Report

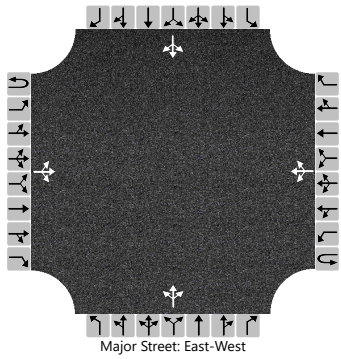
General Information

Analyst	MTC
Agency/Co.	BA Group
Date Performed	07/23/2021
Analysis Year	2031
Time Analyzed	
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Central / Franklin
Jurisdiction	
East/West Street	Central Street
North/South Street	Franklin Street
Peak Hour Factor	0.89
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		0	205	0		0	565	5		0	0	5		10	0	0
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				0					6				11	
Capacity, c (veh/h)		954				1349					814				272	
v/c Ratio		0.00				0.00					0.01				0.04	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.0				0.1	
Control Delay (s/veh)		8.8				7.7					9.5				18.8	
Level of Service (LOS)		A				A					A				C	
Approach Delay (s/veh)		0.0				0.0				9.5				18.8		
Approach LOS										A				C		

HCS7 Two-Way Stop-Control Report

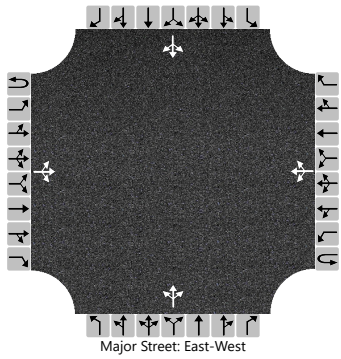
General Information

Analyst	MTC
Agency/Co.	BA Group
Date Performed	07/23/2021
Analysis Year	2031
Time Analyzed	
Intersection Orientation	East-West
Project Description	

Site Information

Intersection	Central / Franklin
Jurisdiction	
East/West Street	Central Street
North/South Street	Franklin Street
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		0	720	5		0	245	5		0	0	0		5	0	0
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				6.40	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				0					0				5	
Capacity, c (veh/h)		1313				859									217	
v/c Ratio		0.00				0.00									0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.0									0.1	
Control Delay (s/veh)		7.7				9.2									22.0	
Level of Service (LOS)		A				A									C	
Approach Delay (s/veh)		0.0				0.0								22.0		
Approach LOS														C		

HCS7 Two-Way Stop-Control Report

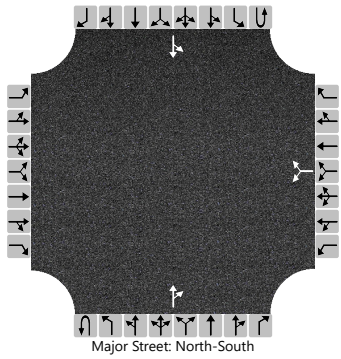
General Information

Analyst	MTC
Agency/Co.	BA Group
Date Performed	07/23/2021
Analysis Year	2031
Time Analyzed	
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Street A/Old Brock
Jurisdiction	
East/West Street	Street A
North/South Street	Old Brock Road
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						20		5			50	15		0	50	
Percent Heavy Vehicles (%)						0		0						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						6.0		6.2						5.0		
Critical Headway (sec)						5.30		6.20						5.00		
Base Follow-Up Headway (sec)						4.0		3.3						3.0		
Follow-Up Headway (sec)						4.00		3.30						3.00		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							32							0		
Capacity, c (veh/h)							827							1108		
v/c Ratio							0.04							0.00		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
Control Delay (s/veh)							9.5							8.3		
Level of Service (LOS)							A							A		
Approach Delay (s/veh)					9.5								0.0			
Approach LOS					A											

HCS7 Two-Way Stop-Control Report

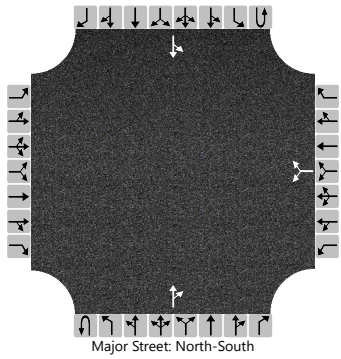
General Information

Analyst	MTC
Agency/Co.	BA Group
Date Performed	07/23/2018
Analysis Year	2031
Time Analyzed	
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Street A/Old Brock
Jurisdiction	
East/West Street	Street A
North/South Street	Old Brock Road
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						15		15			90	25		0	65	
Percent Heavy Vehicles (%)						0		0						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						6.0		6.2						5.0		
Critical Headway (sec)						5.30		6.20						5.00		
Base Follow-Up Headway (sec)						4.0		3.3						3.0		
Follow-Up Headway (sec)						4.00		3.30						3.00		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							38							0		
Capacity, c (veh/h)							822							1041		
v/c Ratio							0.05							0.00		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
Control Delay (s/veh)							9.6							8.5		
Level of Service (LOS)							A							A		
Approach Delay (s/veh)					9.6								0.0			
Approach LOS					A											

HCS7 Two-Way Stop-Control Report

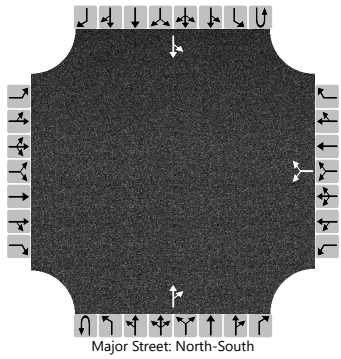
General Information

Analyst	MTC
Agency/Co.	BA Group
Date Performed	07/23/2021
Analysis Year	2031
Time Analyzed	
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Street A/Old Brock
Jurisdiction	
East/West Street	Street B
North/South Street	Old Brock Road
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						15		5			45	10		0	35	
Percent Heavy Vehicles (%)						0		0						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						6.0		6.2						5.0		
Critical Headway (sec)						5.30		6.20						5.00		
Base Follow-Up Headway (sec)						4.0		3.3						3.0		
Follow-Up Headway (sec)						4.00		3.30						3.00		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							25							0		
Capacity, c (veh/h)							856							1121		
v/c Ratio							0.03							0.00		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
Control Delay (s/veh)							9.3							8.2		
Level of Service (LOS)							A							A		
Approach Delay (s/veh)					9.3								0.0			
Approach LOS					A											

HCS7 Two-Way Stop-Control Report

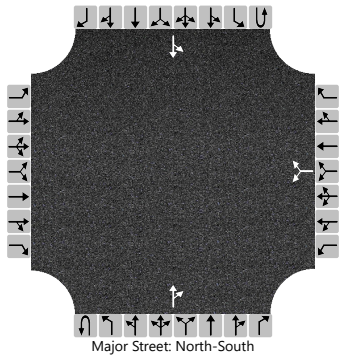
General Information

Analyst	MTC
Agency/Co.	BA Group
Date Performed	07/23/2021
Analysis Year	2031
Time Analyzed	
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Street B/Old Brock
Jurisdiction	
East/West Street	Street B
North/South Street	Old Brock Road
Peak Hour Factor	0.68
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						10		10			90	20		0	60	
Percent Heavy Vehicles (%)						0		0						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						6.0		6.2						5.0		
Critical Headway (sec)						5.30		6.20						5.00		
Base Follow-Up Headway (sec)						4.0		3.3						3.0		
Follow-Up Headway (sec)						4.00		3.30						3.00		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							29							0		
Capacity, c (veh/h)							804							1025		
v/c Ratio							0.04							0.00		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
Control Delay (s/veh)							9.6							8.5		
Level of Service (LOS)							A							A		
Approach Delay (s/veh)					9.6								0.0			
Approach LOS					A											

HCS7 Two-Way Stop-Control Report

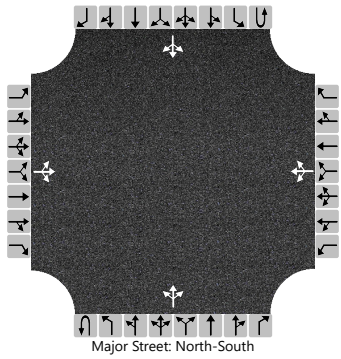
General Information

Analyst	MTC
Agency/Co.	BA Group
Date Performed	07/23/2021
Analysis Year	2031
Time Analyzed	
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	William/Lane/Old Brock
Jurisdiction	
East/West Street	William/Lane Street
North/South Street	Old Brock Road
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		10	0	5		5	0	5		5	50	0		0	65	5
Percent Heavy Vehicles (%)		0	0	0		0	0	0		0				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		6.0	6.5	6.2		6.0	6.5	6.2		5.0				5.0		
Critical Headway (sec)		6.00	6.50	6.20		6.00	6.50	6.20		5.00				5.00		
Base Follow-Up Headway (sec)		4.0	4.0	3.3		4.0	4.0	3.3		3.0				3.0		
Follow-Up Headway (sec)		4.00	4.00	3.30		4.00	4.00	3.30		3.00				3.00		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			19				13			6				0		
Capacity, c (veh/h)			797				849			1093				1126		
v/c Ratio			0.02				0.01			0.01				0.00		
95% Queue Length, Q_{95} (veh)			0.1				0.0			0.0				0.0		
Control Delay (s/veh)			9.6				9.3			8.3				8.2		
Level of Service (LOS)			A				A			A				A		
Approach Delay (s/veh)	9.6				9.3				0.8				0.0			
Approach LOS	A				A											

HCS7 Two-Way Stop-Control Report

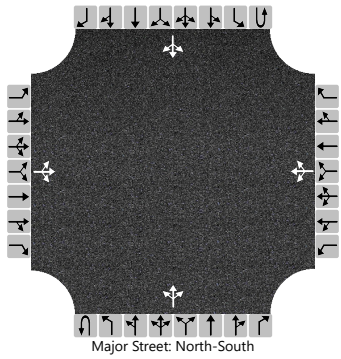
General Information

Analyst	MTC
Agency/Co.	BA Group
Date Performed	07/23/2021
Analysis Year	2031
Time Analyzed	
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	William/Lane/Old Brock
Jurisdiction	
East/West Street	William/Lane Street
North/South Street	Old Brock Road
Peak Hour Factor	0.68
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		20	0	5		5	0	0		5	105	0		5	75	5
Percent Heavy Vehicles (%)		0	0	0		0	0	0		0				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

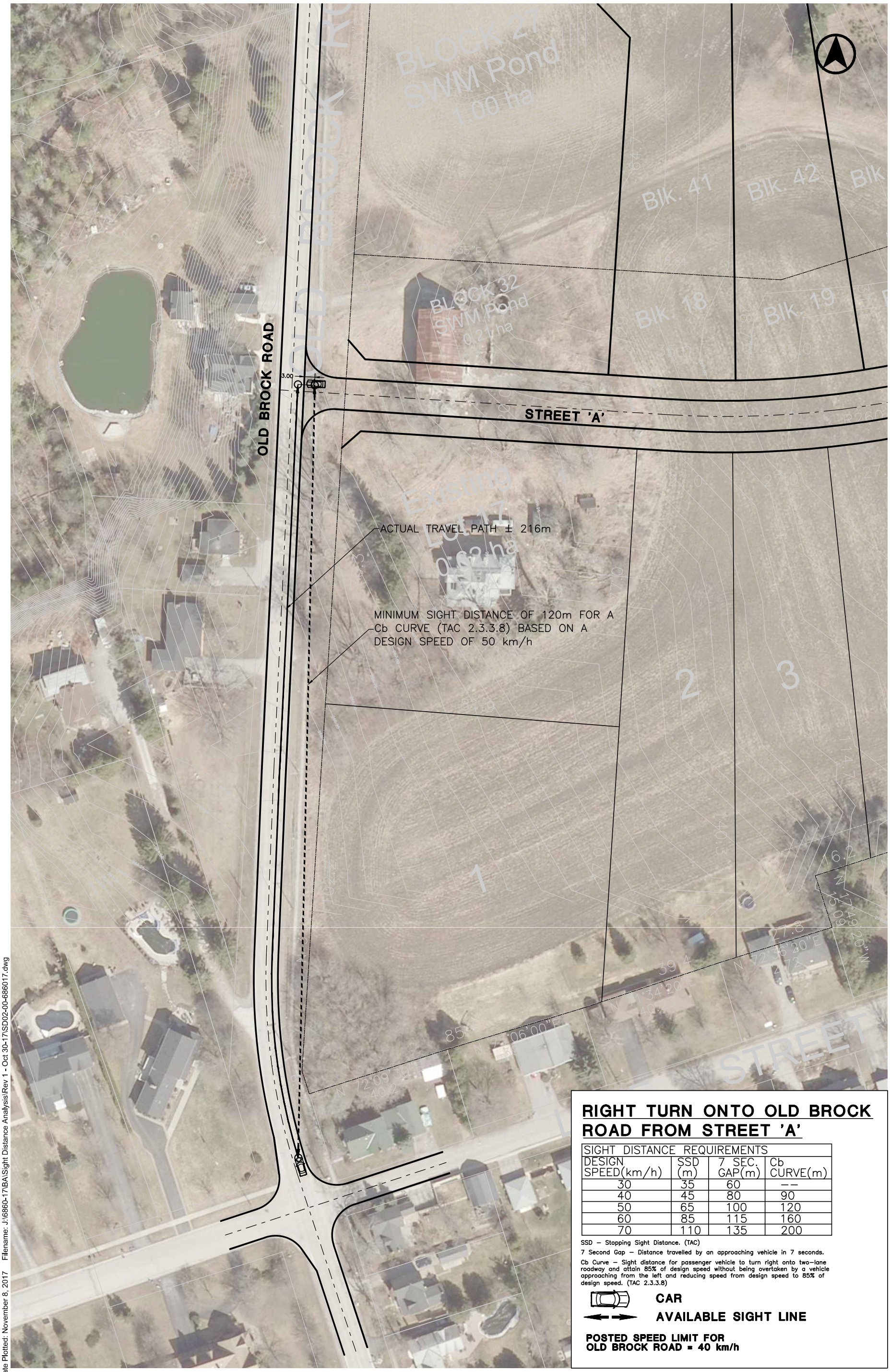
Critical and Follow-up Headways

Base Critical Headway (sec)		6.0	6.5	6.2		6.0	6.5	6.2		5.0				5.0		
Critical Headway (sec)		6.00	6.50	6.20		6.00	6.50	6.20		5.00				5.00		
Base Follow-Up Headway (sec)		4.0	4.0	3.3		4.0	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		4.00	4.00	3.30		4.00	4.00	3.30		2.20				2.20		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			37				7			7				7		
Capacity, c (veh/h)			682				629			1440				1381		
v/c Ratio			0.05				0.01			0.01				0.01		
95% Queue Length, Q_{95} (veh)			0.2				0.0			0.0				0.0		
Control Delay (s/veh)			10.6				10.8			7.5				7.6		
Level of Service (LOS)			B				B			A				A		
Approach Delay (s/veh)	10.6				10.8				0.4				0.5			
Approach LOS	B				B											

Appendix E: Sight Distance Review



RIGHT TURN ONTO OLD BROCK ROAD FROM STREET 'A'

SIGHT DISTANCE REQUIREMENTS			
DESIGN SPEED(km/h)	SSD (m)	7 SEC. GAP(m)	Cb CURVE(m)
30	35	60	--
40	45	80	90
50	65	100	120
60	85	115	160
70	110	135	200

SSD – Stopping Sight Distance. (TAC)

7 Second Gap – Distance travelled by an approaching vehicle in 7 seconds.

Cb Curve – Sight distance for passenger vehicle to turn right onto two-lane roadway and attain 85% of design speed without being overtaken by a vehicle approaching from the left and reducing speed from design speed to 85% of design speed. (TAC 2.3.3.8)

CAR

AVAILABLE SIGHT LINE

POSTED SPEED LIMIT FOR OLD BROCK ROAD = 40 km/h

BA Group

SIGHT DISTANCE REVIEW

Intersection of Old Brock Road and Proposed Street 'A'

Project: Claremont
Project No. 6860-17
Date: October 30, 2017
Revised: --

Scale 1:1,000 (0 10 20 30 40 50m)

Drawing No. **SD-01**

Date Plotted: November 8, 2017 Filename: J:\6860-17\BA\Sight Distance Analysis\Rev 1 - Oct 30-17\SD02-00-686017.dwg