

Loon Avenue Lands

City of Barrie

Traffic Impact Study for Loon Avenue Lands OP Inc.

Type of Document:
Final Report

Project Number:
JDE – 19070

Date Submitted:
December 24th , 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 **Loon Avenue Lands OP 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 site located on the south side of Loon Avenue midblock between Gadwall Avenue and Widgeon Street in the City of Barrie [City]. The report assesses the impact of traffic related to the community on the adjacent roadway and provides recommendations to accommodate this traffic in a safe and efficient manner.

The proposed community is anticipated to include 105 residential townhouse units.

The proposed community will have access onto Loon Avenue via a proposed private road [Street A]. The proposed community will also have an emergency traffic access via a connection to the proposed 521 Huronia development to the west. The eastbound lanes at this access will be controlled with an automated parking control gate. This will prohibit public traffic from the proposed development travelling via this access, without restricting traffic access from the 521 Huronia development. Additional details are provided in Section 5.2.

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

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

Conclusions

1. The proposed community is expected to generate a total of 50 AM and 60 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 community 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 (2021) and background (2023 & 2031) traffic volumes without the proposed community traffic. This enabled a review of existing and future traffic deficiencies that would be present without the influence of the proposed community. 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 community was prepared and assigned to the study area streets and intersections.
6. An intersection operation analysis was completed under total (2023 & 2031) traffic volumes with the proposed community operational at the study area intersections. No geometric lane improvements or traffic signal improvements are warranted within the study area.
7. Based on our traffic projections for Loon Avenue, for the critical condition, the auto-traffic capacity for Loon Avenue exceeds the anticipated future traffic volume, including the additional traffic generated by the proposed community.
8. An eastbound parking control gate is anticipated to be installed at the west end of the community to prohibit cut-through traffic entering via the 521 Huronia development.
9. 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 community.

10. 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 proposed community.
11. There are no issues with the sight distance available for the future Street 'A' intersection at Loon Avenue.
12. A sidewalk is proposed on the east and west side of Street 'A', which will connect into the existing sidewalk on the south side of Loon Avenue. The proposed community will include an internal sidewalk network that will connect into Loon Avenue via Street 'A' and also into the 521 Huronia development. The proposed 521 Huronia development includes the construction of a sidewalk on the east side of Huronia Road between the RIRO Access and Loon Avenue, which will provide a secondary connection into the City's sidewalk network providing pedestrian access throughout the City.
13. 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. The minor additional traffic on Loon Avenue, from the proposed community, will not have a notable impact on the average speed of traffic on Loon Avenue. Notwithstanding, it is recommended that the Client provide the City with \$15,000 to be used for traffic calming on Loon Avenue, in the study area.
14. The ZBL does not permit tandem parking spaces to be counted toward the parking minimum; however, the proposed tandem parking configuration is consistent with the majority of existing street townhouse units within the City, where shared visitor parking is provided along the municipal road. Consequently, the proposed tandem parking spaces with separate shared visitor parking is appropriate for the intended use.
15. The proposed community includes a total parking supply of 228 parking spaces, including 105 garage spaces, 102 driveway spaces and 21 shared visitor parking spaces (including 6 barrier-free parking spaces). Based on our review of the proxy parking data, existing development within the City and parking standards in similar municipalities, the proposed parking supply will accommodate the anticipated parking demand generated by the proposed community.
16. In summary, the proposed community will not cause any operational or traffic safety 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	5
2.4.2	521 Huronia Development.....	6
2.5	Background Growth Rate	10
2.6	Traffic Counts.....	10
2.7	Horizon Year Traffic Volumes.....	10
3	Intersection Operation without Proposed Community	14
3.1	Introduction.....	14
3.2	Existing (2021) Intersection Operation	15
3.3	Background (2023) Intersection Operation.....	16
3.4	Background (2031) Intersection Operation.....	16
4	Proposed Community Traffic Generation and Assignment.....	18
4.1	Traffic Generation.....	18
4.2	Traffic Assignment.....	18
4.3	Total Horizon Year Traffic Volumes with the Proposed Community.....	19
5	Intersection Operation with Proposed Community	23
5.1	Total (2023) Intersection Operation	23
5.2	Total (2031) Intersection Operation	24
5.3	Supplementary Analysis - Total (2031) Intersection Operation with (SB Left Turn Lane).....	25
5.4	Site Access.....	26
5.5	Sight Distance Review	27
5.6	Traffic Safety Review	27

5.7	Active Transportation Review	27
6	Parking Review	28
6.1	Scope	28
6.2	Existing Study Area Parking Infrastructure	28
6.3	Municipal By-law.....	28
6.4	Proxy Counts – Residential Visitor Parking	29
6.4.1	Proxy Site Locations – Residential Visitor Parking	29
6.4.2	Proxy Survey Data – Residential Visitor Parking	29
6.5	Analysis – Residential Visitor Parking	30
6.6	Analysis – Resident Parking	30
6.7	Parking Recommendation	31
6.8	Construction Parking.....	31
7	Summary	31

List of Tables

Table 1 - Estimated Traffic Generation – 131 Ellis Drive	6
Table 2 – Traffic Distribution – 131 Ellis Drive	6
Table 3 – Traffic Count Data	10
Table 4 – Level of Service Criteria for Intersections.....	15
Table 5 – Existing (2021) LOS.....	15
Table 6 – Background (2023) LOS	16
Table 7 – Background (2031) LOS	17
Table 8 – Estimated Traffic Generation of Proposed Community	18
Table 9 – Proposed Community Traffic Distribution	19
Table 10 – Total (2023) LOS	23
Table 11 – Total (2031) LOS	24
Table 12 – Total (2031) LOS with Improvements	26
Table 13 – Zoning By-law Requirement Parking Calculation.....	28
Table 14 – Residential Visitor Proxy Survey Site Statistics.....	29
Table 15 – Residential Visitor Proxy Survey Site Data	30
Table 16 – Recommended Parking Supply	31

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)	7
Figure 4 – Adjacent Development Traffic Volumes – 521 Huronia Development (2023)	8
Figure 5 – Total Adjacent Development Traffic Volumes (2023)	9
Figure 6 – Existing (2021) Traffic Volumes	11
Figure 7 – Background (2023) Traffic Volumes	12
Figure 8 – Background (2031) Traffic Volumes	13
Figure 9 – Proposed Community Traffic Assignment	20
Figure 10 – Total (2023) Traffic Volumes	21
Figure 11 – Total (2031) Traffic Volumes	22

List of Appendices

APPENDIX A – Site Plan
APPENDIX B – 521 Huronia TIS Excerpts
APPENDIX C – Traffic and Parking Count Data
APPENDIX D – Synchro Analysis Output – Existing Traffic Volumes
APPENDIX E – Synchro Analysis Output – Background Traffic Volumes
APPENDIX F – Transportation Tomorrow Survey – Excerpt
APPENDIX G – Synchro Analysis Output – Total Traffic Volumes
APPENDIX H – OTM Signal Justification Sheets
APPENDIX I – MTO Left-Turn Analysis

1 Introduction

1.1 Background

Loon Avenue Lands OP Inc. [The Client] is proposing to develop a site located on the south side of Loon Avenue midblock between Gadwall Avenue and Widgeon Street, in the City of Barrie [City].

The proposed community is anticipated to include 105 residential townhouse units.

The proposed community will have access onto Loon Avenue via a proposed private road [Street A]. The proposed community will also have an emergency traffic access via a connection to the proposed 521 Huronia development to the west. The eastbound lanes at this access will be controlled with an automated parking control gate. This will prohibit public traffic from the proposed development travelling via this access, without restricting traffic access from the 521 Huronia development. Additional details are provided in Section 5.2.

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

1.2 Study Area

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

The community is bound by existing residential lands to the north, future residential development to the west (521 Huronia Road Development), Mapleview Drive East to the south and environmentally protected lands to the east and south.

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

- Huronia Road / Loon Avenue & Commercial 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 community;
- Determine existing traffic volumes and circulation patterns;
- Estimate future traffic volumes if the proposed community 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 community) traffic conditions and identify operational deficiencies;
- Estimate the amount of traffic that would be generated by the proposed community and assign to the roadway network;
- Complete LOS analysis of horizon year (with the proposed community) 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 (2021) year and horizon years (2023 & 2031) 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

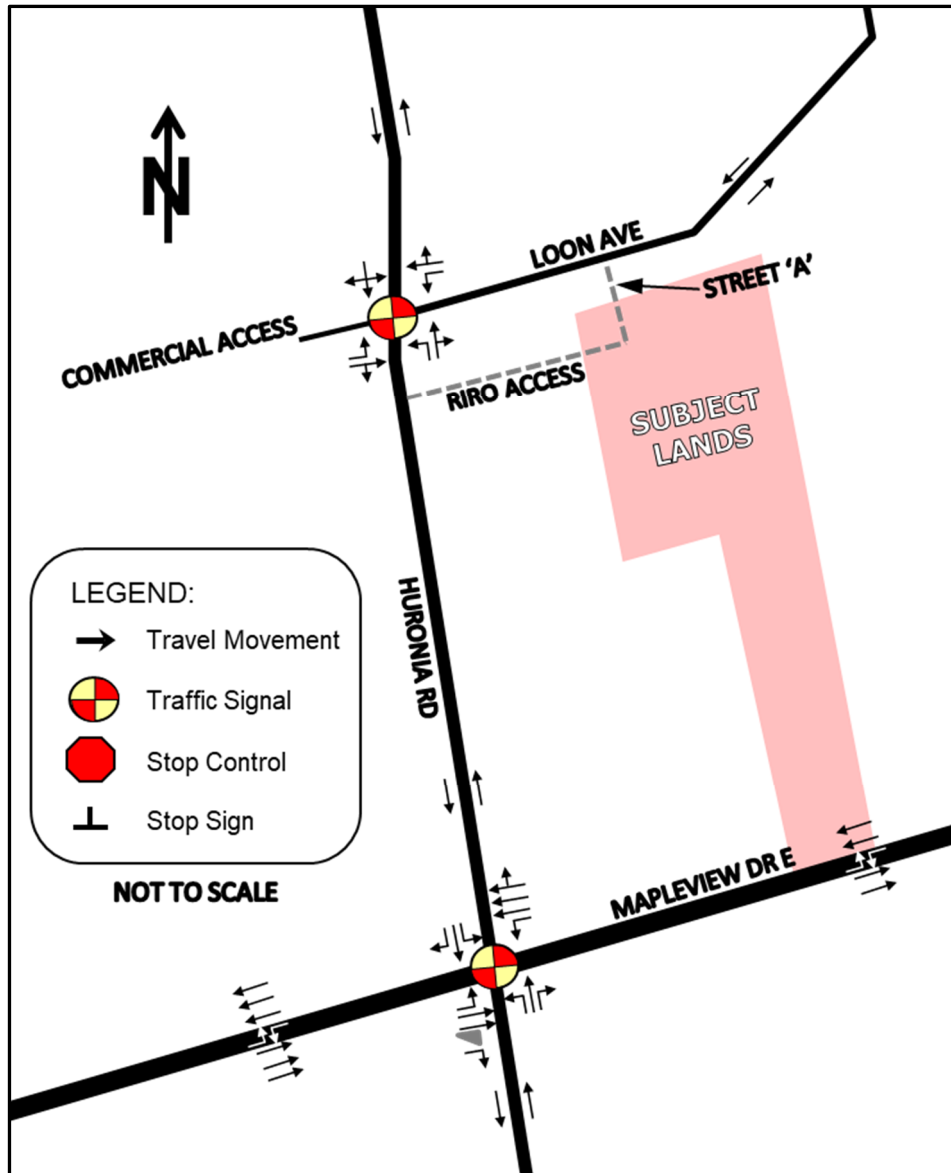
2.1 Street and Intersection Characteristics

Huronia Road is a two-lane arterial road with a rural cross section and no sidewalks within the study area. Huronia 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 2031 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 community 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 and the 521 Huronia development are the only other proposed developments in the study area that will have an 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.

The 521 Huronia development is located in the southeast quadrant of the Huronia Road / Loon Avenue & Commercial Access intersection. The 521 Huronia development is anticipated to consist of 52 residential townhouse units. The 521 Huronia development will have an access onto Huronia Road [RIRO Access]. The 521 Huronia development will also have an internal connection to the proposed development which will provide a connection to Street A. JD Engineering completed a traffic impact study for the 521 Huronia development (dated July 2021) [521 Huronia TIS]. The 521 Huronia development is pending an Official Plan Amendment and Zoning By-Law Amendment.

It is assumed that the 131 Ellis Drive development and 521 Huronia development will be built-out by the 2023 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**.

2.4.2 521 Huronia Development

The traffic generation and assignment for the 521 Huronia development is based on the 521 Huronia TIS (excerpts provided in **Appendix B**).

Figure 4 illustrates the traffic assignment for the 521 Huronia development for the AM and PM peak hour.

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)

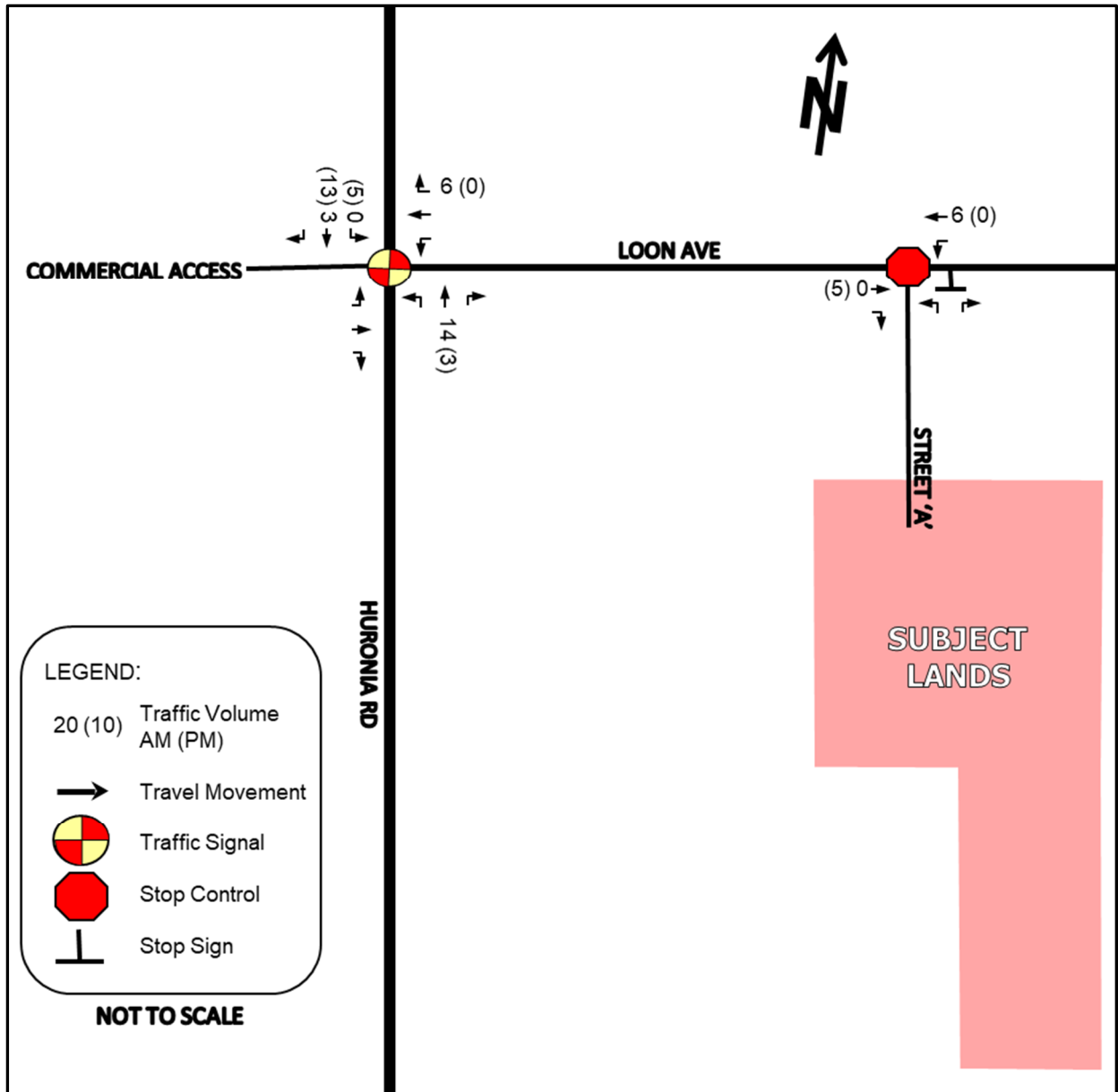


Figure 4 – Adjacent Development Traffic Volumes – 521 Huronia Development (2023)

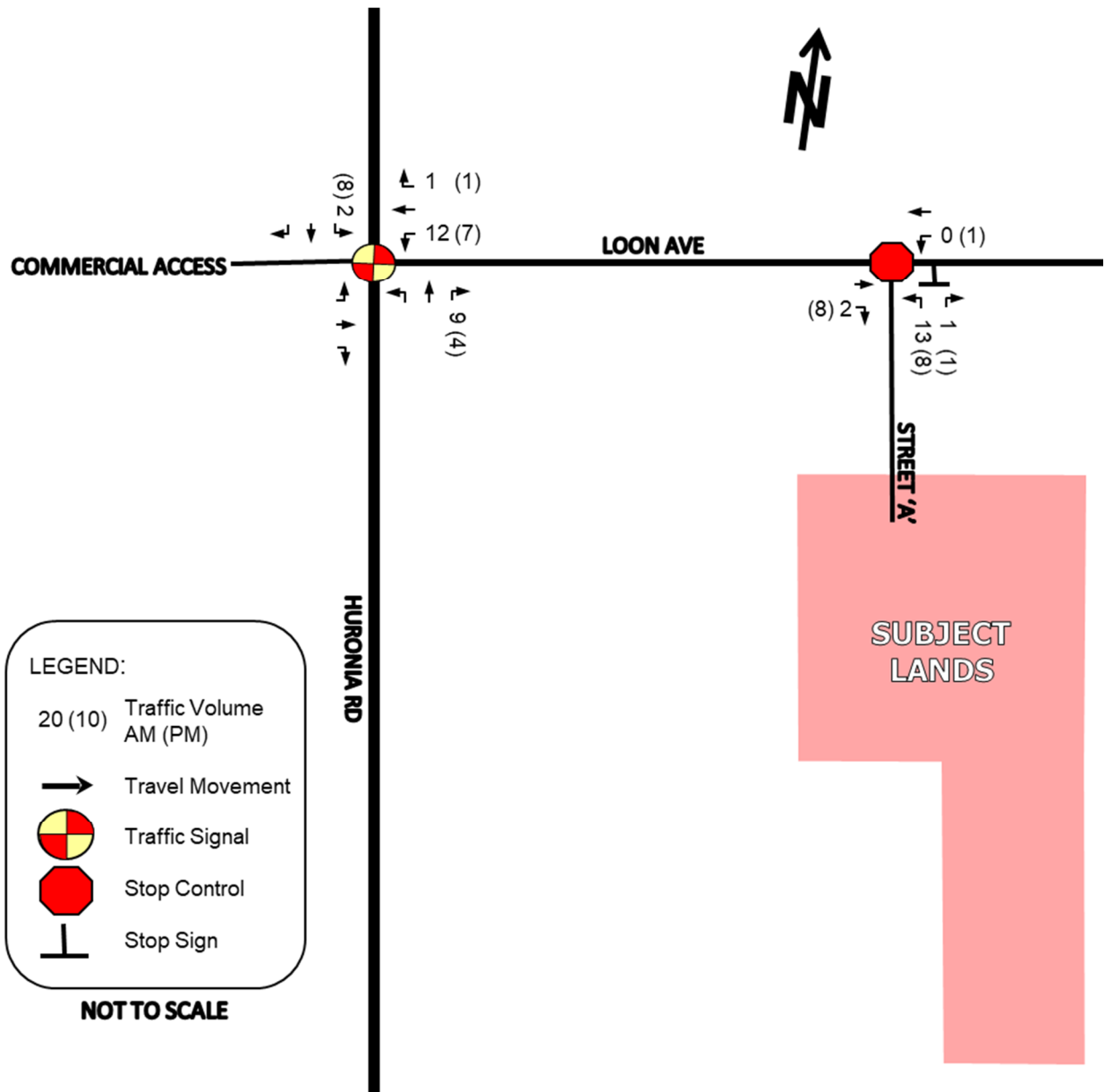
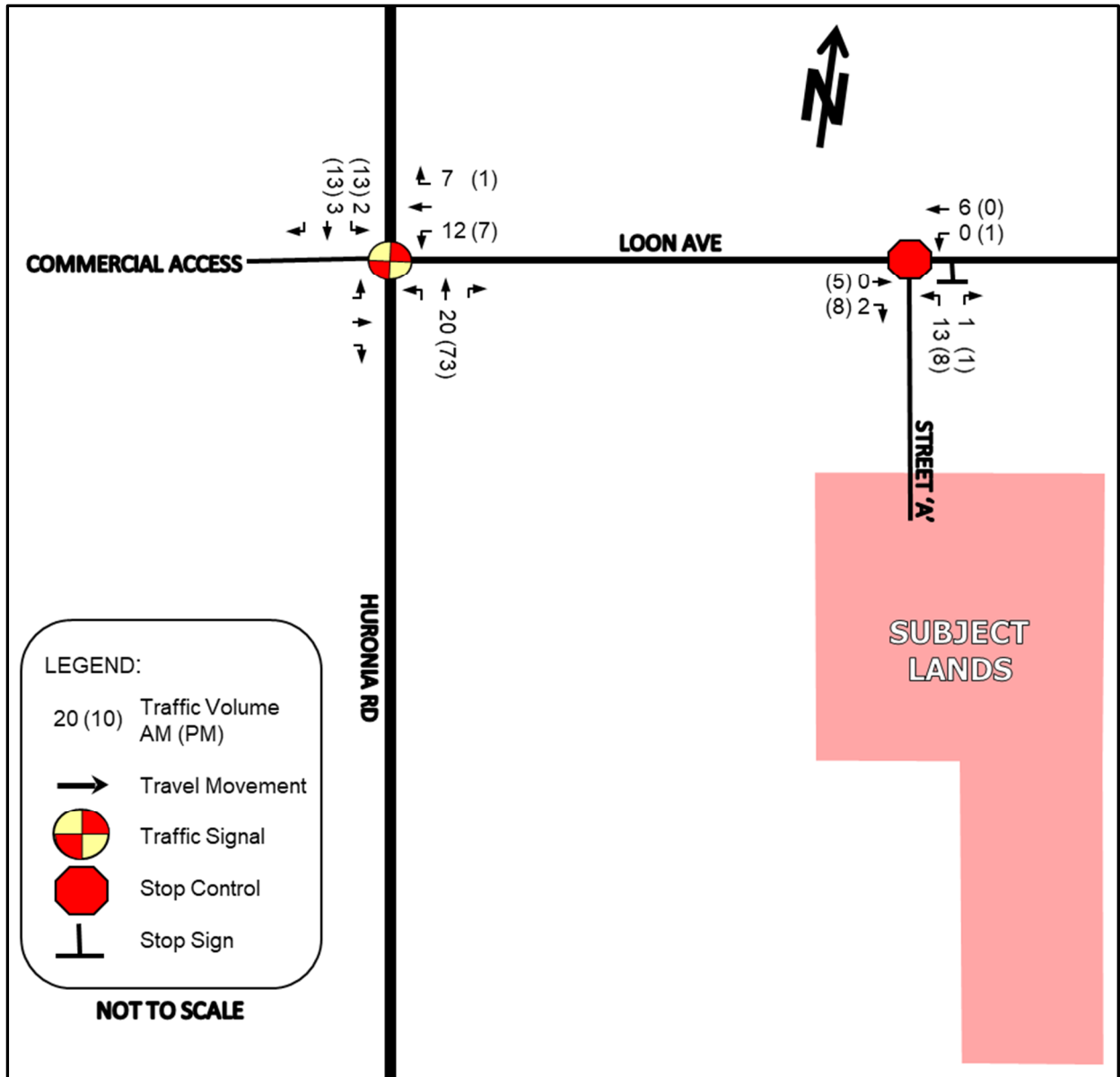


Figure 5 –Total Adjacent Development Traffic Volumes (2023)



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 3 summarizes the traffic count data collection information.

Table 3 – 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 C**. The peak hours of traffic generation for the study area intersections generally aligned with the anticipated peak hour of traffic generation by the proposed community.

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 (2021) horizon year traffic volumes.

Figure 6 illustrates the existing (2021) 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 & 2031) horizon year traffic volumes.

Figures 7 and **8** illustrates the background (2023 & 2031) horizon year traffic volumes respectively, for the AM and PM peak hour traffic volumes in the study area.

3 Intersection Operation without Proposed Community

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 4.** description of traffic performance characteristics is included for each LOS.

Figure 6 – Existing (2021) Traffic Volumes

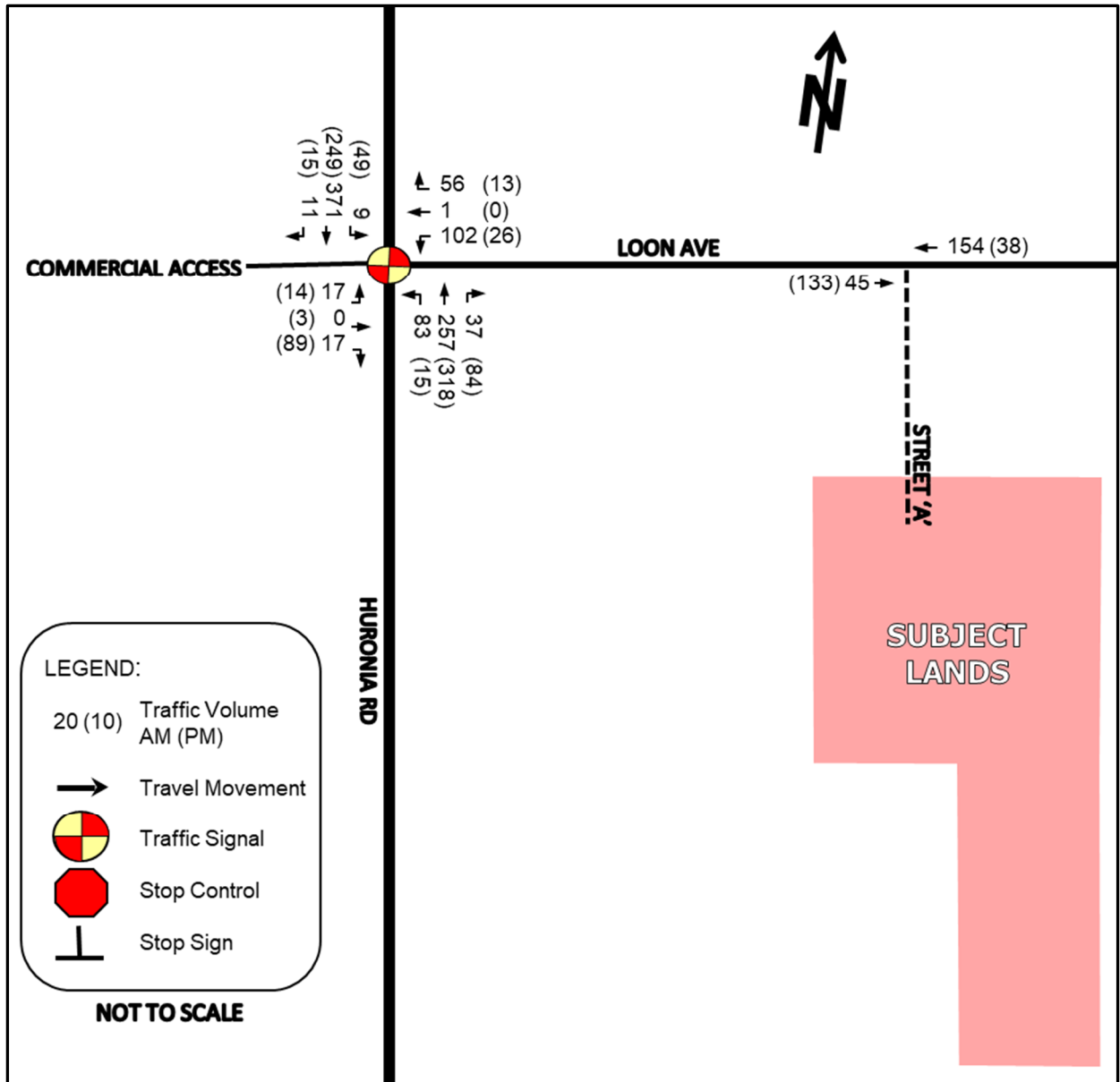


Figure 7 – Background (2023) Traffic Volumes

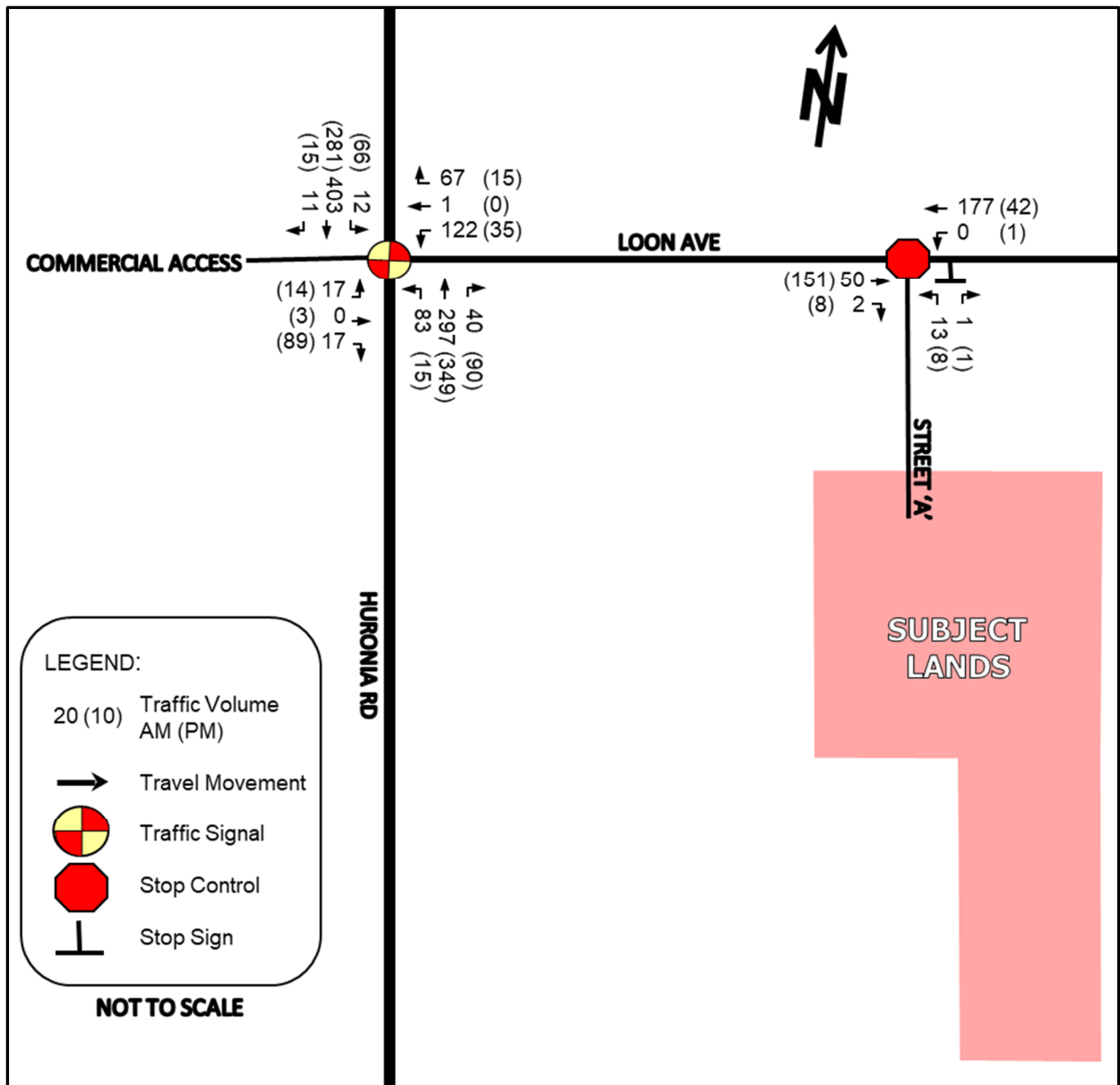


Figure 8 – Background (2031) Traffic Volumes

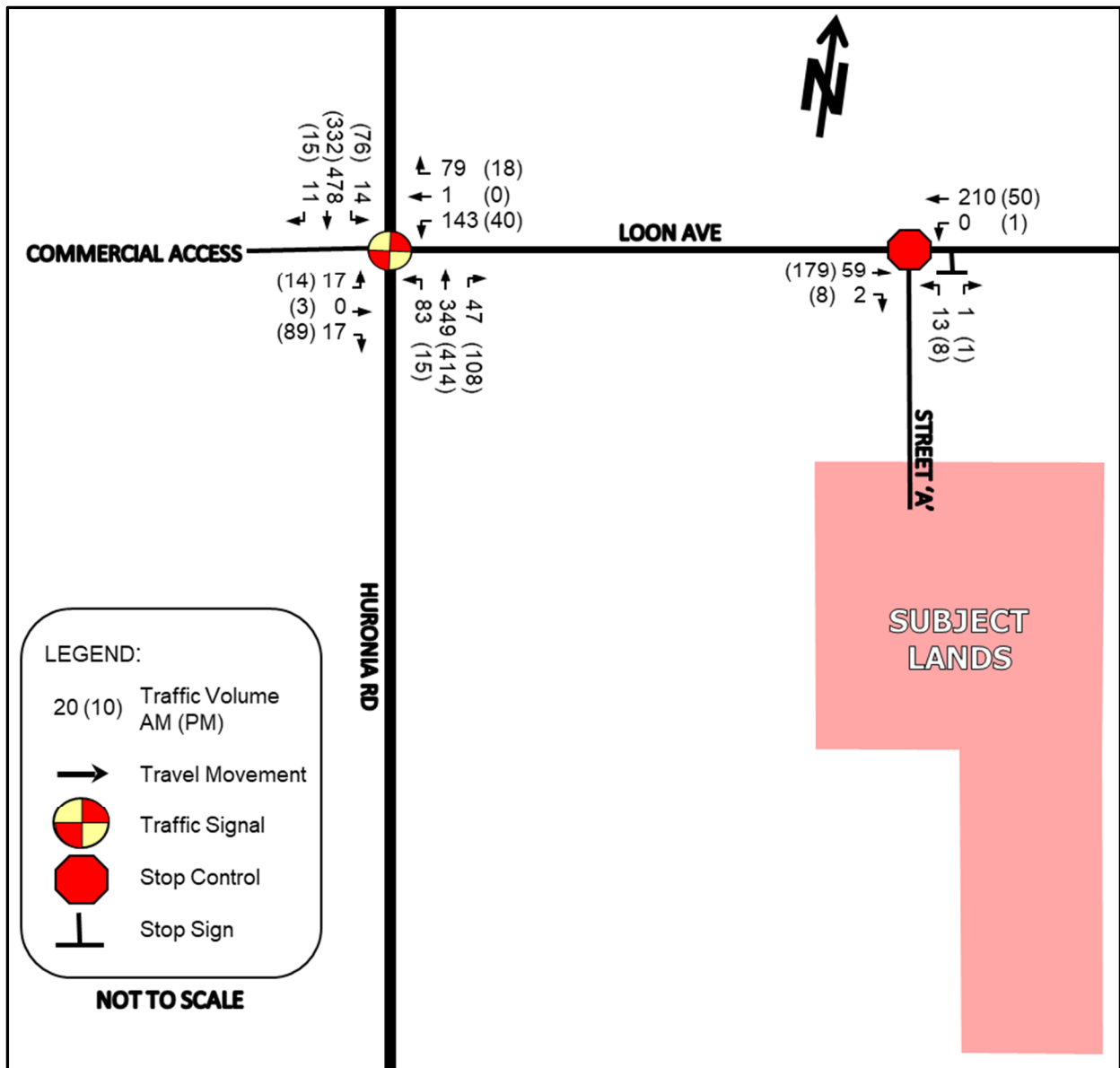


Table 4 – Level of Service Criteria for Intersections

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 (2021) Intersection Operation

The results of the LOS analysis under existing (2021) traffic volumes during the AM and PM peak hour can be found below in **Table 5**. 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 5 – Existing (2021) 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
Huronia Road / Loon Avenue & Commercial Access (signalized)	0.44	15.6	B	-	-	0.36	12.1	B	-	-
EBL	0.12	34.1	C	10	-	0.11	35.0	C	8	-
EBTR	0.01	33.4	C	-	-	0.08	34.7	C	-	-
WBL	0.66	45.6	D	36	20	0.23	35.9	D	13	20
WBTR	0.04	33.6	C	11	-	0.01	34.3	C	0	-
NBL	0.12	4.2	A	10	75	0.02	2.8	A	2	75
NBTR	0.24	4.0	A	32	-	0.31	3.6	A	29	-
SB	0.45	14.6	B	80	-	0.39	12.7	B	51	-

The results of the LOS analysis indicate that the Huronia 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 Huronia 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 Huronia 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 6**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix E**.

Table 6 – 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
Huronia Road / Loon Avenue & Commercial Access (signalized)	0.49	16.6	B	-	-	0.43	12.6	B	-	-
EBL	0.09	32.3	C	10	-	0.11	34.9	C	8	-
EBTR	0.01	31.7	C	-	-	0.08	34.6	C	-	-
WBL	0.60	39.5	D	42	20	0.30	36.5	D	16	20
WBTR	0.05	32.0	C	13	-	0.01	34.2	C	0	-
NBL	0.13	5.5	A	10	75	0.02	3.0	A	2	75
NBTR	0.29	5.4	A	40	-	0.34	3.9	A	34	-
SB	0.52	17.4	B	93	-	0.47	14.0	B	65	-

The results of the LOS analysis indicate that the Huronia 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 Huronia 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 Huronia 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 (2031) Intersection Operation

The results of the LOS analysis under background (2031) 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 E**.

Table 7 – Background (2031) 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
Huronia Road / Loon Avenue & Commercial Access (signalized)	0.58	18.3	B	-	-	0.51	13.2	B	-	-
EBL	0.08	31.8	C	10	-	0.11	34.9	C	8	-
EBTR	0.01	31.2	C	-	-	0.08	34.6	C	-	-
WBL	0.65	41.3	D	48	20	0.34	36.9	D	17	20
WBTR	0.06	31.6	C	13	-	0.01	34.2	C	0	-
NBL	0.14	6.4	A	11	75	0.02	3.7	A	2	75
NBTR	0.35	6.2	A	53	-	0.40	4.4	A	45	-
SB	0.62	20.3	C	123	-	0.56	15.9	B	83	-

The results of the LOS analysis indicate that the Huronia 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 Huronia 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 Huronia 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 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 (2031) scenario is provided in Section 5.3 to illustrate the traffic operations with a southbound left turn lane on Huronia Road at Loon Avenue.

4 Proposed Community Traffic Generation and Assignment

4.1 Traffic Generation

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

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

The estimated trip generation of the proposed community is illustrated below in **Table 8**. The AM and PM peak traffic generation for the proposed community 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 8 – Estimated Traffic Generation of Proposed Community

Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Multifamily Housing (Low-Rise) ITE Land Use: 220	105 units	12	38	50	38	22	60

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 community will be new traffic and would not be in the study area if the community 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 F**). 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 community 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 9** using the methodology outlined above.

Table 9 – Proposed Community 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 community 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 Community

For the total (2023 & 2031) horizon year traffic volumes, the proposed community traffic was added to the background (2023 & 2031) traffic volumes. **Figures 10** and **11** illustrate the resulting total (2023 & 2031) horizon year traffic volumes for the AM and PM peak hour.

Figure 9 – Proposed Community Traffic Assignment

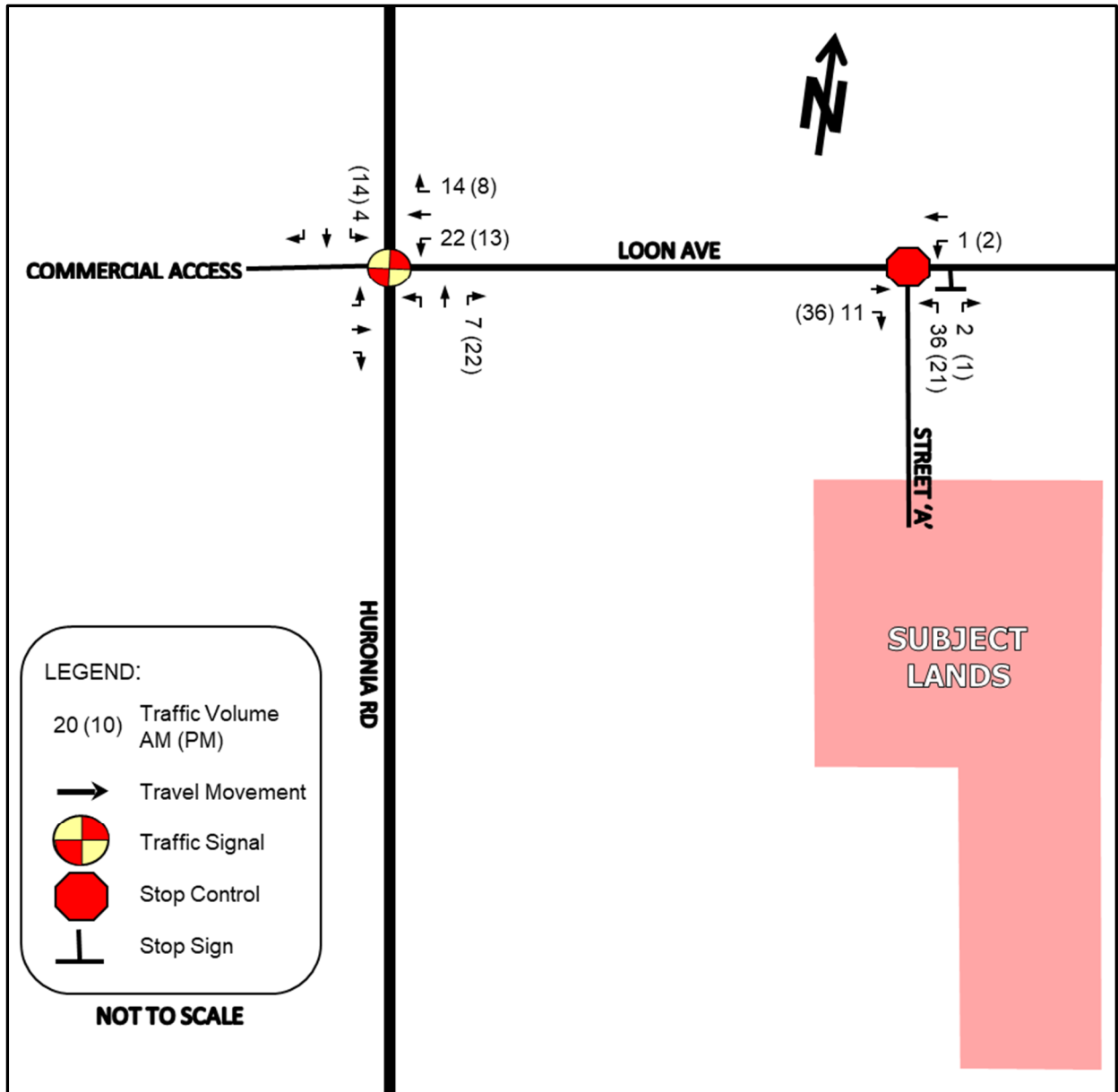


Figure 10 – Total (2023) Traffic Volumes

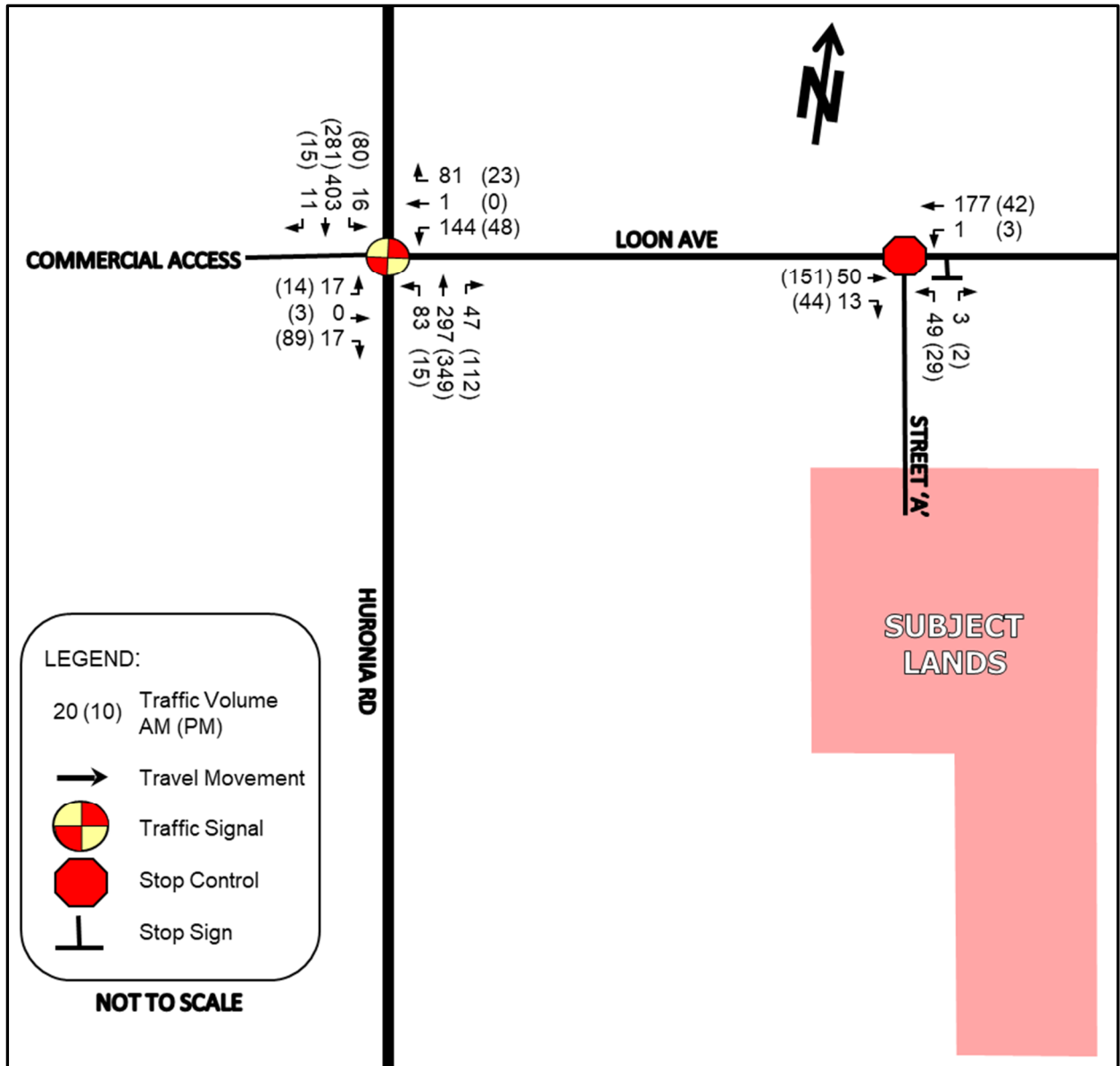
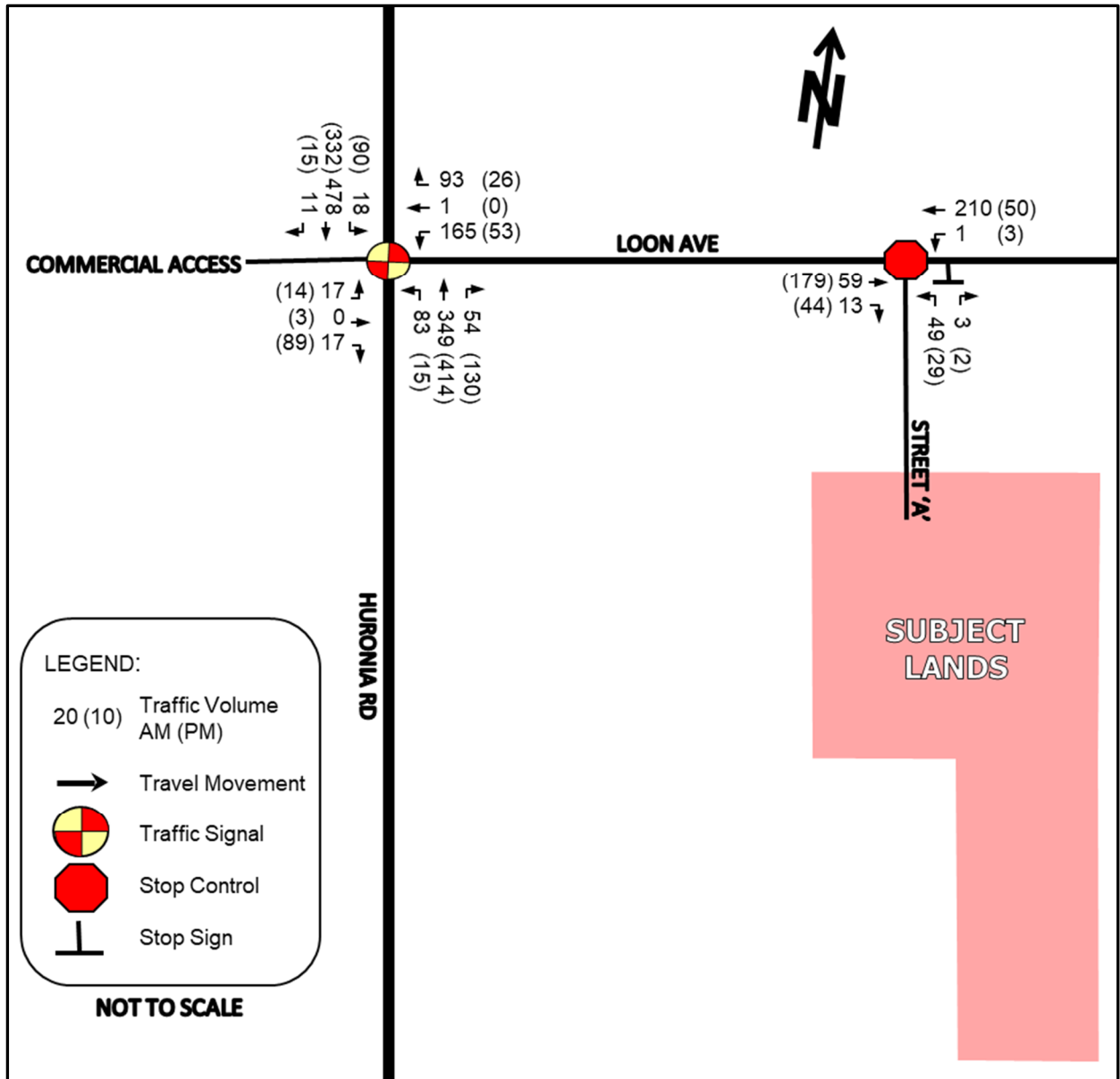


Figure 11 – Total (2031) Traffic Volumes



5 Intersection Operation with Proposed Community

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 10**. Existing intersection geometry and traffic control have been utilized for this scenario. Detailed output of the Synchro analysis can be found in **Appendix G**.

Table 10 – 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
Huronia Road / Loon Avenue & Commercial Access (signalized)	0.52	18.0	B	-	-	0.47	13.4	B	-	-
EBL	0.08	31.7	C	10	-	0.11	34.8	C	8	-
EBTR	0.01	31.2	C	-	-	0.08	34.6	C	-	-
WBL	0.65	41.2	D	48	20	0.40	37.5	D	19	20
WBTR	0.06	31.5	C	13	-	0.01	34.2	C	0	-
NBL	0.13	6.0	A	11	75	0.02	3.1	A	2	75
NBTR	0.30	5.9	A	45	-	0.36	4.1	A	40	-
SB	0.54	18.5	B	100	-	0.51	14.9	B	72	-
Street 'A' / Loon Avenue (unsignalized)	-	1.8	A	-	-	-	1.2	A	-	-
NB	0.07	10.2	A	2	-	0.04	10.0	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 Huronia 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 Huronia 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 I**).

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 H**).

No infrastructure improvements are recommended within the study area.

5.2 Total (2031) Intersection Operation

The results of the LOS analysis under total (2031) traffic volumes during the AM and PM peak hour can be found below in **Table 11**.

In the 521 Huronia TIS, all-way stop control was recommended at the Loon Avenue / Street 'A' intersection, once all future development lands were occupied. At that time, the anticipated number of units in the community was anticipated to be significantly higher (325 units) than what is currently proposed (105 units). As a result of the reduction in the number of units, the the Loon Avenue / Street 'A' intersection does not reach the following OTM Book 5 criteria for all-way stop control.

- 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.

Consequently, our analysis is based on one-way stop control at the Loon Avenue / Street 'A' intersection.

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 G**.

Table 11 – Total (2031) 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
Huronia Road / Loon Avenue & Commercial Access (signalized)	0.60	19.7	C	-	-	0.55	14.1	B	-	-
EBL	0.08	31.4	C	9	-	0.11	34.7	C	8	-
EBTR	0.01	30.8	C	-	-	0.08	34.5	C	-	-
WBL	0.70	43.8	D	55	20	0.43	37.8	D	21	20
WBTR	0.07	31.2	C	14	-	0.02	34.1	C	0	-
NBL	0.14	6.8	A	12	75	0.02	3.3	A	2	75
NBTR	0.36	6.8	A	57	-	0.42	4.6	A	52	-
SB	0.64	21.5	C	128	-	0.61	17.3	B	93	-
Street 'A' / Loon Avenue (unsignalized)	-	1.6	A	-	-	-	1.1	A	-	-
NB	0.08	10.5	A	3	-	0.05	10.3	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 Huronia 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 Huronia 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 G**).

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 H**).

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 (2031) 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 (2031) Intersection Operation with (SB Left Turn Lane)

The results of the LOS analysis under total (2031) traffic volumes during the AM and PM peak hour can be found below in **Table 12**. 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 G**.

Table 12 – Total (2031) 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
Huronia Road / Loon Avenue & Commercial Access (signalized)	0.58	19.2	B	-	-	0.45	12.4	B	-	-
EBL	0.08	31.4	C	9	-	0.11	34.7	C	8	-
EBTR	0.01	30.8	C	-	-	0.08	34.5	C	-	-
WBL	0.70	43.8	D	55	20	0.43	37.8	D	21	20
WBTR	0.07	31.2	C	14	-	0.02	34.1	C	0	-
NBL	0.16	7.3	A	12	75	0.02	2.9	A	2	75
NBTR	0.36	6.8	A	57	-	0.42	4.6	A	52	-
SBL	0.05	12.9	B	7	30	0.21	11.5	B	20	30
SBTR	0.60	20.4	C	120	-	0.39	12.8	B	60	-

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 proposed community.

5.4 Site Access

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 community. 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 community within the community and the future adjacent developments.

The 521 Huronia development will install an eastbound parking control gate at the west end of the community to prohibit cut-through traffic from the proposed community to the 521 Huronia development. Residents within the 521 Huronia development will control the main gates using a key fob and a separate control gate is proposed to allow for guests to exit the site and travel via Loon Avenue.

The community will have the single access via Street A as noted above; however, the internal connection to the RIRO Access in the 521 Huronia development will provide access redundancy, in the event that one access becomes blocked and emergency vehicles need to enter the community. Based

on the layout of the community and the number of units, an additional (third) emergency access is not justified.

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 Transportation Association of Canada *Design Guide for Canadian Roads* (2017) [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 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 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 2031 will be approximately 35% 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 community, 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 one permanent speed cushions on Loon Avenue to address this issue. It is recommended that the City complete an additional investigation to determine the magnitude and travel time of the cut-through traffic before implementing additional traffic calming measures. Notwithstanding, it is recommended that the Client provide the City with \$15,000 to be used for the installation of traffic calming¹ on Loon Avenue, in the study area.

5.7 Active Transportation Review

Huronia 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 community. Cyclists from the community 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.

¹ The specific traffic calming measure to be implemented is to be determined by the City, through consultation with the local residents.

An internal sidewalk is proposed on the east and west side of Street 'A', which will connect into the sidewalk on the south side of Loon Avenue. The proposed community has an internal sidewalk network that will connect to the 521 Huronia development which will have a proposed sidewalk on the east side of Huronia Road between the RIRO Access and Loon Avenue, will connect into the City's sidewalk network providing pedestrian access throughout the City.

6 Parking Review

6.1 Scope

The purpose of this analysis is to estimate the minimum parking supply required to adequately service the community. The proposed Site Plan includes a total parking supply of 228 parking spaces, including 105 garage spaces, 102 driveway spaces and 21 shared visitor parking spaces (including 6 barrier-free parking spaces).

6.2 Existing Study Area Parking Infrastructure

Currently, on-street parking is permitted on both sides of the following local roads in the study area:

- Loon Avenue;
- Drake Drive;
- Gadwall Avenue (excluding the south side at the bend); and
- Widgeon Street;

There is no signed on-street parking restrictions on Huronia Road, in the study area; however, there is currently a narrow paved shoulder, which would not support on-street parking without disrupting the flow of traffic on Huronia Road. In our experience working in the area, on-street parking is not anticipated on Huronia Road.

It is noted that the on-street parking is subject to the City's Parking By-law (2007-209) which prohibits on-street parking between 12:01 and 07:00, from December 1st each year until March 31st in the following year.

There is an existing private parking lot located west of the Huronia Road / Loon Avenue intersection. Private visitor parking is proposed in the adjacent 521 Huronia development, west of the community.

6.3 Municipal By-law

The City of Barrie Zoning By-Law 2009-141 [ZBL] (Office Consolidation January 2021) provides parking requirements for a variety of building types and land uses. **Table 13** summarizes the parking requirement, according to the ZBL, for the proposed community.

Table 13 – Zoning By-law Requirement Parking Calculation

Category	Zoning By-Law Section	Parking Standard	Units	Parking	
				Required	Provided
Residential dwelling(s)	4.6.1	Minimum of 1.5 spaces per dwelling unit	105 units	158 spaces	126 spaces (102 tandem spaces)
Accessible Parking	4.6.4	1 space plus 3% of required spaces	158 spaces	6 spaces	6 spaces

The ZBL does not permit tandem parking spaces to be counted toward the parking minimum, consequently, the proposed parking supply falls below the calculated requirement by 32 spaces. The The residential parking requirement in the ZBL does not identify a specific breakdown for the resident / residential visitor parking supply.

6.4 Proxy Counts – Residential Visitor Parking

6.4.1 Proxy Site Locations – Residential Visitor Parking

To estimate the residential visitor parking demand for the proposed community, two proxy parking surveys have been commissioned by JD Engineering. Both proxy sites are similar in scale to the proposed community. Both proxy sites are townhouse developments. One proxy site was constructed within the last 5 years and the other proxy site was constructed over 20 years ago. The surrounding transportation conditions at the proxy parking sites are consistent with the surrounding transportation conditions at the proposed community. The selected proxy survey locations are as follows:

- 1) 369 Essa Road, Barrie [369 Essa]; and
- 2) 28 Donald Street, Barrie [28 Donald].

The proxy surveys at 369 Essa and 28 Donald were completed at the following times:

- 1) Friday December 3rd, 2021 from 14:00 to 23:00; and
- 2) Saturday December 4th, 2021 from 10:00 to 23:00.

The proxy parking counts were completed at 30-minute intervals during the above-noted periods.

No on-street parking was observed on Essa Road, in the area, during the proxy surveys.

On-street parking is permitted on Donald Street, adjacent to 28 Donald; however, as illustrated in the proxy parking counts, the dedicated visitor parking areas maintain additional capacity throughout the survey. Consequently, there would be no incentive for residential visitors to park on Donald Street. As such, the parking data collected represents the full visitor parking demand.

Table 14 summarizes the building and parking statistics at each of the proxy sites.

Table 14 – Residential Visitor Proxy Survey Site Statistics

Proxy Site	Number of Units	Visitor Parking Supply (At-Grade)
369 Essa	104	14
28 Donald	82	27

6.4.2 Proxy Survey Data – Residential Visitor Parking

Table 15 summarizes the visitor parking survey data for the proxy sites detailed results are provided in **Appendix C**.

Table 15 – Residential Visitor Proxy Survey Site Data

Proxy Site	Number of Units	Visitor Parking			
		Peak Period	Supply (spaces)	Demand (spaces)	Demand Rate (spaces/unit)
369 Essa	104	Friday, 21:00 Saturday, 19:30 Saturday, 20:30 Saturday, 21:00	14	12	0.15
28 Donald	82	Friday, 18:30	15	25	0.18
AVERAGE					0.165

6.5 Analysis – Residential Visitor Parking

The proxy survey at 369 Essa found that the standard visitor parking spaces were fully occupied for a three-hour period during the Friday survey and for a total of two and a half hours during the Saturday survey. It is also noted that some vehicles were parked illegally, in areas along the driveways that were not designated as visitor parking. The survey data also shows that illegal parking occurred at times when there were visitor parking spaces available. This suggests that the illegal parking was not directly related to a shortage of visitor parking spaces. Consequently, we have assumed that the visitor parking demand was not constrained by the visitor parking supply.

Based on the parking data collected at the proxy sites, the proposed 21 visitor parking spaces (0.20 spaces per unit) will provide sufficient parking supply to accommodate the peak visitor parking demand from the proposed 105 residential units. The visitor parking generated by the proposed community is not anticipated to impact the existing on-street parking or private parking in the study area.

6.6 Analysis – Resident Parking

In the case of residential visitor parking, when the visitor parking demand exceeds the visitor parking supply, the additional parking demand may result unauthorized parking in nearby parking lots or undesignated areas. Consequently, providing a conservative visitor parking supply as outlined in Section 6.5, will ensure overflow visitor parking issues do not occur. Allocation of resident parking is different than visitor parking. Lowering the resident parking supply, in conjunction with clear communication during sales / rental process and ongoing parking enforcement, can increase development efficiency and provide transportation demand management.

The majority of the proposed community provides two tandem resident parking spaces, one space in the garage and one space in the driveway. This is consistent with many existing street townhouse units within the City, where shared visitor parking is provided along the municipal road. Consequently, the proposed tandem parking spaces with separate shared visitor parking is appropriate for the intended use.

The proposed community includes three units with one resident parking space in the garage and no driveway parking. A number of municipalities in and around the GTA permit a minimum resident parking supply of 1.0 space per townhouse unit, including the City of Guelph, City of Hamilton, Town of Oakville (North Oakville) and East Gwillimbury. Given the community includes only a small proportion of units with one resident parking space, permitting these units provides an opportunity to fill a specific housing demand (individuals or families with one vehicle), without overwhelming the market. This reduced parking rate is also consistent with the City's Transportation Demand Management objectives.

6.7 Parking Recommendation

Based on our review of the proxy parking data, existing development within the City and parking standards in similar municipalities, the proposed parking supply will accommodate the anticipated parking demand generated by the proposed community. The recommended parking supply is summarized in **Table 16**. Our analysis

Table 16 – Recommended Parking Supply

Category	Units	Parking Rate	
Resident Parking	102 units	2.0 spaces per dwelling unit (tandem)	204 spaces
	3 units	1.0 space per unit	3 spaces
Resident Visitor Parking	105 units	0.20 spaces per unit	21 spaces
Total Parking			228 spaces
Barrier Free Parking	226 spaces	1 space plus 3% of required spaces	6 spaces

6.8 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 community and avoid parking within private parking lots surrounding the community, without consent from the owner of the parking lots.

7 Summary

Loon Avenue Lands OP Inc. retained **JD Engineering** to prepare this traffic impact study in support of the proposed community located on the south side of Loon Avenue midblock between Gadwall Avenue and Widgeon Street 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 community is anticipated to include 105 residential townhouse units.

1. The proposed community is expected to generate a total of 50 AM and 60 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 community 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 (2021) and background (2023 & 2031) traffic volumes without the proposed community traffic. This enabled a review of existing and future traffic deficiencies that would be present without the influence of the proposed community. 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 community was prepared and assigned to the study area streets and intersections.
6. An intersection operation analysis was completed under total (2023 & 2031) traffic volumes with the proposed community operational at the study area intersections. No geometric lane improvements or traffic signal improvements are warranted within the study area.
7. Based on our traffic projections for Loon Avenue, for the critical condition, the auto-traffic capacity for Loon Avenue exceeds the anticipated future traffic volume, including the additional traffic generated by the proposed community.
8. An eastbound parking control gate is anticipated to be installed at the west end of the community to prohibit cut-through traffic entering via the 521 Huronia development.
9. 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 community.
10. 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 proposed community.
11. There are no issues with the sight distance available for the future Street 'A' intersection at Loon Avenue.
12. A sidewalk is proposed on the east and west side of Street 'A', which will connect into the existing sidewalk on the south side of Loon Avenue. The proposed community will include an internal sidewalk network that will connect into Loon Avenue via Street 'A' and also into the 521 Huronia development. The proposed 521 Huronia development includes the construction of a sidewalk on the east side of Huronia Road between the RIRO Access and Loon Avenue, which will provide a secondary connection into the City's sidewalk network providing pedestrian access throughout the City.
13. 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. The minor additional traffic on Loon Avenue, from the proposed community, will not have a notable impact on the average speed of traffic on Loon Avenue. Notwithstanding, it is recommended that the Client provide the City with \$15,000 to be used for traffic calming on Loon Avenue, in the study area.
14. The ZBL does not permit tandem parking spaces to be counted toward the parking minimum; however, the proposed tandem parking configuration is consistent with the majority of existing street townhouse units within the City, where shared visitor parking is provided along the municipal road. Consequently, the proposed tandem parking spaces with separate shared visitor parking is appropriate for the intended use.
15. The proposed community includes a total parking supply of 228 parking spaces, including 105 garage spaces, 102 driveway spaces and 21 shared visitor parking spaces (including 6 barrier-free parking spaces). Based on our review of the proxy parking data, existing development within the City and parking standards in similar municipalities, the proposed parking supply will accommodate the anticipated parking demand generated by the proposed community.
16. In summary, the proposed community will not cause any operational or traffic safety issues and will not add significant delay or congestion to the local roadway network.

Appendix A – Site Plan

Appendix B – 521 Huronia TIS Excerpts

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



ENGINEERING

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

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.

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.

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 Maplevue 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 Maplevue 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

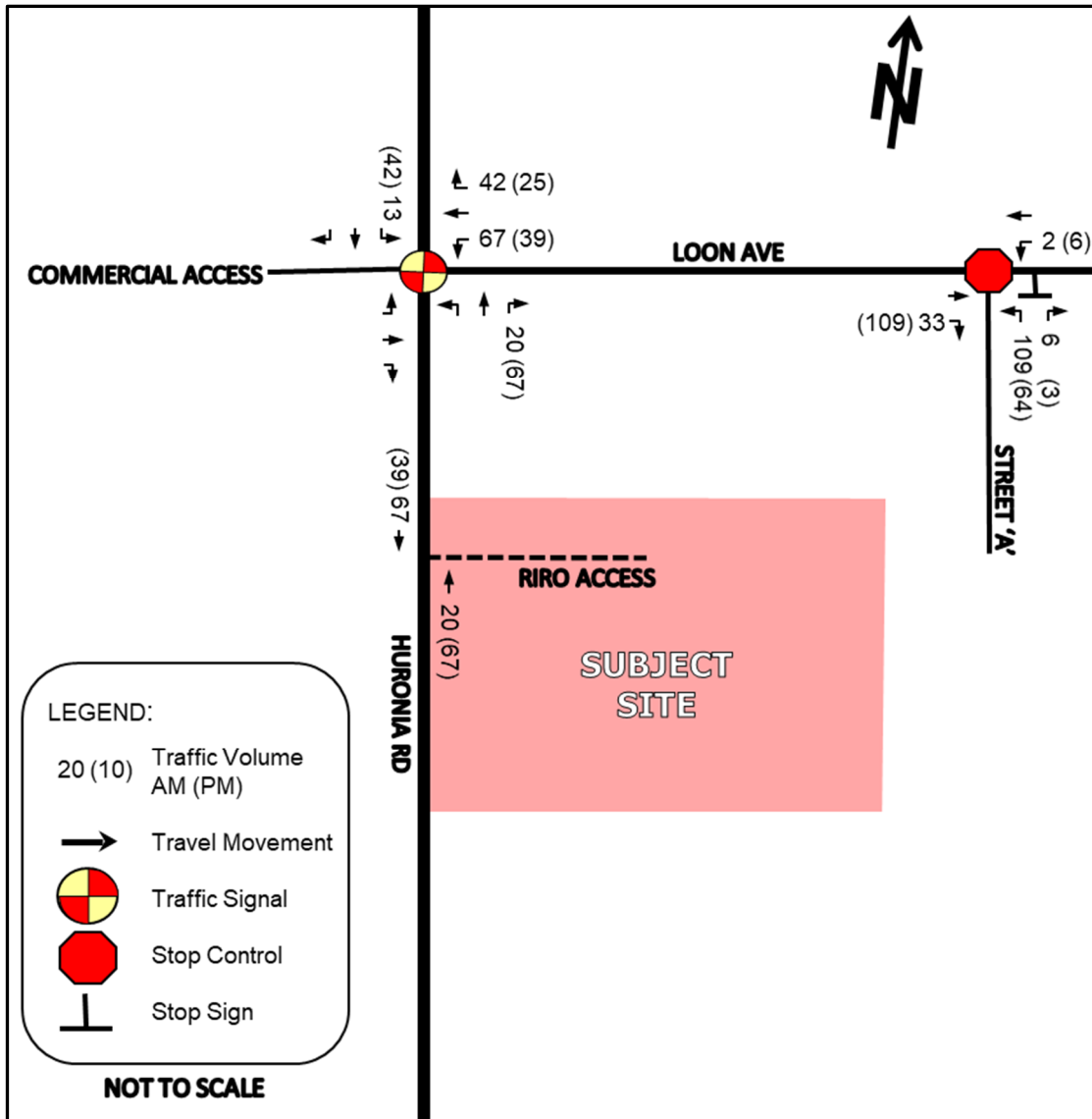
Land Use	Size	AM Peak Hour			PM Peak Hour		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Multifamily Housing (Low-Rise) ITE Land Use: 220	325 units	35	115	150	115	67	182

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



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

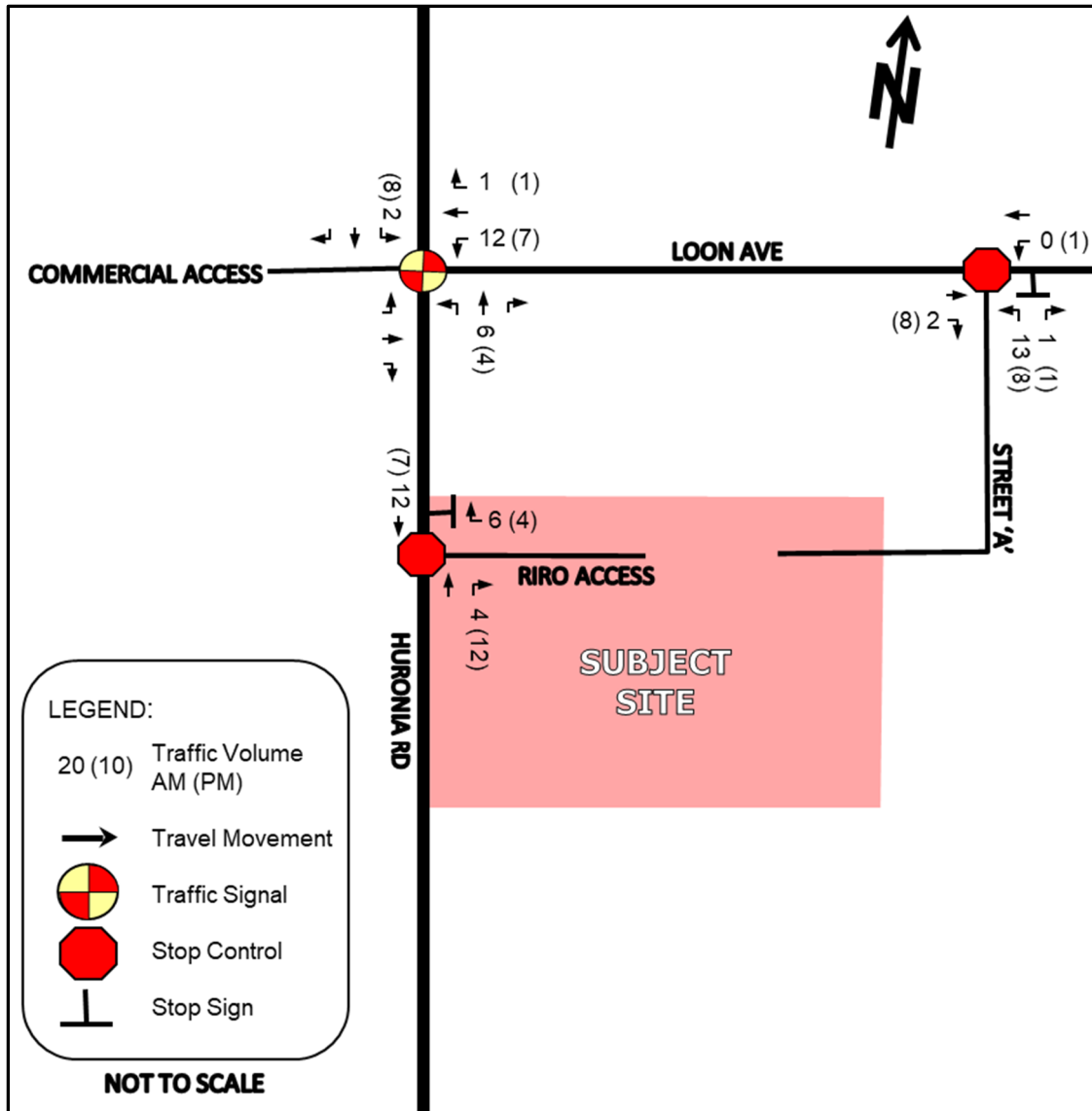
Travel Direction (to/from)	Percent of Total Traffic Generation
North via Huronia Road	58%
South via Huronia Road	37%
East via Loon Avenue	5%
Total	100%

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



Appendix C – Traffic and Parking Count Data

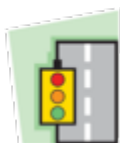


Ontario Traffic Inc.
TRAFFIC MONITORING  SERVICES & PRODUCTS

Project #19390 – JD Engineering Inc

Intersection Count Report

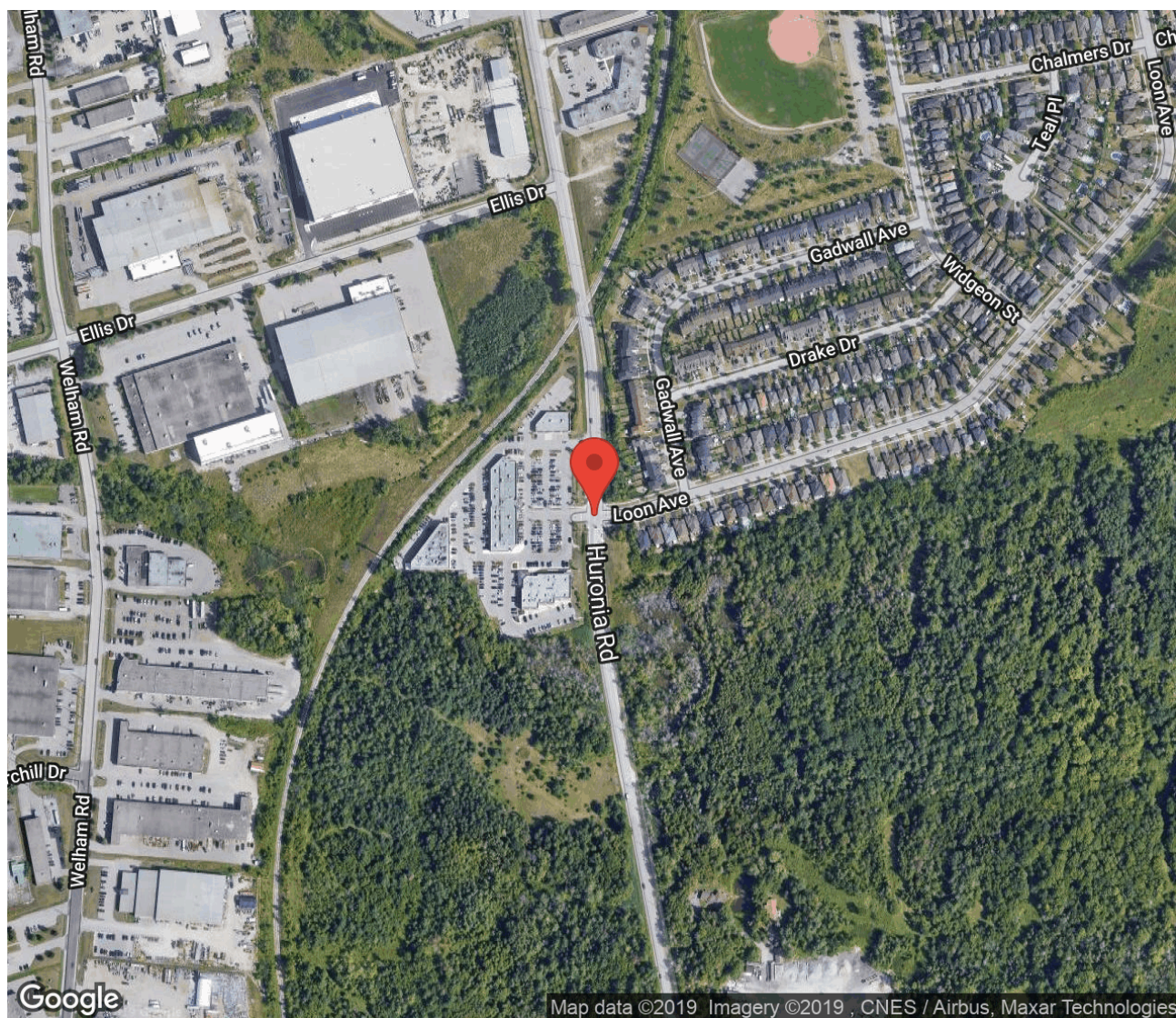
Intersection:	Huron Rd & Loon Ave-Commercial Access
Municipality:	Barrie
Count Date:	Dec 04, 2019
Site Code:	1939000001
Count Categories:	Cars, Trucks, Pedestrians
Count Period:	07:00-09:00, 16:00-19:00
Weather:	Clear



Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

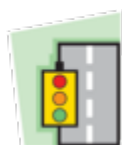
Traffic Count Map

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



Google

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



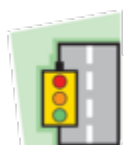
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

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



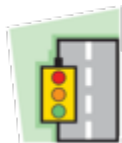
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

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



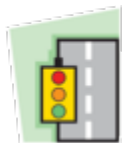
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

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



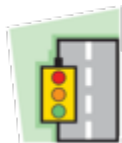
Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

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



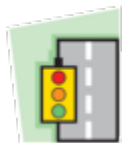
Ontario Traffic Inc.
TRAFFIC MONITORING  SERVICES & PRODUCTS

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



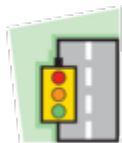
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

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



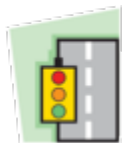
Ontario Traffic Inc.
TRAFFIC MONITORING  SERVICES & PRODUCTS

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



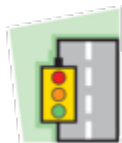
Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

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



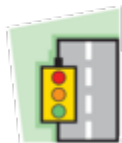
Ontario Traffic Inc.
TRAFFIC MONITORING + SERVICES & PRODUCTS

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



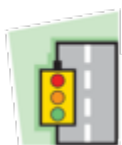
Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

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	
	53	
	1	
	97	

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

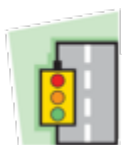


Peak Hour Summary

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

Peds: 0

	Totals	
	0	
	0	
	14	
	3	
	89	

Peds: 0



Peds: 0

Peds: 3

Totals		
0	0	0
12	12	0
0	0	0
25	25	0

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

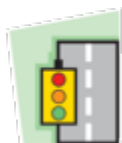
South Approach

	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	-	

Location: 369 Essa Road (104 townhouse units)

Date: Friday Dec 3rd from 4:00 PM to 11:00 PM

Time			Visitor	Accessible Vistor	Illegal	TOTAL
Supplay			10	4		
16:00	to	16:30	6	0	0	6
16:30	to	17:00	7	0	1	8
17:00	to	17:30	6	0	1	7
17:30	to	18:00	9	0	1	10
18:00	to	18:30	9	0	0	9
18:30	to	19:00	10	1	0	11
19:00	to	19:30	10	1	0	11
19:30	to	20:00	10	1	0	11
20:00	to	20:30	10	1	0	11
20:30	to	21:00	10	1	0	11
21:00	to	21:30	10	1	1	12
21:30	to	22:00	8	1	0	9
22:00	to	22:30	9	2	0	11
22:30	to	23:00	7	2	0	9

Date: Saturday Dec 4 from 10:00 AM to 11:00 PM

Time			Visitor	Accessible Vistor	Illegal	TOTAL
			10	4		
10:00	to	10:30	10	1	0	11
10:30	to	11:00	10	1	0	11
11:00	to	11:30	8	1	1	10
11:30	to	12:00	9	1	1	11
12:00	to	12:30	7	1	1	9
12:30	to	13:00	7	2	2	11
13:00	to	13:30	9	0	2	11
13:30	to	14:00	8	0	1	9
14:00	to	14:30	8	1	2	11
14:30	to	15:00	8	1	2	11
15:00	to	15:30	8	0	2	10
15:30	to	16:00	7	1	2	10
16:00	to	16:30	7	1	2	10
16:30	to	17:00	8	1	1	10
17:00	to	17:30	8	1	1	10
17:30	to	18:00	9	0	1	10
18:00	to	18:30	9	0	1	10
18:30	to	19:00	9	0	2	11
19:00	to	19:30	9	0	2	11
19:30	to	20:00	10	0	2	12
20:00	to	20:30	8	0	0	8
20:30	to	21:00	10	0	2	12
21:00	to	21:30	10	1	1	12
21:30	to	22:00	8	1	1	10
22:00	to	22:30	8	1	0	9
22:30	to	23:00	7	1	0	8

Location: 28 Donald Street (82 townhouse units)

Date: Friday Dec 3rd from 4:00 PM to 11:00 PM

Time			Visitor	Accessible Vistor	Illegal	TOTAL
Supplay			27	0		
16:00	to	16:30	10	0	0	10
16:30	to	17:00	12	0	1	13
17:00	to	17:30	12	0	1	13
17:30	to	18:00	11	0	1	12
18:00	to	18:30	12	0	2	14
18:30	to	19:00	13	0	2	15
19:00	to	19:30	10	0	2	12
19:30	to	20:00	8	0	2	10
20:00	to	20:30	7	0	2	9
20:30	to	21:00	6	0	2	8
21:00	to	21:30	6	0	2	8
21:30	to	22:00	7	0	2	9
22:00	to	22:30	5	0	2	7
22:30	to	23:00	5	0	2	7

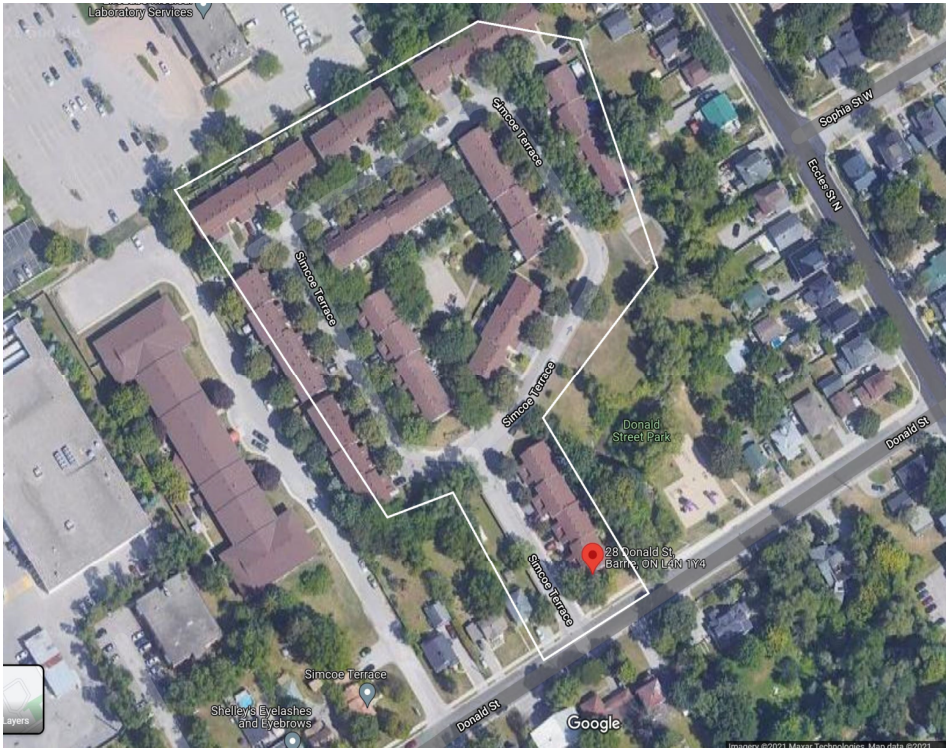
Date: Saturday Dec 4 from 10:00 AM to 11:00 PM

Time			Visitor	Accessible Vistor	Illegal	TOTAL
			27	0		
10:00	to	10:30	8	0	0	8
10:30	to	11:00	10	0	0	10
11:00	to	11:30	9	0	1	10
11:30	to	12:00	10	0	1	11
12:00	to	12:30	10	0	0	10
12:30	to	13:00	11	0	0	11
13:00	to	13:30	11	0	0	11
13:30	to	14:00	12	0	0	12
14:00	to	14:30	11	0	0	11
14:30	to	15:00	11	0	1	12
15:00	to	15:30	12	0	0	12
15:30	to	16:00	12	0	0	12
16:00	to	16:30	11	0	0	11
16:30	to	17:00	11	0	1	12
17:00	to	17:30	10	0	1	11
17:30	to	18:00	10	0	0	10
18:00	to	18:30	10	0	0	10
18:30	to	19:00	10	0	0	10
19:00	to	19:30	10	0	0	10
19:30	to	20:00	11	0	0	11
20:00	to	20:30	12	0	1	13
20:30	to	21:00	13	0	1	14
21:00	to	21:30	11	0	0	11
21:30	to	22:00	9	0	0	9
22:00	to	22:30	9	0	0	9
22:30	to	23:00	7	0	0	7

379 Essa Road (104 townhouse units)



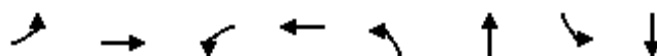
28 Donald Street (82 townhouse units)



Appendix D – Synchro Analysis Output – Existing Traffic Volumes

Loon Avenue Lands
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Existing (2021) AM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	17	0	102	1	83	257	9	371
Future Volume (vph)	17	0	102	1	83	257	9	371
Lane Group Flow (vph)	19	19	112	63	91	323	0	430
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	0.53	0.21	0.11	0.23		0.45
Control Delay	32.9	0.1	43.8	10.9	3.9	4.6		15.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	32.9	0.1	43.8	10.9	3.9	4.6		15.9
Queue Length 50th (m)	3.0	0.0	18.7	0.2	3.4	15.0		46.1
Queue Length 95th (m)	9.3	0.0	35.3	10.9	9.1	31.1		80.0
Internal Link Dist (m)		281.8		237.1		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	389	837	405	508	816	1378		965
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	0.28	0.12	0.11	0.23		0.45

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 84.7

Natural Cycle: 95

Control Type: Semi Act-Uncoord

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



Loon Avenue Lands

1: Huronia Rd & Commercial Access/Loon Ave

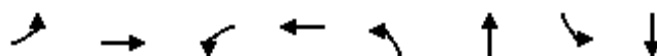
HCM Signalized Intersection Capacity Analysis

Existing (2021) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	0	17	102	1	56	83	257	37	9	371	11
Future Volume (vph)	17	0	17	102	1	56	83	257	37	9	371	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		0.43	1.00			0.99	
Satd. Flow (perm)	1360	1615		1416	1620		826	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	112	1	62	91	282	41	10	408	12
RTOR Reduction (vph)	0	17	0	0	55	0	0	4	0	0	1	0
Lane Group Flow (vph)	19	2	0	112	8	0	91	319	0	0	429	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)	10.3	10.3		10.3	10.3		63.7	63.7			44.5	
Effective Green, g (s)	10.3	10.3		10.3	10.3		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)	162	193		169	194		784	1322			950	
v/s Ratio Prot		0.00			0.01		0.02	c0.18				
v/s Ratio Perm	0.01			c0.08			0.07				c0.23	
v/c Ratio	0.12	0.01		0.66	0.04		0.12	0.24			0.45	
Uniform Delay, d1	33.8	33.4		36.2	33.5		3.9	3.5			13.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.3	0.0		9.4	0.1		0.3	0.4			1.6	
Delay (s)	34.1	33.4		45.6	33.6		4.2	4.0			14.6	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		33.8			41.3			4.0			14.6	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			15.6			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.44									
Actuated Cycle Length (s)			86.0			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			73.6%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

Loon Avenue Lands
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Existing (2021) PM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	14	3	26	0	15	318	49	249
Future Volume (vph)	14	3	26	0	15	318	49	249
Lane Group Flow (vph)	15	98	28	14	16	427	0	333
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	0.30		0.38
Control Delay	34.9	12.4	36.8	0.1	2.5	3.8		13.4
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		13.4
Queue Length 50th (m)	2.3	0.5	4.4	0.0	0.5	18.4		32.3
Queue Length 95th (m)	8.0	14.5	12.6	0.0	1.7	28.9		52.0
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	865	936	1420		873
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	0.02	0.02	0.30		0.38

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



Loon Avenue Lands

1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis

Existing (2021) 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	13	15	318	84	49	249	15
Future Volume (vph)	14	3	89	26	0	13	15	318	84	49	249	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)	1422	1624		1318	1615		980	1784			1609	
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	14	16	338	89	52	265	16
RTOR Reduction (vph)	0	86	0	0	13	0	0	6	0	0	1	0
Lane Group Flow (vph)	15	12	0	28	1	0	16	421	0	0	332	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		897	1361			857	
v/s Ratio Prot		0.01			0.00		0.00	c0.24				
v/s Ratio Perm	0.01			c0.02			0.01				c0.21	
v/c Ratio	0.11	0.08		0.23	0.01		0.02	0.31			0.39	
Uniform Delay, d1	34.6	34.5		34.9	34.2		2.8	3.1			11.4	
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			12.7	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		34.7			35.4			3.6			12.7	
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			0.36									
Actuated Cycle Length (s)			83.1				Sum of lost time (s)		16.0			
Intersection Capacity Utilization			74.4%				ICU Level of Service		D			
Analysis Period (min)			15									
c Critical Lane Group												

Appendix E – Synchro Analysis Output – Background Traffic Volumes

Loon Avenue Lands
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	122	1	83	297	12	403
Future Volume (vph)	17	0	122	1	83	297	12	403
Lane Group Flow (vph)	19	19	134	75	91	370	0	468
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	0.24	0.12	0.29		0.52
Control Delay	32.2	0.1	46.6	10.1	4.4	5.8		18.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	32.2	0.1	46.6	10.1	4.4	5.8		18.5
Queue Length 50th (m)	3.0	0.0	22.7	0.2	3.8	19.5		53.7
Queue Length 95th (m)	9.1	0.0	41.3	11.7	9.9	39.8		92.8
Internal Link Dist (m)		281.8		237.1		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	362	800	381	490	732	1268		905
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	0.35	0.15	0.12	0.29		0.52

Intersection Summary

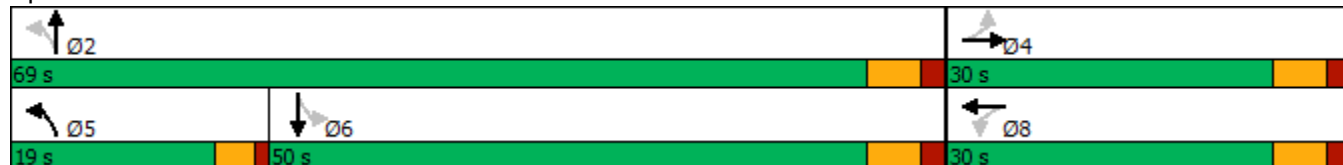
Cycle Length: 99

Actuated Cycle Length: 89.1

Natural Cycle: 95

Control Type: Semi Act-Uncoord

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



Loon Avenue Lands

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	122	1	67	83	297	40	12	403	11
Future Volume (vph)	17	0	17	122	1	67	83	297	40	12	403	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		0.40	1.00			0.99	
Satd. Flow (perm)	1346	1615		1416	1619		762	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	134	1	74	91	326	44	13	443	12
RTOR Reduction (vph)	0	16	0	0	62	0	0	4	0	0	1	0
Lane Group Flow (vph)	19	3	0	134	13	0	91	366	0	0	467	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)	14.0	14.0		14.0	14.0		63.1	63.1			44.1	
Effective Green, g (s)	14.0	14.0		14.0	14.0		63.1	63.1			44.1	
Actuated g/C Ratio	0.16	0.16		0.16	0.16		0.71	0.71			0.49	
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)	211	253		222	254		715	1265			904	
v/s Ratio Prot		0.00			0.01		0.02	c0.20				
v/s Ratio Perm	0.01			c0.09			0.07				c0.26	
v/c Ratio	0.09	0.01		0.60	0.05		0.13	0.29			0.52	
Uniform Delay, d1	32.1	31.7		35.0	31.9		5.1	4.8			15.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.2	0.0		4.6	0.1		0.4	0.6			2.1	
Delay (s)	32.3	31.7		39.5	32.0		5.5	5.4			17.4	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		32.0			36.8			5.4			17.4	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			16.6			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.49									
Actuated Cycle Length (s)			89.1			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			71.9%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

Loon Avenue Lands
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)	14	3	35	0	15	349	66	281
Future Volume (vph)	14	3	35	0	15	349	66	281
Lane Group Flow (vph)	15	98	37	16	16	467	0	385
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	0.34	0.23	0.02	0.02	0.33		0.46
Control Delay	34.7	12.3	37.8	0.1	2.5	4.1		14.8
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	4.1		14.8
Queue Length 50th (m)	2.3	0.5	5.8	0.0	0.5	20.8		39.6
Queue Length 95th (m)	8.0	14.5	15.2	0.0	1.8	33.9		64.6
Internal Link Dist (m)		281.8		281.2		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	418	545	389	840	900	1417		837
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	0.33		0.46

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



Loon Avenue Lands

1: Huronia Rd & Commercial Access/Loon Ave

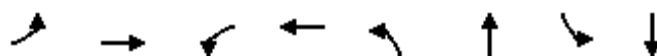
HCM Signalized Intersection Capacity Analysis

Background (2023) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	3	89	35	0	15	15	349	90	66	281	15
Future Volume (vph)	14	3	89	35	0	15	15	349	90	66	281	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)	1419	1624		1318	1615		923	1785			1546	
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	16	16	371	96	70	299	16
RTOR Reduction (vph)	0	86	0	0	15	0	0	6	0	0	1	0
Lane Group Flow (vph)	15	12	0	37	2	0	16	461	0	0	384	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		863	1360			823	
v/s Ratio Prot		0.01			0.00		0.00	c0.26				
v/s Ratio Perm	0.01			c0.03			0.01				c0.25	
v/c Ratio	0.11	0.08		0.30	0.01		0.02	0.34			0.47	
Uniform Delay, d1	34.5	34.4		35.2	34.2		2.9	3.2			12.1	
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			1.9	
Delay (s)	34.9	34.6		36.5	34.2		3.0	3.9			14.0	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		34.7			35.8			3.8			14.0	
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			0.43									
Actuated Cycle Length (s)			83.2			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			91.3%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

Loon Avenue Lands
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Background (2031) AM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	17	0	143	1	83	349	14	478
Future Volume (vph)	17	0	143	1	83	349	14	478
Lane Group Flow (vph)	19	19	157	88	91	436	0	552
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	0.03	0.65	0.25	0.14	0.35		0.62
Control Delay	31.4	0.1	48.1	9.3	5.0	6.8		21.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	31.4	0.1	48.1	9.3	5.0	6.8		21.8
Queue Length 50th (m)	3.0	0.0	27.1	0.2	4.1	26.0		70.4
Queue Length 95th (m)	9.1	0.0	47.4	12.4	10.8	52.8		121.7
Internal Link Dist (m)		281.8		237.1		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	353	760	375	493	668	1250		888
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	0.03	0.42	0.18	0.14	0.35		0.62

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 90.6

Natural Cycle: 95

Control Type: Semi Act-Uncoord

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



Loon Avenue Lands

1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis

Background (2031) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	0	17	143	1	79	83	349	47	14	478	11
Future Volume (vph)	17	0	17	143	1	79	83	349	47	14	478	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	1618		1805	1787			1851	
Flt Permitted	0.70	1.00		0.75	1.00		0.35	1.00			0.98	
Satd. Flow (perm)	1330	1615		1416	1618		666	1787			1825	
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	157	1	87	91	384	52	15	525	12
RTOR Reduction (vph)	0	16	0	0	72	0	0	4	0	0	1	0
Lane Group Flow (vph)	19	3	0	157	16	0	91	432	0	0	551	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)	15.4	15.4		15.4	15.4		63.1	63.1			44.1	
Effective Green, g (s)	15.4	15.4		15.4	15.4		63.1	63.1			44.1	
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.70	0.70			0.49	
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)	226	274		240	275		653	1245			889	
v/s Ratio Prot		0.00			0.01		0.02	c0.24				
v/s Ratio Perm	0.01			c0.11			0.07				c0.30	
v/c Ratio	0.08	0.01		0.65	0.06		0.14	0.35			0.62	
Uniform Delay, d1	31.6	31.2		35.1	31.5		5.9	5.5			17.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.2	0.0		6.3	0.1		0.4	0.8			3.2	
Delay (s)	31.8	31.2		41.3	31.6		6.4	6.2			20.3	
Level of Service	C	C		D	C		A	A			C	
Approach Delay (s)		31.5			37.8			6.3			20.3	
Approach LOS		C			D			A			C	
Intersection Summary												
HCM 2000 Control Delay			18.3			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			90.5			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												

Loon Avenue Lands
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Background (2031) PM Peak Hour

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	14	3	40	0	15	414	76	332
Future Volume (vph)	14	3	40	0	15	414	76	332
Lane Group Flow (vph)	15	98	43	19	16	555	0	450
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	0.26	0.03	0.02	0.39		0.55
Control Delay	34.6	12.1	38.5	0.1	2.6	4.6		16.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	34.6	12.1	38.5	0.1	2.6	4.6		16.9
Queue Length 50th (m)	2.3	0.5	6.8	0.0	0.5	26.8		49.8
Queue Length 95th (m)	8.0	14.3	17.0	0.0	1.9	45.0		82.5
Internal Link Dist (m)		281.8		281.2		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	416	545	388	790	855	1416		811
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	0.11	0.02	0.02	0.39		0.55

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 82.1

Natural Cycle: 95

Control Type: Semi Act-Uncoord

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



Loon Avenue Lands

1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis

Background (2031) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	3	89	40	0	18	15	414	108	76	332	15
Future Volume (vph)	14	3	89	40	0	18	15	414	108	76	332	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			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	1784			1803	
Flt Permitted	0.75	1.00		0.69	1.00		0.45	1.00			0.82	
Satd. Flow (perm)	1416	1624		1318	1615		852	1784			1501	
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	43	0	19	16	440	115	81	353	16
RTOR Reduction (vph)	0	86	0	0	17	0	0	6	0	0	1	0
Lane Group Flow (vph)	15	12	0	43	2	0	16	549	0	0	449	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)	8.0	8.0		8.0	8.0		63.5	63.5			44.4	
Effective Green, g (s)	8.0	8.0		8.0	8.0		63.5	63.5			44.4	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		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)	135	155		126	154		820	1356			798	
v/s Ratio Prot		0.01			0.00		0.00	c0.31				
v/s Ratio Perm	0.01			c0.03			0.01				c0.30	
v/c Ratio	0.11	0.08		0.34	0.01		0.02	0.40			0.56	
Uniform Delay, d1	34.5	34.4		35.3	34.2		3.2	3.5			13.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.4	0.2		1.6	0.0		0.0	0.9			2.9	
Delay (s)	34.9	34.6		36.9	34.2		3.2	4.4			15.9	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		34.6			36.1			4.3			15.9	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			13.2			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.51									
Actuated Cycle Length (s)			83.5			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			97.2%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

Appendix F – 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 G – Synchro Analysis Output – Total Traffic Volumes

Loon Avenue Lands
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	144	1	83	297	16	403
Future Volume (vph)	17	0	144	1	83	297	16	403
Lane Group Flow (vph)	19	19	158	90	91	378	0	473
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	0.03	0.66	0.26	0.13	0.30		0.54
Control Delay	31.4	0.1	48.1	9.2	5.0	6.4		19.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	31.4	0.1	48.1	9.2	5.0	6.4		19.7
Queue Length 50th (m)	3.0	0.0	27.3	0.2	4.1	21.4		56.9
Queue Length 95th (m)	9.1	0.0	47.9	12.6	10.9	44.2		99.3
Internal Link Dist (m)		281.8		237.1		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	352	795	375	495	714	1247		883
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	0.42	0.18	0.13	0.30		0.54

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 90.6

Natural Cycle: 95

Control Type: Semi Act-Uncoord

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



Loon Avenue Lands

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	144	1	81	83	297	47	16	403	11
Future Volume (vph)	17	0	17	144	1	81	83	297	47	16	403	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	1618		1805	1784			1848	
Flt Permitted	0.70	1.00		0.75	1.00		0.39	1.00			0.98	
Satd. Flow (perm)	1327	1615		1416	1618		750	1784			1813	
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	158	1	89	91	326	52	18	443	12
RTOR Reduction (vph)	0	16	0	0	74	0	0	5	0	0	1	0
Lane Group Flow (vph)	19	3	0	158	16	0	91	373	0	0	472	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)	15.5	15.5		15.5	15.5		63.1	63.1			44.1	
Effective Green, g (s)	15.5	15.5		15.5	15.5		63.1	63.1			44.1	
Actuated g/C Ratio	0.17	0.17		0.17	0.17		0.70	0.70			0.49	
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)	227	276		242	276		697	1242			882	
v/s Ratio Prot		0.00			0.01		0.02	c0.21				
v/s Ratio Perm	0.01			c0.11			0.07				c0.26	
v/c Ratio	0.08	0.01		0.65	0.06		0.13	0.30			0.54	
Uniform Delay, d1	31.6	31.2		35.0	31.4		5.6	5.3			16.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.2	0.0		6.2	0.1		0.4	0.6			2.3	
Delay (s)	31.7	31.2		41.2	31.5		6.0	5.9			18.5	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		31.5			37.7			5.9			18.5	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			18.0			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			90.6			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			68.9%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

Loon Avenue Lands
2: 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)	50	13	1	177	49	3
Future Volume (Veh/h)	50	13	1	177	49	3
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)	54	14	1	192	53	3
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	68			255 61		
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	68			255 61		
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			93 100		
cM capacity (veh/h)	1546			738 1010		
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	68	193	56			
Volume Left	0	1	53			
Volume Right	14	0	3			
cSH	1700	1546	748			
Volume to Capacity	0.04	0.00	0.07			
Queue Length 95th (m)	0.0	0.0	1.9			
Control Delay (s)	0.0	0.0	10.2			
Lane LOS	A		B			
Approach Delay (s)	0.0	0.0	10.2			
Approach LOS	B					
Intersection Summary						
Average Delay	1.8					
Intersection Capacity Utilization	20.1%			ICU Level of Service		A
Analysis Period (min)	15					

Loon Avenue Lands
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	48	0	15	349	80	281
Future Volume (vph)	14	3	48	0	15	349	80	281
Lane Group Flow (vph)	15	98	51	24	16	490	0	400
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	0.30	0.04	0.02	0.35		0.50
Control Delay	34.4	12.0	39.4	0.1	2.7	4.3		15.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	34.4	12.0	39.4	0.1	2.7	4.3		15.9
Queue Length 50th (m)	2.3	0.5	8.2	0.0	0.5	22.0		42.3
Queue Length 95th (m)	8.0	14.3	18.9	0.0	1.9	39.1		71.8
Internal Link Dist (m)		281.8		281.2		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	414	544	387	839	890	1409		801
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	0.13	0.03	0.02	0.35		0.50

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 82.3

Natural Cycle: 95

Control Type: Semi Act-Uncoord

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



Loon Avenue Lands

HCM Signalized Intersection Capacity Analysis

1: Huronia Rd & Commercial Access/Loon Ave

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	48	0	23	15	349	112	80	281	15
Future Volume (vph)	14	3	89	48	0	23	15	349	112	80	281	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			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	1777			1803	
Flt Permitted	0.74	1.00		0.69	1.00		0.48	1.00			0.81	
Satd. Flow (perm)	1409	1624		1318	1615		912	1777			1484	
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	51	0	24	16	371	119	85	299	16
RTOR Reduction (vph)	0	86	0	0	22	0	0	8	0	0	1	0
Lane Group Flow (vph)	15	12	0	51	2	0	16	482	0	0	399	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)	8.1	8.1		8.1	8.1		63.5	63.5			44.4	
Effective Green, g (s)	8.1	8.1		8.1	8.1		63.5	63.5			44.4	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		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)	136	157		127	156		854	1349			788	
v/s Ratio Prot		0.01			0.00		0.00	c0.27				
v/s Ratio Perm	0.01			c0.04			0.01				c0.27	
v/c Ratio	0.11	0.08		0.40	0.01		0.02	0.36			0.51	
Uniform Delay, d1	34.5	34.4		35.5	34.1		3.1	3.3			12.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.4	0.2		2.1	0.0		0.0	0.7			2.3	
Delay (s)	34.8	34.6		37.5	34.2		3.1	4.1			14.9	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		34.6			36.5			4.0			14.9	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			13.4				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.47									
Actuated Cycle Length (s)			83.6				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			97.7%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

Loon Avenue Lands
2: 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)	151	44	3	42	29	2
Future Volume (Veh/h)	151	44	3	42	29	2
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)	164	48	3	46	32	2
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			212		240	188
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			212		240	188
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		96	100
cM capacity (veh/h)			1370		751	859
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	212	49	34			
Volume Left	0	3	32			
Volume Right	48	0	2			
cSH	1700	1370	757			
Volume to Capacity	0.12	0.00	0.04			
Queue Length 95th (m)	0.0	0.1	1.1			
Control Delay (s)	0.0	0.5	10.0			
Lane LOS		A	A			
Approach Delay (s)	0.0	0.5	10.0			
Approach LOS			A			
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			20.6%	ICU Level of Service		A
Analysis Period (min)			15			

Loon Avenue Lands
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Total (2031) AM Peak Hour

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	17	0	165	1	83	349	18	478
Future Volume (vph)	17	0	165	1	83	349	18	478
Lane Group Flow (vph)	19	19	181	103	91	443	0	557
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	0.03	0.70	0.27	0.14	0.36		0.64
Control Delay	30.8	0.1	50.2	8.5	5.5	7.4		23.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	30.8	0.1	50.2	8.5	5.5	7.4		23.2
Queue Length 50th (m)	3.0	0.0	31.8	0.2	4.5	28.6		74.6
Queue Length 95th (m)	9.0	0.0	54.3	13.2	11.5	56.5		127.6
Internal Link Dist (m)		281.8		237.1		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	343	756	370	498	653	1231		868
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	0.49	0.21	0.14	0.36		0.64

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 91.9

Natural Cycle: 95

Control Type: Semi Act-Uncoord

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



Loon Avenue Lands

1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis

Total (2031) AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	17	0	17	165	1	93	83	349	54	18	478	11
Future Volume (vph)	17	0	17	165	1	93	83	349	54	18	478	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	1618		1805	1785			1849	
Flt Permitted	0.69	1.00		0.75	1.00		0.35	1.00			0.98	
Satd. Flow (perm)	1312	1615		1416	1618		657	1785			1810	
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	181	1	102	91	384	59	20	525	12
RTOR Reduction (vph)	0	16	0	0	83	0	0	5	0	0	1	0
Lane Group Flow (vph)	19	3	0	181	20	0	91	438	0	0	556	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)	16.7	16.7		16.7	16.7		63.2	63.2			44.2	
Effective Green, g (s)	16.7	16.7		16.7	16.7		63.2	63.2			44.2	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.69	0.69			0.48	
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)	238	293		257	294		639	1227			870	
v/s Ratio Prot		0.00			0.01		0.02	c0.25				
v/s Ratio Perm	0.01			c0.13			0.07				c0.31	
v/c Ratio	0.08	0.01		0.70	0.07		0.14	0.36			0.64	
Uniform Delay, d1	31.2	30.8		35.3	31.1		6.4	5.9			17.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.1	0.0		8.5	0.1		0.5	0.8			3.6	
Delay (s)	31.4	30.8		43.8	31.2		6.8	6.8			21.5	
Level of Service	C	C		D	C		A	A			C	
Approach Delay (s)		31.1			39.2			6.8			21.5	
Approach LOS		C			D			A			C	
Intersection Summary												
HCM 2000 Control Delay			19.7			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			91.9			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			70.8%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

Loon Avenue Lands
2: Street 'A' & Loon Ave

HCM Unsignalized Intersection Capacity Analysis
Total (2031) AM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	59	13	1	210	49	3
Future Volume (Veh/h)	59	13	1	210	49	3
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)	64	14	1	228	53	3
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			78		301	71
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			78		301	71
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		92	100
cM capacity (veh/h)			1533		694	997
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	78	229	56			
Volume Left	0	1	53			
Volume Right	14	0	3			
cSH	1700	1533	706			
Volume to Capacity	0.05	0.00	0.08			
Queue Length 95th (m)	0.0	0.0	2.1			
Control Delay (s)	0.0	0.0	10.5			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.0	10.5			
Approach LOS			B			
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization		21.8%		ICU Level of Service		A
Analysis Period (min)		15				

Loon Avenue Lands
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Total (2031) PM Peak Hour

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	14	3	53	0	15	414	90	332
Future Volume (vph)	14	3	53	0	15	414	90	332
Lane Group Flow (vph)	15	98	56	28	16	578	0	465
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	0.33	0.33	0.05	0.02	0.41		0.60
Control Delay	34.2	11.8	39.9	0.2	2.8	4.9		18.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Total Delay	34.2	11.8	39.9	0.2	2.8	4.9		18.5
Queue Length 50th (m)	2.3	0.5	9.0	0.0	0.5	28.2		53.2
Queue Length 95th (m)	8.0	14.1	20.6	0.0	2.0	51.1		92.1
Internal Link Dist (m)		281.8		281.2		57.0		190.6
Turn Bay Length (m)			20.0		75.0			
Base Capacity (vph)	411	543	386	789	846	1405		774
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	0.15	0.04	0.02	0.41		0.60

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 82.5

Natural Cycle: 95

Control Type: Semi Act-Uncoord

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



Loon Avenue Lands

1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis

Total (2031) PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	3	89	53	0	26	15	414	130	90	332	15
Future Volume (vph)	14	3	89	53	0	26	15	414	130	90	332	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	1778			1803	
Flt Permitted	0.74	1.00		0.69	1.00		0.44	1.00			0.79	
Satd. Flow (perm)	1404	1624		1318	1615		843	1778			1440	
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	56	0	28	16	440	138	96	353	16
RTOR Reduction (vph)	0	86	0	0	25	0	0	8	0	0	1	0
Lane Group Flow (vph)	15	12	0	56	3	0	16	570	0	0	464	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)	8.3	8.3		8.3	8.3		63.5	63.5			44.4	
Effective Green, g (s)	8.3	8.3		8.3	8.3		63.5	63.5			44.4	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		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)	139	160		130	159		812	1347			762	
v/s Ratio Prot		0.01			0.00		0.00	c0.32				
v/s Ratio Perm	0.01			c0.04			0.01				c0.32	
v/c Ratio	0.11	0.08		0.43	0.02		0.02	0.42			0.61	
Uniform Delay, d1	34.4	34.3		35.5	34.1		3.3	3.6			13.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.3	0.2		2.3	0.0		0.0	1.0			3.6	
Delay (s)	34.7	34.5		37.8	34.1		3.3	4.6			17.3	
Level of Service	C	C		D	C		A	A			B	
Approach Delay (s)		34.5			36.6			4.6			17.3	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			14.1				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.55									
Actuated Cycle Length (s)			83.8				Sum of lost time (s)			16.0		
Intersection Capacity Utilization			97.9%				ICU Level of Service			F		
Analysis Period (min)			15									
c Critical Lane Group												

Loon Avenue Lands
2: Street 'A' & Loon Ave

HCM Unsignalized Intersection Capacity Analysis
Total (2031) PM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	179	44	3	50	29	2
Future Volume (Veh/h)	179	44	3	50	29	2
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)	195	48	3	54	32	2
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			243		279	219
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			243		279	219
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		96	100
cM capacity (veh/h)			1335		714	826
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	243	57	34			
Volume Left	0	3	32			
Volume Right	48	0	2			
cSH	1700	1335	719			
Volume to Capacity	0.14	0.00	0.05			
Queue Length 95th (m)	0.0	0.1	1.2			
Control Delay (s)	0.0	0.4	10.3			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.4	10.3			
Approach LOS			B			
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			22.1%	ICU Level of Service		A
Analysis Period (min)			15			

Loon Avenue Lands
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Total (2031) AM Peak Hour w. Imp

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	17	0	165	1	83	349	18	478
Future Volume (vph)	17	0	165	1	83	349	18	478
Lane Group Flow (vph)	19	19	181	103	91	443	20	537
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	0.03	0.70	0.27	0.15	0.36	0.05	0.60
Control Delay	30.8	0.1	50.2	8.5	5.6	7.4	15.1	22.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.8	0.1	50.2	8.5	5.6	7.4	15.1	22.0
Queue Length 50th (m)	3.0	0.0	31.8	0.2	4.5	28.6	1.9	70.0
Queue Length 95th (m)	9.0	0.0	54.3	13.2	11.5	56.5	6.8	119.4
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)	343	755	370	498	593	1231	415	892
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	0.49	0.21	0.15	0.36	0.05	0.60

Intersection Summary

Cycle Length: 99

Actuated Cycle Length: 91.9

Natural Cycle: 95

Control Type: Semi Act-Uncoord

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



Loon Avenue Lands

1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis

Total (2031) 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	165	1	93	83	349	54	18	478	11
Future Volume (vph)	17	0	17	165	1	93	83	349	54	18	478	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	1618		1805	1785		1626	1857	
Flt Permitted	0.69	1.00		0.75	1.00		0.29	1.00		0.51	1.00	
Satd. Flow (perm)	1312	1615		1416	1618		547	1785		866	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	181	1	102	91	384	59	20	525	12
RTOR Reduction (vph)	0	16	0	0	83	0	0	5	0	0	1	0
Lane Group Flow (vph)	19	3	0	181	20	0	91	438	0	20	536	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)	16.7	16.7		16.7	16.7		63.2	63.2		44.2	44.2	
Effective Green, g (s)	16.7	16.7		16.7	16.7		63.2	63.2		44.2	44.2	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.69	0.69		0.48	0.48	
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)	238	293		257	294		581	1227		416	893	
v/s Ratio Prot		0.00			0.01		0.03	c0.25			c0.29	
v/s Ratio Perm	0.01			c0.13			0.08			0.02		
v/c Ratio	0.08	0.01		0.70	0.07		0.16	0.36		0.05	0.60	
Uniform Delay, d1	31.2	30.8		35.3	31.1		6.7	5.9		12.7	17.4	
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		8.5	0.1		0.6	0.8		0.2	3.0	
Delay (s)	31.4	30.8		43.8	31.2		7.3	6.8		12.9	20.4	
Level of Service	C	C		D	C		A	A		B	C	
Approach Delay (s)		31.1			39.2			6.9			20.1	
Approach LOS		C			D			A			C	
Intersection Summary												
HCM 2000 Control Delay			19.2			HCM 2000 Level of Service			B			
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			91.9			Sum of lost time (s)			16.0			
Intersection Capacity Utilization			94.8%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

Loon Avenue Lands
2: Street 'A' & Loon Ave

HCM Unsignalized Intersection Capacity Analysis
Total (2031) AM Peak Hour w. Imp

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	59	13	1	210	49	3
Future Volume (Veh/h)	59	13	1	210	49	3
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)	64	14	1	228	53	3
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	78			301 71		
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	78			301 71		
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			92 100		
cM capacity (veh/h)	1533			694 997		
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	78	229	56			
Volume Left	0	1	53			
Volume Right	14	0	3			
cSH	1700	1533	706			
Volume to Capacity	0.05	0.00	0.08			
Queue Length 95th (m)	0.0	0.0	2.1			
Control Delay (s)	0.0	0.0	10.5			
Lane LOS	A		B			
Approach Delay (s)	0.0	0.0	10.5			
Approach LOS	B					
Intersection Summary						
Average Delay	1.6					
Intersection Capacity Utilization	21.8%			ICU Level of Service		A
Analysis Period (min)	15					

Loon Avenue Lands
1: Huronia Rd & Commercial Access/Loon Ave

Queues
Total (2031) PM Peak Hour w. Imp

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	14	3	53	0	15	414	90	332
Future Volume (vph)	14	3	53	0	15	414	90	332
Lane Group Flow (vph)	15	98	56	28	16	578	96	369
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	0.33	0.33	0.05	0.02	0.41	0.21	0.38
Control Delay	34.2	11.8	39.9	0.2	2.8	4.9	13.2	13.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.2	11.8	39.9	0.2	2.8	4.9	13.2	13.7
Queue Length 50th (m)	2.3	0.5	9.0	0.0	0.5	28.2	8.4	35.8
Queue Length 95th (m)	8.0	14.1	20.6	0.0	2.0	51.1	19.1	60.0
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)	411	543	386	789	853	1405	456	969
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	0.15	0.04	0.02	0.41	0.21	0.38

Intersection Summary

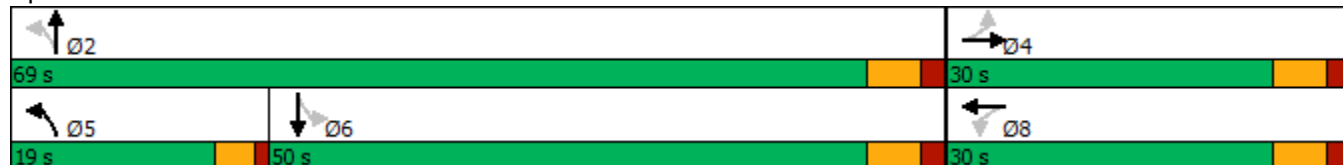
Cycle Length: 99

Actuated Cycle Length: 82.5

Natural Cycle: 95

Control Type: Semi Act-Uncoord

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



Loon Avenue Lands

1: Huronia Rd & Commercial Access/Loon Ave

HCM Signalized Intersection Capacity Analysis

Total (2031) 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	53	0	26	15	414	130	90	332	15
Future Volume (vph)	14	3	89	53	0	26	15	414	130	90	332	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	1778		1805	1801	
Flt Permitted	0.74	1.00		0.69	1.00		0.45	1.00		0.45	1.00	
Satd. Flow (perm)	1404	1624		1318	1615		856	1778		849	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	56	0	28	16	440	138	96	353	16
RTOR Reduction (vph)	0	86	0	0	25	0	0	8	0	0	1	0
Lane Group Flow (vph)	15	12	0	56	3	0	16	570	0	96	368	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)	8.3	8.3		8.3	8.3		63.5	63.5		44.4	44.4	
Effective Green, g (s)	8.3	8.3		8.3	8.3		63.5	63.5		44.4	44.4	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.76	0.76		0.53	0.53	
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)	139	160		130	159		819	1347		449	954	
v/s Ratio Prot		0.01			0.00		0.00	c0.32			0.20	
v/s Ratio Perm	0.01			c0.04			0.01			0.11		
v/c Ratio	0.11	0.08		0.43	0.02		0.02	0.42		0.21	0.39	
Uniform Delay, d1	34.4	34.3		35.5	34.1		2.9	3.6		10.4	11.6	
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		2.3	0.0		0.0	1.0		1.1	1.2	
Delay (s)	34.7	34.5		37.8	34.1		2.9	4.6		11.5	12.8	
Level of Service	C	C		D	C		A	A		B	B	
Approach Delay (s)		34.5			36.6			4.6			12.6	
Approach LOS		C			D			A			B	
Intersection Summary												
HCM 2000 Control Delay			12.4			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.45									
Actuated Cycle Length (s)			83.8			Sum of lost time (s)				16.0		
Intersection Capacity Utilization			94.4%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												

Loon Avenue Lands
2: Street 'A' & Loon Ave

HCM Unsignalized Intersection Capacity Analysis
Total (2031) PM Peak Hour w. Imp

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	179	44	3	50	29	2
Future Volume (Veh/h)	179	44	3	50	29	2
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)	195	48	3	54	32	2
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			243		279	219
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			243		279	219
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		96	100
cM capacity (veh/h)			1335		714	826
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	243	57	34			
Volume Left	0	3	32			
Volume Right	48	0	2			
cSH	1700	1335	719			
Volume to Capacity	0.14	0.00	0.05			
Queue Length 95th (m)	0.0	0.1	1.2			
Control Delay (s)	0.0	0.4	10.3			
Lane LOS		A	B			
Approach Delay (s)	0.0	0.4	10.3			
Approach LOS			B			
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			22.1%	ICU Level of Service		A
Analysis Period (min)			15			

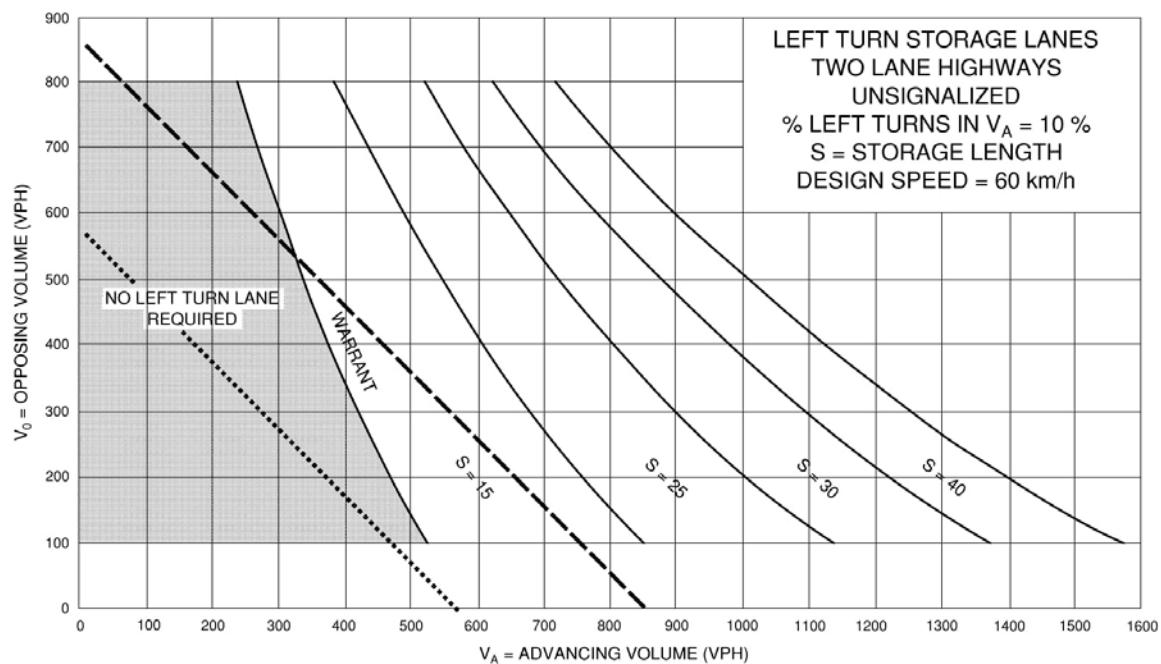
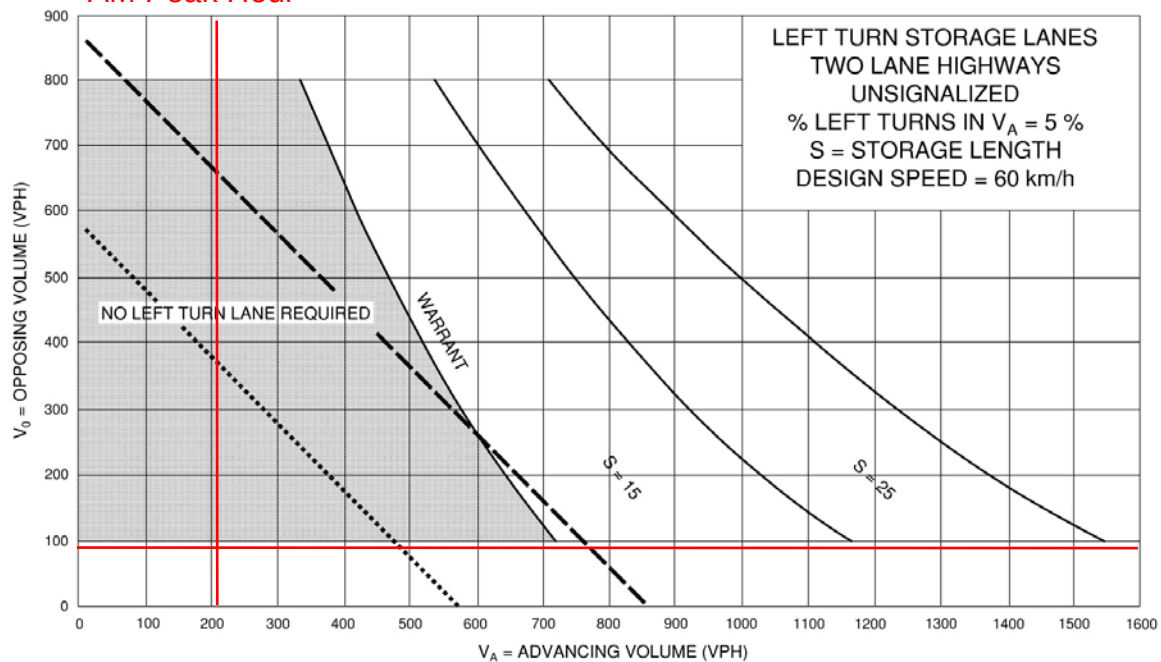
Appendix H – OTM Signal Justification Sheets

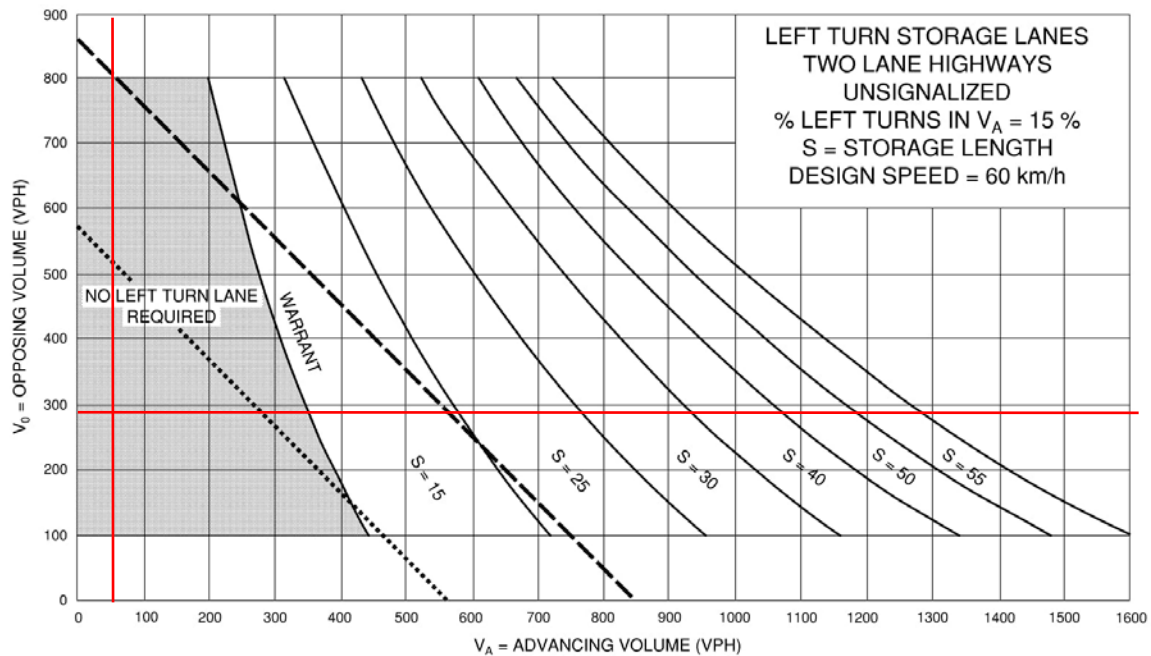
Justification No. 7 - 2030 Total Traffic (Critical Case)

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 I – 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

