

521 Huronia Proposed Townhome Community

City of Barrie

Traffic Impact Study for Huronia Barrie Land Inc.

Type of Document:
Final Report

Project Number:
JDE – 19070

Date Submitted:
March 2nd, 2020
Revised: October 16th, 2020
Revised: July 21st, 2021



John Northcote, P.Eng.
Professional License #: 100124071



JD Northcote Engineering Inc.
86 Cumberland Street
Barrie, ON
705.725.4035
www.JDEngineering.ca

Legal Notification

This report was prepared by **JD Northcote Engineering Inc.** for the account of the **Huronie Barrie Land Inc.**

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. **JD Northcote Engineering Inc.** accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project.

Executive Summary

This report summarizes the traffic impact study prepared for a proposed development municipally known as 521 Huronia Road, generally located in the southeast quadrant of the Huronia Road / Loon Avenue & Commercial Access intersection in the City of Barrie [City]. The report assesses the impact of traffic related to the development on the adjacent roadway and provides recommendations to accommodate this traffic in a safe and efficient manner.

The proposed development is anticipated to include 52 residential townhouse units.

The proposed development will have a single right-in / right-out access onto Huronia Road [RIRO Access] and an internal connection to the subdivision to the east, which will provide access to Loon Avenue via a proposed private road [Street A]

The scope of this analysis includes a review of the following intersections:

- Huronia Road / Loon Avenue & Commercial Access; and
- Huronia Road / RIRO Access; and
- Street 'A' / Loon Avenue.

Conclusions

1. The proposed development is expected to generate a total of 26 AM and 34 PM peak hour trips.
2. Detailed turning movement traffic and pedestrian counts were commissioned by JD Engineering for the existing Huronia Road / Loon Avenue & Commercial Access intersection.
3. An estimate of the amount of traffic that would be generated by the proposed development was prepared and assigned to the study area streets and intersections.
4. An intersection operation analysis was completed at the study area intersections, using the existing (2020) and background (2023 & 2030) traffic volumes without the proposed development traffic. This enabled a review of existing and future traffic deficiencies that would be present without the influence of the proposed development. No geometric lane improvements or traffic signal improvements are recommended within the study area.
5. An estimate of the amount of traffic that would be generated by the Subject Site was prepared and assigned to the study area streets and intersections.
6. An intersection operation analysis was completed under total (2023 & 2030) traffic volumes with the proposed development operational at the study area intersections. No geometric lane improvements or traffic signal improvements are recommended within the study area.
7. The proposed RIRO Access will operate efficiently as a right-in-right-out access driveway with one-way stop control for westbound traffic. A single lane for ingress and egress movements at the RIRO Access will provide the necessary capacity to convey the traffic volume generated by the proposed development.
8. It is recommended a parking control gate be installed at the east end of the subject site to prohibit cut-through traffic within the subject site.
9. In order to improve safety for the adjacent residents on Loon Avenue, the subject site has been designed to include a retaining wall along the north side of the main driveway within the subject site, which will redirect errant passenger vehicles.

10. For the proposed development, Street 'A' will operate efficiently as a full-movement access roadway with one-way stop control for northbound movements. No lane improvements are recommended on Loon Avenue at Street 'A'. A single northbound and southbound lane at Street 'A' will provide the necessary capacity to service the proposed development. Once the Future Development Lands east of the subject site develop, it is recommended that all-way stop control is provided at the Loon Avenue / Street 'A' intersection. The timing for the implementation of the all-way stop adjustment is recommended when the following criteria are met (based on OTM Book 5 criteria):
 - Total vehicle volume on all intersection approaches exceeds 350 for the highest hour recorded; and
 - Volume split does not exceed 75/25 for Loon Avenue / Street 'A', where volume is defined as vehicles only.
11. In order to address concerns regarding the traffic operations at the Huronia Road / Loon Avenue & Commercial Access intersection, a southbound left turn lane on Huronia Road at Loon Avenue is recommended with a 30-metre storage length and a 55-metre taper length. It is recommended that the timing for the installation of this temporary road widening coincide with the occupancy of the Future Development Lands. This improvement is not warranted as a result of the increase in traffic from the proposed development.
12. There are no issues with the sight distance available for the proposed RIRO Access at Huronia Road or the Street 'A' intersection at Loon Avenue.
13. The proposed parking supply meets the parking required identified in the City's Zoning By-law 2009-141.
14. In summary, the proposed development will not cause any operational issues and will not add significant delay or congestion to the local roadway network.

Table of Contents

1	Introduction	1
1.1	Background	1
1.2	Study Area	1
1.3	Study Scope and Objectives.....	3
1.4	Horizon Year and Analysis Periods	3
2	Information Gathering	3
2.1	Street and Intersection Characteristics	3
2.2	Local Transportation Infrastructure Improvements.....	5
2.3	Transit Access.....	5
2.4	Other Developments within the Study Area.....	5
2.4.1	131 Ellis Drive Development	6
2.4.2	Future Development Lands.....	6
2.5	Background Growth Rate	11
2.6	Traffic Counts.....	11
2.7	Horizon Year Traffic Volumes.....	11
3	Intersection Operation without Proposed Development.....	15
3.1	Introduction.....	15
3.2	Existing (2020) Intersection Operation	16
3.3	Background (2023) Intersection Operation.....	17
3.4	Background (2030) Intersection Operation.....	18
4	Proposed Development Traffic Generation and Assignment.....	19
4.1	Traffic Generation.....	19
4.2	Traffic Assignment.....	19
4.3	Total Horizon Year Traffic Volumes with the Proposed Development	20
5	Intersection Operation with Proposed Development.....	24
5.1	Total (2023) Intersection Operation	24
5.2	Total (2030) Intersection Operation	25
5.3	Supplementary Analysis - Total (2030) Intersection Operation with (SB Left Turn Lane).....	27
5.4	Site Access.....	28
5.5	Sight Distance Review	29
5.6	Traffic Safety Review	29

5.7	Active Transportation Review.....	29
5.8	Parking Review.....	29
5.9	Construction Parking.....	30
6	Summary.....	30

List of Tables

Table 1 - Estimated Traffic Generation – 131 Ellis Drive.....	6
Table 2 – Traffic Distribution – 131 Ellis Drive	6
Table 3 - Estimated Traffic Generation – Future Development Lands	7
Table 4 – Traffic Count Data	11
Table 5 – Level of Service Criteria for Intersections.....	16
Table 6 – Existing (2020) LOS.....	16
Table 7 – Background (2023) LOS	17
Table 8 – Background (2030) LOS	18
Table 9 – Estimated Traffic Generation of Proposed Development.....	19
Table 10 – Proposed Development Traffic Distribution	20
Table 11 – Total (2023) LOS	24
Table 12 – Total (2030) LOS	26
Table 13 – Total (2030) LOS with Improvements	27
Table 14 – Parking Statistics.....	30

List of Figures

Figure 1 – Proposed Site Location and Study Area	2
Figure 2 – Existing Lane Configuration within Study Area	4
Figure 3 – Adjacent Development Traffic Volumes – 131 Ellis Drive Development (2023)	8
Figure 4 – Adjacent Development Traffic Volumes – Future Development Lands (2030)	9
Figure 5 – Total Adjacent Development Traffic Volumes (2030).....	10
Figure 6 – Existing (2020) Traffic Volumes.....	12
Figure 7 – Background (2023) Traffic Volumes	13
Figure 8 – Background (2030) Traffic Volumes	14
Figure 9 – Proposed Development Traffic Assignment	21
Figure 10 – Total (2023) Traffic Volumes.....	22
Figure 11 – Total (2030) Traffic Volumes.....	23

List of Appendices

APPENDIX A – Site Plan
APPENDIX B – Traffic Count Data
APPENDIX C – Synchro Analysis Output – Existing Traffic Volumes
APPENDIX D – Synchro Analysis Output – Background Traffic Volumes
APPENDIX E – Transportation Tomorrow Survey – Excerpt
APPENDIX F – Synchro Analysis Output – Total Traffic Volumes
APPENDIX G – OTM Signal Justification Sheets
APPENDIX H – MTO Left-Turn Analysis

1 Introduction

1.1 Background

Huronie Barrie Land Inc. [The Developer] is proposing to develop a site municipally known as 521 Huronia Road, generally located in the southeast quadrant of the Huronia Road / Loon Avenue & Commercial Access intersection in the City of Barrie [City].

The proposed development is anticipated to include 52 residential townhouse units.

The proposed development will have a single right-in-right-out [RIRO] access onto Huronia Road [RIRO Access] and an internal connection to the proposed subdivision to the east, which will provide access to Loon Avenue via a proposed private road [Street A]

The Developer has retained **JD Engineering Inc.** [JD Engineering] to prepare this traffic impact study in support of the proposed development.

1.2 Study Area

Figure 1 illustrates the location of the proposed development and study area intersections, in relation to the surrounding area. The Site Plan by We Merchandise Space Inc. is provided in **Appendix A**.

The subject site is bound by Huronia Road to the west, existing residential lands to the north, future residential lands to the east and environmentally protected lands to the south.

The following intersections will be analysed as part of the study:

- Huronia Road / Loon Avenue & Commercial Access;
- Huronia Road / RIRO Access; and
- Street 'A' / Loon Avenue.

Figure 1 – Proposed Site Location and Study Area



1.3 Study Scope and Objectives

The purpose of this study is to identify the potential impacts to traffic flow at the access driveways / roadway and on the surrounding roadway network. The study analysis includes the following tasks:

- Consult with the City to address any traffic-related issues or concerns they have with the proposed development;
- Determine existing traffic volumes and circulation patterns;
- Estimate future traffic volumes if the proposed development was not constructed, including the impact of additional proposed developments in the area;
- Complete level-of-service [LOS] analysis of horizon year (without the proposed development) traffic conditions and identify operational deficiencies;
- Estimate the amount of traffic that would be generated by the proposed development and assign to the roadway network;
- Complete LOS analysis of horizon year (with the proposed development) traffic conditions and identify additional operational deficiencies;
- Identify improvement options to address operational deficiencies; and
- Document findings and recommendations in a final report.

1.4 Horizon Year and Analysis Periods

Traffic scenarios for the existing (2020) year and horizon years (2023 & 2030) were selected for analysis of traffic operations in the study area. The weekday morning [AM] and weekday afternoon [PM] peak hours have been selected as the analysis periods for this study.

2 Information Gathering

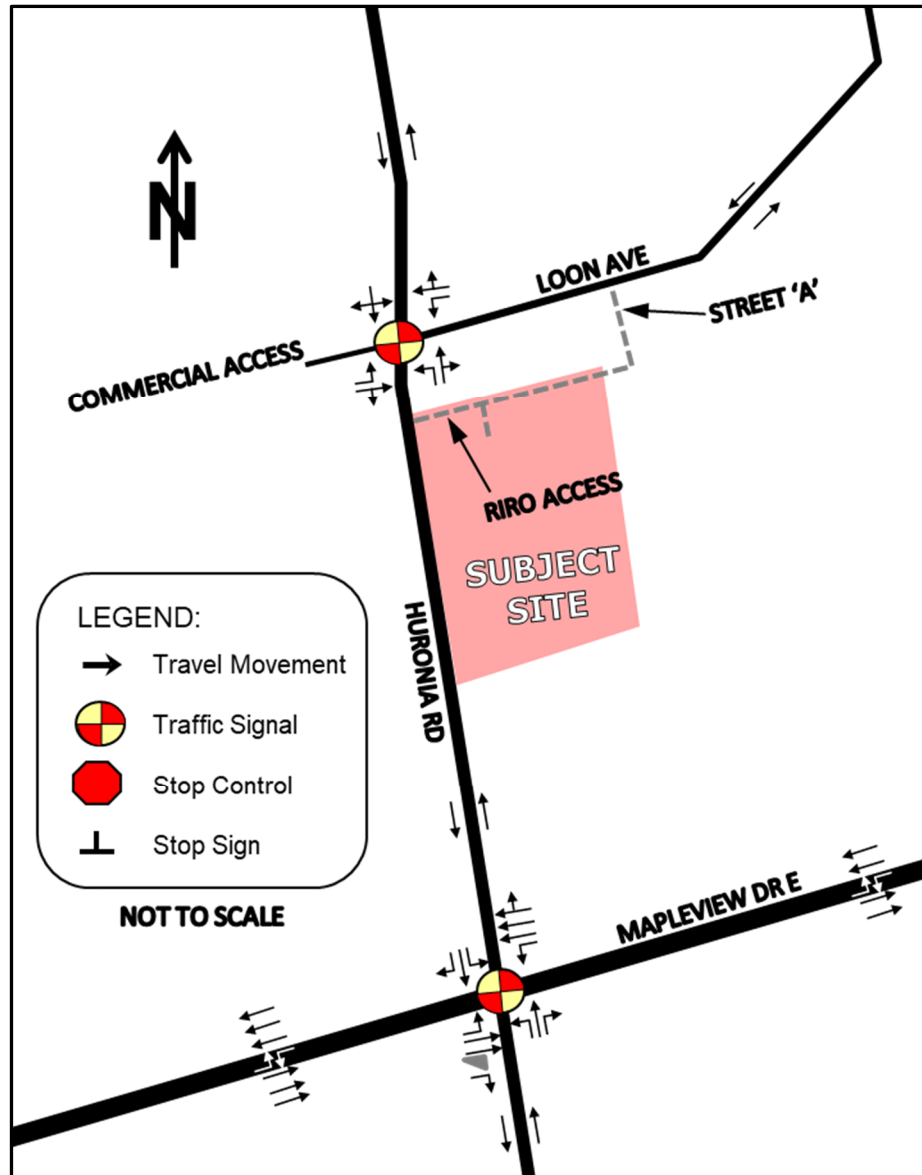
2.1 Street and Intersection Characteristics

Huronía Road is a two-lane arterial road with a rural cross section and no sidewalks within the study area. Huronía Road has a posted speed limit of 60km/h and is under the jurisdiction of the City within the study area.

Loon Avenue is a two-lane local road with an urban cross-section and a sidewalk on both sides of the road. Loon Avenue has a posted speed limit of 50 km/h and is under jurisdiction of the City.

The existing lane configuration within the study area is illustrated in **Figure 2**.

Figure 2 – Existing Lane Configuration within Study Area



2.2 Local Transportation Infrastructure Improvements

Based on the City's Transportation Master Plan [City TMP], the following improvements are proposed within the study area by 2031:

- Widening of Huronia Road to add a two-way-left-turn lane, cycle track and sidewalks on both sides of the road within the study area; and
- Construction of a signed bike route on Loon Avenue.

Based on a review of the City's 2019 Capital budget, the above noted improvements are not identified in the 2019 – 2028 capital plan. For the purpose of our analysis, we have assumed that the above noted improvements will not be completed by the 2030 horizon year to illustrate operation of the study area intersections without the above noted improvements.

2.3 Transit Access

Barrie Transit provides one bus route (No. 3A-3B (Bayview-Painswick)) along Huronia Road within the study area. The No. 3A & 3B bus route operate along the same route but in opposite directions. The No. 3A & 3B bus routes operate from 05:10 – 23:26 on weekdays with daytime service every 30 minutes, from 06:29 – 23:26 on Saturdays with daytime service every 30 minutes and from 08:29 – 21:26 on Sundays with daytime service every hour. The closest bus stops to the proposed development are located at the northwest and southeast corners of the Huronia Road / Loon Avenue & Commercial Access intersection, for the No.3A & No. 3B routes respectively.

2.4 Other Developments within the Study Area

Based on correspondence with the City and a review of the City's Proposed Developments webpage, the 131 Ellis Drive development, the Loon Avenue development and the 340 Mapleview Drive East development are the only proposed development in the study area that will have a notable impact on the local traffic volumes.

The 131 Ellis Drive development is located in the southwest corner of the Huronia Road / Ellis Drive intersection and is anticipated to include 54,063 sq.ft. of industrial space. The 131 Ellis Drive development application is currently under the City's review.

Future residential development is planned on two properties located directly east of the proposed development (Loon Avenue development and 340 Mapleview Drive East development). The specifics of the development of these properties is not known at this time; however, for the purpose of this analysis we have conservatively assumed a combined total of 325 townhouse units [Future Development Lands].

The Future Development Lands are expected to include internal connections and a primary access onto Loon Avenue via Street 'A'. The proposed internal connection between the subject site and the Future Development Lands will be controlled with an automated parking control gate at the east end of the subject site. The control gate will prohibit cut-through traffic from the Future Development Lands. Additional details are provided in Section 5.2.

It is assumed that the 131 Ellis Drive development will be built-out by the 2023 horizon year. It is anticipated the Future Development Lands will be fully built-out and occupied by the 2030 horizon year.

2.4.1 131 Ellis Drive Development

The traffic generation for the 131 Ellis Drive development has been based on the Institute of Transportation Engineers [ITE] *Trip Generation Manual* (10th Edition) [ITE Trip Generation Manual]. The following ITE land uses have been applied to estimate the traffic from the 131 Ellis Drive development:

- ITE land use 110 (General Light Industrial) – General Urban / Suburban Setting

The estimated trip generation of the 131 Ellis Drive development is illustrated below in **Table 1**. The AM and PM peak traffic generation for the 131 Ellis Drive development is not expected to exactly align with the AM and PM peak hour in the traffic counts; consequently, we have applied the peak hour of adjacent street traffic values provided in the ITE Trip Generation Manual.

Table 1 - Estimated Traffic Generation – 131 Ellis Drive

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
General Light Industrial ITE Land Use: 110	54,063 sq.ft.	33	5	38	5	30	35

No transportation modal split has been applied to the above-noted traffic generation calculation.

The distribution of traffic for the 131 Ellis Drive development is assumed to follow the distribution of the existing traffic volumes within the study area. **Table 2** illustrates the calculation of the distribution of ingress and egress traffic for the 131 Ellis Drive development.

Table 2 – Traffic Distribution – 131 Ellis Drive

Travel Direction (to / from)	AM Peak Hour		PM Peak Hour	
	Ingress	Egress	Ingress	Egress
South via Huronia Road	41%	57%	54%	43%
East via Loon Avenue	17%	5%	5%	16%
Outside of Study Area	42%	38%	41%	41%
TOTAL	100%	100%	100%	100%

Using the traffic distributions patterns noted above, the traffic assignment for the 131 Ellis Drive development (2023) was calculated for the AM and PM peak hour and is illustrated in **Figure 3**.

2.4.2 Future Development Lands

The traffic generation for the Future Development Lands has been based on the ITE Trip Generation Manual. The following ITE land uses have been applied to estimate the traffic from both developments:

- ITE land use 220 (Multifamily Housing (Low-Rise)) – General Urban / Suburban Setting

The estimated trip generation of the Future Development Lands is illustrated below in **Table 3**.

Table 3 - Estimated Traffic Generation – Future Development Lands

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Multifamily Housing (Low-Rise) ITE Land Use: 220	325 units	35	115	150	115	67	182

The traffic distribution for the Future Development Lands will follow the same distribution as the proposed development noted in Section 4.2.

Using the traffic distribution noted above, the traffic assignment for Future Development Lands (2030) was calculated for the AM and PM peak hour and is illustrated in **Figure 4**.

Figure 5 illustrates the traffic assignment during the AM and PM peak hour for all the adjacent developments (2030) within the study area.

Figure 3 – Adjacent Development Traffic Volumes – 131 Ellis Drive Development (2023)

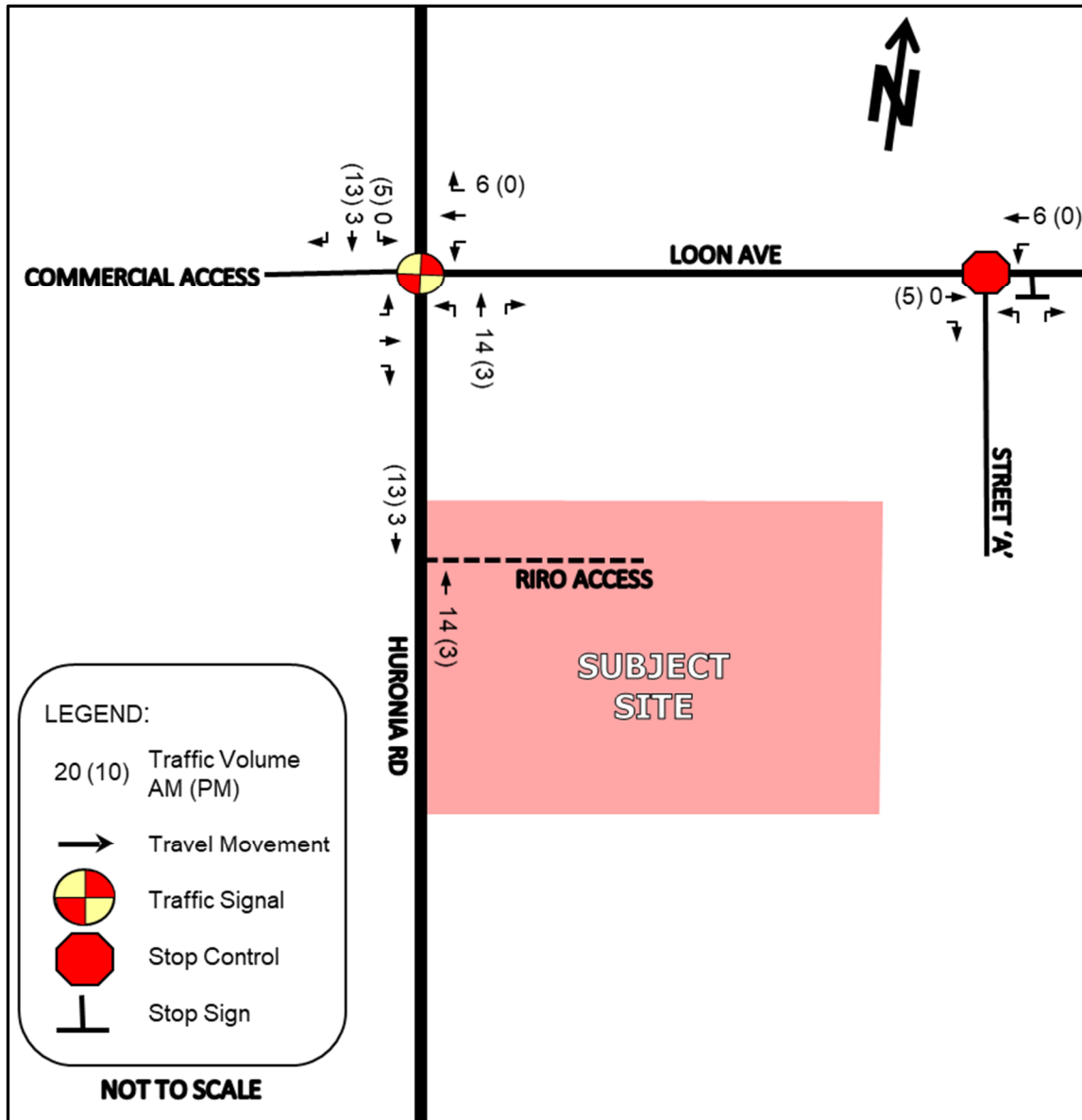


Figure 4 – Adjacent Development Traffic Volumes – Future Development Lands (2030)

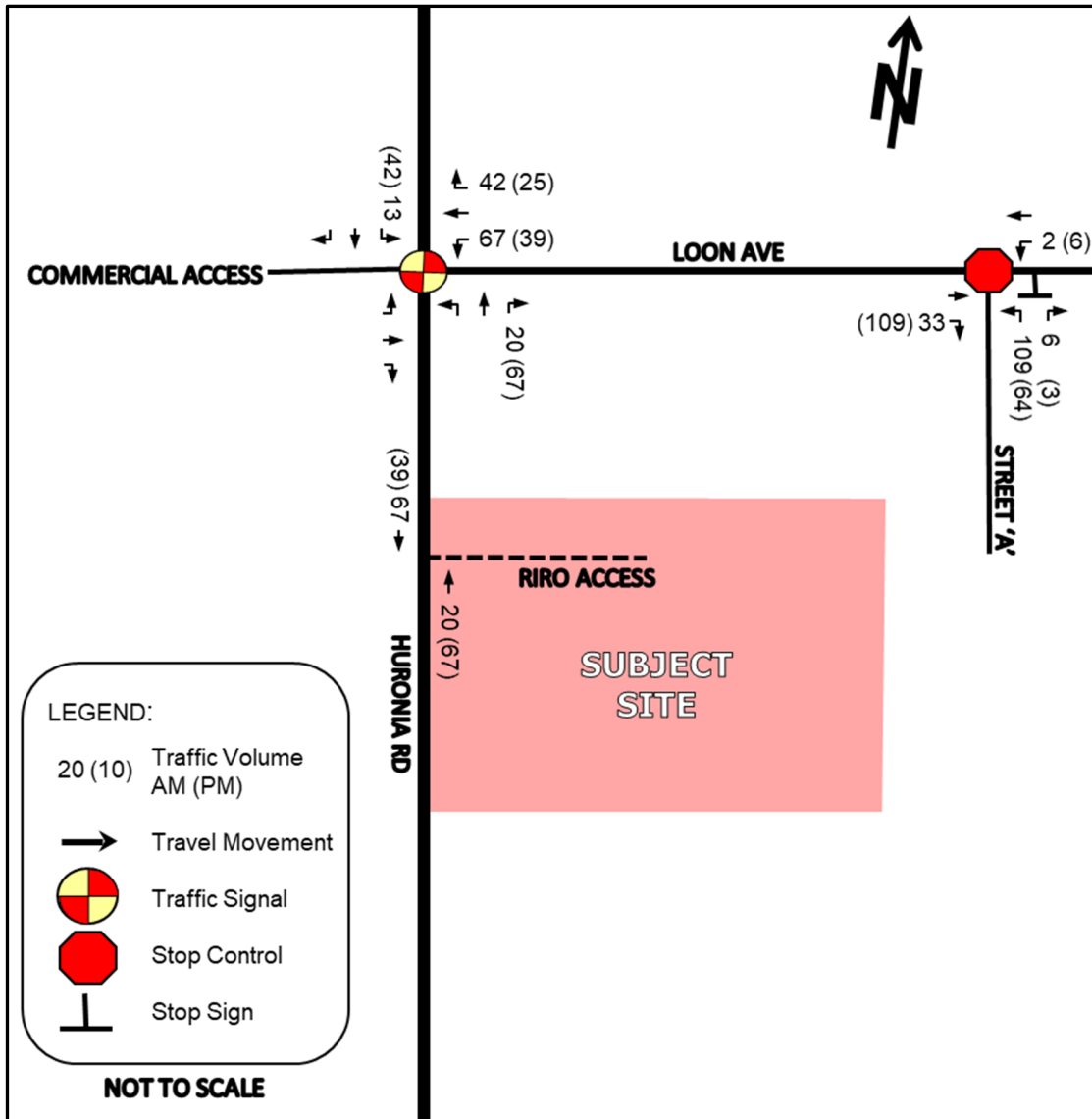
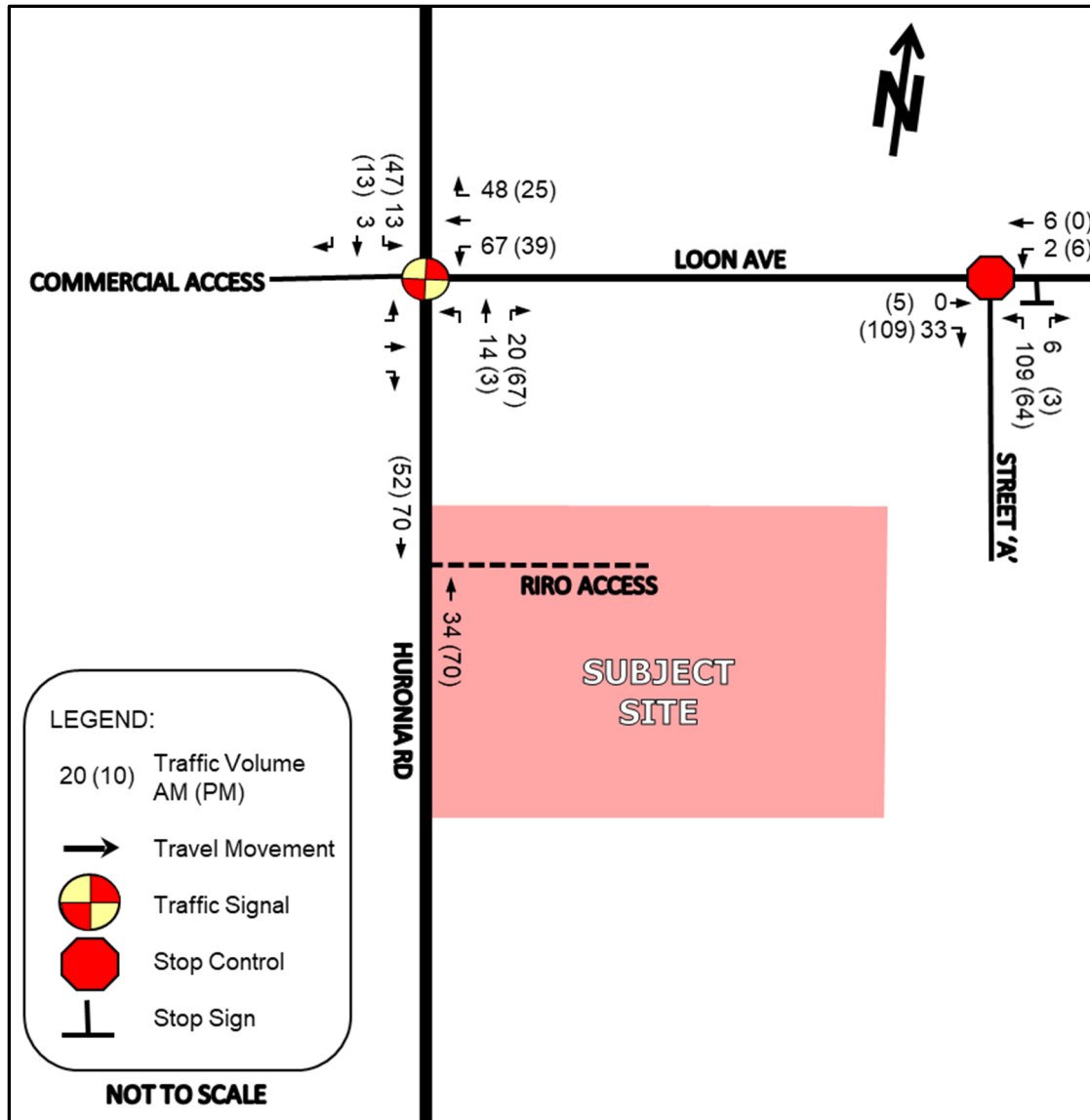


Figure 5 –Total Adjacent Development Traffic Volumes (2030)



2.5 Background Growth Rate

Based on our review of the City's TMP EMME Model Output, we have conservatively selected a background traffic growth rate of 2.50% per year for Huronia Road and Loon Avenue within the study area.

2.6 Traffic Counts

Detailed turning movement traffic and pedestrian counts were commissioned by JD Engineering for the existing Huronia Road / Loon Avenue & Commercial Access intersection.

Table 4 summarizes the traffic count data collection information.

Table 4 – Traffic Count Data

Intersection (N-S Street / E-W Street)	Count Date	AM Peak Hour	PM Peak Hour	Source
Huronia Road / Loon Avenue & Commercial Access	Wednesday, December 4, 2019	07:45 – 08:45	16:15 – 17:15	*JD. Eng.

*Traffic counts were completed by Ontario Traffic Inc. on behalf of JD Engineering.

Detailed traffic count data can be found in **Appendix B**. The peak hours of traffic generation for the study area intersections generally aligned with the anticipated peak hour of traffic generation by the proposed development.

Heavy vehicle percentages from the traffic count data have also been included in the Synchro analysis.

The background traffic growth rates discussed in Section 2.5 have been applied to the traffic count data to estimate the existing (2020) horizon year traffic volumes.

Figure 6 illustrates the existing (2020) AM and PM peak hour traffic volumes within the study area.

2.7 Horizon Year Traffic Volumes

In addition to the adjacent development traffic volumes discussed in Section 2.4, the background traffic growth rates discussed in Section 2.5 have been applied to the existing traffic volumes to estimate the background (2023 & 2030) horizon year traffic volumes.

Figures 7 and 8 illustrates the background (2023 & 2030) horizon year traffic volumes respectively, for the AM and PM peak hour traffic volumes in the study area.

Figure 6 – Existing (2020) Traffic Volumes

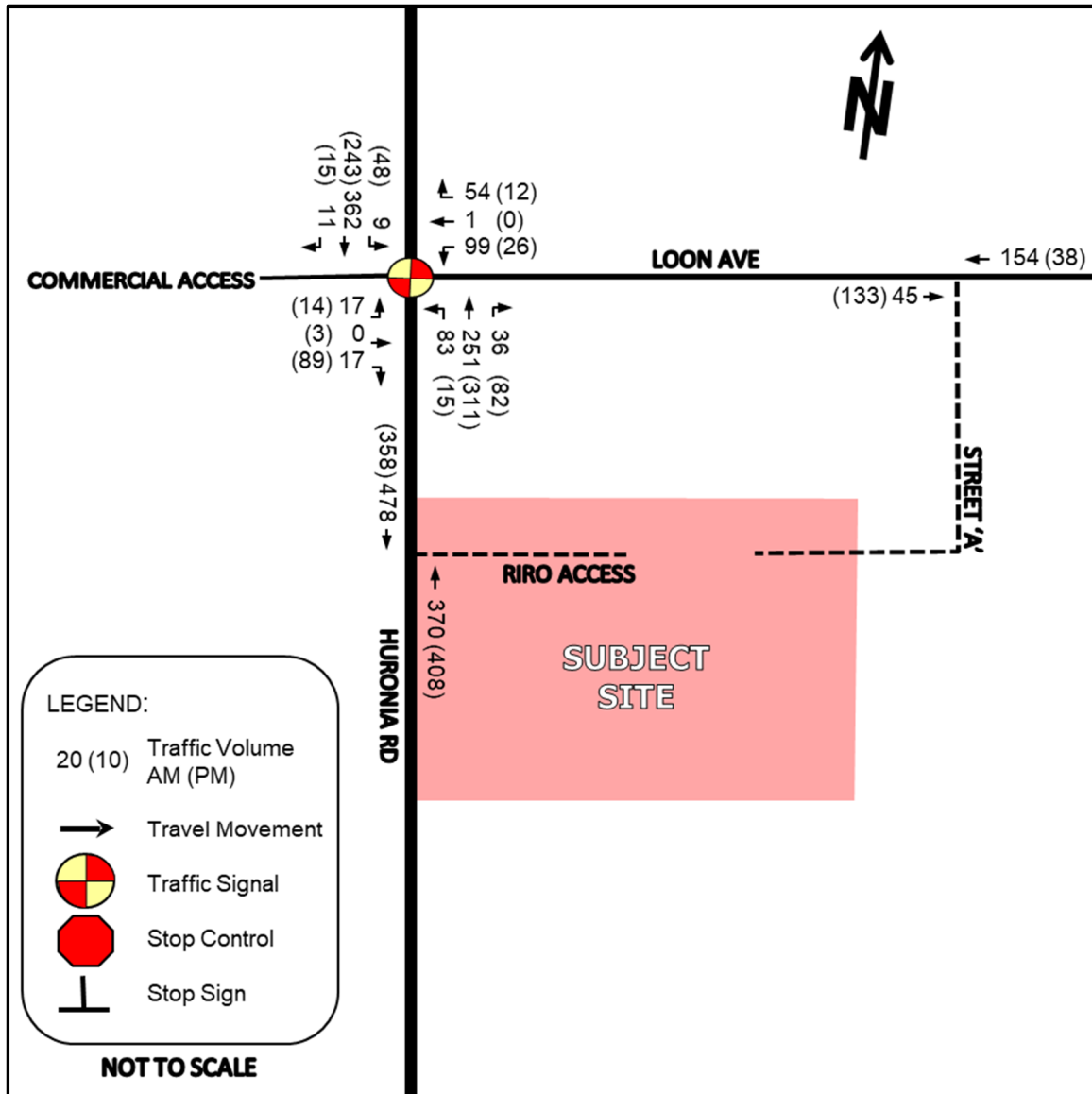


Figure 7 – Background (2023) Traffic Volumes

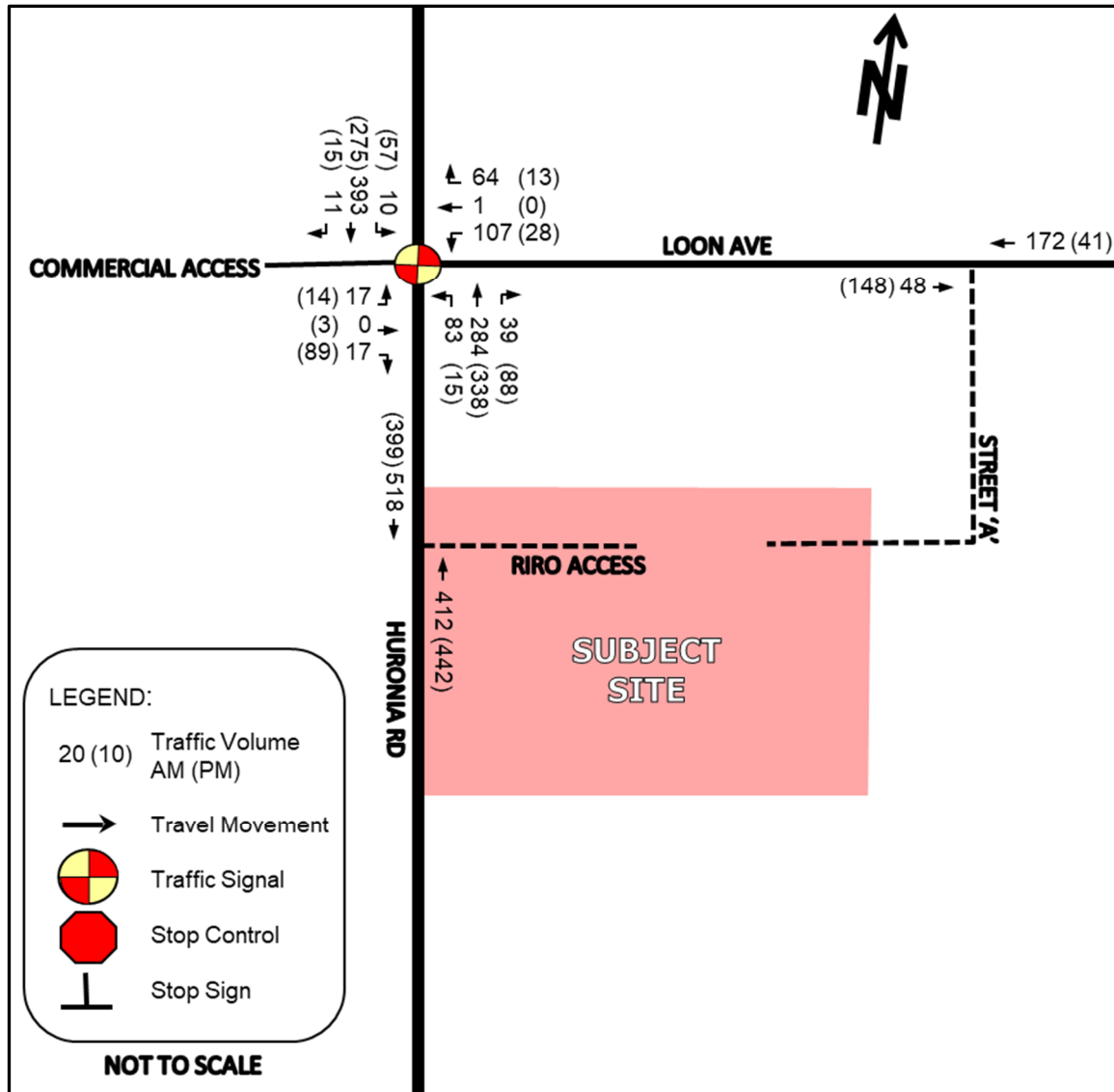
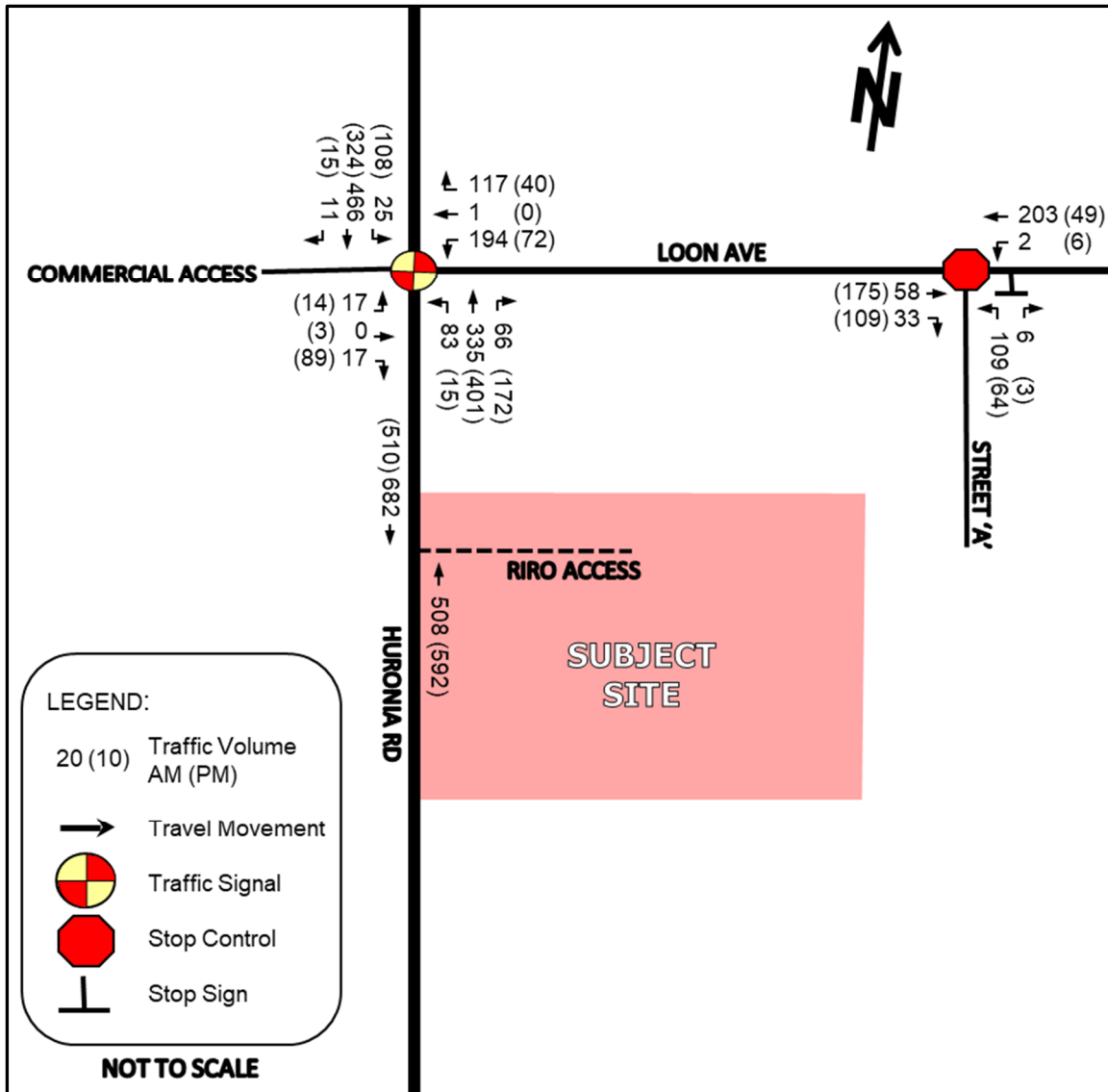


Figure 8 – Background (2030) Traffic Volumes



3 Intersection Operation without Proposed Development

3.1 Introduction

Intersection performance was measured using the traffic analysis software, Synchro 11, a deterministic model that employs Highway Capacity Manual and Intersection Capacity Utilization methodologies for analysing intersection operations. These procedures are accepted by provincial and municipal agencies throughout North America.

Synchro 11 enables the study area to be graphically defined in terms of streets and intersections, along with their geometric and traffic control characteristics. The user is able to evaluate both signalized and unsignalized intersections in relation to each other, thus not only providing level of service for the individual intersections, but also enabling an assessment of the impact the various intersections in a network have on each other in terms of spacing, traffic congestion, delay, and queuing.

The intersection operations were also evaluated in terms of the LOS. LOS is a common measure of the quality of performance at an intersection and is defined in terms of vehicular delay. This delay includes deceleration delay, queue move-up time, stopped delay, and acceleration delay. LOS is expressed on a scale of A through F, where LOS A represents very little delay (i.e. less than 10 seconds per vehicle) and LOS F represents very high delay (i.e. greater than 50 seconds per vehicle for a stop sign controlled intersection and greater than 80 seconds per vehicle for a signalized intersection).

The design limits outlined in the City's TIS Guidelines are highlighted in this report. At signalized intersections overall intersection operation exceeding LOS D and intersection and individual turning movements with a volume-to-capacity [V/C] ratio of 0.85 or greater are considered to be critical. At unsignalized intersections individual turning movements operating at LOS E or greater are considered to be critical movements. Values approaching these thresholds have been highlighted in the LOS tables.

The LOS criteria for signalized and stop sign controlled intersections are shown in **Table 5**. description of traffic performance characteristics is included for each LOS.

Table 5 – Level of Service Criteria for Intersections

LOS	LOS Description	Control Delay (seconds per vehicle)	
		Signalized Intersections	Stop Controlled Intersections
A	Very low delay; most vehicles do not stop (Excellent)	less than 10.0	less than 10.0
B	Higher delay; more vehicles stop (Very Good)	between 10.0 and 20.0	between 10.0 and 15.0
C	Higher level of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping (Good)	between 20.0 and 35.0	between 15.0 and 25.0
D	Congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop (Satisfactory)	between 35.0 and 55.0	between 25.0 and 35.0
E	Vehicles must often wait through more than one red light; considered by many agencies to be the limit of acceptable delay	between 55.0 and 80.0	between 35.0 and 50.0
F	This level is considered to be unacceptable to most drivers; occurs when arrival flow rates exceed the capacity of the intersection (Unacceptable)	greater than 80.0	greater than 50.0

3.2 Existing (2020) Intersection Operation

The results of the LOS analysis under existing (2020) traffic volumes during the AM and PM peak hour can be found below in **Table 6**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix C**.

Table 6 – Existing (2020) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95 th Percentile Queue		V/C	Delay (s)	LOS	95 th Percentile Queue	
				Model	Storage				Model	Storage
Huronie Road / Loon Avenue & Commercial Access (signalized)	0.43	15.3	C	-	-	0.35	12.1	B	-	-
EBL	0.12	34.2	C	10	-	0.11	35.0	C	8	-
EBTR	0.01	33.4	C	-	-	0.08	34.7	C	-	-
WBL	0.65	44.5	D	35	20	0.23	35.9	D	13	20
WBTR	0.04	33.6	C	11	-	0.01	34.3	C	0	-
NBL	0.11	4.1	A	9	75	0.02	2.8	A	2	75
NBTR	0.24	3.9	A	30	-	0.30	3.6	A	29	-
SB	0.44	14.4	B	78	-	0.38	12.6	B	51	-

The results of the LOS analysis indicate that the Huronie Road / Loon Avenue & Commercial Access intersection is generally operating within the typical design limits noted in Section 3.1.

The anticipated 95th percentile queue length for the westbound left turn lane at the Huronie Road / Loon Avenue intersection during the AM peak hour exceeds the existing storage length. The queuing extends beyond the first two residential driveways on Loon Avenue, which is common near major intersections. The westbound left queue will not block access to the Gadwall Avenue intersection. The existing width of Loon Avenue can accommodate a three-lane cross-section between Huronie Road and Gadwall Avenue and can be repainted as necessary in the future.

The existing storage length for all other auxiliary turn lanes within the study area can accommodate the anticipated 95th percentile queue length for the associated turning movement.

No infrastructure improvements are recommended within the study area.

3.3 Background (2023) Intersection Operation

The results of the LOS analysis under background (2023) traffic volumes during the AM and PM peak hour can be found below in **Table 7**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix D**.

Table 7 – Background (2023) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95 th Percentile Queue		V/C	Delay (s)	LOS	95 th Percentile Queue	
				Model	Storage				Model	Storage
Huronie Road / Loon Avenue & Commercial Access (signalized)	0.47	15.8	B	-	-	0.46	15.7	B	-	-
EBL	0.10	32.6	C	10	-	0.09	32.7	C	9	-
EBTR	0.01	32.0	C	-	-	0.01	32.1	C	-	-
WBL	0.56	38.3	D	37	20	0.55	38.0	D	36	20
WBTR	0.05	32.3	C	12	-	0.05	32.3	C	12	-
NBL	0.12	5.1	A	10	75	0.12	5.0	A	9	75
NBTR	0.27	5.0	A	36	-	0.26	4.8	A	34	-
SB	0.50	16.6	B	87	-	0.49	16.4	B	84	-

The results of the LOS analysis indicate that the Huronie Road / Loon Avenue & Commercial Access intersection is operating within the typical design limits noted in Section 3.1.

The anticipated 95th percentile queue length for the westbound left turn lane at the Huronie Road / Loon Avenue intersection during the AM peak hour exceeds the existing storage length. The queuing extends beyond the first four residential driveways on Loon Avenue, which is common near major intersections. The westbound left queue will not block access to the Gadwall Avenue intersection. The existing width of Loon Avenue can accommodate a three-lane cross-section between Huronie Road and Gadwall Avenue and can be repainted as necessary in the future.

The existing storage length for all other auxiliary turn lanes within the study area can accommodate the anticipated 95th percentile queue length for the associated turning movement.

No infrastructure improvements are recommended within the study area.

3.4 Background (2030) Intersection Operation

The results of the LOS analysis under background (2030) traffic volumes during the AM and PM peak hour can be found below in **Table 8**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix D**.

Table 8 – Background (2030) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95 th Percentile Queue		V/C	Delay (s)	LOS	95 th Percentile Queue	
				Model	Storage				Model	Storage
Huronie Road / Loon Avenue & Commercial Access (signalized)	0.64	21.9	C	-	-	0.64	16.3	B	-	-
EBL	0.08	30.7	C	9	-	0.10	34.3	C	8	-
EBTR	0.01	30.2	C	-	-	0.08	34.1	C	-	-
WBL	0.77	47.5	D	65	20	0.58	41.4	D	28	20
WBTR	0.08	30.8	C	15	-	0.03	33.8	C	0	-
NBL	0.15	7.5	A	12	75	0.02	3.7	A	3	75
NBTR	0.37	7.5	A	57	-	0.46	5.3	A	65	-
SB	0.66	23.1	C	128	-	0.69	20.6	C	111	-

The results of the LOS analysis indicate that the Huronie Road / Loon Avenue & Commercial Access intersection is operating within the typical design limits noted in Section 3.1.

The anticipated 95th percentile queue length for the westbound left turn lane at the Huronie Road / Loon Avenue intersection during the AM peak hour exceeds the existing storage length. The queuing extends beyond the first four residential driveways on Loon Avenue, which is common near major intersections. The westbound left queue will not block access to the Gadwall Avenue intersection. The existing width of Loon Avenue can accommodate a three-lane cross-section between Huronie Road and Gadwall Avenue and can be repainted as necessary in the future.

The existing storage length for all other auxiliary turn lanes within the study area can accommodate the anticipated 95th percentile queue length for the associated turning movement.

No infrastructure improvements are recommended within the study area for this scenario.

Based on our correspondence with the City, we understand that there is a concern with the southbound left turn movement on Huronie Road at Loon Avenue. There is currently no dedicated left turn storage lane for this movement. As outlined above, the movement is anticipated to operate within the typical design limits noted in Section 3.1; however, a southbound left turn lane would improve operations at the intersection. A supplementary analysis for the critical total (2030) scenario is provided in Section 5.3 to illustrate the traffic operations with a southbound left turn lane on Huronie Road at Loon Avenue.

4 Proposed Development Traffic Generation and Assignment

4.1 Traffic Generation

The traffic generation for the proposed development has been based on the ITE Trip Generation Manual. The following ITE land use has been applied to estimate the traffic from the proposed development:

- ITE land use 220 (Multifamily Housing (Low-Rise)) – General Urban / Suburban Setting

The estimated trip generation of the proposed development is illustrated below in **Table 9**. The AM and PM peak traffic generation for the proposed development is not expected to exactly align with the AM and PM peak hour in the traffic counts; consequently, we have applied the peak hour of adjacent street traffic values provided in the ITE Trip Generation Manual.

Table 9 – Estimated Traffic Generation of Proposed Development

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Multifamily Housing (Low-Rise) ITE Land Use: 220	52 units	6	20	26	21	13	34

In order to be conservative, no transportation modal split has been applied to the above-noted traffic generation calculation.

4.2 Traffic Assignment

For the purposes of this study, it has been assumed that all traffic generated by the proposed development will be new traffic and would not be in the study area if the development was not constructed.

The ITE data provides the anticipated percentage of new traffic entering and exiting during the peak hour. The distribution of residential traffic has been calculated based on the 2016 Transportation Tomorrow Survey [TTS] data for traffic zones 8527 & 8528, retrieved using the TTS Internet Data Retrieval System [IDRS] (output attached as **Appendix E**). TTS data provides historical origin and destination work trip percentages for specific areas within the City and southern Ontario.

Traffic distribution for the trips generated by the proposed development during the AM and PM peak hour is expected to generally follow commuter travel patterns. Our analysis is based on egress traffic during the AM peak hour. Logically, the distribution of ingress traffic will follow the inverse of the exiting traffic distribution. For each of the individual areas identified in the TTS data, we have selected the probable route of travel, assuming that people will select their route primarily based on travel time.

The distribution of trips is illustrated in **Table 10** using the methodology outlined above.

Table 10 – Proposed Development Traffic Distribution

Travel Direction (to/from)	Percent of Total Traffic Generation
North via Huronia Road	58%
South via Huronia Road	37%
East via Loon Avenue	5%
Total	100%

Using the traffic distributions pattern noted above, the traffic assignment for the proposed development was calculated for the AM and PM peak hour and is illustrated in **Figure 9**.

4.3 Total Horizon Year Traffic Volumes with the Proposed Development

For the total (2023 & 2030) horizon year traffic volumes, the proposed development traffic was added to the background (2023 & 2030) traffic volumes. **Figures 10** and **11** illustrate the resulting total (2023 & 2030) horizon year traffic volumes for the AM and PM peak hour .

Figure 9 – Proposed Development Traffic Assignment

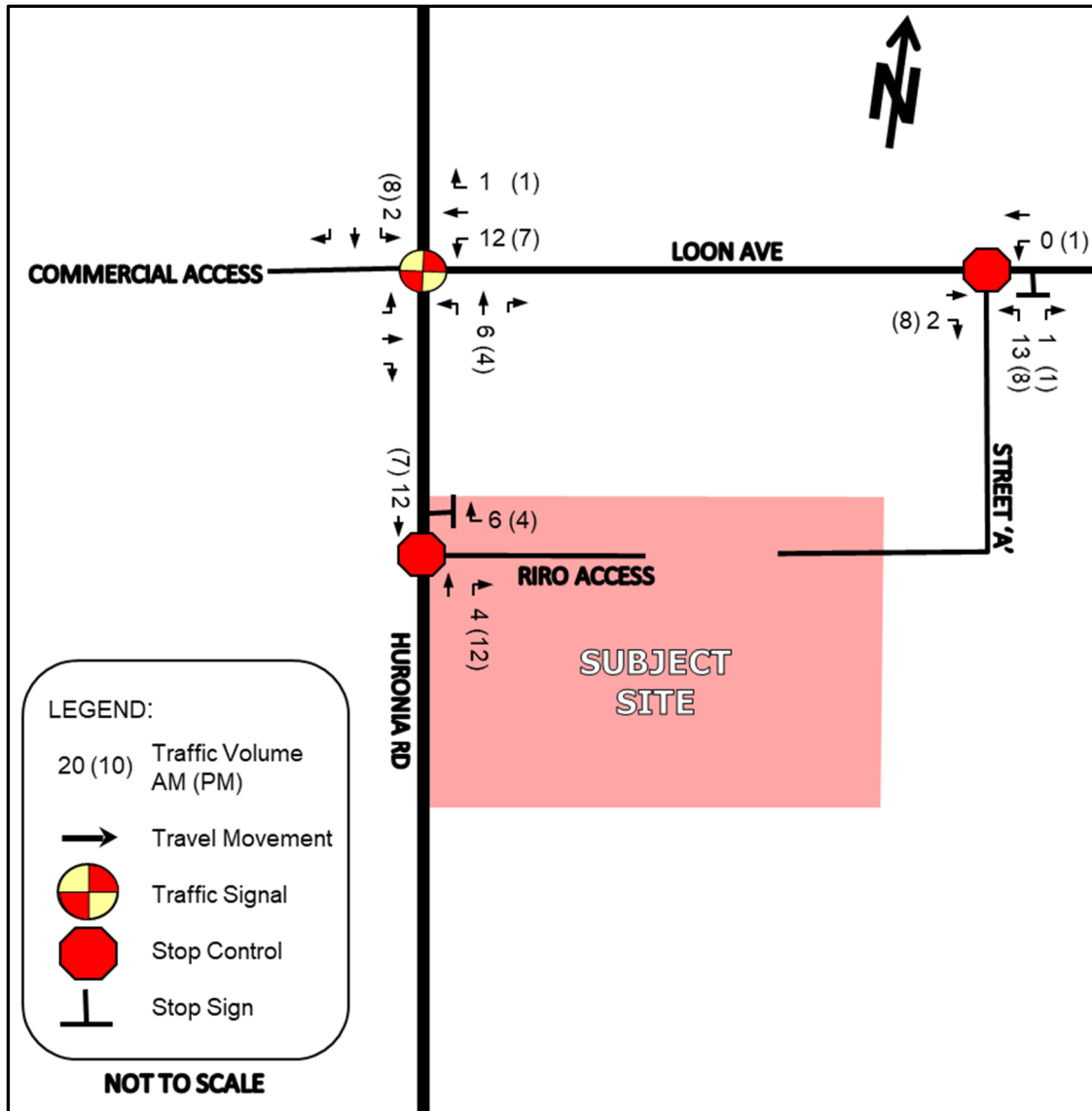


Figure 10 – Total (2023) Traffic Volumes

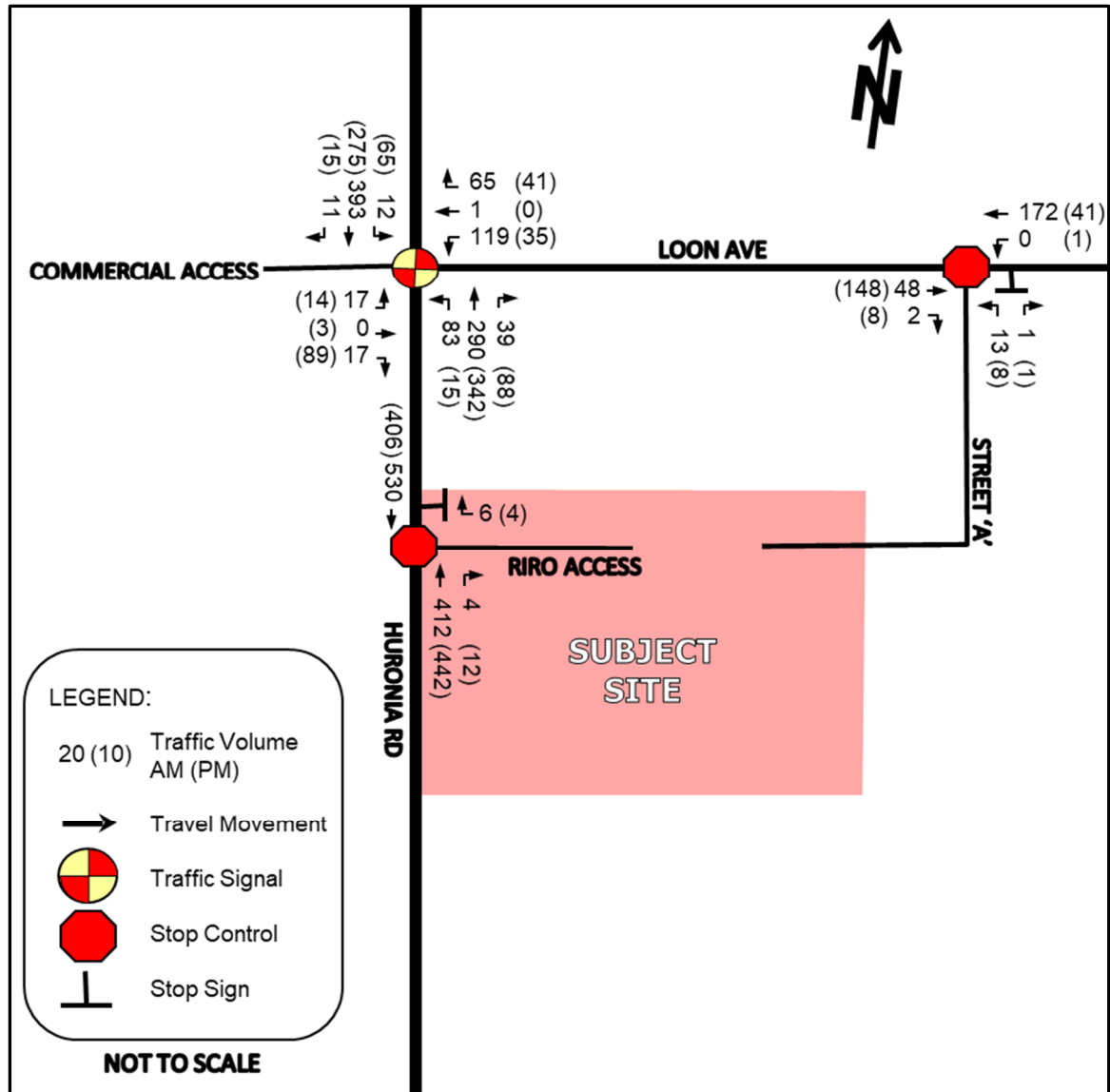
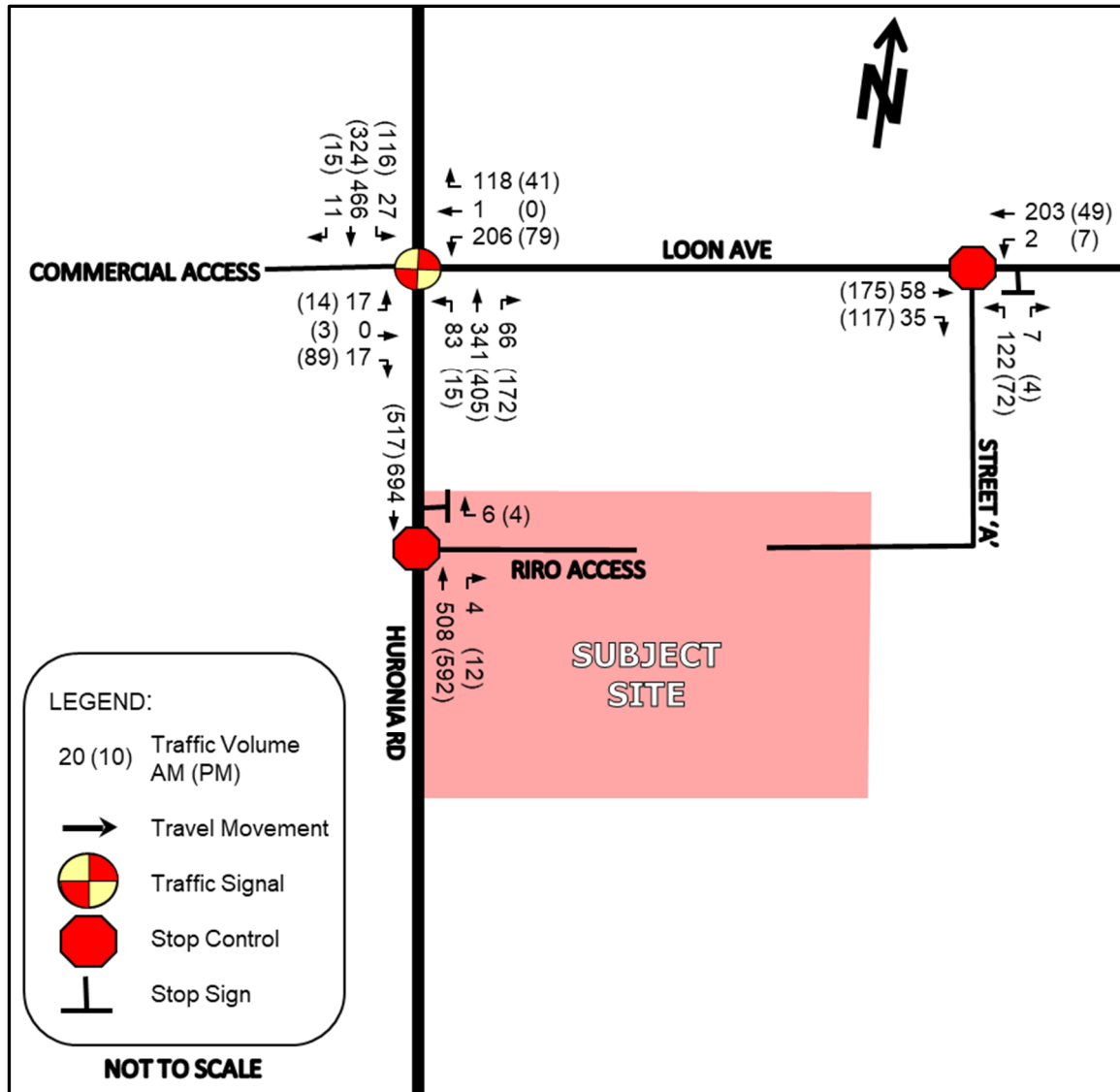


Figure 11 – Total (2030) Traffic Volumes



5 Intersection Operation with Proposed Development

5.1 Total (2023) Intersection Operation

The results of the LOS analysis under total (2023) traffic volumes during the AM and PM peak hour can be found below in **Table 11**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix F**.

Table 11 – Total (2023) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95 th Percentile Queue		V/C	Delay (s)	LOS	95 th Percentile Queue	
				Model	Storage				Model	Storage
Huronie Road / Loon Avenue & Commercial Access (signalized)	0.48	16.4	B	-	-	0.42	12.6	B	-	-
EBL	0.09	32.4	C	10	-	0.11	34.9	C	8	-
EBTR	0.01	31.8	C	-	-	0.08	34.6	C	-	-
WBL	0.60	39.3	D	41	20	0.30	36.5	D	16	20
WBTR	0.05	32.0	C	12	-	0.01	34.2	C	0	-
NBL	0.13	5.0	A	10	75	0.02	3.0	A	2	75
NBTR	0.28	4.7	A	39	-	0.33	3.8	A	33	-
SB	0.50	17.0	B	90	-	0.46	13.8	B	63	-
Huronie Road / RIRO Access (unsignalized)	-	0.1	A	-	-	-	0.0	A	-	-
WB	0.01	11.0	B	1	-	0.01	11.2	B	1	-
Street 'A' / Loon Avenue (unsignalized)	-	0.6	A	-	-	-	0.5	A	-	-
NB	0.02	9.8	A	1	-	0.01	9.6	A	1	-

The results of the LOS analysis indicate that all study area intersections are operating within the typical design limits noted in Section 3.1.

The anticipated 95th percentile queue length for the westbound left turn lane at the Huronie Road / Loon Avenue intersection during the AM peak hour exceeds the existing storage length. The queuing extends beyond the first five residential driveways on Loon Avenue, which is common near major intersections. The westbound left queue will not block access to the Gadwall Avenue intersection. The existing width of Loon Avenue can accommodate a three-lane cross-section between Huronie Road and Gadwall Avenue and can be repainted as necessary in the future.

The existing storage length for all other auxiliary turn lanes within the study area can accommodate the anticipated 95th percentile queue length for the associated turning movement.

An analysis was completed for left turn movements at the Street 'A' / Loon Avenue intersection, based on the criteria outlined in Appendix 9A of the Ontario Ministry of Transportation Design Supplement for TAC Geometric Design Guide for Canadian Roads June 2017. Based off the above noted criteria a left-turn lanes is not warranted at the Street 'A' / Loon Avenue intersection (results provided in **Appendix H**).

A review of the need for an auxiliary right turn lane at the unsignalized intersections in the study area was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, auxiliary right turn lanes are not recommended.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at any of the study area intersections (results are provided in **Appendix G**).

No infrastructure improvements are recommended within the study area.

5.2 Total (2030) Intersection Operation

The results of the LOS analysis under total (2030) traffic volumes during the AM and PM peak hour can be found below in **Table 12**.

Based on the increased volume of traffic on the Street 'A' approach at Loon Avenue, it is recommended that all-way stop control is provided at this intersection. The timing for the implementation of the all-way stop adjustment is recommended when the following criteria are met (based on OTM Book 5 criteria)

- Total vehicle volume on all intersection approaches exceeds 350 for the highest hour recorded; and
- Volume split does not exceed 75/25 for Loon Avenue / Street 'A', where volume is defined as vehicles only.

Since it is anticipated that this will occur before the total (2030) traffic volume scenario, we have included this improvement in the Synchro analysis.

Existing intersection geometry and traffic control have been utilized for all other intersections for this scenario.

Detailed output of the Synchro analysis can be found in **Appendix F**.

Table 12 – Total (2030) LOS

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95 th Percentile Queue		V/C	Delay (s)	LOS	95 th Percentile Queue	
				Model	Storage				Model	Storage
Huronie Road / Loon Avenue & Commercial Access (signalized)	0.65	22.5	C	-	-	0.64	16.3	B	-	-
EBL	0.07	30.5	C	9	-	0.10	34.3	C	8	-
EBTR	0.01	30.0	C	-	-	0.08	34.1	C	-	-
WBL	0.78	48.7	D	69	20	0.58	41.4	D	29	20
WBTR	0.08	30.6	C	15	-	0.03	33.8	C	0	-
NBL	0.15	7.7	A	12	75	0.02	3.7	A	3	75
NBTR	0.37	7.7	A	57	-	0.46	5.2	A	64	-
SB	0.67	23.6	C	129	-	0.69	20.7	C	112	-
Huronie Road / RIRO Access (unsignalized)	-	0.1	A	-	-	-	0.0	A	-	-
WB	0.01	11.9	B	1	-	0.01	12.7	B	1	-
Street 'A' / Loon Avenue (unsignalized)	-	8.7	A	-	-	-	8.8	A	-	-
EB	0.12	7.9	A	6	-	0.35	9.0	A	4	-
WB	0.27	9.0	A	4	-	0.08	7.8	A	12	-
NB	0.19	8.9	A	9	-	0.11	8.5	A	2	-

The results of the LOS analysis indicate that all study area intersections are operating within the typical design limits noted in Section 3.1.

The anticipated 95th percentile queue length for the westbound left turn lane at the Huronie Road / Loon Avenue intersection during the AM peak hour exceeds the existing storage length. The queuing extends beyond the first five residential driveways on Loon Avenue, which is common near major intersections. The westbound left queue will not block access to the Gadwall Avenue intersection. The existing width of Loon Avenue can accommodate a three-lane cross-section between Huronie Road and Gadwall Avenue and can be repainted as necessary in the future.

The existing storage length for all other auxiliary turn lanes within the study area can accommodate the anticipated 95th percentile queue length for the associated turning movement.

An analysis was completed for left turn movements at the Street 'A' / Loon Avenue intersection, based on the criteria outlined in Appendix 9A of the Ontario Ministry of Transportation Design Supplement for TAC Geometric Design Guide for Canadian Roads June 2017. Based off the above noted criteria a left-turn lanes is not warranted at the Street 'A' / Loon Avenue intersection (results provided in **Appendix H**).

A review of the need for an auxiliary right turn lane at the unsignalized intersections in the study area was completed as part of our analysis. The results of the Synchro analysis indicate that there is excess capacity for all movements; consequently, auxiliary right turn lanes are not recommended.

Based on the Ontario Traffic Manual Book 12 *Signal Justification*, traffic signals are not warranted at any of the study area intersections (results are provided in **Appendix G**).

No other infrastructure improvements are recommended within the study area.

As outlined in Section 3.4, based on our correspondence with the City, we understand that there is a concern with the southbound left turn movement on Huronia Road at Loon Avenue. There is currently no dedicated left turn storage lane for this movement. As outlined above, the movement is anticipated to operate within the typical design limits noted in Section 3.1; however, a southbound left turn lane would improve operations at the intersection. A supplementary analysis for the critical total (2030) scenario is provided in Section 5.3 to illustrate the traffic operations with a southbound left turn lane on Huronia Road at Loon Avenue.

5.3 Supplementary Analysis - Total (2030) Intersection Operation with (SB Left Turn Lane)

The results of the LOS analysis under total (2030) traffic volumes during the AM and PM peak hour can be found below in **Table 13**. Existing traffic control have been utilized for this scenario. A southbound left turn lane on Huronia Road at Loon Avenue is provided with a 30-metre storage length and a 55-metre taper length was utilized in this scenario. Detailed output of the Synchro analysis can be found in **Appendix F**.

Table 13 – Total (2030) LOS with Improvements

Location (N-S Street / E-W Street)	Weekday AM Peak Hour					Weekday PM Peak Hour				
	V/C	Delay (s)	LOS	95 th Percentile Queue		V/C	Delay (s)	LOS	95 th Percentile Queue	
				Model	Storage				Model	Storage
Huronie Road / Loon Avenue & Commercial Access (signalized)	0.61	21.6	C	-	-	0.50	13.6	B	-	-
EBL	0.07	30.5	C	9	-	0.10	34.3	C	8	-
EBTR	0.01	30.0	C	-	-	0.08	34.1	C	-	-
WBL	0.78	48.7	D	69	20	0.58	41.4	D	29	20
WBTR	0.08	30.6	C	15	-	0.03	33.8	C	0	-
NBL	0.16	8.1	A	15	75	0.02	3.2	A	3	75
NBTR	0.37	7.7	A	57	-	0.46	5.2	A	64	-
SBL	0.07	14.2	B	10	30	0.29	13.0	B	27	30
SBTR	0.60	21.7	C	116	-	0.38	13.7	B	63	-

The results of the LOS analysis indicate that all study area intersections are operating within the typical design limits noted in Section 3.1.

The anticipated 95th percentile queue length for the westbound left turn lane at the Huronia Road / Loon Avenue intersection during the AM peak hour exceeds the existing storage length. As noted in Section 5.2, the anticipated queue will not block any intersections and no issues are anticipated. The existing width of Loon Avenue can accommodate a three-lane cross-section between Huronia Road and Gadwall Avenue and can be repainted as necessary in the future.

As illustrated in Table 13, the construction of a southbound left turn lane will marginally improve the overall intersection operation and will provide queuing space for southbound vehicles turning left onto Loon Avenue.

In order to address concerns regarding the traffic operations at the Huronia Road / Loon Avenue & Commercial Access intersection, a southbound left turn lane on Huronia Road at Loon Avenue is recommended with a 30-metre storage length and a 55-metre taper length. It is recommended that the timing for the installation of this temporary road widening coincide with the occupancy of the Future

Development Lands. The southbound left turn lane is not warranted for the construction of the subject site.

5.4 Site Access

The RIRO Access will operate efficiently as a RIRO access driveway, with one-way stop control for the westbound movements. No lane improvements are recommended on Huronia Road at the RIRO Access. A single eastbound and westbound lane at the RIRO Access driveway will provide the necessary capacity to service the proposed development.

A parking control gate is recommended at the east end of the subject site to prohibit cut-through traffic within the subject site. Residents within the subject site (521 Huronia) will control the main gates using a key fob and a separate control gate is proposed to allow for guests to enter and exit the site.

In order to improve safety for the adjacent residents on Loon Avenue, the subject site has been designed to include a retaining wall along the north side of the main driveway within the subject site, which will redirect errant passenger vehicles. The retaining wall will not have any gaps for driveways, so it will provide a continuous barrier along the entire length of the development.

Street 'A' will operate efficiently as a full-movement access roadway with one-way stop control for northbound movements for full-build out of the proposed development. No lane improvements are recommended on Loon Avenue at Street 'A'. A single northbound and southbound lane at Street 'A' will provide the necessary capacity to service the proposed development within the subject site and the future adjacent developments.

For the total (2030) traffic scenario, Street 'A' will operate efficiently as a full-movement access roadway with all-way stop control. No lane improvements are recommended on Loon Avenue at Street 'A'. A single northbound and southbound lane at Street 'A' will provide the necessary capacity to service the proposed development and full build-out of the Future Development Lands.

The subject site will have two points of access as noted above. The RIRO Access onto Huronia Road and the Street 'A' access via Loon Avenue. This will provide access redundancy, in the event that one access becomes blocked and emergency vehicles need to enter the subject site. Based on the layout of the subject site and the number of units, an additional (third) emergency access is not justified.

It is noted that the proposed spacing between the RIRO Access and the intersection of Huronia Road / Loon Avenue & Commercial Access (measured edge to edge of driveways) is approximately 50m, which is less than the suggested minimum corner clearance requirements for an access driveway as identified in the Transportation Association of Canada *Design Guide for Canadian Roads* (2017) [TAC Guidelines] – Figure 8.8.2 (Suggested Minimum Corner Clearances to Accesses or Public Lanes at Major Intersections) – access placed in advance of the left turn storage and taper length for a signalized condition; however, the proposed intersection spacing is considered to be acceptable for the intended use for the following reasons:

- The proposed access is a RIRO access, so back-to-back left turn interaction will not be an issue;
- The volume of traffic at the RIRO Access is relatively low; and
- The sight distance for the RIRO Access is acceptable sight distance available (per Section 5.3).

The proposed spacing between Street 'A' and Gadwall Avenue and between Street 'A' and Widgeon Street (measured centre of intersection to centre of intersection) are greater than the suggested minimum intersection spacing for t-intersections on a local road (40m) as identified in TAC Guidelines – Section 9.4.2.3.

5.5 Sight Distance Review

A review of the available sight distance for the proposed site access driveways / roadways was completed as part of this analysis.

The sight distance south of the RIRO Access (140 metres) is greater than the minimum stopping sight distance and intersection sight distance requirements as identified in the TAC Guidelines for a design speed of 70km/h (105 meters / 130 metres).

The sight distance east and west of Street 'A' is greater than 100 metres which is greater than the stopping sight distance requirements as identified in the TAC Guidelines for a design speed of 60km/h (85 metres)

Consequently, there are no issues with the sight distance available for the proposed RIRO Access or Street 'A' / Loon Avenue intersection.

5.6 Traffic Safety Review

Loon Avenue is classified as a local road; however, it is constructed with an 11 metre width, which is consistent with a minor collector road. The single lane capacity for Loon Avenue, is 400 trips per hour (per the City's Transportation Master Plan – local and minor collector roads). Based on our traffic projections for Loon Avenue, for the critical condition (westbound during the AM peak hour) the traffic volume in 2030 will be approximately 19% less than the road capacity. Consequently, the traffic volume will be within the acceptable operating range. The minor additional traffic on Loon Avenue, from the subject site, will not have a notable impact on the average speed of traffic on Loon Avenue.

The existing concern with cut-through traffic on Loon Avenue can be addressed through a review of the traffic capacity constraints at the Big Bay Point Road / Huronia Road intersection and through additional traffic calming along Loon Avenue. It is noted that there are currently two speed cushions (seasonal) on Loon Avenue to address this issue. It is recommended that additional investigation is completed to determine the magnitude and travel time of the cut-through traffic before implementing additional traffic calming measures.

5.7 Active Transportation Review

Huronie Road and Loon Avenue within the study area are identified as a part of 'The Great Trail' system; however, there is currently no dedicated cycling infrastructure adjacent to the proposed development. Cyclists from the subject site would be required to share the existing road network with all other users.

As noted in Section 2.2, the construction of a cycle track on both sides of Huronia Road and a signed bike route on Loon Avenue within the study area is planned to be completed by 2031. It is recommended that the City move ahead with the planned cycling infrastructure on Huronia Road and Loon Avenue, as soon as possible, to address transportation demand in and around the study area.

The proposed development also includes a proposed sidewalk on the east side of Huronia Road between the RIRO Access and Loon Avenue, which will connect into the City's sidewalk network providing pedestrian access throughout the City. An internal sidewalk is also proposed via Street 'A', which will connect into the sidewalk on the south side of Loon Avenue.

5.8 Parking Review

The proposed parking supply for the subject site meets the parking requirements specified in the City's Zoning By-law 2009-141. The proposed parking breakdown is provided in **Table 14**.

Table 14 – Parking Statistics

Category	Zoning By-Law Section	Parking Standard	Size	Parking	
				Required	Provided
Total Residential Parking	4.6.1	1.5 spaces per dwelling unit	52 units	78 Spaces	115 spaces

5.9 Construction Parking

Based on our correspondence with the design team for this project, the Developer is committed to the following arrangement for construction parking:

The parking of construction vehicles and vehicles owned by staff and subcontractors employed by the Developer will be formally directed (in writing where possible) to avoid parking on municipal streets surrounding the subject site and avoid parking within private parking lots surrounding the subject site, without consent from the owner of the parking lots.

6 Summary

Huronie Barrie Land Inc retained **JD Engineering** to prepare this traffic impact study in support of the proposed development municipally known as 521 Huronia Road in the City of Barrie [City]. The proposed Site Plan is shown in **Appendix A**. This chapter summarizes the conclusions and recommendations from the study.

The proposed development is anticipated to include 52 residential townhouse units.

1. The proposed development is expected to generate a total of 26 AM and 34 PM peak hour trips.
2. Detailed turning movement traffic and pedestrian counts were commissioned by JD Engineering for the existing Huronia Road / Loon Avenue & Commercial Access intersection.
3. An estimate of the amount of traffic that would be generated by the proposed development was prepared and assigned to the study area streets and intersections.
4. An intersection operation analysis was completed at the study area intersections, using the existing (2020) and background (2023 & 2030) traffic volumes without the proposed development traffic. This enabled a review of existing and future traffic deficiencies that would be present without the influence of the proposed development. No geometric lane improvements or traffic signal improvements are recommended within the study area.
5. An estimate of the amount of traffic that would be generated by the Subject Site was prepared and assigned to the study area streets and intersections.
6. An intersection operation analysis was completed under total (2023 & 2030) traffic volumes with the proposed development operational at the study area intersections. No geometric lane improvements or traffic signal improvements are recommended within the study area.
7. The proposed RIRO Access will operate efficiently as a right-in-right-out access driveway with one-way stop control for westbound traffic. A single lane for ingress and egress movements at the RIRO Access will provide the necessary capacity to convey the traffic volume generated by the proposed development.
8. It is recommended a parking control gate be installed at the east end of the subject site to prohibit cut-through traffic within the subject site.

9. In order to improve safety for the adjacent residents on Loon Avenue, the subject site has been designed to include a retaining wall along the north side of the main driveway within the subject site, which will redirect errant passenger vehicles.
10. For the proposed development, Street 'A' will operate efficiently as a full-movement access roadway with one-way stop control for northbound movements. No lane improvements are recommended on Loon Avenue at Street 'A'. A single northbound and southbound lane at Street 'A' will provide the necessary capacity to service the proposed development. Once the Future Development Lands east of the subject site develop, it is recommended that all-way stop control is provided at the Loon Avenue / Street 'A' intersection. The timing for the implementation of the all-way stop adjustment is recommended when the following criteria are met (based on OTM Book 5 criteria):
 - Total vehicle volume on all intersection approaches exceeds 350 for the highest hour recorded; and
 - Volume split does not exceed 75/25 for Loon Avenue / Street 'A', where volume is defined as vehicles only.
11. In order to address concerns regarding the traffic operations at the Huronia Road / Loon Avenue & Commercial Access intersection, a southbound left turn lane on Huronia Road at Loon Avenue is recommended with a 30-metre storage length and a 55-metre taper length. It is recommended that the timing for the installation of this temporary road widening coincide with the occupancy of the Future Development Lands. This improvement is not warranted as a result of the increase in traffic from the proposed development.
12. There are no issues with the sight distance available for the proposed RIRO Access at Huronia Road or the Street 'A' intersection at Loon Avenue.
13. The proposed parking supply meets the parking required identified in the City's Zoning By-law 2009-141.
14. In summary, the proposed development will not cause any operational issues and will not add significant delay or congestion to the local roadway network.

Appendix A – Site Plan

The intent of this drawing is to provide a preliminary concept for this community, as an instrument of service.

This drawing is provided by and is the property of We Merchandise Space Inc. and Forest Group Inc.

We Merchandise Space Inc. and Forest Group Inc. retains ownership of copyright in all of its drawings.

We Merchandise Space Inc. and Forest Group Inc. are not responsible for the accuracy of underlying information, such as the survey.

This drawing is not to be scaled.

All Consultants and others must verify and accept responsibility for all dimensions and conditions on site and must notify We Merchandise Space Inc. and Forest Group Inc. of any variations from the provided information.

The Client named herein is granted a license to reproduce, distribute, exhibit or otherwise use, said materials, in accordance with this agreement, which license may be revoked for cause.

Nothing but not limited to, inhouse of drawings or failure to pay accounts.

It is expressly understood and agreed that no action, lawsuit, or claim may be made against the employees, officers, or directors of We Merchandise Space Inc. or Forest Group Inc. for any reason whatsoever.

For greater clarity, We Merchandise Space Inc. and Forest Group Inc. shall not be liable, directly or indirectly, in any manner whatsoever by any party by reason of the use of the drawings and materials referred to herein.

[illegible]

We Merchandise Space Inc.
Forrest Group Inc.
44 Upjohn Road
North York, ON
M3B 2W1
Tel. 905-752-6776

CLIENT:		HURONIA BARRIE LAND INC.	
PROJECT:		PROPOSED TOWNHOME COMMUNITY 521 HURONIA ROAD BARRIE, ON.	
DRAWING:		CONCEPT SITE PLAN V3.3	
Designer:	PR	Project number:	5214
Drawn by:	PR	Date:	NOV. 2019
Checked by:	PR	SCALE:	1 : 500
		DRAWING NO: A1	

Appendix B – Traffic Count Data

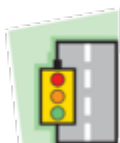


Ontario Traffic Inc.
TRAFFIC MONITORING  SERVICES & PRODUCTS

Project #19390 – JD Engineering Inc

Intersection Count Report

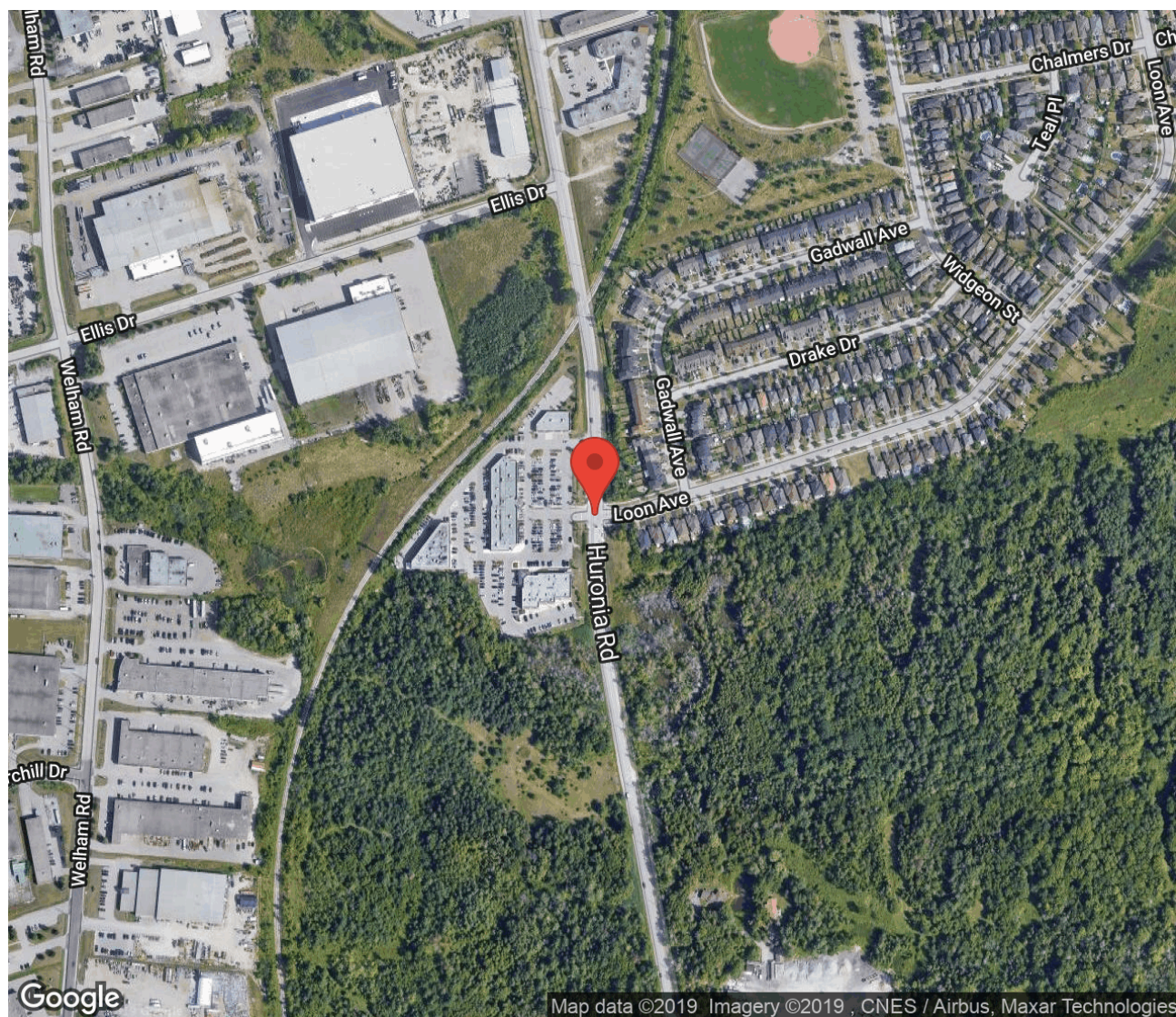
Intersection:	Huron Rd & Loon Ave-Commercial Access
Municipality:	Barrie
Count Date:	Dec 04, 2019
Site Code:	1939000001
Count Categories:	Cars, Trucks, Pedestrians
Count Period:	07:00-09:00, 16:00-19:00
Weather:	Clear



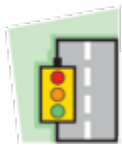
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Map

Intersection: Huronia Rd & Loon Ave-Commercial Access
Municipality: Barrie
Count Date: Dec 04, 2019



Map data ©2019 Imagery ©2019 , CNES / Airbus, Maxar Technologies



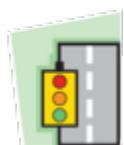
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Summary

Intersection: Huronia Rd & Loon Ave-Commercial Access
Municipality: Barrie
Count Date: Dec 04, 2019

- Traffic Summary

Hour	North Approach Totals						South Approach Totals					
	Includes Cars, Trucks						Includes Cars, Trucks					
	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds
07:00 - 08:00	7	321	4	0	332	0	41	172	16	0	229	1
08:00 - 09:00	11	325	17	0	353	0	84	237	39	0	360	2
BREAK												
16:00 - 17:00	38	229	14	0	281	0	20	281	75	0	376	3
17:00 - 18:00	40	202	8	0	250	0	6	368	87	0	461	3
18:00 - 19:00	24	152	1	0	177	0	4	281	66	0	351	3
GRAND TOTAL	120	1229	44	0	1393	0	155	1339	283	0	1777	12



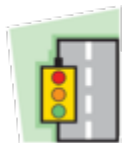
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Summary

Intersection: Huronia Rd & Loon Ave-Commercial Access
Municipality: Barrie
Count Date: Dec 04, 2019

- Traffic Summary

Hour	East Approach Totals						West Approach Totals					
	Includes Cars, Trucks						Includes Cars, Trucks					
	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds
07:00 - 08:00	100	2	22	0	124	0	3	0	7	0	10	0
08:00 - 09:00	94	1	53	0	148	1	21	0	23	0	44	1
BREAK												
16:00 - 17:00	24	0	13	0	37	0	16	2	95	0	113	0
17:00 - 18:00	15	0	7	0	22	0	12	2	26	0	40	0
18:00 - 19:00	18	0	9	0	27	0	10	1	12	0	23	0
GRAND TOTAL	251	3	104	0	358	1	62	5	163	0	230	1



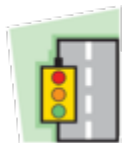
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Data

Intersection: Huronia Rd & Loon Ave-Commercial Access
Municipality: Barrie
Count Date: Dec 04, 2019

North Approach -

Start Time	Cars					Trucks					Total Peds
	←	↑	→	↪	Total	←	↑	→	↪	Total	
07:00	1	58	0	0	59	0	1	0	0	1	0
07:15	3	74	0	0	77	0	1	0	0	1	0
07:30	1	80	2	0	83	0	1	0	0	1	0
07:45	2	105	2	0	109	0	1	0	0	1	0
08:00	1	85	3	0	89	0	3	0	0	3	0
08:15	1	77	4	0	82	0	2	0	0	2	0
08:30	4	79	2	0	85	1	1	0	0	2	0
08:45	4	73	8	0	85	0	5	0	0	5	0
SUBTOTAL	17	631	21	0	669	1	15	0	0	16	0



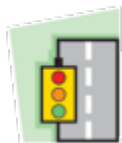
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Data

Intersection: Huronia Rd & Loon Ave-Commercial Access
Municipality: Barrie
Count Date: Dec 04, 2019

North Approach -

Start Time	Cars					Trucks					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	
16:00	6	46	2	0	54	0	3	0	0	3	0
16:15	7	54	3	0	64	0	2	0	0	2	0
16:30	15	61	4	0	80	0	4	0	0	4	0
16:45	10	56	5	0	71	0	3	0	0	3	0
17:00	15	55	3	0	73	0	2	0	0	2	0
17:15	13	53	2	0	68	0	1	0	0	1	0
17:30	8	48	1	0	57	0	0	0	0	0	0
17:45	4	43	2	0	49	0	0	0	0	0	0
18:00	7	46	1	0	54	0	0	0	0	0	0
18:15	6	38	0	0	44	0	0	0	0	0	0
18:30	5	36	0	0	41	0	0	0	0	0	0
18:45	6	32	0	0	38	0	0	0	0	0	0
SUBTOTAL	102	568	23	0	693	0	15	0	0	15	0
GRAND TOTAL	119	1199	44	0	1362	1	30	0	0	31	0



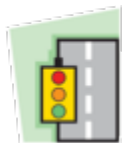
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Data

Intersection: Huronia Rd & Loon Ave-Commercial Access
Municipality: Barrie
Count Date: Dec 04, 2019

South Approach -

Start Time	Cars					Trucks					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	
07:00	6	33	2	0	41	0	4	0	0	4	1
07:15	9	39	4	0	52	0	2	0	0	2	0
07:30	6	38	7	0	51	0	2	0	0	2	0
07:45	20	53	3	0	76	0	1	0	0	1	0
08:00	14	54	11	0	79	0	3	0	0	3	2
08:15	22	59	10	0	91	0	3	0	0	3	0
08:30	27	67	11	0	105	0	5	0	0	5	0
08:45	21	44	7	0	72	0	2	0	0	2	0
SUBTOTAL	125	387	55	0	567	0	22	0	0	22	3



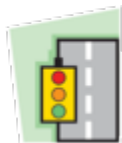
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Data

Intersection: Huronia Rd & Loon Ave-Commercial Access
Municipality: Barrie
Count Date: Dec 04, 2019

South Approach -

Start Time	Cars					Trucks					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	
16:00	8	58	15	0	81	0	4	0	0	4	1
16:15	5	66	20	0	91	0	4	0	0	4	2
16:30	4	71	23	0	98	0	2	0	0	2	0
16:45	3	74	17	0	94	0	2	0	0	2	0
17:00	3	81	20	0	104	0	3	0	0	3	1
17:15	1	96	19	0	116	0	2	0	0	2	0
17:30	1	99	23	0	123	0	1	0	0	1	0
17:45	1	85	25	0	111	0	1	0	0	1	2
18:00	1	89	21	0	111	0	1	0	0	1	0
18:15	1	72	17	0	90	0	0	0	0	0	1
18:30	1	66	15	0	82	0	0	0	0	0	0
18:45	1	53	13	0	67	0	0	0	0	0	2
SUBTOTAL	30	910	228	0	1168	0	20	0	0	20	9
GRAND TOTAL	155	1297	283	0	1735	0	42	0	0	42	12



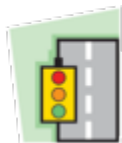
Ontario Traffic Inc.
TRAFFIC MONITORING  SERVICES & PRODUCTS

Traffic Count Data

Intersection: Huronia Rd & Loon Ave-Commercial Access
Municipality: Barrie
Count Date: Dec 04, 2019

East Approach -

Start Time	Cars					Trucks					Total Peds
					Total					Total	
07:00	22	1	5	0	28	0	0	0	0	0	0
07:15	27	1	3	0	31	0	0	0	0	0	0
07:30	28	0	4	0	32	0	0	0	0	0	0
07:45	23	0	10	0	33	0	0	0	0	0	0
08:00	22	1	15	0	38	0	0	0	0	0	0
08:15	26	0	11	0	37	0	0	0	0	0	1
08:30	26	0	17	0	43	0	0	0	0	0	0
08:45	19	0	10	0	29	1	0	0	0	1	0
SUBTOTAL	193	3	75	0	271	1	0	0	0	1	1



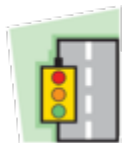
Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Huronia Rd & Loon Ave-Commercial Access
Municipality: Barrie
Count Date: Dec 04, 2019

East Approach -

Start Time	Cars					Trucks					Total Peds
	←	↑	→	↻	Total	←	↑	→	↻	Total	
16:00	5	0	3	0	8	0	0	0	0	0	0
16:15	6	0	4	0	10	0	0	0	0	0	0
16:30	7	0	4	0	11	0	0	0	0	0	0
16:45	6	0	2	0	8	0	0	0	0	0	0
17:00	6	0	2	0	8	0	0	0	0	0	0
17:15	0	0	1	0	1	0	0	0	0	0	0
17:30	2	0	2	0	4	0	0	0	0	0	0
17:45	7	0	2	0	9	0	0	0	0	0	0
18:00	6	0	3	0	9	0	0	0	0	0	0
18:15	5	0	4	0	9	0	0	0	0	0	0
18:30	3	0	1	0	4	0	0	0	0	0	0
18:45	4	0	1	0	5	0	0	0	0	0	0
SUBTOTAL	57	0	29	0	86	0	0	0	0	0	0
GRAND TOTAL	250	3	104	0	357	1	0	0	0	1	1



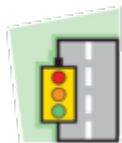
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

Traffic Count Data

Intersection: Huronia Rd & Loon Ave-Commercial Access
Municipality: Barrie
Count Date: Dec 04, 2019

West Approach -

Start Time	Cars					Trucks					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	
07:00	0	0	1	0	1	0	0	0	0	0	0
07:15	0	0	1	0	1	0	0	0	0	0	0
07:30	2	0	1	0	3	0	0	0	0	0	0
07:45	1	0	4	0	5	0	0	0	0	0	0
08:00	5	0	4	0	9	0	0	0	0	0	1
08:15	5	0	2	0	7	0	0	0	0	0	0
08:30	6	0	7	0	13	0	0	0	0	0	0
08:45	5	0	10	0	15	0	0	0	0	0	0
SUBTOTAL	24	0	30	0	54	0	0	0	0	0	1



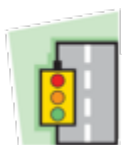
Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Huronia Rd & Loon Ave-Commercial Access
Municipality: Barrie
Count Date: Dec 04, 2019

West Approach -

Start Time	Cars					Trucks					Total Peds
	←	↑	→	↺	Total	←	↑	→	↺	Total	
16:00	6	0	22	0	28	0	0	0	0	0	0
16:15	5	1	26	0	32	0	0	0	0	0	0
16:30	2	0	26	0	28	0	0	0	0	0	0
16:45	3	1	21	0	25	0	0	0	0	0	0
17:00	4	1	16	0	21	0	0	0	0	0	0
17:15	5	0	3	0	8	0	0	0	0	0	0
17:30	1	0	3	0	4	0	0	0	0	0	0
17:45	2	0	4	0	6	0	1	0	0	1	0
18:00	2	1	3	0	6	0	0	0	0	0	0
18:15	3	0	4	0	7	0	0	0	0	0	0
18:30	2	0	3	0	5	0	0	0	0	0	0
18:45	3	0	2	0	5	0	0	0	0	0	0
SUBTOTAL	38	4	133	0	175	0	1	0	0	1	0
GRAND TOTAL	62	4	163	0	229	0	1	0	0	1	1



Ontario Traffic Inc.

TRAFFIC MONITORING SERVICES & PRODUCTS

Peak Hour Diagram

Specified Period

From: 07:00:00
To: 09:00:00

One Hour Peak

From: 07:45:00
To: 08:45:00

Intersection: Huronia Rd & Loon Ave-Commercial Access

Site ID: 1939000001

Count Date: Dec 04, 2019

Weather conditions:

**** Signalized Intersection ****

Major Road: runs N/S

North Approach

	Out	In	Total
	365	303	668
	8	12	20
Totals	373	315	688

	0	7	1	0
	11	346	8	0
Totals	11	353	9	0

East Approach

	Out	In	Total
	151	43	194
	0	1	1
Totals	151	44	195

Peds: 0

	Totals	
	0	
	17	
	0	
	17	

Peds: 1



Peds: 1

Peds: 2

Totals		
0	0	0
53	53	0
1	1	0
97	97	0

West Approach

	Out	In	Total
	34	95	129
	0	0	0
Totals	34	95	129

	83	245	35	0
	83	233	35	0
	0	12	0	0
Totals	83	245	35	0

South Approach

	Out	In	Total
	351	460	811
	12	7	19
Totals	363	467	830

- Cars

- Trucks

Comments

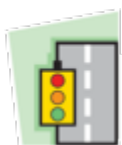


Peak Hour Summary

Intersection: Huronia Rd & Loon Ave-Commercial Access
 Count Date: Dec 04, 2019
 Period: 07:00 - 09:00

Peak Hour Data (07:45 - 08:45)

Start Time	North Approach						South Approach						East Approach						West Approach						Total Vehicles
	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	
07:45	2	106	2	0	0	110	20	54	3	0	0	77	23	0	10	0	0	33	1	0	4	0	0	5	225
08:00	1	88	3	0	0	92	14	57	11	0	2	82	22	1	15	0	0	38	5	0	4	0	1	9	221
08:15	1	79	4	0	0	84	22	62	10	0	0	94	26	0	11	0	1	37	5	0	2	0	0	7	222
08:30	5	80	2	0	0	87	27	72	11	0	0	110	26	0	17	0	0	43	6	0	7	0	0	13	253
Grand Total	9	353	11	0	0	373	83	245	35	0	2	363	97	1	53	0	1	151	17	0	17	0	1	34	921
Approach %	2.4	94.6	2.9	0	-	-	22.9	67.5	9.6	0	-	-	64.2	0.7	35.1	0	-	-	50	0	50	0	-	-	-
Totals %	1	38.3	1.2	0	-	40.5	9	26.6	3.8	0	-	39.4	10.5	0.1	5.8	0	-	16.4	1.8	0	1.8	0	-	3.7	-
PHF	0.45	0.83	0.69	0	-	0.85	0.77	0.85	0.8	0	-	0.83	0.93	0.25	0.78	0	-	0.88	0.71	0	0.61	0	-	0.65	0.91
Cars	8	346	11	0	-	365	83	233	35	0	-	351	97	1	53	0	-	151	17	0	17	0	-	34	901
% Cars	88.9	98	100	0	-	97.9	100	95.1	100	0	-	96.7	100	100	100	0	-	100	100	0	100	0	-	100	97.8
Trucks	1	7	0	0	-	8	0	12	0	0	-	12	0	0	0	0	-	0	0	0	0	0	-	0	20
% Trucks	11.1	2	0	0	-	2.1	0	4.9	0	0	-	3.3	0	0	0	0	-	0	0	0	0	0	-	0	2.2
Peds	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	1	-	4
% Peds	-	-	-	-	0	-	-	-	-	-	50	-	-	-	-	-	25	-	-	-	-	-	25	-	-



Ontario Traffic Inc.

TRAFFIC MONITORING SERVICES & PRODUCTS

Peak Hour Diagram

Specified Period

From: 16:00:00
To: 19:00:00

One Hour Peak

From: 16:15:00
To: 17:15:00

Intersection: Huronia Rd & Loon Ave-Commercial Access

Site ID: 1939000001

Count Date: Dec 04, 2019

Weather conditions:

**** Signalized Intersection ****

Major Road: runs N/S

North Approach

	Out	In	Total
	288	318	606
	11	11	22
Totals	299	329	628

	0	11	0	0
	15	226	47	0
Totals	15	237	47	0

East Approach

	Out	In	Total
	37	130	167
	0	0	0
Totals	37	130	167

	Totals	
	0	
	0	
	14	
	3	
	89	

Peds: 0



Peds: 0

Peds: 3

	Totals	
	0	
	12	
	0	
	25	

West Approach

	Out	In	Total
	106	30	136
	0	0	0
Totals	106	30	136

	15	303	80	0
	15	292	80	0
	0	11	0	0
Totals	15	303	80	0

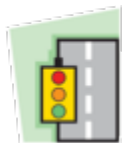
South Approach

	Out	In	Total
	387	340	727
	11	11	22
Totals	398	351	749

- Cars

- Trucks

Comments



Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Peak Hour Summary

Intersection: Huronia Rd & Loon Ave-Commercial Access
Count Date: Dec 04, 2019
Period: 16:00 - 19:00

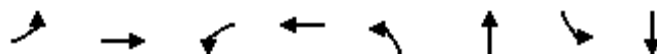
Peak Hour Data (16:15 - 17:15)

Start Time	North Approach						South Approach						East Approach						West Approach						Total Vehicles
	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	←	↑	→	↻	Peds	Total	
16:15	7	56	3	0	0	66	5	70	20	0	2	95	6	0	4	0	0	10	5	1	26	0	0	32	203
16:30	15	65	4	0	0	84	4	73	23	0	0	100	7	0	4	0	0	11	2	0	26	0	0	28	223
16:45	10	59	5	0	0	74	3	76	17	0	0	96	6	0	2	0	0	8	3	1	21	0	0	25	203
17:00	15	57	3	0	0	75	3	84	20	0	1	107	6	0	2	0	0	8	4	1	16	0	0	21	211
Grand Total	47	237	15	0	0	299	15	303	80	0	3	398	25	0	12	0	0	37	14	3	89	0	0	106	840
Approach %	15.7	79.3	5	0		-	3.8	76.1	20.1	0		-	67.6	0	32.4	0		-	13.2	2.8	84	0		-	
Totals %	5.6	28.2	1.8	0		35.6	1.8	36.1	9.5	0		47.4	3	0	1.4	0		4.4	1.7	0.4	10.6	0		12.6	
PHF	0.78	0.91	0.75	0		0.89	0.75	0.9	0.87	0		0.93	0.89	0	0.75	0		0.84	0.7	0.75	0.86	0		0.83	0.94
Cars	47	226	15	0		288	15	292	80	0		387	25	0	12	0		37	14	3	89	0		106	818
% Cars	100	95.4	100	0		96.3	100	96.4	100	0		97.2	100	0	100	0		100	100	100	100	0		100	97.4
Trucks	0	11	0	0		11	0	11	0	0		11	0	0	0	0		0	0	0	0	0		0	22
% Trucks	0	4.6	0	0		3.7	0	3.6	0	0		2.8	0	0	0	0		0	0	0	0	0		0	2.6
Peds					0	-					3	-					0	-					0	-	3
% Peds					0	-					100	-					0	-					0	-	

Appendix C – Synchro Analysis Output – Existing Traffic Volumes

521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Existing (2020) AM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	17	0	99	1	83	251	9	362
Future Volume (vph)	17	0	99	1	83	251	9	362
Lane Group Flow (vph)	19	19	109	60	91	316	0	420
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		4		8	5	2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	44.0	44.0	44.0
Minimum Split (s)	30.0	30.0	30.0	30.0	11.0	50.0	50.0	50.0
Total Split (s)	30.0	30.0	30.0	30.0	19.0	69.0	50.0	50.0
Total Split (%)	30.3%	30.3%	30.3%	30.3%	19.2%	69.7%	50.5%	50.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0		6.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.09	0.03	0.52	0.21	0.11	0.23		0.43
Control Delay	33.0	0.1	43.6	11.2	3.9	4.6		15.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	33.0	0.1	43.6	11.2	3.9	4.6		15.7
Queue Length 50th (m)	3.0	0.0	18.1	0.2	3.4	14.5		44.4
Queue Length 95th (m)	9.3	0.0	34.5	10.6	9.0	30.0		77.2
Internal Link Dist (m)		281.8		237.1		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	391	842	406	506	824	1379		967
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.05	0.02	0.27	0.12	0.11	0.23		0.43

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 84.5

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Huronia Rd & Commercial Access/Loon Ave



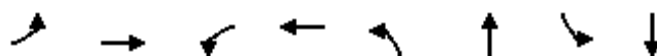
521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis
Existing (2020) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	0	17	99	1	54	83	251	36	9	362	11
Future Volume (vph)	17	0	17	99	1	54	83	251	36	9	362	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.98			1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1805	1615		1805	1620		1805	1786			1851	
Flt Permitted	0.72	1.00		0.75	1.00		0.44	1.00			0.99	
Satd. Flow (perm)	1364	1615		1416	1620		838	1786			1836	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	19	0	19	109	1	59	91	276	40	10	398	12
RTOR Reduction (vph)	0	17	0	0	52	0	0	4	0	0	1	0
Lane Group Flow (vph)	19	2	0	109	8	0	91	312	0	0	419	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	5%	0%	11%	2%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	10.2	10.2		10.2	10.2		63.7	63.7			44.5	
Effective Green, g (s)	10.2	10.2		10.2	10.2		63.7	63.7			44.5	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.74	0.74			0.52	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	161	191		168	192		792	1324			951	
v/s Ratio Prot		0.00			0.00		0.02	c0.17				
v/s Ratio Perm	0.01			c0.08			0.06				c0.23	
v/c Ratio	0.12	0.01		0.65	0.04		0.11	0.24			0.44	
Uniform Delay, d1	33.8	33.4		36.1	33.5		3.8	3.5			12.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.3	0.0		8.3	0.1		0.3	0.4			1.5	
Delay (s)	34.2	33.4		44.5	33.6		4.1	3.9			14.4	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		33.8			40.6			3.9			14.4	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			15.3			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.43									
Actuated Cycle Length (s)			85.9			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			73.1%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Existing (2020) PM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↰	→	↰	→	↰	→	↰	↻
Traffic Volume (vph)	14	3	26	0	15	311	48	243
Future Volume (vph)	14	3	26	0	15	311	48	243
Lane Group Flow (vph)	15	98	28	13	16	418	0	326
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		4		8	5	2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	44.0	44.0	44.0
Minimum Split (s)	30.0	30.0	30.0	30.0	11.0	50.0	50.0	50.0
Total Split (s)	30.0	30.0	30.0	30.0	19.0	69.0	50.0	50.0
Total Split (%)	30.3%	30.3%	30.3%	30.3%	19.2%	69.7%	50.5%	50.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0		6.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.09	0.35	0.17	0.02	0.02	0.29		0.37
Control Delay	34.9	12.4	36.8	0.1	2.5	3.8		13.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	34.9	12.4	36.8	0.1	2.5	3.8		13.3
Queue Length 50th (m)	2.3	0.5	4.4	0.0	0.5	17.9		31.5
Queue Length 95th (m)	8.0	14.5	12.6	0.0	1.7	28.2		50.9
Internal Link Dist (m)		281.8		281.2		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	420	546	389	871	941	1420		874
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.04	0.18	0.07	0.01	0.02	0.29		0.37

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 81.8

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Huronia Rd & Commercial Access/Loon Ave



521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

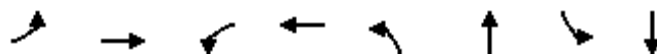
HCM Signalized Intersection Capacity Analysis
Existing (2020) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	3	89	26	0	12	15	311	82	48	243	15
Future Volume (vph)	14	3	89	26	0	12	15	311	82	48	243	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.97			0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1805	1624		1805	1615		1805	1784			1801	
Flt Permitted	0.75	1.00		0.69	1.00		0.52	1.00			0.89	
Satd. Flow (perm)	1423	1624		1318	1615		988	1784			1612	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	15	3	95	28	0	13	16	331	87	51	259	16
RTOR Reduction (vph)	0	86	0	0	12	0	0	6	0	0	1	0
Lane Group Flow (vph)	15	12	0	28	1	0	16	412	0	0	325	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	5%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	7.7	7.7		7.7	7.7		63.4	63.4			44.3	
Effective Green, g (s)	7.7	7.7		7.7	7.7		63.4	63.4			44.3	
Actuated g/C Ratio	0.09	0.09		0.09	0.09		0.76	0.76			0.53	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	131	150		122	149		902	1361			859	
v/s Ratio Prot		0.01			0.00		0.00	c0.23				
v/s Ratio Perm	0.01			c0.02			0.01				c0.20	
v/c Ratio	0.11	0.08		0.23	0.01		0.02	0.30			0.38	
Uniform Delay, d1	34.6	34.5		34.9	34.2		2.8	3.0			11.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.4	0.2		1.0	0.0		0.0	0.6			1.3	
Delay (s)	35.0	34.7		35.9	34.3		2.8	3.6			12.6	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		34.7			35.4			3.6			12.6	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			12.1			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.35									
Actuated Cycle Length (s)			83.1			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			73.2%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Appendix D – Synchro Analysis Output – Background Traffic Volumes

521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Background (2023) AM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	17	0	107	1	83	284	10	393
Future Volume (vph)	17	0	107	1	83	284	10	393
Lane Group Flow (vph)	19	19	118	71	91	355	0	455
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		4		8	5	2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	44.0	44.0	44.0
Minimum Split (s)	30.0	30.0	30.0	30.0	11.0	50.0	50.0	50.0
Total Split (s)	30.0	30.0	30.0	30.0	19.0	69.0	50.0	50.0
Total Split (%)	30.3%	30.3%	30.3%	30.3%	19.2%	69.7%	50.5%	50.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0		6.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.10	0.03	0.56	0.24	0.12	0.28		0.50
Control Delay	32.8	0.1	45.6	10.7	4.1	5.3		17.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	32.8	0.1	45.6	10.7	4.1	5.3		17.5
Queue Length 50th (m)	3.0	0.0	19.8	0.2	3.5	17.4		50.2
Queue Length 95th (m)	9.3	0.0	37.0	11.4	9.3	35.5		86.8
Internal Link Dist (m)		281.8		237.1		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	368	809	385	491	750	1282		916
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.05	0.02	0.31	0.14	0.12	0.28		0.50

Intersection Summary

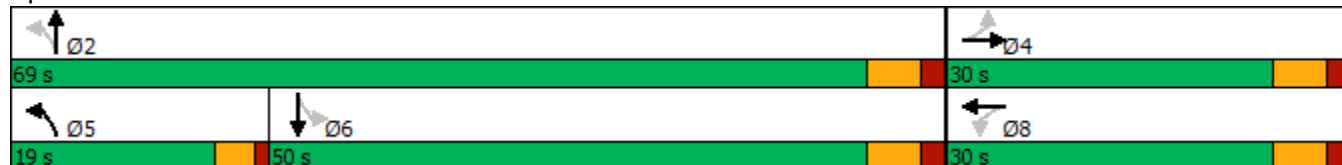
Cycle Length: 99

Actuated Cycle Length: 88.2

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Huronia Rd & Commercial Access/Loon Ave



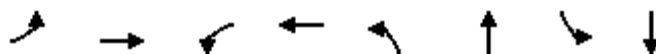
521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis
Background (2023) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	0	17	107	1	64	83	284	39	10	393	11
Future Volume (vph)	17	0	17	107	1	64	83	284	39	10	393	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.98			1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1805	1615		1805	1619		1805	1787			1851	
Flt Permitted	0.71	1.00		0.75	1.00		0.41	1.00			0.99	
Satd. Flow (perm)	1350	1615		1416	1619		781	1787			1834	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	19	0	19	118	1	70	91	312	43	11	432	12
RTOR Reduction (vph)	0	16	0	0	60	0	0	4	0	0	1	0
Lane Group Flow (vph)	19	3	0	118	11	0	91	351	0	0	454	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	5%	0%	11%	2%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	13.1	13.1		13.1	13.1		63.1	63.1			44.1	
Effective Green, g (s)	13.1	13.1		13.1	13.1		63.1	63.1			44.1	
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.72	0.72			0.50	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	200	239		210	240		732	1278			917	
v/s Ratio Prot		0.00			0.01		0.02	c0.20				
v/s Ratio Perm	0.01			c0.08			0.07				c0.25	
v/c Ratio	0.10	0.01		0.56	0.05		0.12	0.27			0.50	
Uniform Delay, d1	32.4	32.0		34.9	32.2		4.8	4.4			14.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.2	0.0		3.4	0.1		0.3	0.5			1.9	
Delay (s)	32.6	32.0		38.3	32.3		5.1	5.0			16.6	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		32.3			36.0			5.0			16.6	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			15.8			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			88.2			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			73.2%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Background (2023) PM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	17	0	107	1	83	284	10	393
Future Volume (vph)	17	0	107	1	83	284	10	393
Lane Group Flow (vph)	18	18	114	69	88	343	0	441
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		4		8	5	2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	44.0	44.0	44.0
Minimum Split (s)	30.0	30.0	30.0	30.0	11.0	50.0	50.0	50.0
Total Split (s)	30.0	30.0	30.0	30.0	19.0	69.0	50.0	50.0
Total Split (%)	30.3%	30.3%	30.3%	30.3%	19.2%	69.7%	50.5%	50.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0		6.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.09	0.03	0.55	0.23	0.12	0.26		0.49
Control Delay	32.8	0.1	45.2	10.8	4.0	5.1		17.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	32.8	0.1	45.2	10.8	4.0	5.1		17.4
Queue Length 50th (m)	2.8	0.0	19.0	0.2	3.4	16.3		48.2
Queue Length 95th (m)	8.8	0.0	35.9	11.4	9.0	33.6		83.9
Internal Link Dist (m)		281.8		281.2		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	369	817	387	491	762	1296		895
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.05	0.02	0.29	0.14	0.12	0.26		0.49

Intersection Summary

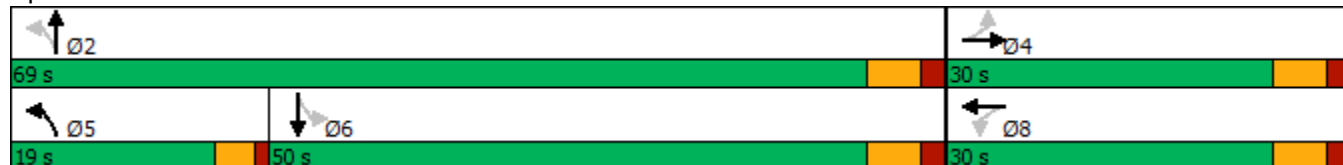
Cycle Length: 99

Actuated Cycle Length: 88

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Huronia Rd & Commercial Access/Loon Ave



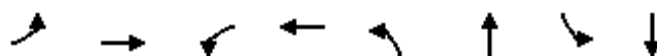
521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis
Background (2023) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	0	17	107	1	64	83	284	39	10	393	11
Future Volume (vph)	17	0	17	107	1	64	83	284	39	10	393	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.98			1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1805	1615		1805	1619		1805	1802			1805	
Flt Permitted	0.71	1.00		0.75	1.00		0.42	1.00			0.99	
Satd. Flow (perm)	1353	1615		1417	1619		798	1802			1788	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	18	0	18	114	1	68	88	302	41	11	418	12
RTOR Reduction (vph)	0	15	0	0	58	0	0	4	0	0	1	0
Lane Group Flow (vph)	18	3	0	114	11	0	88	339	0	0	440	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	5%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.9	12.9		12.9	12.9		63.1	63.1			44.1	
Effective Green, g (s)	12.9	12.9		12.9	12.9		63.1	63.1			44.1	
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.72	0.72			0.50	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	198	236		207	237		743	1292			896	
v/s Ratio Prot		0.00			0.01		0.02	c0.19				
v/s Ratio Perm	0.01			c0.08			0.06				c0.25	
v/c Ratio	0.09	0.01		0.55	0.05		0.12	0.26			0.49	
Uniform Delay, d1	32.5	32.1		34.9	32.3		4.7	4.3			14.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.2	0.0		3.1	0.1		0.3	0.5			1.9	
Delay (s)	32.7	32.1		38.0	32.3		5.0	4.8			16.4	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		32.4			35.9			4.9			16.4	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			15.7			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			88.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			73.2%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Background (2030) AM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	17	0	107	1	83	284	10	393
Future Volume (vph)	17	0	107	1	83	284	10	393
Lane Group Flow (vph)	19	19	118	71	91	355	0	455
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		4		8	5	2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	44.0	44.0	44.0
Minimum Split (s)	30.0	30.0	30.0	30.0	11.0	50.0	50.0	50.0
Total Split (s)	30.0	30.0	30.0	30.0	19.0	69.0	50.0	50.0
Total Split (%)	30.3%	30.3%	30.3%	30.3%	19.2%	69.7%	50.5%	50.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0		6.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.10	0.03	0.56	0.24	0.12	0.28		0.50
Control Delay	32.8	0.1	45.6	10.7	4.1	5.3		17.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	32.8	0.1	45.6	10.7	4.1	5.3		17.5
Queue Length 50th (m)	3.0	0.0	19.8	0.2	3.5	17.4		50.2
Queue Length 95th (m)	9.3	0.0	37.0	11.4	9.3	35.5		86.8
Internal Link Dist (m)		281.8		237.1		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	368	809	385	491	750	1282		916
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.05	0.02	0.31	0.14	0.12	0.28		0.50

Intersection Summary

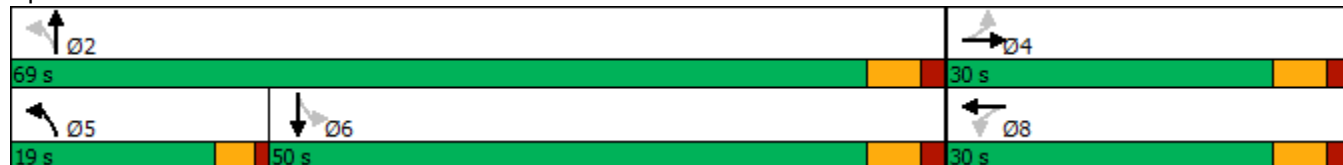
Cycle Length: 99

Actuated Cycle Length: 88.2

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Huronia Rd & Commercial Access/Loon Ave



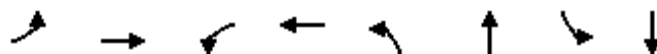
521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis
Background (2030) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	0	17	107	1	64	83	284	39	10	393	11
Future Volume (vph)	17	0	17	107	1	64	83	284	39	10	393	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.98			1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1805	1615		1805	1619		1805	1787			1851	
Flt Permitted	0.71	1.00		0.75	1.00		0.41	1.00			0.99	
Satd. Flow (perm)	1350	1615		1416	1619		781	1787			1834	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	19	0	19	118	1	70	91	312	43	11	432	12
RTOR Reduction (vph)	0	16	0	0	60	0	0	4	0	0	1	0
Lane Group Flow (vph)	19	3	0	118	11	0	91	351	0	0	454	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	5%	0%	11%	2%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	13.1	13.1		13.1	13.1		63.1	63.1			44.1	
Effective Green, g (s)	13.1	13.1		13.1	13.1		63.1	63.1			44.1	
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.72	0.72			0.50	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	200	239		210	240		732	1278			917	
v/s Ratio Prot		0.00			0.01		0.02	c0.20				
v/s Ratio Perm	0.01			c0.08			0.07				c0.25	
v/c Ratio	0.10	0.01		0.56	0.05		0.12	0.27			0.50	
Uniform Delay, d1	32.4	32.0		34.9	32.2		4.8	4.4			14.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.2	0.0		3.4	0.1		0.3	0.5			1.9	
Delay (s)	32.6	32.0		38.3	32.3		5.1	5.0			16.6	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		32.3			36.0			5.0			16.6	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay	15.8			HCM 2000 Level of Service			B					
HCM 2000 Volume to Capacity ratio	0.47											
Actuated Cycle Length (s)	88.2			Sum of lost time (s)			16.0					
Intersection Capacity Utilization	73.2%			ICU Level of Service			D					
Analysis Period (min)	15											
c Critical Lane Group												

521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Background (2030) PM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	17	0	107	1	83	284	10	393
Future Volume (vph)	17	0	107	1	83	284	10	393
Lane Group Flow (vph)	18	18	114	69	88	343	0	441
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		4		8	5	2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	44.0	44.0	44.0
Minimum Split (s)	30.0	30.0	30.0	30.0	11.0	50.0	50.0	50.0
Total Split (s)	30.0	30.0	30.0	30.0	19.0	69.0	50.0	50.0
Total Split (%)	30.3%	30.3%	30.3%	30.3%	19.2%	69.7%	50.5%	50.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0		6.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.09	0.03	0.55	0.23	0.12	0.26		0.49
Control Delay	32.8	0.1	45.2	10.8	4.0	5.1		17.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	32.8	0.1	45.2	10.8	4.0	5.1		17.4
Queue Length 50th (m)	2.8	0.0	19.0	0.2	3.4	16.3		48.2
Queue Length 95th (m)	8.8	0.0	35.9	11.4	9.0	33.6		83.9
Internal Link Dist (m)		281.8		281.2		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	369	817	387	491	762	1296		895
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.05	0.02	0.29	0.14	0.12	0.26		0.49

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 88

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Huronia Rd & Commercial Access/Loon Ave



521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis
Background (2030) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	0	17	107	1	64	83	284	39	10	393	11
Future Volume (vph)	17	0	17	107	1	64	83	284	39	10	393	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.98			1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1805	1615		1805	1619		1805	1802			1805	
Flt Permitted	0.71	1.00		0.75	1.00		0.42	1.00			0.99	
Satd. Flow (perm)	1353	1615		1417	1619		798	1802			1788	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	18	0	18	114	1	68	88	302	41	11	418	12
RTOR Reduction (vph)	0	15	0	0	58	0	0	4	0	0	1	0
Lane Group Flow (vph)	18	3	0	114	11	0	88	339	0	0	440	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	5%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.9	12.9		12.9	12.9		63.1	63.1			44.1	
Effective Green, g (s)	12.9	12.9		12.9	12.9		63.1	63.1			44.1	
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.72	0.72			0.50	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	198	236		207	237		743	1292			896	
v/s Ratio Prot		0.00			0.01		0.02	c0.19				
v/s Ratio Perm	0.01			c0.08			0.06				c0.25	
v/c Ratio	0.09	0.01		0.55	0.05		0.12	0.26			0.49	
Uniform Delay, d1	32.5	32.1		34.9	32.3		4.7	4.3			14.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.2	0.0		3.1	0.1		0.3	0.5			1.9	
Delay (s)	32.7	32.1		38.0	32.3		5.0	4.8			16.4	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		32.4			35.9			4.9			16.4	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			15.7			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			88.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			73.2%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Appendix E – Transportation Tomorrow Survey - Excerpt

Tue Sep 08 2020 11:11:59 GMT-0400 (Eastern Daylight Time) - Run Time: 1846ms Cross Tabulation Query Form - Trip - 2016 v1.1 Row: Planning district of destination - pd_dest Column: 2006 GTA zone of household - gta06_hhld Filters: (2006 GTA zone of household - gta06_hhld In 8527, 8528); and (Start time of trip - start_time In 700 - 900); and (Trip purpose of destination - purp_dest In W, R) Trip 2016 ROW : pd_dest COLUMN : gta06_hhld	Tue Sep 08 2020 11:15:59 GMT-0400 (Eastern Daylight Time) - Run Time: 1761ms Cross Tabulation Query Form - Trip - 2016 v1.1 Row: 2006 GTA zone of destination - gta06_dest Column: 2006 GTA zone of household - gta06_hhld Filters: (2006 GTA zone of household - gta06_hhld In 8527, 8528); and (Start time of trip - start_time In 700 - 900); and (Trip purpose of destination - purp_dest In W, R); and (Planning district of destination - pd_dest In 81)
---	---

Cross Tabulation Query Form - Trip - 2016 v1.1

Filter Variables

Planning district of desti... x

2006 GTA zone of hous... x

(Optional) Table Attribute

Group Attributes

Row Grouping

Column Grouping

Table Grouping

Grouping file: Choose File No file chosen

Filter Selection +

☐ 2006 GTA zone of household In

8527, 8528

And

☐ Start time of trip In

700 - 900

And

☐ Trip purpose of destination In

w, r

Add

Delete

Output

☐ Comma-delimited table☒ Column format

Expansion Factor On

Click to Select Load

Load

Execute Query

Select All

Save As

Thu Oct 15 2020 10:08:50 GMT-0400 (Eastern Daylight Time) - Run Time: 1700ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of destination - pd_dest

Column: 2006 GTA zone of household - gta06_hhld

Filters:

2006 GTA zone of household - gta06_hhld In 8527, 8528

and

Start time of trip - start_time In 700 - 900

and

Trip purpose of destination - purp_dest In w, r

Trip 2016

ROW : pd_dest

COLUMN : gta06_hhld

pd_dest	gta06_hhld	total
1	8528	53
10	8528	16
27	8527	27
27	8528	28
28	8528	22
33	8528	51
36	8528	43
81	8527	266
81	8528	841
82	8528	7
83	8527	34
83	8528	34
84	8528	8
86	8528	50
88	8528	7
133	8528	59
136	8527	34

Cross Tabulation Query Form - Trip - 2016 v1.1

Filter Variables

2006 GTA zone of desti... x

2006 GTA zone of hous... x

(Optional) Table Attribute

Group Attributes

Row Grouping

Column Grouping

Table Grouping

Grouping file: Choose File No file chosen

Filter Selection +

☐ 2006 GTA zone of household In

8527, 8528

And

☐ Start time of trip In

700 - 900

And

☐ Trip purpose of destination In

w, r

And

☐ Planning district of destination In

81

Add Delete

Output

☐ Comma-delimited table☒ Column format

Expansion Factor On

Click to Select Load

Load

Execute Query

Select All

Save As

Thu Oct 15 2020 10:10:08 GMT-0400 (Eastern Daylight Time) - Run Time: 1708ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of destination - gta06_dest

Column: 2006 GTA zone of household - gta06_hhld

Filters:

2006 GTA zone of household - gta06_hhld In 8527, 8528

and

Start time of trip - start_time In 700 - 900

and

Trip purpose of destination - purp_dest In w, r

and

Planning district of destination - pd_dest In 81

Trip 2016

ROW : gta06_dest

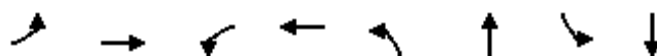
COLUMN : gta06_hhld

gta06_dest	gta06_hhld	total
8501	8527	68
8501	8528	82
8502	8527	30
8504	8528	41
8508	8528	47
8509	8528	22
8510	8527	39
8510	8528	110
8511	8528	52
8514	8528	75
8516	8528	19
8521	8528	22
8523	8528	23
8524	8527	36
8524	8528	121
8526	8528	7
8527	8527	25
8527	8528	172
8528	8528	11
8529	8528	8
8530	8527	32
8530	8528	14
8531	8527	36
8532	8528	15

Appendix F – Synchro Analysis Output – Total Traffic Volumes

521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Total (2023) AM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	17	0	119	1	83	290	12	393
Future Volume (vph)	17	0	119	1	83	290	12	393
Lane Group Flow (vph)	19	19	131	72	91	362	0	457
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		4		8	5	2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	44.0	44.0	44.0
Minimum Split (s)	30.0	30.0	30.0	30.0	11.0	50.0	50.0	50.0
Total Split (s)	30.0	30.0	30.0	30.0	19.0	69.0	50.0	50.0
Total Split (%)	30.3%	30.3%	30.3%	30.3%	19.2%	69.7%	50.5%	50.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0		6.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.09	0.03	0.60	0.23	0.12	0.28		0.50
Control Delay	32.4	0.1	46.4	10.3	4.3	5.7		18.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	32.4	0.1	46.4	10.3	4.3	5.7		18.1
Queue Length 50th (m)	3.0	0.0	22.2	0.2	3.7	18.7		51.8
Queue Length 95th (m)	9.1	0.0	40.4	11.4	9.8	38.3		89.8
Internal Link Dist (m)		281.8		237.1		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	364	806	382	489	740	1271		906
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.05	0.02	0.34	0.15	0.12	0.28		0.50

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 89

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Huronia Rd & Commercial Access/Loon Ave



521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis
Total (2023) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	0	17	119	1	65	83	290	39	12	393	11
Future Volume (vph)	17	0	17	119	1	65	83	290	39	12	393	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.98			1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1805	1615		1805	1619		1805	1787			1850	
Flt Permitted	0.71	1.00		0.75	1.00		0.41	1.00			0.99	
Satd. Flow (perm)	1349	1615		1416	1619		775	1787			1828	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	19	0	19	131	1	71	91	319	43	13	432	12
RTOR Reduction (vph)	0	16	0	0	60	0	0	4	0	0	1	0
Lane Group Flow (vph)	19	3	0	131	12	0	91	358	0	0	456	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	5%	0%	11%	2%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	13.8	13.8		13.8	13.8		63.1	63.1			44.1	
Effective Green, g (s)	13.8	13.8		13.8	13.8		63.1	63.1			44.1	
Actuated g/C Ratio	0.16	0.16		0.16	0.16		0.71	0.71			0.50	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	209	250		219	251		723	1268			906	
v/s Ratio Prot		0.00			0.01		0.02	c0.20				
v/s Ratio Perm	0.01			c0.09			0.07				c0.25	
v/c Ratio	0.09	0.01		0.60	0.05		0.13	0.28			0.50	
Uniform Delay, d1	32.2	31.8		35.0	32.0		5.0	4.7			15.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.2	0.0		4.3	0.1		0.4	0.6			2.0	
Delay (s)	32.4	31.8		39.3	32.0		5.4	5.2			17.0	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		32.1			36.7			5.3			17.0	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			16.4			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			88.9			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			71.4%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

521 Huronia Rd
2: Huronia Rd & RIRO Access

HCM Unsignalized Intersection Capacity Analysis
Total (2023) AM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	6	412	4	0	530
Future Volume (Veh/h)	0	6	412	4	0	530
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	7	448	4	0	576
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						81
pX, platoon unblocked	0.77					
vC, conflicting volume	1026	450			452	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	888	450			452	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			100	
cM capacity (veh/h)	243	609			1109	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	7	452	576			
Volume Left	0	0	0			
Volume Right	7	4	0			
cSH	609	1700	1700			
Volume to Capacity	0.01	0.27	0.34			
Queue Length 95th (m)	0.3	0.0	0.0			
Control Delay (s)	11.0	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	11.0	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		0.1				
Intersection Capacity Utilization		31.9%		ICU Level of Service		A
Analysis Period (min)		15				

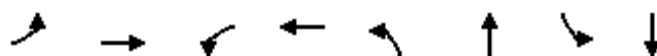
521 Huronia Rd
3: Street 'A' & Loon Ave

HCM Unsignalized Intersection Capacity Analysis
Total (2023) AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Traffic Volume (veh/h)	48	2	0	172	13	1
Future Volume (Veh/h)	48	2	0	172	13	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	2	0	187	14	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	261					
pX, platoon unblocked						
vC, conflicting volume			54		240	53
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			54		240	53
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		98	100
cM capacity (veh/h)			1564		753	1020
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	54	187	15			
Volume Left	0	0	14			
Volume Right	2	0	1			
cSH	1700	1564	766			
Volume to Capacity	0.03	0.00	0.02			
Queue Length 95th (m)	0.0	0.0	0.5			
Control Delay (s)	0.0	0.0	9.8			
Lane LOS			A			
Approach Delay (s)	0.0	0.0	9.8			
Approach LOS			A			
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization		19.1%		ICU Level of Service		A
Analysis Period (min)			15			

521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Total (2023) PM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	14	3	35	0	15	342	65	275
Future Volume (vph)	14	3	35	0	15	342	65	275
Lane Group Flow (vph)	15	98	37	15	16	458	0	378
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		4		8	5	2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	44.0	44.0	44.0
Minimum Split (s)	30.0	30.0	30.0	30.0	11.0	50.0	50.0	50.0
Total Split (s)	30.0	30.0	30.0	30.0	19.0	69.0	50.0	50.0
Total Split (%)	30.3%	30.3%	30.3%	30.3%	19.2%	69.7%	50.5%	50.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0		6.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.08	0.34	0.23	0.02	0.02	0.32		0.45
Control Delay	34.7	12.3	37.8	0.1	2.5	4.0		14.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	34.7	12.3	37.8	0.1	2.5	4.0		14.6
Queue Length 50th (m)	2.3	0.5	5.8	0.0	0.5	20.3		38.6
Queue Length 95th (m)	8.0	14.5	15.2	0.0	1.8	33.0		62.9
Internal Link Dist (m)		281.8		281.2		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	419	545	389	845	905	1417		839
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.04	0.18	0.10	0.02	0.02	0.32		0.45

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 81.9

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Huronia Rd & Commercial Access/Loon Ave



521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis
Total (2023) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	3	89	35	0	14	15	342	88	65	275	15
Future Volume (vph)	14	3	89	35	0	14	15	342	88	65	275	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.97			0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1805	1624		1805	1615		1805	1785			1802	
Flt Permitted	0.75	1.00		0.69	1.00		0.49	1.00			0.85	
Satd. Flow (perm)	1421	1624		1318	1615		931	1785			1550	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	15	3	95	37	0	15	16	364	94	69	293	16
RTOR Reduction (vph)	0	86	0	0	14	0	0	6	0	0	1	0
Lane Group Flow (vph)	15	12	0	37	1	0	16	452	0	0	377	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	5%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	7.8	7.8		7.8	7.8		63.4	63.4			44.3	
Effective Green, g (s)	7.8	7.8		7.8	7.8		63.4	63.4			44.3	
Actuated g/C Ratio	0.09	0.09		0.09	0.09		0.76	0.76			0.53	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	133	152		123	151		868	1360			825	
v/s Ratio Prot		0.01			0.00		0.00	c0.25				
v/s Ratio Perm	0.01			c0.03			0.01				c0.24	
v/c Ratio	0.11	0.08		0.30	0.01		0.02	0.33			0.46	
Uniform Delay, d1	34.5	34.4		35.2	34.2		2.9	3.2			12.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.4	0.2		1.4	0.0		0.0	0.7			1.8	
Delay (s)	34.9	34.6		36.5	34.2		3.0	3.8			13.8	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		34.7			35.9			3.8			13.8	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			12.6			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.42									
Actuated Cycle Length (s)			83.2			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			90.2%			ICU Level of Service			E			
Analysis Period (min)			15									
c Critical Lane Group												

521 Huronia Rd
2: Huronia Rd & RIRO Access

HCM Unsignalized Intersection Capacity Analysis
Total (2023) PM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	4	442	12	0	406
Future Volume (Veh/h)	0	4	442	12	0	406
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	4	480	13	0	441
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						81
pX, platoon unblocked	0.89					
vC, conflicting volume	928	486			493	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	858	486			493	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			100	
cM capacity (veh/h)	292	581			1071	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	4	493	441			
Volume Left	0	0	0			
Volume Right	4	13	0			
cSH	581	1700	1700			
Volume to Capacity	0.01	0.29	0.26			
Queue Length 95th (m)	0.2	0.0	0.0			
Control Delay (s)	11.2	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	11.2	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		0.0				
Intersection Capacity Utilization		34.0%		ICU Level of Service		A
Analysis Period (min)		15				

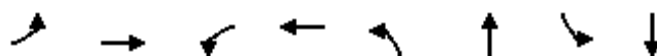
521 Huronia Rd
3: Street 'A' & Loon Ave

HCM Unsignalized Intersection Capacity Analysis
Total (2023) PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↱	↘↗	
Traffic Volume (veh/h)	148	8	1	41	8	1
Future Volume (Veh/h)	148	8	1	41	8	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	161	9	1	45	9	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	305					
pX, platoon unblocked						
vC, conflicting volume			170		212	166
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			170		212	166
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	100
cM capacity (veh/h)			1420		780	884
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	170	46	10			
Volume Left	0	1	9			
Volume Right	9	0	1			
cSH	1700	1420	789			
Volume to Capacity	0.10	0.00	0.01			
Queue Length 95th (m)	0.0	0.0	0.3			
Control Delay (s)	0.0	0.2	9.6			
Lane LOS		A	A			
Approach Delay (s)	0.0	0.2	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			18.3%	ICU Level of Service		A
Analysis Period (min)			15			

521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Total (2030) AM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	17	0	206	1	83	341	27	466
Future Volume (vph)	17	0	206	1	83	341	27	466
Lane Group Flow (vph)	19	19	226	131	91	448	0	554
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		4		8	5	2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	44.0	44.0	44.0
Minimum Split (s)	30.0	30.0	30.0	30.0	11.0	50.0	50.0	50.0
Total Split (s)	30.0	30.0	30.0	30.0	19.0	69.0	50.0	50.0
Total Split (%)	30.3%	30.3%	30.3%	30.3%	19.2%	69.7%	50.5%	50.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0		6.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.07	0.03	0.79	0.30	0.14	0.37		0.67
Control Delay	30.1	0.1	55.0	7.7	6.2	8.3		25.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	30.1	0.1	55.0	7.7	6.2	8.3		25.2
Queue Length 50th (m)	3.0	0.0	41.3	0.2	5.2	33.0		80.7
Queue Length 95th (m)	9.0	0.0	68.1	14.8	11.5	57.0		128.2
Internal Link Dist (m)		281.8		237.1		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	326	753	361	509	633	1197		830
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.06	0.03	0.63	0.26	0.14	0.37		0.67

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 94.4

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Huronia Rd & Commercial Access/Loon Ave



521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis
Total (2030) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	0	17	206	1	118	83	341	66	27	466	11
Future Volume (vph)	17	0	17	206	1	118	83	341	66	27	466	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.98			1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1805	1615		1805	1617		1805	1779			1844	
Flt Permitted	0.67	1.00		0.75	1.00		0.34	1.00			0.96	
Satd. Flow (perm)	1279	1615		1416	1617		651	1779			1776	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	19	0	19	226	1	130	91	375	73	30	512	12
RTOR Reduction (vph)	0	15	0	0	104	0	0	6	0	0	1	0
Lane Group Flow (vph)	19	4	0	226	27	0	91	442	0	0	553	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	5%	0%	11%	2%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.2	19.2		19.2	19.2		63.2	63.2			44.2	
Effective Green, g (s)	19.2	19.2		19.2	19.2		63.2	63.2			44.2	
Actuated g/C Ratio	0.20	0.20		0.20	0.20		0.67	0.67			0.47	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	260	328		288	328		619	1191			831	
v/s Ratio Prot		0.00			0.02		0.02	c0.25				
v/s Ratio Perm	0.01			c0.16			0.08				c0.31	
v/c Ratio	0.07	0.01		0.78	0.08		0.15	0.37			0.67	
Uniform Delay, d1	30.4	30.0		35.6	30.5		7.2	6.9			19.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.1	0.0		13.1	0.1		0.5	0.9			4.2	
Delay (s)	30.5	30.0		48.7	30.6		7.7	7.7			23.6	
Level of Service	C	C		D	C		A	A			C	
Approach Delay (s)		30.3			42.1			7.7			23.6	
Approach LOS		C			D			A			C	
Intersection Summary												
HCM 2000 Control Delay			22.5			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			94.4			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			75.4%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

521 Huronia Rd
2: Huronia Rd & RIRO Access

HCM Unsignalized Intersection Capacity Analysis
Total (2030) AM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	6	508	4	0	694
Future Volume (Veh/h)	0	6	508	4	0	694
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	7	552	4	0	754
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						81
pX, platoon unblocked	0.66					
vC, conflicting volume	1308	554			556	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1209	554			556	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			100	
cM capacity (veh/h)	133	532			1015	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	7	556	754			
Volume Left	0	0	0			
Volume Right	7	4	0			
cSH	532	1700	1700			
Volume to Capacity	0.01	0.33	0.44			
Queue Length 95th (m)	0.3	0.0	0.0			
Control Delay (s)	11.9	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	11.9	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		0.1				
Intersection Capacity Utilization		39.9%		ICU Level of Service		A
Analysis Period (min)		15				

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	58	35	2	203	122	7
Future Volume (vph)	58	35	2	203	122	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	63	38	2	221	133	8
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	101	223	141			
Volume Left (vph)	0	2	133			
Volume Right (vph)	38	0	8			
Hadj (s)	-0.23	0.00	0.15			
Departure Headway (s)	4.3	4.4	4.8			
Degree Utilization, x	0.12	0.27	0.19			
Capacity (veh/h)	802	789	707			
Control Delay (s)	7.9	9.0	8.9			
Approach Delay (s)	7.9	9.0	8.9			
Approach LOS	A	A	A			
Intersection Summary						
Delay			8.7			
Level of Service			A			
Intersection Capacity Utilization			26.1%	ICU Level of Service	A	
Analysis Period (min)			15			

Intersection

Intersection Delay, s/veh 8.7
Intersection LOS A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	58	35	2	203	122	7
Future Vol, veh/h	58	35	2	203	122	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	63	38	2	221	133	8
Number of Lanes	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right NB			WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	7.9	9	8.9
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	95%	0%	1%
Vol Thru, %	0%	62%	99%
Vol Right, %	5%	38%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	129	93	205
LT Vol	122	0	2
Through Vol	0	58	203
RT Vol	7	35	0
Lane Flow Rate	140	101	223
Geometry Grp	1	1	1
Degree of Util (X)	0.186	0.12	0.27
Departure Headway (Hd)	4.773	4.264	4.36
Convergence, Y/N	Yes	Yes	Yes
Cap	753	841	827
Service Time	2.797	2.286	2.378
HCM Lane V/C Ratio	0.186	0.12	0.27
HCM Control Delay	8.9	7.9	9
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.7	0.4	1.1

521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Total (2030) PM Peak Hour

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	14	3	79	0	15	405	116	324
Future Volume (vph)	14	3	79	0	15	405	116	324
Lane Group Flow (vph)	15	98	84	44	16	614	0	484
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		4		8	5	2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	44.0	44.0	44.0
Minimum Split (s)	30.0	30.0	30.0	30.0	11.0	50.0	50.0	50.0
Total Split (s)	30.0	30.0	30.0	30.0	19.0	69.0	50.0	50.0
Total Split (%)	30.3%	30.3%	30.3%	30.3%	19.2%	69.7%	50.5%	50.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0		6.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.08	0.32	0.45	0.07	0.02	0.44		0.68
Control Delay	33.2	11.0	42.8	0.2	3.3	5.7		22.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	33.2	11.0	42.8	0.2	3.3	5.7		22.6
Queue Length 50th (m)	2.3	0.5	13.8	0.0	0.5	31.7		60.1
Queue Length 95th (m)	8.0	13.9	28.2	0.0	2.3	63.7		111.5
Internal Link Dist (m)		281.8		281.2		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	400	537	381	791	831	1382		708
Starvation Cap Reductn	0	0	0	0	0	0		0
Spillback Cap Reductn	0	0	0	0	0	0		0
Storage Cap Reductn	0	0	0	0	0	0		0
Reduced v/c Ratio	0.04	0.18	0.22	0.06	0.02	0.44		0.68

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 83.6

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Huronia Rd & Commercial Access/Loon Ave



521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis
Total (2030) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	3	89	79	0	41	15	405	172	116	324	15
Future Volume (vph)	14	3	89	79	0	41	15	405	172	116	324	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.96			1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.99	
Satd. Flow (prot)	1805	1624		1805	1615		1805	1765			1804	
Flt Permitted	0.73	1.00		0.69	1.00		0.44	1.00			0.73	
Satd. Flow (perm)	1384	1624		1318	1615		836	1765			1332	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	15	3	95	84	0	44	16	431	183	123	345	16
RTOR Reduction (vph)	0	84	0	0	39	0	0	11	0	0	1	0
Lane Group Flow (vph)	15	14	0	84	5	0	16	603	0	0	483	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	5%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	9.4	9.4		9.4	9.4		63.6	63.6			44.5	
Effective Green, g (s)	9.4	9.4		9.4	9.4		63.6	63.6			44.5	
Actuated g/C Ratio	0.11	0.11		0.11	0.11		0.75	0.75			0.52	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	153	179		145	178		797	1320			697	
v/s Ratio Prot		0.01			0.00		0.00	c0.34				
v/s Ratio Perm	0.01			c0.06			0.01				c0.36	
v/c Ratio	0.10	0.08		0.58	0.03		0.02	0.46			0.69	
Uniform Delay, d1	34.0	33.9		35.9	33.7		3.6	4.1			15.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.3	0.2		5.5	0.1		0.0	1.1			5.6	
Delay (s)	34.3	34.1		41.4	33.8		3.7	5.2			20.7	
Level of Service	C	C		D	C		A	A			C	
Approach Delay (s)		34.1			38.8			5.2			20.7	
Approach LOS		C			D			A			C	
Intersection Summary												
HCM 2000 Control Delay			16.3			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			85.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			99.4%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

521 Huronia Rd
2: Huronia Rd & RIRO Access

HCM Unsignalized Intersection Capacity Analysis
Total (2030) PM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	4	592	12	0	517
Future Volume (Veh/h)	0	4	592	12	0	517
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	4	643	13	0	562
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						81
pX, platoon unblocked	0.81					
vC, conflicting volume	1212	650			656	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1146	650			656	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	99			100	
cM capacity (veh/h)	179	469			931	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	4	656	562			
Volume Left	0	0	0			
Volume Right	4	13	0			
cSH	469	1700	1700			
Volume to Capacity	0.01	0.39	0.33			
Queue Length 95th (m)	0.2	0.0	0.0			
Control Delay (s)	12.7	0.0	0.0			
Lane LOS	B					
Approach Delay (s)	12.7	0.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		0.0				
Intersection Capacity Utilization		41.9%		ICU Level of Service		A
Analysis Period (min)		15				

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	175	117	7	49	72	4
Future Volume (vph)	175	117	7	49	72	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	190	127	8	53	78	4
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total (vph)	317	61	82			
Volume Left (vph)	0	8	78			
Volume Right (vph)	127	0	4			
Hadj (s)	-0.24	0.03	0.16			
Departure Headway (s)	3.9	4.4	4.9			
Degree Utilization, x	0.35	0.08	0.11			
Capacity (veh/h)	895	772	688			
Control Delay (s)	9.0	7.8	8.5			
Approach Delay (s)	9.0	7.8	8.5			
Approach LOS	A	A	A			
Intersection Summary						
Delay			8.8			
Level of Service			A			
Intersection Capacity Utilization			27.3%	ICU Level of Service	A	
Analysis Period (min)			15			

Intersection

Intersection Delay, s/veh 8.8
Intersection LOS A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	175	117	7	49	72	4
Future Vol, veh/h	175	117	7	49	72	4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	190	127	8	53	78	4
Number of Lanes	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	1	1
Conflicting Approach Right NB			WB
Conflicting Lanes Right	1	0	1
HCM Control Delay	9	7.8	8.5
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1
Vol Left, %	95%	0%	12%
Vol Thru, %	0%	60%	88%
Vol Right, %	5%	40%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	76	292	56
LT Vol	72	0	7
Through Vol	0	175	49
RT Vol	4	117	0
Lane Flow Rate	83	317	61
Geometry Grp	1	1	1
Degree of Util (X)	0.111	0.339	0.075
Departure Headway (Hd)	4.847	3.85	4.436
Convergence, Y/N	Yes	Yes	Yes
Cap	743	917	811
Service Time	2.85	1.944	2.442
HCM Lane V/C Ratio	0.112	0.346	0.075
HCM Control Delay	8.5	9	7.8
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.4	1.5	0.2

521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Total (2030) AM Peak Hour w. Imp

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	17	0	206	1	83	341	27	466
Future Volume (vph)	17	0	206	1	83	341	27	466
Lane Group Flow (vph)	19	19	226	131	91	448	30	524
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		4		8	5	2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	44.0	44.0	44.0
Minimum Split (s)	30.0	30.0	30.0	30.0	11.0	50.0	50.0	50.0
Total Split (s)	30.0	30.0	30.0	30.0	19.0	69.0	50.0	50.0
Total Split (%)	30.3%	30.3%	30.3%	30.3%	19.2%	69.7%	50.5%	50.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0	6.0	6.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.07	0.03	0.79	0.30	0.16	0.37	0.07	0.60
Control Delay	30.1	0.1	55.0	7.7	6.3	8.3	16.1	23.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.1	0.1	55.0	7.7	6.3	8.3	16.1	23.1
Queue Length 50th (m)	3.0	0.0	41.3	0.2	5.2	33.0	3.1	73.1
Queue Length 95th (m)	9.0	0.0	68.1	14.8	11.5	57.0	9.1	115.4
Internal Link Dist (m)		281.8		237.1		57.0		190.6
Turn Bay Length (m)			20.0		75.0		25.0	
Base Capacity (vph)	326	753	361	509	578	1197	403	869
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.03	0.63	0.26	0.16	0.37	0.07	0.60

Intersection Summary

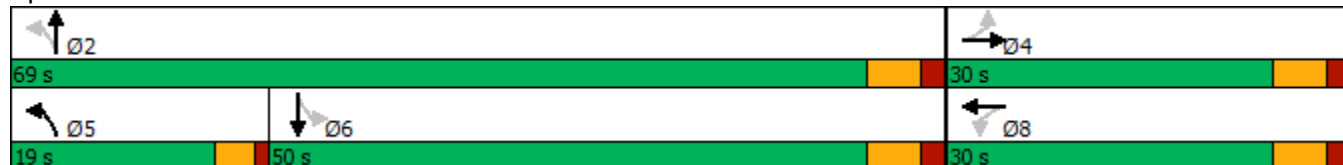
Cycle Length: 99

Actuated Cycle Length: 94.4

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Huronia Rd & Commercial Access/Loon Ave



521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis
Total (2030) AM Peak Hour w. Imp

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	0	17	206	1	118	83	341	66	27	466	11
Future Volume (vph)	17	0	17	206	1	118	83	341	66	27	466	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.98		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1615		1805	1617		1805	1779		1626	1857	
Flt Permitted	0.67	1.00		0.75	1.00		0.29	1.00		0.50	1.00	
Satd. Flow (perm)	1279	1615		1416	1617		548	1779		862	1857	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	19	0	19	226	1	130	91	375	73	30	512	12
RTOR Reduction (vph)	0	15	0	0	104	0	0	6	0	0	1	0
Lane Group Flow (vph)	19	4	0	226	27	0	91	442	0	30	523	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	5%	0%	11%	2%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	19.2	19.2		19.2	19.2		63.2	63.2		44.2	44.2	
Effective Green, g (s)	19.2	19.2		19.2	19.2		63.2	63.2		44.2	44.2	
Actuated g/C Ratio	0.20	0.20		0.20	0.20		0.67	0.67		0.47	0.47	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	260	328		288	328		566	1191		403	869	
v/s Ratio Prot		0.00			0.02		0.03	c0.25			c0.28	
v/s Ratio Perm	0.01			c0.16			0.08			0.03		
v/c Ratio	0.07	0.01		0.78	0.08		0.16	0.37		0.07	0.60	
Uniform Delay, d1	30.4	30.0		35.6	30.5		7.5	6.9		13.8	18.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.0		13.1	0.1		0.6	0.9		0.4	3.1	
Delay (s)	30.5	30.0		48.7	30.6		8.1	7.7		14.2	21.7	
Level of Service	C	C		D	C		A	A		B	C	
Approach Delay (s)		30.3			42.1			7.8			21.3	
Approach LOS		C			D			A			C	
Intersection Summary												
HCM 2000 Control Delay			21.6			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			94.4			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			97.1%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Total (2030) PM Peak Hour w. Imp

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	14	3	79	0	15	405	116	324
Future Volume (vph)	14	3	79	0	15	405	116	324
Lane Group Flow (vph)	15	98	84	44	16	614	123	361
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		4		8	5	2		6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	6	6
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	7.0	44.0	44.0	44.0
Minimum Split (s)	30.0	30.0	30.0	30.0	11.0	50.0	50.0	50.0
Total Split (s)	30.0	30.0	30.0	30.0	19.0	69.0	50.0	50.0
Total Split (%)	30.3%	30.3%	30.3%	30.3%	19.2%	69.7%	50.5%	50.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	4.0	6.0	6.0	6.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Recall Mode	None	None	None	None	Max	Max	Max	Max
v/c Ratio	0.08	0.32	0.45	0.07	0.02	0.44	0.28	0.38
Control Delay	33.2	11.0	42.8	0.2	3.3	5.7	15.1	14.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.2	11.0	42.8	0.2	3.3	5.7	15.1	14.3
Queue Length 50th (m)	2.3	0.5	13.8	0.0	0.5	31.7	11.5	35.5
Queue Length 95th (m)	8.0	13.9	28.2	0.0	2.3	63.7	26.2	62.7
Internal Link Dist (m)		281.8		281.2		57.0		190.6
Turn Bay Length (m)			20.0		75.0		25.0	
Base Capacity (vph)	400	537	381	791	847	1382	435	957
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.18	0.22	0.06	0.02	0.44	0.28	0.38

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 83.6

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Huronia Rd & Commercial Access/Loon Ave



521 Huronia Rd
1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis
Total (2030) PM Peak Hour w. Imp

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	3	89	79	0	41	15	405	172	116	324	15
Future Volume (vph)	14	3	89	79	0	41	15	405	172	116	324	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		4.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1624		1805	1615		1805	1765		1805	1801	
Flt Permitted	0.73	1.00		0.69	1.00		0.45	1.00		0.43	1.00	
Satd. Flow (perm)	1384	1624		1318	1615		862	1765		821	1801	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	15	3	95	84	0	44	16	431	183	123	345	16
RTOR Reduction (vph)	0	84	0	0	39	0	0	11	0	0	1	0
Lane Group Flow (vph)	15	14	0	84	5	0	16	603	0	123	360	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	5%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	9.4	9.4		9.4	9.4		63.6	63.6		44.5	44.5	
Effective Green, g (s)	9.4	9.4		9.4	9.4		63.6	63.6		44.5	44.5	
Actuated g/C Ratio	0.11	0.11		0.11	0.11		0.75	0.75		0.52	0.52	
Clearance Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	153	179		145	178		812	1320		429	942	
v/s Ratio Prot		0.01			0.00		0.00	c0.34			0.20	
v/s Ratio Perm	0.01			c0.06			0.01			0.15		
v/c Ratio	0.10	0.08		0.58	0.03		0.02	0.46		0.29	0.38	
Uniform Delay, d1	34.0	33.9		35.9	33.7		3.1	4.1		11.4	12.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.2		5.5	0.1		0.0	1.1		1.7	1.2	
Delay (s)	34.3	34.1		41.4	33.8		3.2	5.2		13.0	13.2	
Level of Service	C	C		D	C		A	A		B	B	
Approach Delay (s)		34.1			38.8			5.2			13.2	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			13.6			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.50									
Actuated Cycle Length (s)			85.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			99.4%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

Appendix G – OTM Signal Justification Sheets

Justification No. 7 - 2030 Total Traffic (Critical Case)

Huronia Rd / RIRO Access

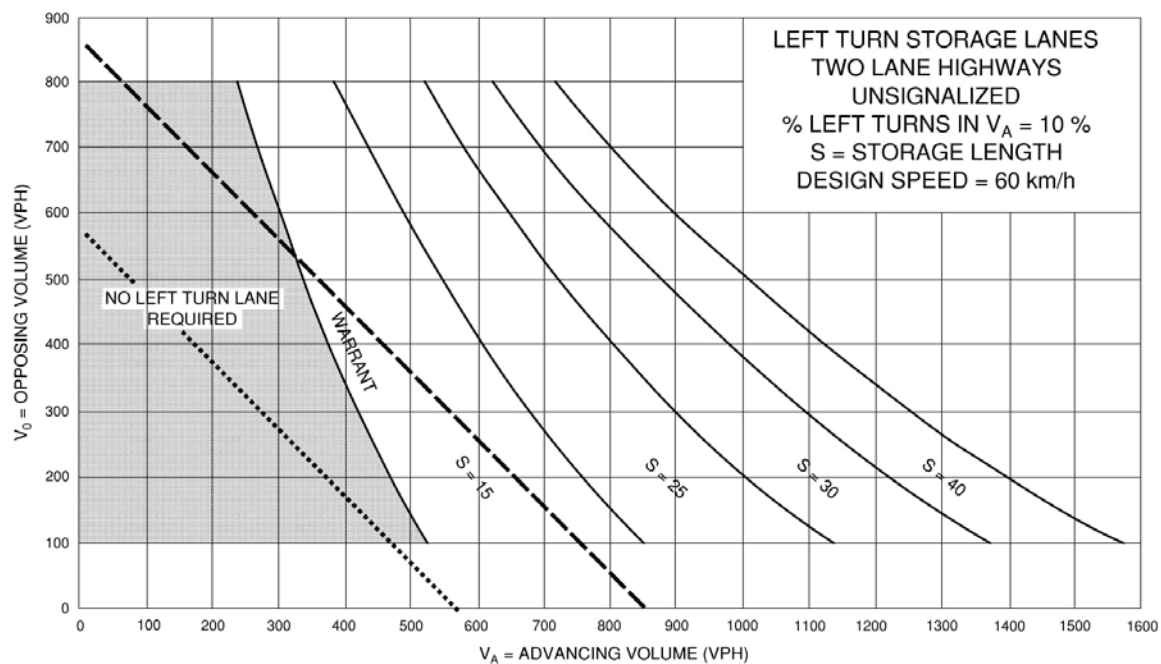
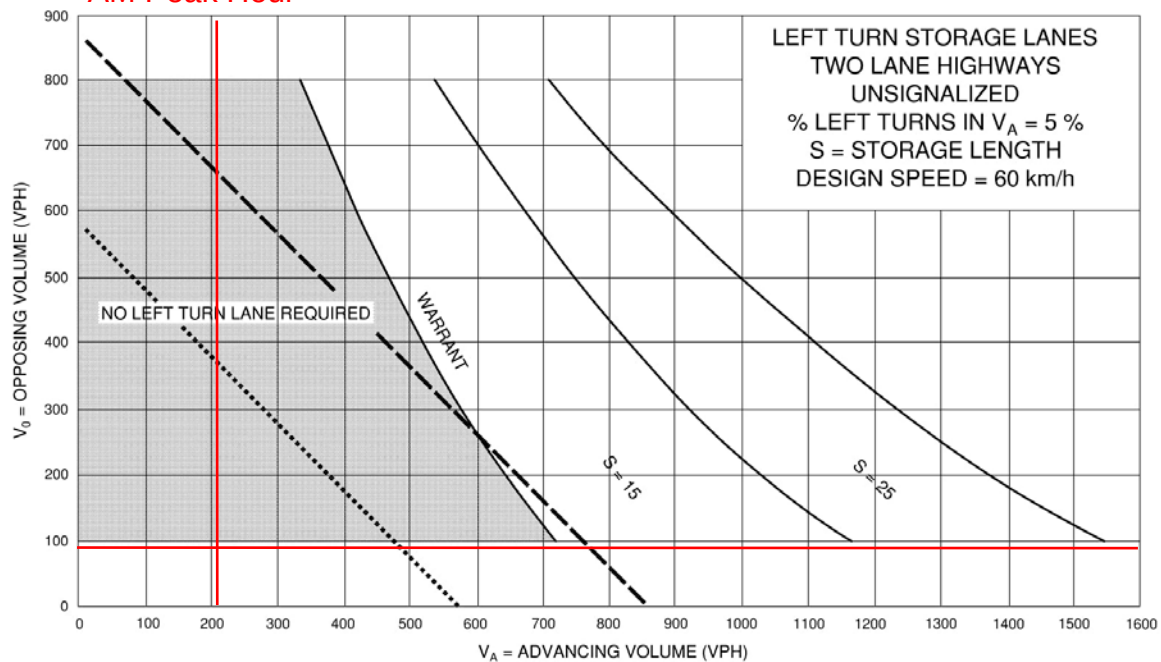
Justification	Description		Compliance			Signal Warrant	Underground Provisions Warrant
			Sectional		Entire %		
			Rest. Flow	Numerical			
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	720	584	81%	1%	NO	NO
	B. Vehicle volume, along minor streets (average hour)	255	3	1%		NO	NO
2. Delay to cross traffic	A. Vehicle volume, major street (average hour)	720	578	80%	0%	NO	NO
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	75	0	0%		NO	NO

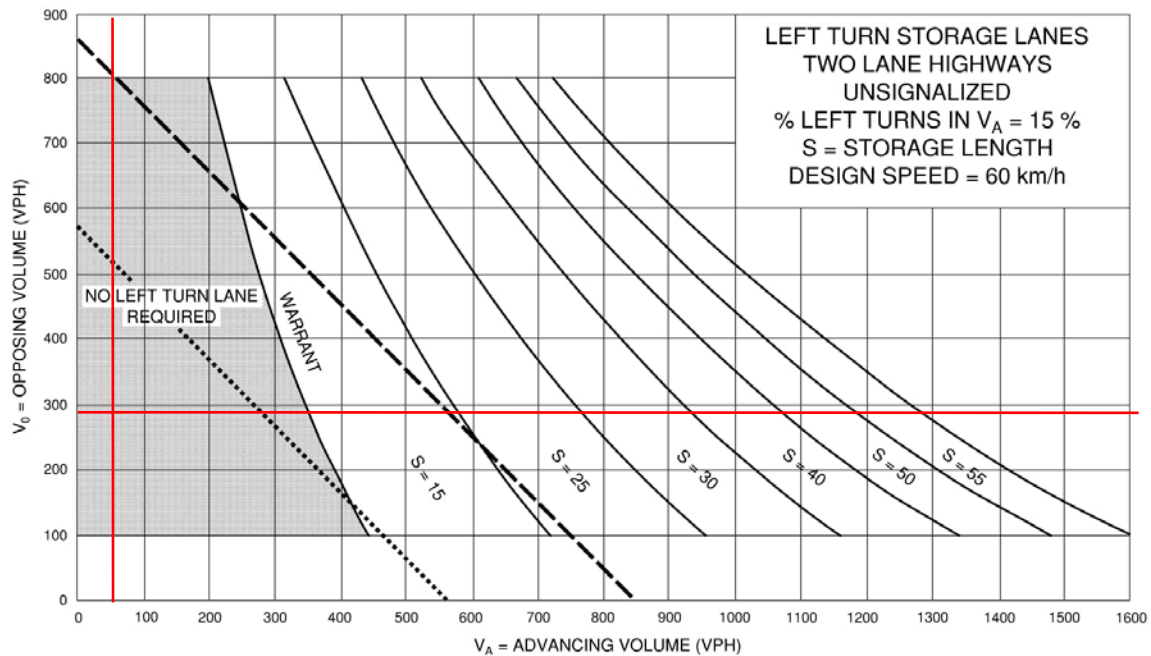
Justification No. 7 - 2030 Total Traffic (Critical Case)

Street 'A' / Loon Avenue

Justification	Description		Compliance			Signal Warrant	Underground Provisions Warrant
			Sectional		Entire %		
			Rest. Flow	Numerical			
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	720	213	30%	20%	NO	NO
	B. Vehicle volume, along minor streets (average hour)	255	161	63%		NO	NO
2. Delay to cross traffic	A. Vehicle volume, major street (average hour)	720	49	7%	4%	NO	NO
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	75	65	87%		NO	NO

Appendix H – MTO Left-Turn Analysis

Street 'A' / Loon Avenue2030 Total - Westbound
AM Peak Hour**Exhibit 9A-6**

Street 'A' / Loon Avenue**2030 Total - Westbound
PM Peak Hour****Exhibit 9A-7**

- TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW
- TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

