

TRANSPORTATION STUDY

- Traffic Impact Study
- Parking Study
- Site Plan Review
- Transportation Demand Management Plan

Proposed Residential
Development 958 – 960 East
Avenue
City of Mississauga, ON

March 2020

Prepared for
Peel Housing Corporation



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March 27, 2020

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Re: Transportation Study, Proposed Residential Development, 958-960 East Avenue, Mississauga, Ontario

TRANS-PLAN is pleased to submit this Traffic Impact Study, Parking Study and Site Plan Review in support of the proposed residential development, located at 958-960 East Avenue, Mississauga, Ontario.

We have prepared a Traffic Impact Study, Parking Study and Site Plan Review that includes analysis horizon years for existing conditions and five-year traffic volume projections to review traffic operations after development. The TIS report contains an analysis of the intersection capacity and level of service for the boundary roadways. The study intersections surrounding the proposed site were targeted as well as the future road connections to the subject site. Our traffic analysis findings indicate that all intersections are operating within acceptable limits and the introduction of the site will not cause traffic conditions to deteriorate.

The Parking Study contains a review of parking requirements compared to proposed supply. The Site Plan Review contains tests of the circulation for loading, waste collection and fire truck operations to ensure that all vehicle types can access all the relevant areas of the site. Additionally, we completed a sight line review and gap study. All studies indicate the development will function well without issue.

Sincerely,

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1. INTRODUCTION

Trans-Plan has been retained by Peel Housing Corporation (Peel Region) to complete a Traffic Impact Study (TIS), Parking Study and Site Plan Review for a proposed residential apartment development located at 958-960 East Avenue in the City of Mississauga. This study includes the following components:

Traffic Impact Study

- Review of the proposed development and site statistics
- Review and assessment of the existing road network and study area intersections
- Assessment of future background conditions based on anticipated traffic growth, area developments and planned transportation improvements in the study area
- Assessment of the impact of site-generated traffic on the adjacent roadway network under future background and total traffic conditions for a five-year study horizon
- Confirmation that the roadway and intersections can accommodate the proposed development for traffic capacity and level of service (LOS)
- Determination of roadway and intersection improvements, as required, to accommodate the proposed development, including future roadways / connections to the subject site

Parking Study

- Review of the City of Mississauga Parking By-law for parking requirements in comparison to the proposed supply
- Review of similar sites for provided parking relative to size of development
- Justification for the proposed parking supply based on a review of the study area travel characteristics and site context

Site Plan Review

- Review of the site plan for site access and vehicle circulation
- Review of the site access for sight distance and available gaps in traffic for exiting the site

Prior to commencing these studies engineering staff at the City of Mississauga were contacted to discuss the scope of the work and to request traffic data. This study reflects feedback received from the City as well as standards set out in the Highway Capacity Manual (HCM) and the Ontario Provincial Standards for Roads & Public Works (OPS).

2. BACKGROUND

2.1 Site location

The proposed site is located on the southwest corner of Lakeshore Road East and East Avenue within the City of Mississauga. The site is currently occupied by two residential buildings featuring 30 units in total. The area on the north side of Lakeshore Road East is mostly occupied by residential buildings with some commercial business along Lakeshore. To the south is Lake Ontario, a paramedic station, and the Lakeview



Water Treatment Plant, and to the east is an industrial area featuring a variety of different commodities production and shipping businesses.

2.2 Development Proposal

The development proposes to construct a 7-storey residential building containing 151 units and a total of 157 parking spaces. The existing buildings on the site will be demolished to make room. The site has a single private driveway connected to East Avenue. A single-level of underground parking is provided via a ramp in the centre of the site. The private driveway at East Avenue connects to one site entrance.

This building is set to be managed by the Peel Housing Corporation and provided as affordable housing for residents in the area.

2.3 Roadways

The study area roadways in the immediate vicinity of the site can be described as follows:

Lakeshore Road East runs in an east west direction consisting of four travel lanes, two in each direction. There is also a centre two way turn lane. The roadway has a posted speed limit of 50 km/h.

East Avenue runs in a north south direction consisting of two travel lanes, one in each direction. The roadway has a posted speed limit of 40 km/h.

West Avenue/Montbeck Crescent runs in a north south direction consisting of two travel lanes, one in each direction. The roadway has an assumed speed limit of 50 km/h.

Byngmount Avenue runs in an east west direction consisting of two travel lanes, one in each direction. The roadway has an assumed speed limit of 50 km/h. Byngmount Avenue terminates to the west end of the subject lands and currently does not connect to East Avenue.

The study area roadway characteristics are shown in Figure 3.

3. TRANSPORTATION IMPACT STUDY COMPONENTS

This TIS was completed to analyse the impacts that the proposed development will have on the surrounding network. This analysis took a stepwise approach to making sure that the development would not cause surrounding conditions to deteriorate. First a model was constructed that mirrors the existing conditions to provide baseline judgement. This model was then taken and a growth rate was applied to yield future conditions for a five-year horizon. Then site traffic was generated, distributed across the road network and added to the growth case to yield a total case that reflects the impacts of the site on the surrounding network.

3.1 Study Area Intersections

For the purposes of analysis, a zone of review had to be selected that contained a logical snapshot of the surrounding traffic conditions. Through communication with the City of Kawartha Lakes, the following intersections encompassing the proposed development were selected:

- Lakeshore Road East & East Avenue
- Lakeshore Road East & Montbeck Crescent
- Montbeck Crescent & Byngmount Avenue



- East Avenue & Site Access

3.2 Traffic Counts

To determine existing operating conditions within the study area, Trans-Plan conducted a site visit and intersection turning movement counts (TMCs), as recent counts were not readily available. The traffic counts were all conducted on a typical weekday to capture peak hour roadway traffic volumes (when the residential uses would likely peak). TMC diagrams are provided in Appendix A. The dates and times that TMCs were undertaken, as well as the peak hours obtained, are summarized in Table 1.

Table 1 – Turning Movement Count Details

Survey Dates	Survey Periods	Intersections	Peak Hours
Wednesday November 13 th , 2019	Weekday AM 7:00 am – 9:30 am & Weekday PM 4:00 pm – 6:30 pm	Lakeshore Road East & East Avenue	AM: 8:00 – 9:00 PM: 4:30 – 5:30
Wednesday November 20 th , 2019		Lakeshore Road East & Montbeck Crescent	AM: 7:45 – 8:45 PM: 5:15 – 6:15
Wednesday November 13 th , 2019		Montbeck Crescent & Byngmount Avenue	AM: 8:00 – 9:00 PM: 4:00 – 5:00

The existing traffic volumes for the weekday AM and PM peak hours are shown in Figure 4.

3.3 Traffic Growth & Peak Hour Factors

Through correspondence with the City of Mississauga the following growth rates were provided for the use in this study.

Table 2 – Compounded Annual Growth Rate from Existing to 2026

Time	Eastbound	Westbound
AM Peak Hour	0%	2%
PM Peak Hour	2%	0%

Peak hour factors for the local road network were calculated from the hourly traffic count data. The Grand Total column in the detailed count volume summaries (see Appendix A) is used to determine the peak hour for each intersection. Once the peak hour has been found, the peak hour factor (PHF) is calculated by taking the maximum 15-minute volume, multiplying it by 4 and then the previously found peak hour volume is divided by this number. This PHF is then inputted into the synchro analysis.

3.4 Planned Road Improvements & Background Developments

No planned roadway improvements or new developments are to be completed within the time period that this study has considered. However, to the east of the site there is a large development called Lakeview Village. This will feature several thousand new residential units spread between condominium tower style and townhome style, as well as significant space devoted to retail and office space. This



development will transform the landscape of the waterfront east of the site and provide multiple amenities for the use of residents. The growth rates that were discussed previously account for this development.

There is an additional scenario where Byngmount Avenue is extended to connect with East Avenue past the south limit of the site. This scenario has been analysed for local traffic impacts and feasibility later in this study.

The City of Mississauga commissioned the Lakeshore Road Transportation Master Plan, dated May 2019, which discusses further roadway improvements to support the Lakeview Village area. Phase 1, between 2019-2025, includes improvements to transit headways along Lakeshore Road, increasing bus service to at least 10 minutes. Phase 2, between 2025-2030, includes dedicated transit lanes and protected cycle tracks.

3.5 Trip Generation

In order to determine the impact of the proposed development on the surrounding road network, trips were generated for the subject site so that these vehicles could be added to the adjacent intersections. The Institute of Transportation Engineers Trip Generation Manuals, 10th Edition was used, the outputs can be found in Table 3.

Table 3 – Site Trip Generation for Residential Units

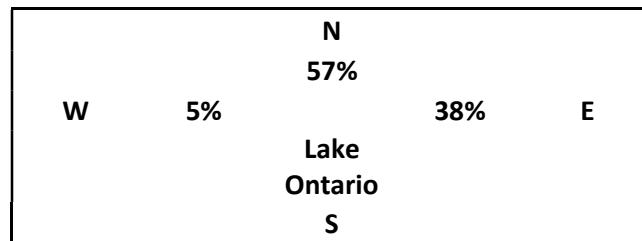
Land Use Type	Size		AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Residential Mid-Rise	151 units	Distribution Equation Trips	26%	74%	100%	61%	39%	100%
			$\ln(T)=0.98\ln(x)-0.98$			$\ln(T)=0.96\ln(x)-0.63$		
			13	38	51	40	26	66

The site is anticipated to generate 51 new trips (13 inbound and 38 outbound) in the weekday AM peak hour and 66 new trips (40 inbound and 26 outbound) in the weekday PM peak hour.

3.6 Trip Distribution and Assignment

The trips were distributed in a way that pointed them towards the largest potential draws (as well as based on a review of traffic patterns from the existing turning movement counts and 2016 TTS data). The majority of site traffic was assigned towards the local major highways. The trip assignment scheme can be seen in Figure 6. TTS distribution can be seen in Table 4.

Table 4 – TTS Trip Distribution



Trip distribution was also completed for the alternative scenario where Byngmount is extended to connect with East Avenue. Figure 8 shows the redistribution of the site traffic and Figure 9 shows the redistribution of the local traffic.

3.7 Future Total Traffic Conditions

Site traffic volumes were added to the future background traffic volumes to obtain the future total traffic volumes for a five-year horizon post buildout. Buildout was assumed to occur two years from the current date. The horizons selected were as follows: existing 2020 conditions and 2027 future (background and total) conditions.

3.8 Capacity Analysis

A capacity analysis was performed for the study area intersections using Synchro software to analyse the intersections immediately around the proposed site. Output data sheets for the following cases can be found in Appendix C and Level of Service (LOS) Definitions are provided in Appendix D. The planning horizons assessed include:

- Existing conditions (year 2020)
- Future background conditions for the 5-year horizon post build-out (year 2027)
- Future Total Conditions for the 5-year horizon post build-out (year 2027)

The apartment is assumed in our analysis to be operational / built-out within approximately two years (by year 2022).

The capacity tables for the existing, background and total (for the 5-year horizon post build-out) are provided in Table 5.





Table 5 - Capacity Analysis Results

Lakeshore Road East & Montbeck Crescent / West Avenue

Under existing conditions, this intersection operates at, or above, an average level of service of D with a max delay of 30 seconds with the exception of the northbound left turn movement. The northbound left turn movement operates at a maximum level of service of F with a delay of 70 seconds. This is expected as this is a minor side road turning onto a major thoroughfare. Residents could use the signalized intersection of Hampton crescent and Lakeshore Road East to make easier left turns if necessary. The intersection is expected to operate similarly under future conditions.

Montbeck Crescent & Byngmount Avenue

Under existing conditions, this intersection operates at, or above, an average level of service of A with a max delay of 9 seconds. The intersection is expected to operate similarly under future conditions.

Lakeshore Road East & East Avenue

Under existing conditions, this intersection operates at, or above, an average level of service of C with a max delay of 29 seconds. The intersection is expected to operate similarly under future conditions.

East Avenue & Site Access

Under future conditions, the proposed entrance is expected to operate at, or slightly above, an average level of service of A with a max delay of 9 seconds.

3.9 Byngmount Extension

With the current proposal, the private driveway and Byngmount Avenue are shown to be separate roadway portions and are not connected. The redevelopment proposed access to East Avenue via a private driveway with one access point. There is the potential to extend the private driveway to connect to Byngmount Avenue therefore extending Byngmount Avenue to connect East Avenue and Montbeck Crescent. This potential extension of Byngmount Avenue was requested by the City of Mississauga and further investigation was requested. In this case the site access would become Byngmount Avenue and the site would then have one connection off of the extended Byngmount Avenue, at East Avenue and Montbeck Crescent.

Traffic analysis has been completed for this scenario to determine if this extension would have any negative impacts on the surrounding road network. Capacity analysis can be seen in Table 6. Traffic distribution figures can be seen in Figure 8 and Figure 9.

It may be seen from the capacity analysis that if Byngmount Avenue is extended to connect with East Avenue past the south limit of the site, no negative traffic impacts are expected to arise. The capacity analysis demonstrates that the Byngmount Avenue extension is not necessary to support the subject site and the extension would only encourage through traffic to bypass Lakeshore Road East and into the existing residential area to the west of the site.

After investigation we recommend that this scenario not be pursued, the site functions well with its single access point and extending the access to connect to Byngmount is a significant undertaking not necessary for site functionality.

Table 6 - Capacity Analysis Results, Byngmount Extension



Intersection	Total Ext Traffic Conditions					
	AM Peak Hour			PM Peak Hour		
	V/C	Delay	LOS	V/C	Delay	LOS
Lakeshore Road East & Montbeck Crescent/West Avenue						
Eastbound Left	9	A		10	A	
Eastbound Through	0	A		0	A	
Eastbound Through / Right	0	A		0	A	
Westbound Left	13	B		12	B	
Westbound Through	0	A		0	A	
Westbound Through / Right	0	A		0	A	
Northbound Left	176	F		151	F	
Northbound Through / Right	22	C		15	D	
Southbound Left / Through / Right	37	E		19	C	
Montbeck Crescent & Byngmount Avenue						
Eastbound Left / Through / Right	10	A		7	A	
Westbound Left / Through / Right	9	A		7	A	
Northbound Left / Through / Right	0	A		7	A	
Southbound Left / Through / Right	4	A		7	A	
Lakeshore Road East & East Avenue	0.48	27	C	0.47	25	C
Eastbound Left	0.03	15	B	0.13	16	B
Eastbound Through	0.91	32	C	0.77	24	C
Eastbound Right	0.07	15	B	0.03	15	B
Westbound Left	0.18	16	B	0.30	19	B
Westbound Through	0.73	22	C	0.86	28	C
Westbound Right	0.00	14	B	0.09	15	B
Northbound Left / Through / Right	0.07	14	B	0.10	14	B
Southbound Left	0.02	14	B	0.02	13	B
Southbound Through / Right	0.00	14	B	0.00	13	B
East Avenue & Byngmount Avenue						
Eastbound Left / Right	9	A		9	A	
Northbound Left / Through	4	A		3	A	
Southbound Through / Right	0	A		0	A	

3.10 Queueing Analysis

Synchro queueing analysis was completed to determine if all the movements within the study area operate well under total traffic conditions. Table 7 shows the results of the queueing analysis. It may be seen that all movements operate well and similar to the capacity analysis, local traffic conditions are acceptable.

Table 7 – Queue capacity Analysis for Total Conditions

Intersection Movement	Available Storage Length (m)	95th Percentile Vehicle Queues	
		Total Traffic Conditions	
		AM Peak Hour	PM Peak Hour
Lakeshore Road East & Montbeck Crescent / West Avenue			
Eastbound Left	10	9	10
Eastbound Through	206	3	0
Eastbound Through / Right	206	7	3
Westbound Left	15	7	11
Northbound Left	20	7	5
Northbound Through / Right	67	18	13
Southbound Left / Through / Right	127	9	9
Montbeck Crescent & Byngmount Avenue			
Eastbound Left / Through / Right	90	16	4
Southbound Left / Through / Right	67	3	0
Lakeshore Road East & East Avenue			
Eastbound Left	15	9	7
Eastbound Through	200	110	73
Eastbound Right	30	40	33
Westbound Left	25	19	37
Westbound Through	150	106	108
Westbound Right	20	18	28
Northbound Left / Through / Right	55	23	27
Southbound Left	20	9	8
Southbound Through / Right	93	4	0
East Avenue & Site Access			
Eastbound Left / Right	58	14	13

4. TRAFFIC GAP STUDY

Trans-Plan conducted a traffic gap survey at East Avenue, at the location of the proposed driveway connection for the proposed development on Wednesday November 20, 2019 during the weekday AM and PM peak hours. The study hours were selected based on the peak hours obtained from traffic counts conducted along East Avenue, adjacent the proposed driveway location. The weekday AM peak hour surveyed was 7:45am – 8:45am, and the weekday PM peak hour surveyed was 4:00pm – 5:00pm.

Duration of traffic gaps (in seconds) were recorded for East Avenue that would accommodate the following future turning movements at the site driveway as follows:

- Gaps in southbound traffic on East Avenue – to allow vehicles exiting the site driveway to make a right turn out and vehicles entering the site driveway to make a left turn in
- Gaps in both northbound and southbound traffic (simultaneously) on East Avenue – to allow vehicles exiting the site driveway to make a left turn out

The survey results are provided in Appendix E, and were analyzed using Highway Capacity Manual (HCM) methodology (page 17-7 Exhibit 17.5) for a two-lane roadway. The critical and follow-up gap times used in the analysis for each turning movement are summarized in Table 8.

Table 8 - Critical and Follow-up Times for Traffic Gaps at Proposed Site Access

Northbound Left Turn From East Avenue to Access		Eastbound Right Turn from Access to East Avenue		Eastbound Left Turn from Access to East Avenue	
Critical	Follow Up	Critical	Follow Up	Critical	Follow Up
4.1	2.2	6.2	3.3	7.1	3.5

The available traffic gaps recorded from the survey during the weekday AM and PM peak hours, and residual traffic gaps (remaining after estimated peak hour traffic volumes at the site access are added to the road network) are summarized in Table 9. The future total turning volumes from the scenario with the Byngmount Avenue extension, from Figure 10, were utilized in the gap analysis.

Table 9 - Traffic Gap Survey Results at East Avenue and Proposed Driveway

	Left Turn from Major Road		Right Turn from Future Driveway		Left Turn from Future Driveway	
	AM	PM	AM	PM	AM	PM
Critical Gaps	59	59	59	58	61	56
Follow-up Gaps	1100	1243	682	783	680	699
Total Traffic Gaps	1159	1302	741	841	741	755
Site Traffic Volumes	31	42	37	35	27	19
Residual Traffic Gaps	1128	1260	704	806	714	736

Results of the traffic gap survey show that there are a sufficient number of gaps in traffic on East Avenue during the weekday AM and PM peak hours to ensure that all vehicles are able to enter / exit the proposed driveway in a timely manner without major delays.



5. PARKING STUDY

5.1 Parking Requirements

The parking requirements for the proposed development are based on the City of Mississauga Zoning By-law 0225-2007 and are shown in Table 10, in comparison to the parking supply. Source information is provided in Appendix F.

Table 10 – Parking Requirements (City of Mississauga Zoning By-law 0225-2007)

Land Use	Auto Parking Requirement				Parking Spaces Provided
	# of Bedrooms	# of Units	Rate (parking spaces per unit)	Parking Spaces Required	
Rental Apartment	1 bedroom	65	1.18	76.70	
	2 bedroom	74	1.36	100.64	
	3 bedroom	12	1.50	18.00	
			Resident Total	195	119
	Visitor	151	0.20	30.2	
			Visitor Total	30	38
			Grand Total	225	157

The overall parking requirement is 225 spaces and the proposed parking supply is 157 spaces, provided through surface parking and one level of underground parking, which indicates an overall deficiency of 68 spaces for the subject site. Although the proposed parking supply is below the By-law requirement, it is Trans-Plan's opinion that the proposed supply would be sufficient to support the affordable housing development.

5.2 Parking Guidelines for Public and Private Non-Profit Housing

The City of Mississauga commissioned a study for planning parking guidelines for Private Non-Profit Housing. The unofficial study, the Parking Guidelines for Public and Private Non-Profit Housing, was completed in 2005 and presented to the City's Planning and Development Committee. The study reviewed the parking needs for existing non-profit developments and concluded that the parking demand was always lower than the requirements within the City By-law. The study provided minimum parking guidelines for Peel Living developments, with the source information provided in Appendix F and the subject site parking requirements shown in Table 11. Although the proposed development is not non-profit, we believe this study provides a good baseline for this style of housing.

Table 11 – Parking Requirements (Parking Guidelines for Public and Private Non-Profit Housing)

Land Use	Auto Parking Requirement				Parking Spaces Provided
Rental Apartment	# of Bedrooms	# of Units	Rate (parking spaces per unit)	Parking Spaces Required	
	1 bedroom	65	0.40	26	
	2 bedroom	74	0.60	44.4	
	3 bedroom	12	0.74	8.88	
			Resident Total	80	119
	Visitor	151	0.20	30.2	
			Visitor Total	30	38

The overall parking requirement for residents and visitors is 110 spaces and the proposed parking supply is 157 spaces, meeting the requirements. The future transit improvements along Lakeshore Road East would also reduce the parking needs for residents and visitors to the site.

5.3 Proxy Sites for Residential Uses

As the 2005 guidelines may be outdated, this study also reviewed current parking needs to gain a better understanding of parking demands at existing affordable housing developments. Trans-Plan received unit counts and parking information on other existing Peel Living / Peel Housing Corporation buildings, with characteristics such as the number of units, provision of surface and underground parking, and the spaces assigned to tenants provided in Table 12.

Table 12 - Proxy Site Comparison

Apartment Address	# of Units	2016 Parking Supply and Demand (spaces)		
		Assigned to Tenants	Unassigned*	Total
Queen Frederica, 3020, 3070, 3130 Queen Frederica Drive	198	93	23	Surface: 116
Riley Court, 880 Riley Court	146	101	110	Surface: 88 Underground: 123
Sydenham Place, 4100 & 4110 Westminster Place	107	86	84	Surface: 63 Underground: 107
Mason's Landing, 2660 Aquitaine Avenue	150	138	96	Surface: 60 Underground: 174

Note(*): Unassigned parking spaces may include visitor or non-residential spaces

Based off the assigned and unassigned spaces, the parking supply rates for the proxy developments were reviewed and compared to the proposed development in Table 13.



Table 13 – Parking Supply and Parking Supply Rates

Sites	No. of Units	Parking Supply					
		(spaces)			rate (spaces per unit)		
		Res.	Visitor	Total	Res.	Visitor	Total
Subject Site							
958-960 East Avenue	151	119	38	157	0.79	0.31	1.10
Existing PHC Developments							
Queen Frederica	198	93	23	116	0.47	0.12	0.59
Riley Court	146	101	110	211	0.69	0.75	1.44
Sydenham Place	107	86	84	170	0.80	0.79	1.59
Mason's Landing	150	138	96	234	0.92	0.64	1.56
Average					0.72	0.58	1.30

For the existing affordable housing developments, the average parking rate for residents was 0.72 spaces per unit, which is met by the proposed parking rate of 0.79 spaces per unit for the subject site (119 resident spaces / 151 units). Based on this review, the resident parking supply of 119 spaces is expected to be sufficient to support the subject site.

Although the proposed rate of 0.24 visitor spaces per unit is less than the observed average demand of 0.58 spaces per unit, the observed demand is based off unassigned spots which includes resident spaces that have been left unused. Providing the minimum required spaces allows the development to make the most use of the lot to provide as many units as sustainable. The Lakeshore Road East transit improvements would further justify the reduced visitor parking as the improved transit services would further incentivize transit use to and from the subject site.

To summarize, the proposed 119 resident parking spaces is expected to be sufficient to support the proposed development, based off the unofficial Parking Guidelines for Public and Private Non-Profit Housing and a review of existing affordable housing developments in Peel Region. Additionally, the 38 visitor parking spaces meet the By-law requirements.

6. SITE PLAN REVIEW

6.1 Site Access Review

A review of the proposed driveway spacing was completed as per the TAC Geometric Design Guide for Canadian Roads. Table 14 summarizes the spacing requirements and the proposed driveway spacing for the connection on East Avenue.



Table 14 – Proposed Driveway Spacing

Distance from:	Recommended Spacing	Proposed Spacing
East Avenue and Rangeview Road	40m between three-legged intersections on local roads <i>(TAC Geometric Design Guide for Canadian Roads, Chapter 9.4.2.3)</i>	~100m
Lakeshore Road East and East Avenue	15m corner clearance on local roads <i>(TAC Geometric Design Guide for Canadian Roads, Figure 8.8.2)</i>	~85m

As per the TAC guidelines, the location of the proposed driveway on East Avenue is sufficiently spaced from the adjacent north and south intersections.

Our capacity and queue analysis (in Section 3.8 & 3.9) concluded that the turning movements at the proposed driveway are expected to operate well with minimal delays and no laneway blocking from vehicle queues.

Access to the underground parking ramp and surface parking spaces is provided through two access connections along the proposed East Avenue driveway. Each access provides a width of 7m and the aisle widths within the site are 7m, meeting the City's Site Plan Application Development Standards.

6.2 Sight Distance Review

A driver sight distance review was conducted to measure the available site distance for the proposed driveway at East Avenue. A field visit and driver sight distance measurements were conducted by Trans-Plan staff.

Minimum sight distance requirements were obtained from the Table 9.9.4 & Table 9.9.6, Transportation Association of Canada (TAC) Manual, based on a design speed of 50 km/h for East Avenue (obtained from a posted speed limit of 40km/h). Details of the review are summarized in Table 15. Photographs taken from the proposed driveway location are provided in Appendix G.

Table 15 – Sight Distance Review Summary

Location	Direction	Available Sight Distance (m)	Criteria	Required Sight Distance (m)	Requirement Met?
Proposed East Avenue Driveway	North	~85 (until Lakeshore Road East intersection)	SSD	65	No (due to roadway limit)
			Calculated	90.4	
			Design	95	
	South	~230	SSD	65	Yes
			Calculated	104.3	
			Design	105	

Source: TAC Table 9.9.4 & Table 9.9.6

The available sight distance looking north and south along East Avenue is approximately 85m and 230m, respectively, with no obstructions blocking the view until the adjacent intersections.



Although the available sight distance of 85m looking north is slightly below the required 95m due to the Lakeshore Road intersection, the minimum stopping sight distance of 65m is met, which is the distance required for a vehicle on the roadway to perceive and react to a conflict ahead. As vehicles exiting the site would be aware of vehicles at the traffic lights, the proposed site access layout is expected to be sufficient in providing for vehicles exiting the site. The area is also expected to generate low traffic volumes which is favourable for the available site distance to the north.

The frontage of the proposed development along East Avenue would be kept clear of features to ensure maximum visibility along the road frontage.

6.3 Site Circulation Review

A site circulation review was completed using AutoTurn vehicle turning template software to demonstrate design vehicles properly entering and exiting the site, and utilizing the proposed loading area.

Figure 11 demonstrates a 10.2m waste collection vehicle (10.2m in length) entering, circulating and exiting the site. The vehicle forwards into the provided loading area adjacent the building, near the waste storage room. When exiting the collection area, the vehicle must make a small reversing manoeuvre to properly exit the site. During waste collection pick-up, it is expected that trained management staff would be responsible for the jockeying of bins during collection. Management staff would also ensure the safe exiting manoeuvre of the waste collection vehicle for passenger vehicles utilizing the ramp.

Figure 12 demonstrates a loading vehicle, represented by a TAC medium single-unit (MSU) vehicle, entering the site, utilizing the loading area, and exiting the site. Similar to the waste collection vehicle, a small reversing manoeuvre is necessary for the vehicle to exit the site. A management staff member / flag person is recommended to ensure the safe reversing manoeuvre when exiting the loading area.

Figure 13 demonstrates a 12.8m WB-12 fire truck entering through the main access, circulating the site, and exiting. Similar to the waste collection and loading vehicle, a reversing manoeuvre is necessary if the fire truck would be required to stop at the loading area.

Figure 14 demonstrates a 5.2m passenger vehicle accessing parking spaces at the surface lot. The vehicle is shown entering the site through the main access and turning into a random space. The vehicle is then shown to reverse out of a different parking space and exiting the site this shows both drive aisles work properly. The passenger vehicle is also shown accessing and exiting the ramp to the underground parking area.

In addition to the recommended flag person for safe vehicle circulation on-site, it is recommended that loading and waste collection activities are scheduled during off-peak hours and on separate days to reduce conflict at the loading area and within the site.

7. TRANSPORTATION DEMAND MANAGEMENT PLAN

A Transportation Demand Management (TDM) Plan is provided as part of this report in an effort to minimize parking demands, traffic congestion, improve air quality, reduce greenhouse gas emissions, and improve public health in the long-term within the City of Mississauga.

This TDM plan for the proposed office expansion, along with the City transportation policies and initiatives for the surrounding road network, will help provide the public greater choice, incentives and opportunities to choose travel modes other than single-occupant vehicles. Our proposed TDM plan for the site is outlined as follows:



Transit Services

The site is served by MiWay, operated by the City of Mississauga, which provides bus routes running along Lakeshore Road East and other roadways within Mississauga. MiWay bus route 23 directly passes by the subject site along Lakeshore Road East. There are additional MiWay routes starting at Port Credit GO and TTC routes starting at Long Branch GO connecting riders to areas throughout the City of Mississauga and beyond.

Bus Route 8, Cawthra, is a bus route mainly operating on Cawthra Road in a north-south orientation. The route connects transit riders from Port Credit GO station on the south end and City Centre Transit Terminal (Square One Shopping Centre) on the north end. The nearest bus stop is located at Cawthra Road and Atwater Avenue, approximately 750m north of the site.

Bus Route 23, Lakeshore Road, is a bus route operating on Lakeshore Road East, mainly in an east-west direction. The route connects transit riders between Long Branch GO station on the east end, passing by Port Credit GO, and Clarkson GO station on the west end. Long Branch GO station is also a major terminal for Toronto Transit Commission (TTC) transit routes, thus provides riders access to areas in the City of Toronto. The nearest bus stops for both directions are located at the intersection of Lakeshore Road East and East Avenue, directly adjacent to the site.

Table 16 – Study Area Transit Service

Transit Route	No.	Approximate Peak Service Frequency (min)			
		AM Peak	PM Peak	Off-Peak	Sat-Peak
Cawthra	8	20	20	20	60
Lakeshore Road	23	15	15	25	20

As discussed in Section 3.4, the Lakeshore Road Transportation Master Plan discusses increased transit service and dedicated transit lanes, providing further incentive for residents and visitors of the affordable housing subject site to utilize transit.

To encourage travel by transit, the minimum parking requirements have been provided on-site. Transit information packages containing route maps, schedules and other useful information should be readily available for tenants within an accessible location, such as the entrance lobby. Additionally, pre-loaded PRESTO cards can be considered to be provided to tenants so tenants may grow accustomed to travel by transit to and from the subject site.

Cycling / Walking

Sidewalks are provided along the west side of East Avenue and on both sides of Lakeshore Road East, allowing pedestrians good connectivity to the nearby amenities and transit stops from the subject site. A sidewalk is proposed along the northside of the driveway on East Avenue, connecting residents and visitors from the rear of the building to the existing sidewalks on East Avenue and Lakeshore Road East. As the Lakeview area becomes developed, an increased amount of commercial uses and other amenities would be available for residents within walking distance.

Bicycle parking is recommended to encourage cycling as a mode of travel, with a bicycle storage room provided within the building. Although the City does not have bicycle parking requirements, the City's Transportation Demand Management Strategy and Implementation Plan provides recommended minimum bike parking requirements for long-term and short-term bicycle spaces. Long-term spaces are generally storage rooms with secure access and monitoring. Short-term spaces are designated areas for bicycle parking with racks/stands designed to lock the wheel and frame of a bicycle. Table 17 provides the typical range of bicycle parking requirements recommended by the TDM plan.

Table 17 - Bicycle Parking Requirements

Land Use	Units	Bicycle Parking Requirements		Bicycle Parking Spaces	
		Short-term	Long-term	Short-term	Long-term
Residential	149	Minimum 6	0.8 per unit	6	119

As per the TDM plan, a minimum of 6 short-term bicycle parking spaces and 119 long-term bicycle parking spaces are recommended to serve the development. Based on the latest site plan, the bicycle storage rooms provide approximately 152 spaces and there are an additional 8 spaces outside.

To further incentivize cycling, the Lakeshore Road Transportation Master Plan discusses the provision of cycle tracks and improved pedestrian connections along Lakeshore Road East and the surrounding study area.

Carpool / Carshare

To help reduce travel by single-occupant automobiles, employees are encouraged to carpool. Smart Commute Mississauga, a Transportation Management Association that partners with workplace organizations to reduce traffic congestion, operates in Mississauga, Hamilton and other municipalities in the Greater Toronto Area. The service provides commute options such as transit, carpooling and cycling, which help reduce travel costs and promotes healthy transportation alternatives for commuters. Although the program would not benefit the proposed site as a whole, residents should be notified of the program to ensure they are informed of potential opportunities of alternate transportation modes through their individual workplaces.

The provision of some carshare spaces on the surface lot may be an option to consider, perhaps as part of the non-residential parking supply. Users could rent the carshare vehicles when needed, rather than owning a personal vehicle and paying for a parking space. One dedicated carshare space typically provides a parking reduction of 4 to 5 spaces.

8. CONCLUSIONS

8.1 Summary

Traffic Impact Study

- The proposal outlines plans to construct a 7-storey apartment building, containing 151 units. A total of 157 parking spaces are provided on the surface and in one level of underground parking.
- Traffic counts at the boundary road intersections were conducted during weekday AM and PM peak periods.



- A 2% growth rate was applied to the study area traffic volumes in the major commute directions at the direction of the City of Mississauga.
- Trips were generated for the site using the Institute of Transportation Engineers Trip Generation Manuals, 10th Edition.
- Trips were distributed to the study area road network, based on the existing TMCs and the location of adjacent municipalities / major travel routes and highways as well as TTS data.
- The study horizon selected was set to be five years after the build out of the site. The build out was assumed to take two years. The existing 2020 and future 2027 conditions were analyzed using Synchro traffic software.
- The capacity analysis found acceptable traffic conditions. Overall, all movements and intersections are operating, and are expected to continue to operate, at good to acceptable level of service.
- A scenario was considered with the City requested Byngmount Avenue extension connecting to East Avenue. The traffic impacts were found to be negligible and is not necessary to support the proposed development.

Parking Study

- Parking for the development is provided through one level of underground parking and surface parking, for a total parking supply of 157 spaces. 119 resident spaces and 38 visitor spaces.
- The City of Mississauga Zoning By-law 0225-2007 requires a total of 225 spaces, consisting of 195 resident and 30 visitor. Although the proposed residential parking supply is short of the By-law requirement by 68 spaces, the provided parking spaces is expected to be sufficient to support the subject site.
- The unofficial Parking Guidelines for Public and Private Non-Profit Housing, commissioned by the City of Mississauga, reviewed the parking needs for non-profit housing and recommended separate parking rates. Based on the guidelines, 80 resident parking spaces are recommended for the subject site, which is met by the proposed supply of 119 spaces.
- A review of existing affordable housing developments in Peel indicated an average resident parking rate of 0.72 parking spaces per unit, which is met by the proposed rate of 0.79 spaces per unit (119 resident spaces / 151 units).

Site Plan Review

- Based on the TAC Geometric Design Guide for Canadian Roads, the proposed driveway location located approximately 100m north of Rangeview Road, and approximately 85m south of Lakeshore Road East meets the minimum spacing and corner clearance requirements.
- A sight distance review was conducted at the proposed driveway location, demonstrating that there is sufficient sight distance looking south along East Avenue. Although the sight distance looking north is slightly short (85m provided vs. 95m required), the distance is to the signalized intersection at Lakeshore Road East. Drivers exiting the site are able to see past the lights and

would be aware of vehicles driving southbound along East Avenue. The minimum stopping sight distance of 65m is met.

- A site circulation review was completed to demonstrate design vehicles (waste collection, loading vehicles, emergency vehicles, and passenger vehicles) circulating the subject site. Larger vehicles utilizing the loading area require a reversing manoeuvre to properly exit the site and It is recommended that a flag person is present to assist the site circulation of larger vehicles when exiting the site. It is recommended that loading and waste collection operations are scheduled during off-peak hours and at separate times to ensure minimal conflict within the site.

Transportation Demand Management

- The subject site is well serviced by transit, and with the future dedicated transitway along Lakeshore Road East, transit use is expected to be frequently used by residents and visitors of the site.
- Pedestrian connections are proposed to connect residents and visitors to the existing sidewalks along East Avenue and Lakeshore Road East, providing access to the surrounding amenities and nearby transit stops.
- The City's Transportation Demand Management Strategy and Implementation Plan provides recommendations for minimum bicycle parking requirements. Based on the TDM plan, the subject site is recommended to provide 6 short-term bike spaces and 119 long-term spaces. A bicycle storage room is provided in the building, providing a total of 152 bicycle spaces.
- The Lakeshore Road Transportation Master Plan recommends future dedicated transit lanes and cycle tracks along Lakeshore Road East, further incentivizing alternate modes of travel.
- Residents should be provided information on programs, such as Smart Commute Mississauga, that provide information on alternative modes of travel to get to and from their destinations. Transit route maps are recommended to be provided at an accessible location, such as the entrance lobby.

8.2 Conclusion

To conclude, the proposed development is expected to cause negligible impact to the surrounding roadways. The Byngmount Avenue extension is not necessary to support the subject site, with the one driveway connection on East Avenue expected to be sufficient for the site traffic. Although the parking supply is short of the City's Zoning By-law, the unofficial Parking Guidelines for Public and Private Non-Profit Housing provide parking requirements that better reflect the parking needs of the subject site. A review of existing Peel Housing Corporation buildings was completed, demonstrating that the proposed parking supply would be sufficient in supporting the proposed land uses. The Lakeshore Road Transportation Master Plan, commissioned by the City of Mississauga, discusses roadway improvements along Lakeshore Road East to promote non-auto modes of travel for residents and visitors in the area.



Transportation Study
Proposed Residential Development
958-960 East Avenue, Mississauga, ON

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Anil Seegobin".

Anil Seegobin, P.Eng.
Partner, Engineer

Trans-Plan Transportation Inc.
Transportation Consultants

A handwritten signature in black ink, appearing to read "Jeffrey Gorman".

Jeffrey Gorman
Traffic Assistant

Trans-Plan Transportation Inc.
Transportation Consultants

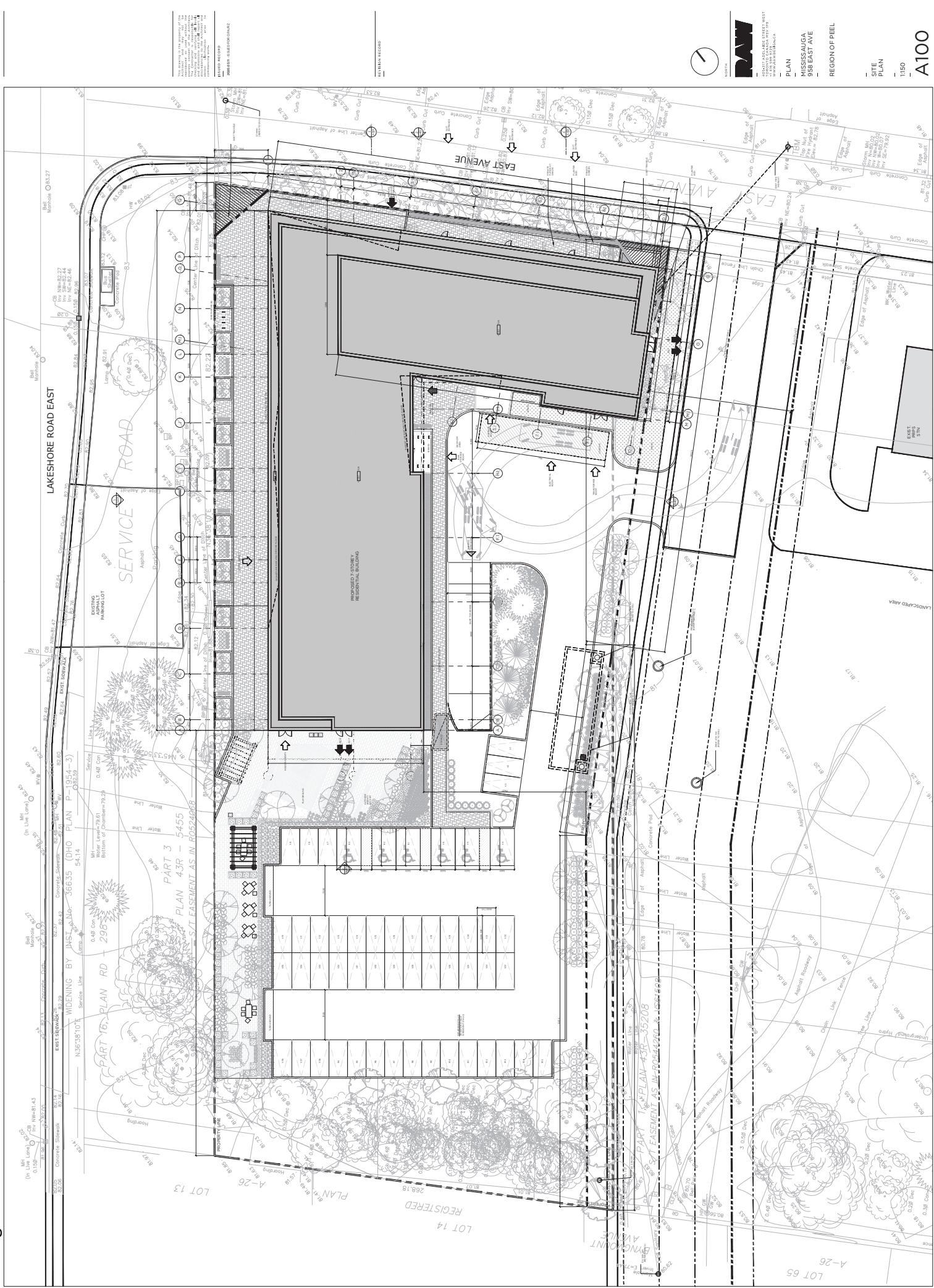


Figure 1 – Site Location



Source: Google Maps

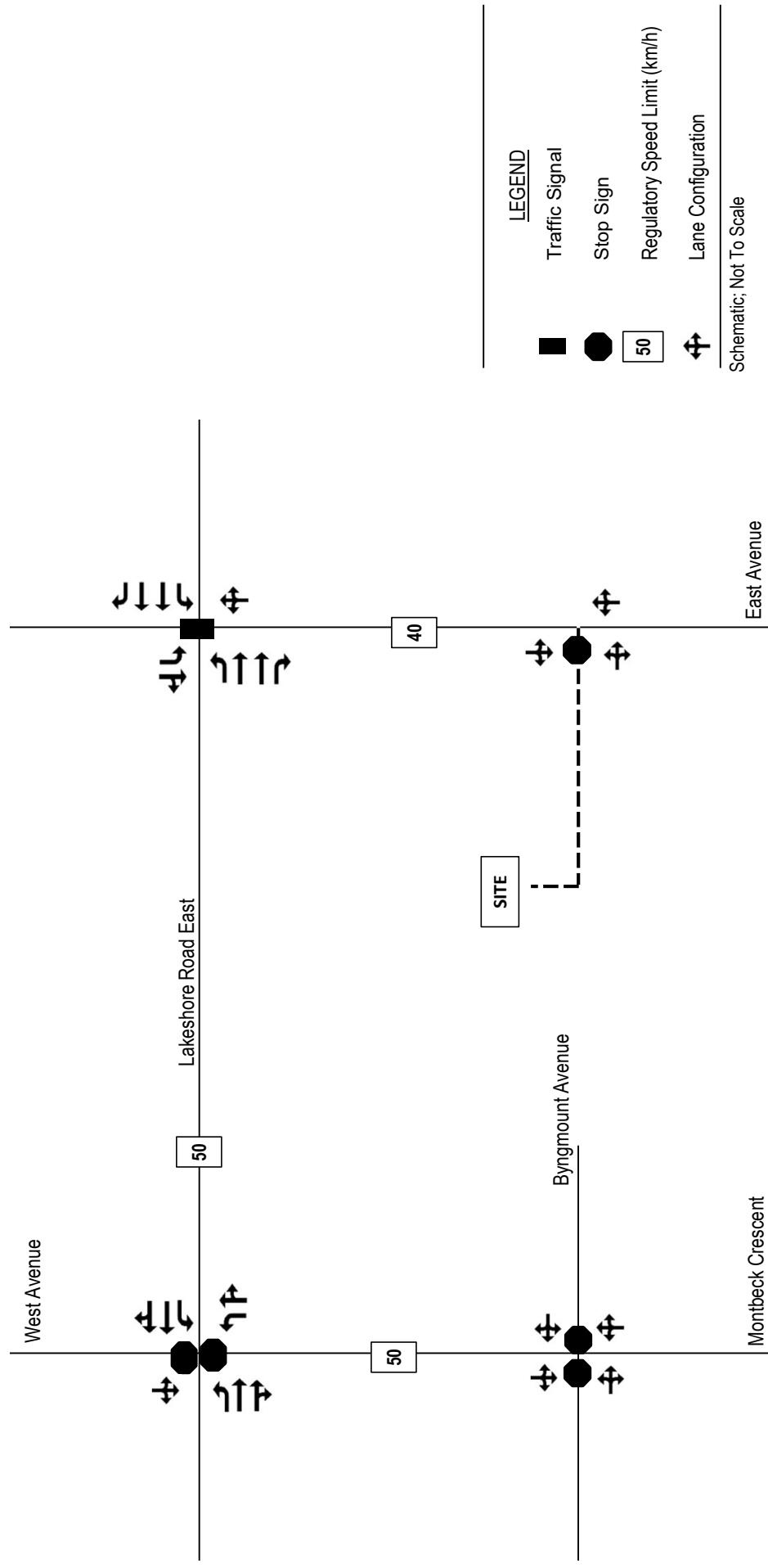
Figure 2 - Site Plan



TRAFFIC IMPACT STUDY

Proposed Residential Development
 958-960 East Avenue Mississauga, ON

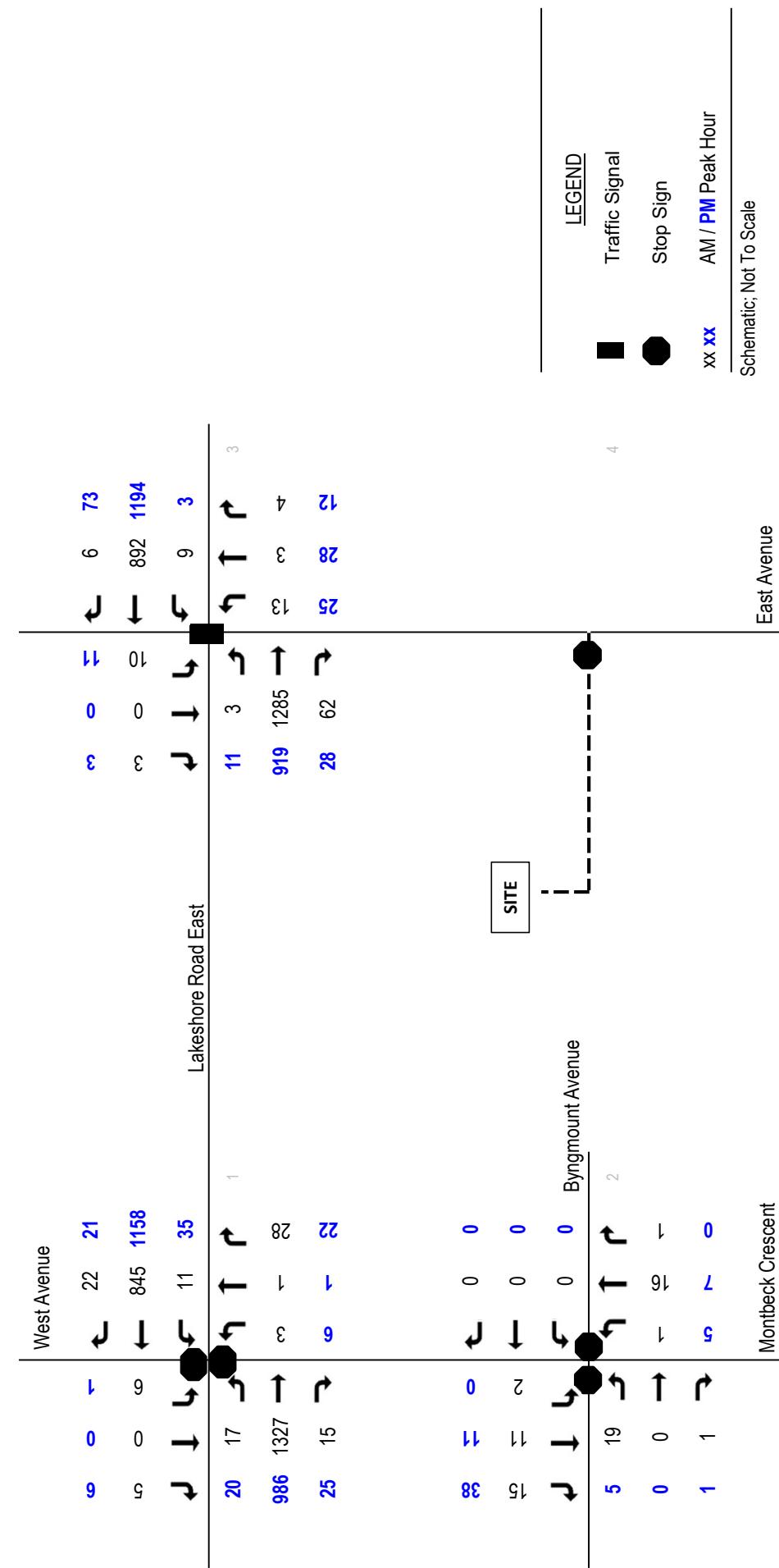
Figure 3 - Existing Study Area Roadway Characteristics



TRAFFIC IMPACT STUDY

Proposed Residential Development
958-960 East Avenue Mississauga, ON

Figure 4 - Existing Traffic Volumes, Weekday AM & PM Peak Hours

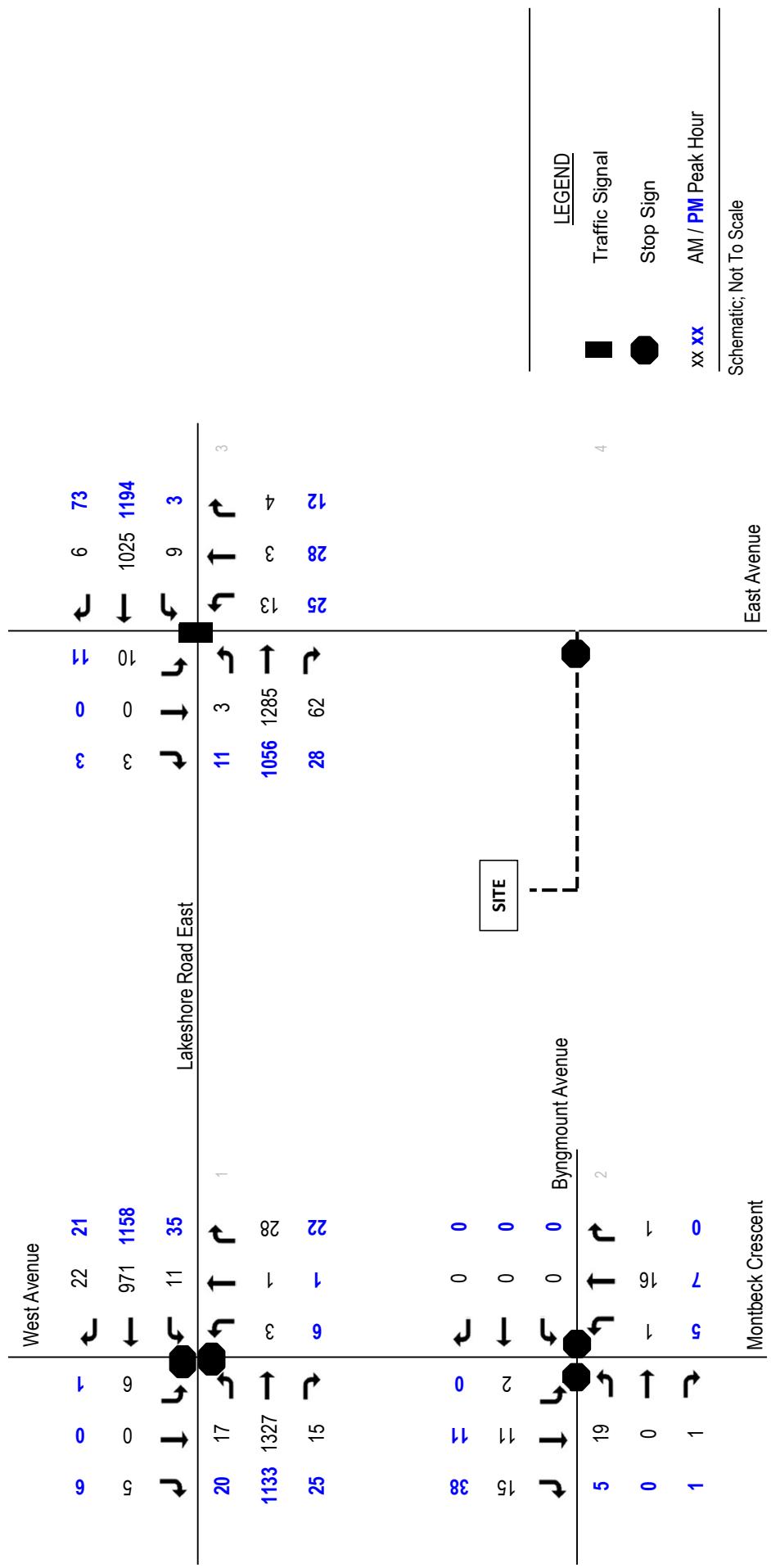


TRAFFIC IMPACT STUDY

Proposed Residential Development
958-960 East Avenue Mississauga, ON



Figure 5 - Background Traffic Volumes, Weekday AM & PM Peak Hours

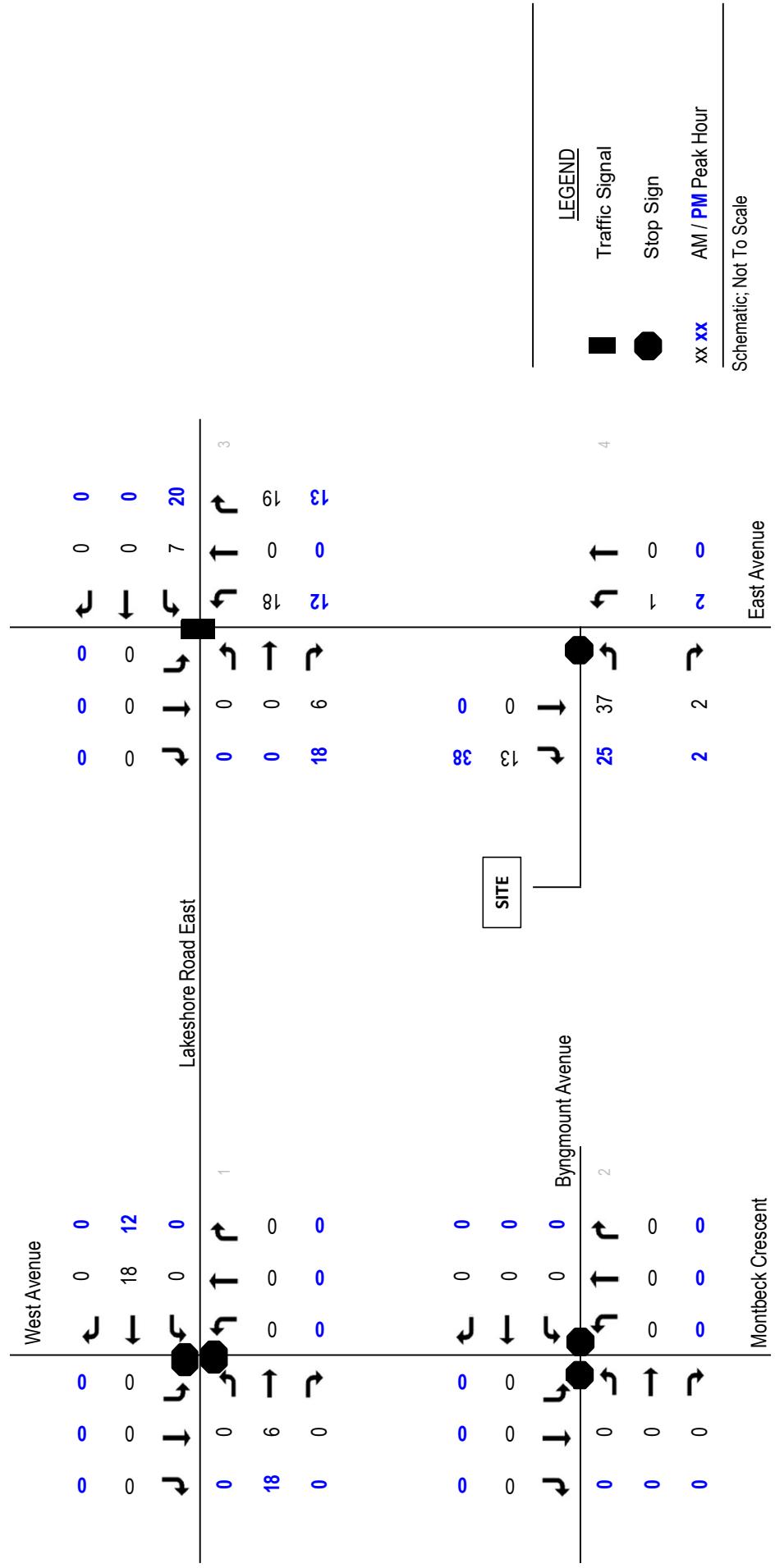


TRAFFIC IMPACT STUDY

Proposed Residential Development
958-960 East Avenue Mississauga, ON



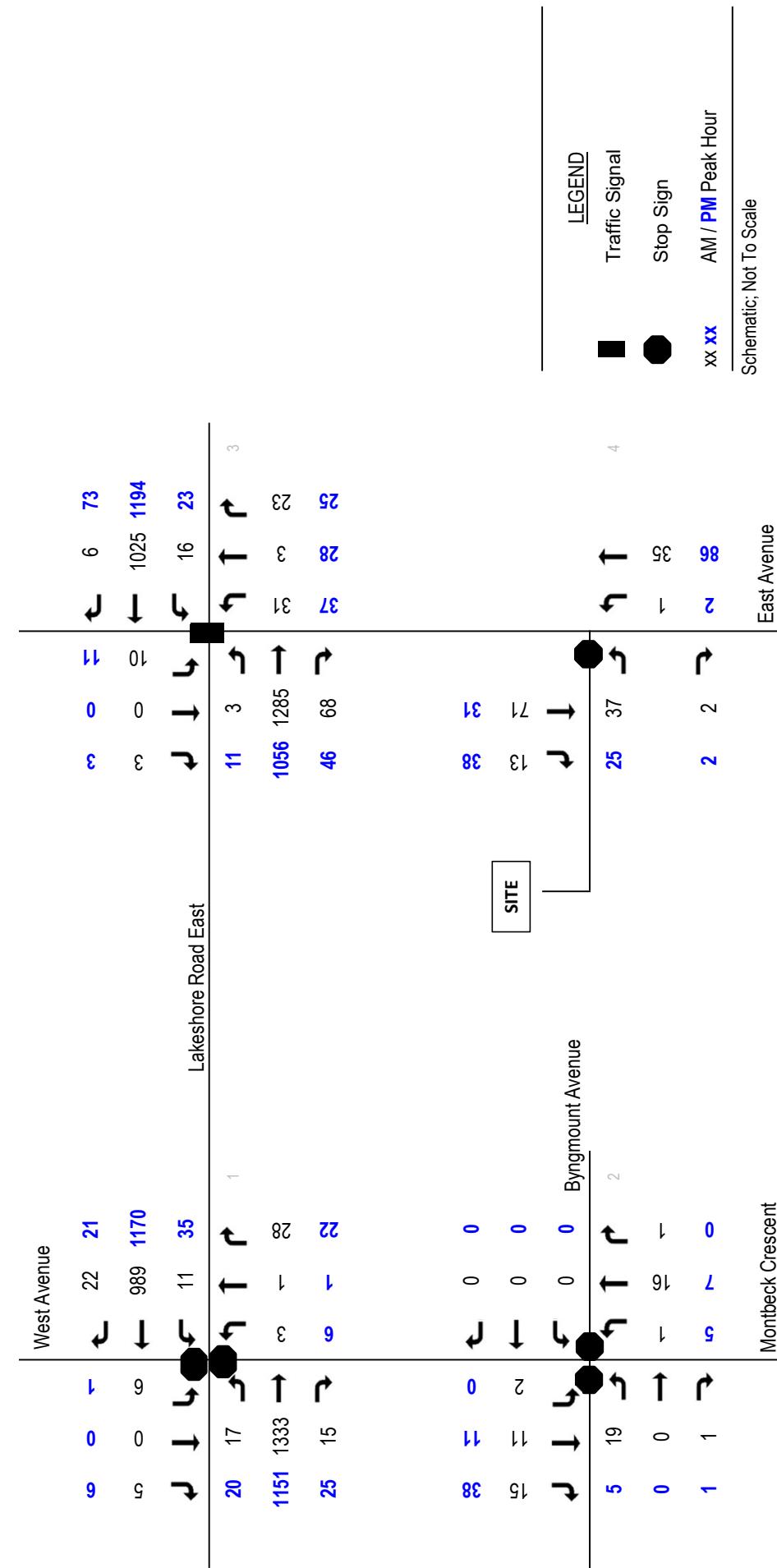
Figure 6 - Site Traffic Assignment, Weekday AM & PM Peak Hours



TRAFFIC IMPACT STUDY

Proposed Residential Development
958-960 East Avenue Mississauga, ON

Figure 7 - Total Traffic Volumes, Weekday AM & PM Peak Hours

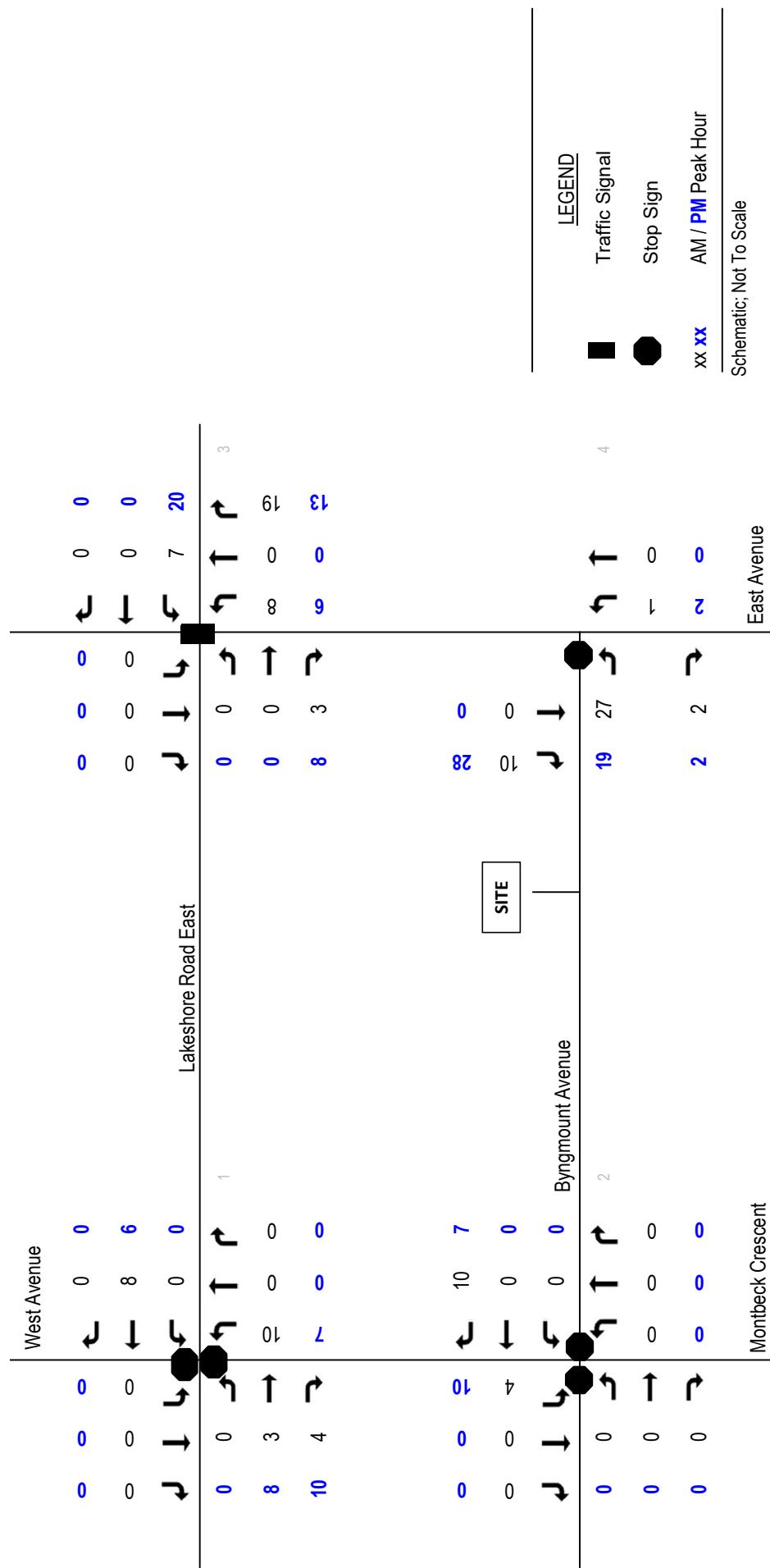


TRAFFIC IMPACT STUDY

Proposed Residential Development
958-960 East Avenue Mississauga, ON



Figure 8 - Site Traffic Assignment, Weekday AM & PM Peak Hours, Byngmount Extension

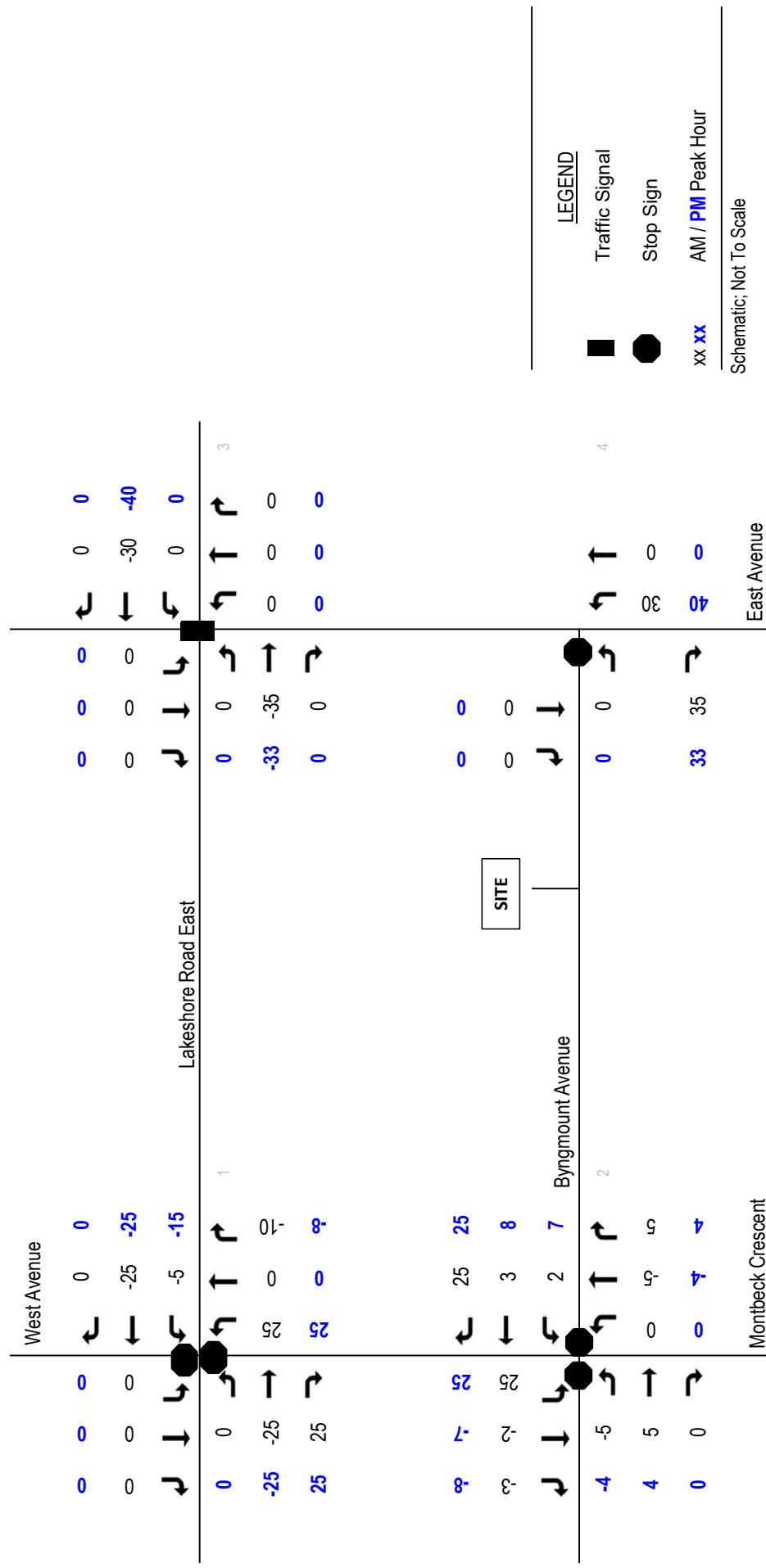


TRAFFIC IMPACT STUDY

Proposed Residential Development
958-960 East Avenue Mississauga, ON



Figure 9 - Redistribution of Traffic, Weekday AM & PM Peak Hours, Byngmount Extension

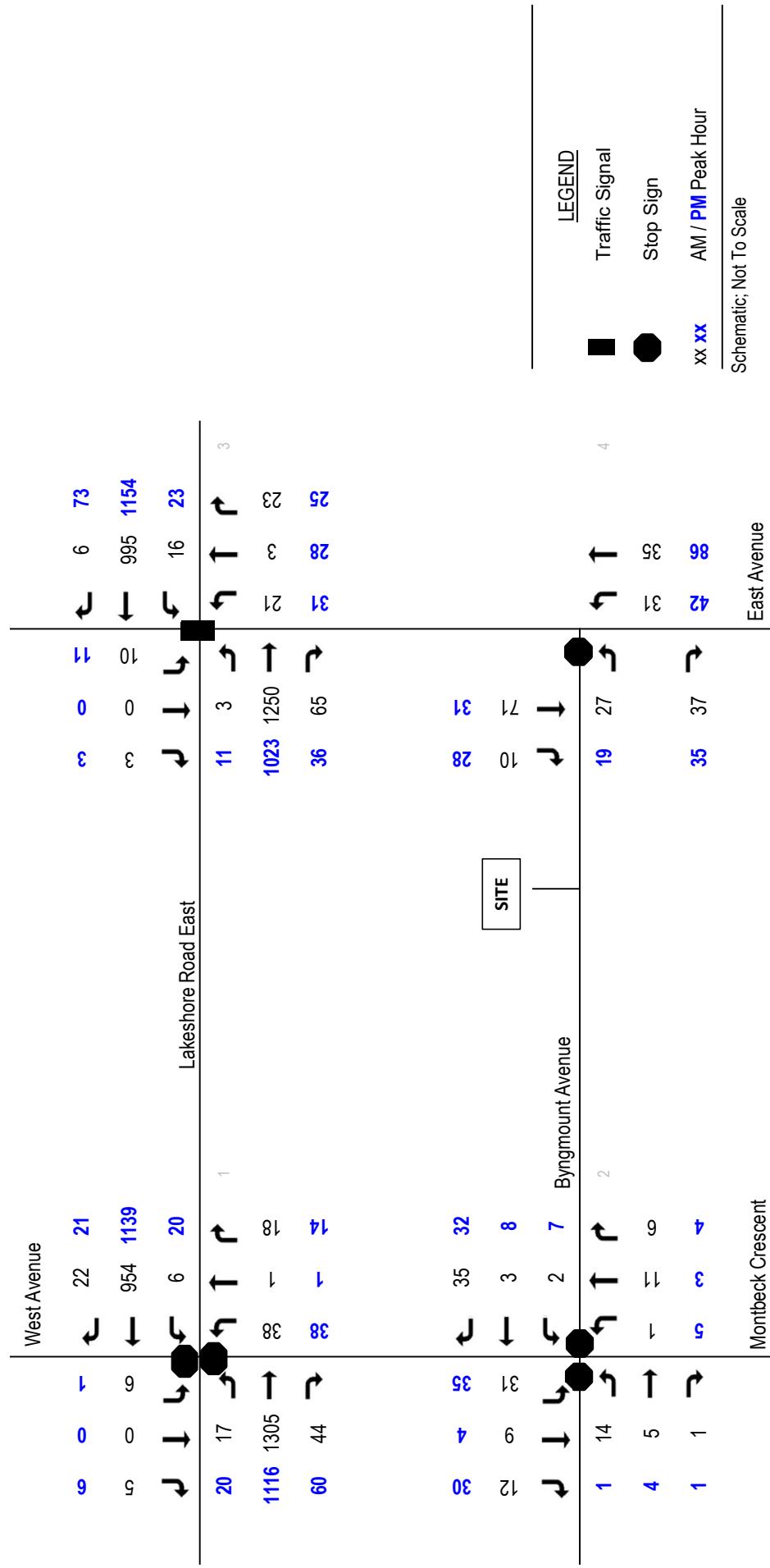


TRAFFIC IMPACT STUDY

Proposed Residential Development
958-960 East Avenue Mississauga, ON



Figure 10 - Total Traffic Volumes, Weekday AM & PM Peak Hours, Byngmount Extension



Exiting Loading Area and Site



Entering Site and Loading Area

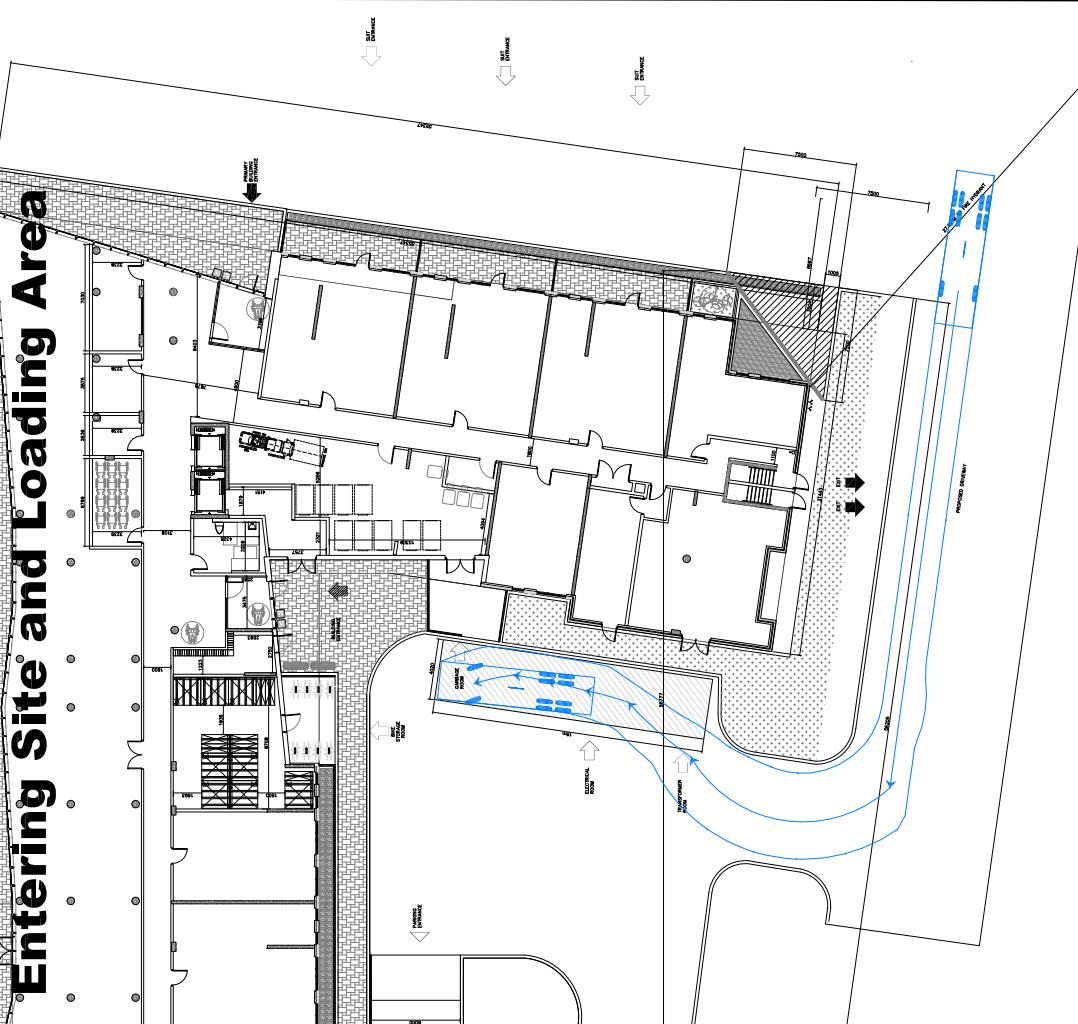
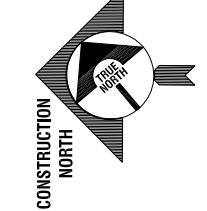
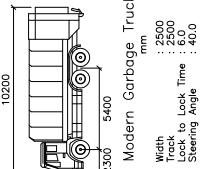


Figure 11 - Waste Collection Vehicle - Circulating Site and Loading Area

PROPOSED 7-STORY RESIDENTIAL DEVELOPMENT
958 - 960 EAST AVENUE
MISSISSAUGA, ON

Source: Site Plan by Raw Design, March 2020



TRANS-PLAN
TM
transportation engineering consultants
785 Dundas Street West
Toronto, Ontario, M6J 1V2
tel: (647) 331-7383
website: www.trans-plan.com

SCALE: 1:500 UNITS: mm

Exiting Loading Area and Site



Entering Site and Loading Area

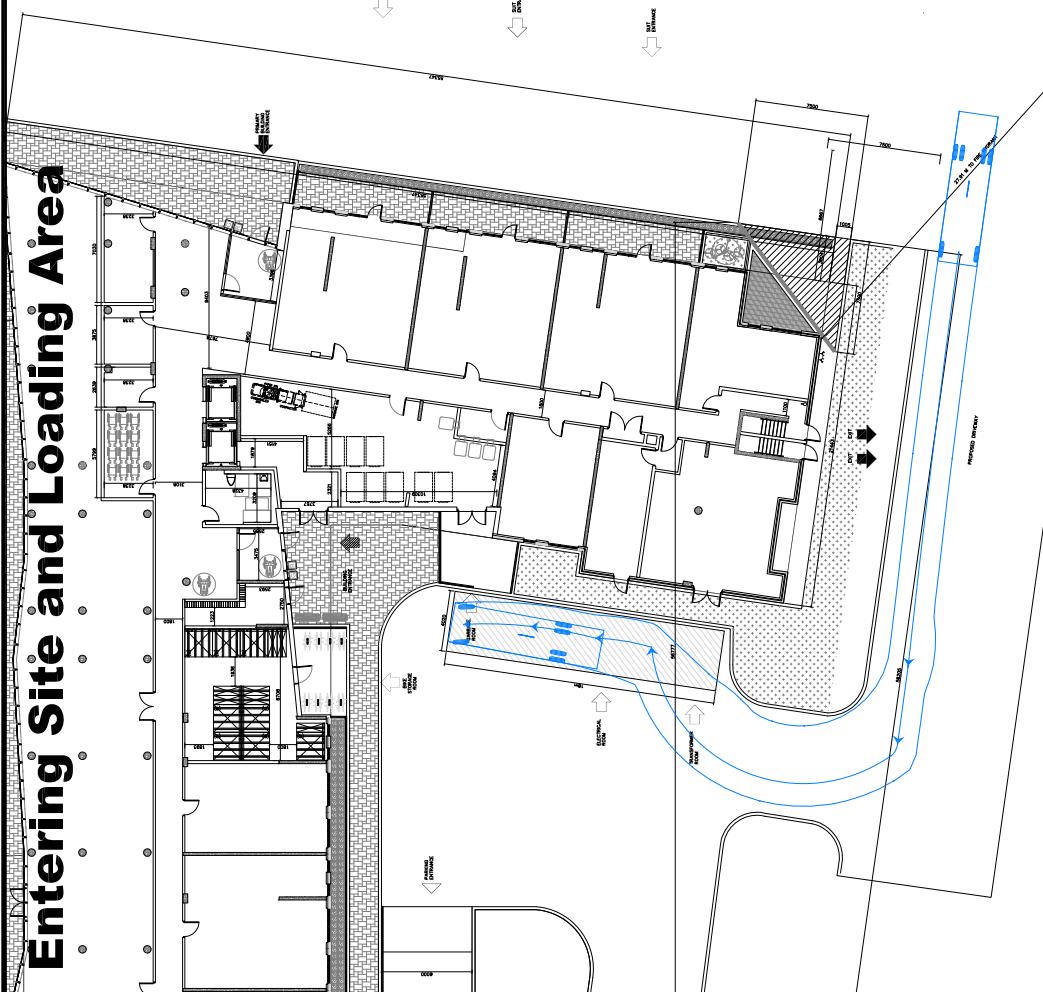
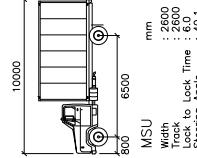


Figure 12 - Medium Single-Unit (Loading) Vehicle - Circulating Site and Loading Area

PROPOSED 7-STORY RESIDENTIAL DEVELOPMENT
958 - 960 EAST AVENUE
MISSISSAUGA, ON

Source: Site Plan by Raw Design, March 2020

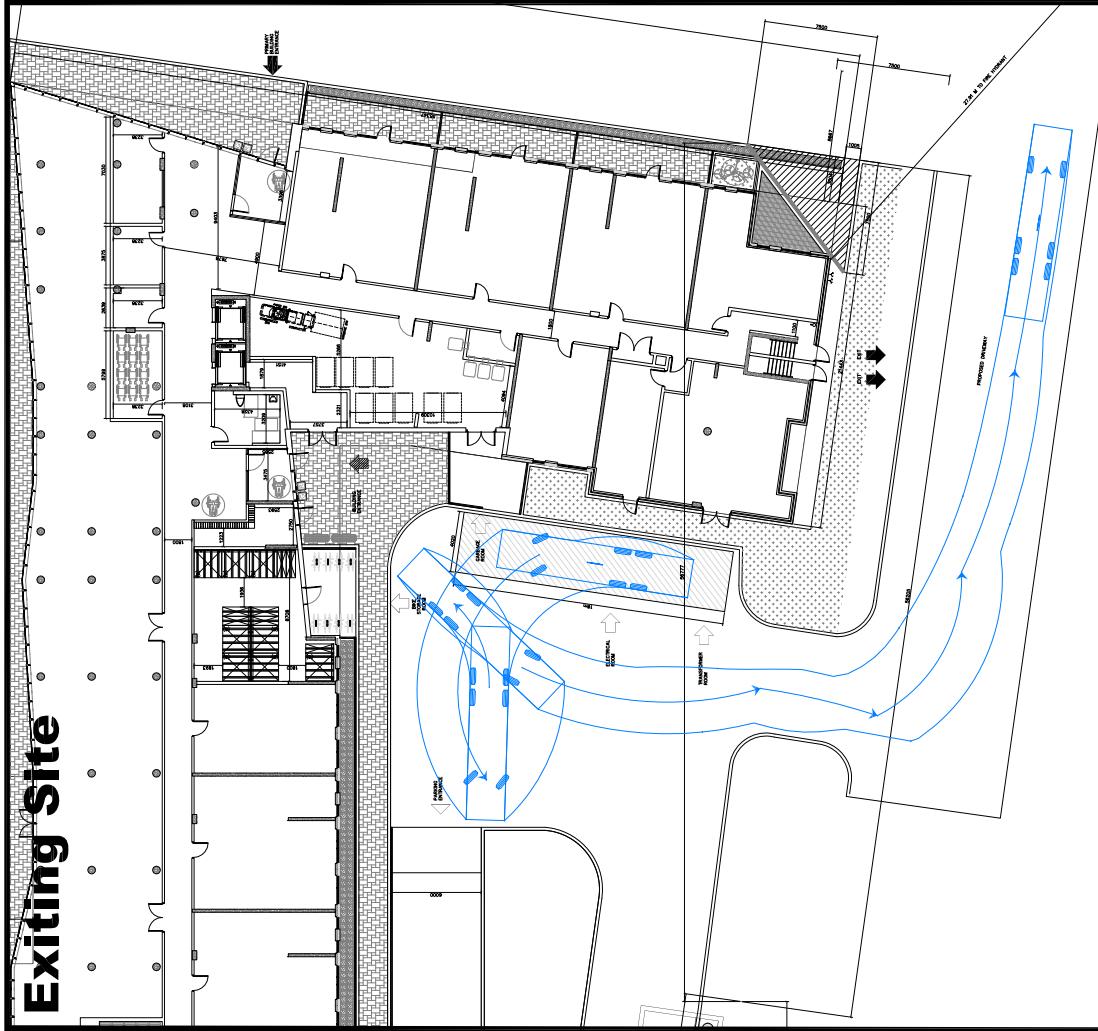


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transportation engineering consultants

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website: www.trans-plan.com

SCALE: 1:500 UNITS: mm

Exiting Site



Entering Site

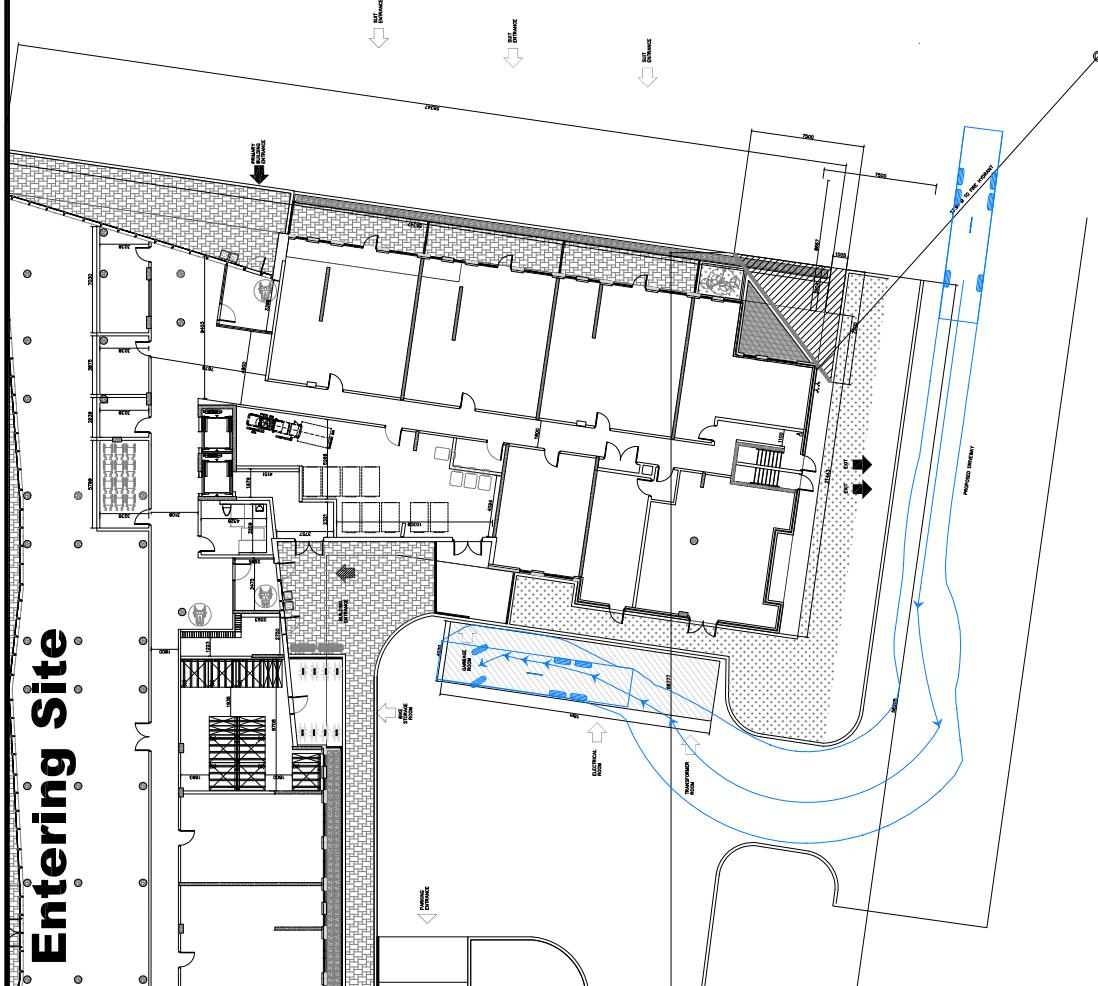
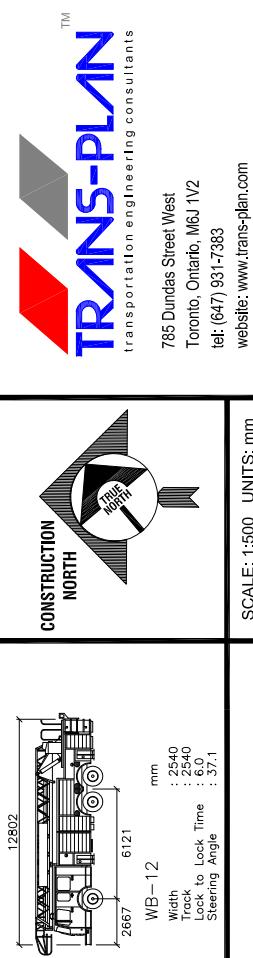
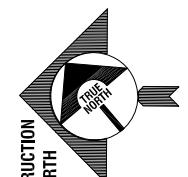


Figure 13 - Fire Truck - Circulating Site

PROPOSED 7-STORY RESIDENTIAL DEVELOPMENT
958 - 960 EAST AVENUE
MISSISSAUGA, ON

Source: Site Plan by Raw Design, March 2020





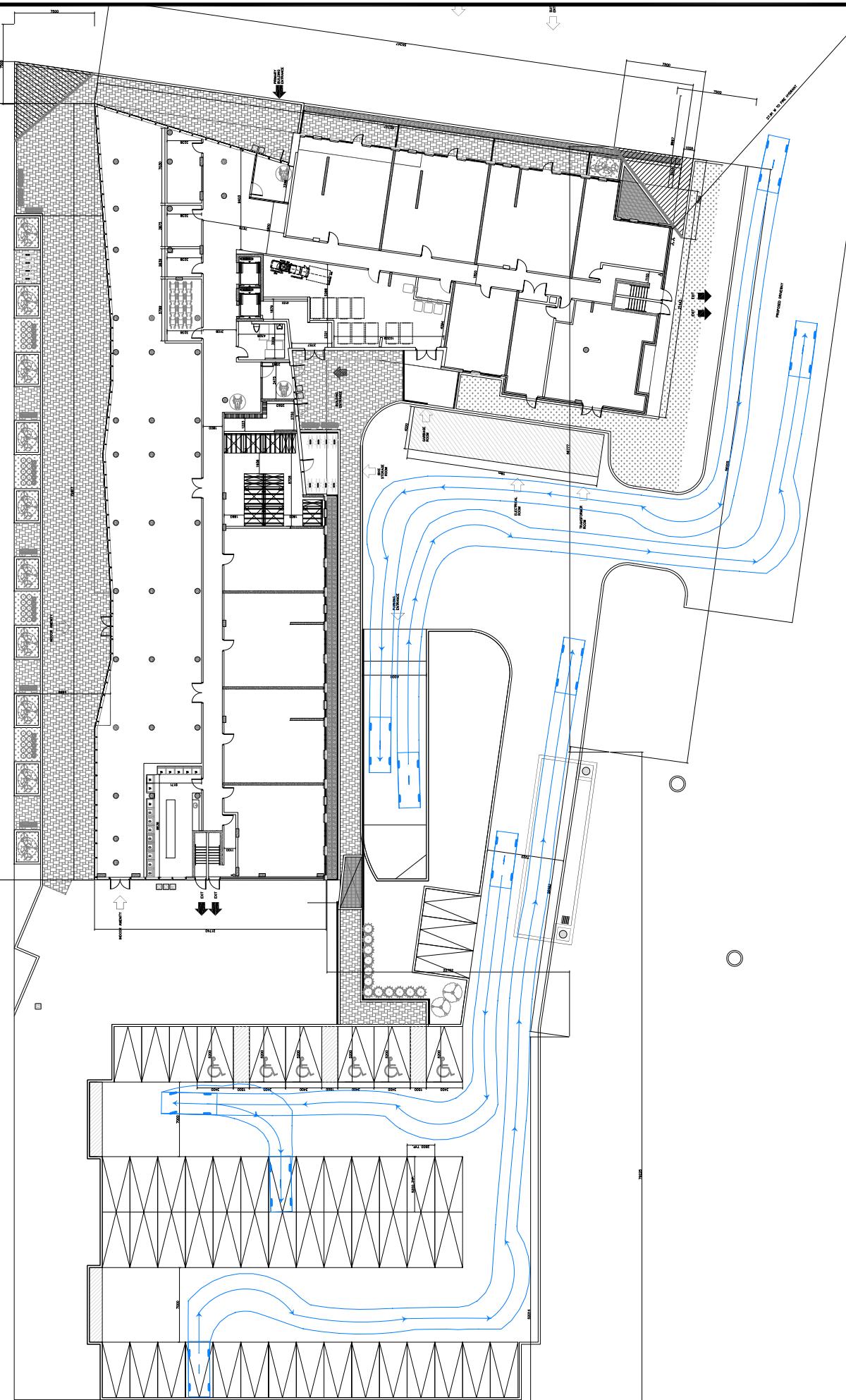
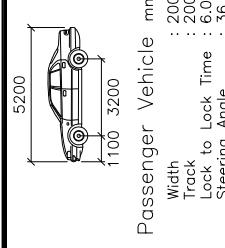
CONSTRUCTION
NORTH

SCALE: 1:500 UNITS: mm

Figure 14 - Passenger Vehicle - Circulating Site

PROPOSED 7-STORY RESIDENTIAL DEVELOPMENT
958 - 960 EAST AVENUE
MISSISSAUGA, ON

Source: Site Plan by Raw Design, March 2020



Appendices

- Appendix A – TMC Counts
- Appendix B – TTS Data Sheets
- Appendix C – Synchro Data Sheets
- Appendix D – LOS Definitions
- Appendix E – Gap Study Surveys
- Appendix F – City of Mississauga Parking Excerpts
- Appendix G – Driver Sight Line Review



APPENDIX A

Turning Movement Counts & Signal Timing Plans

Trans-Plan Transportation Inc.

Site ID Code:
 Intersection Location:
 Mississauga, Ontario
 Municipality:
 Count Date:
 Wednesday, November 13, 2019
 Weather and Temperature:
 Clear, -4 degrees
 Surveyor:
 TP

Lakeshore Road East & East Avenue
 Mississauga, Ontario
 Wednesday, November 13, 2019
 Clear, -4 degrees
 TP

AM	NORTH APPROACH						EAST APPROACH						SOUTH APPROACH						WEST APPROACH						CYCLISTS						Total	Total	Grand Total										
	CAR			TRUCKS			CYCLISTS			CAR			TRUCKS			CYCLISTS			CAR			TRUCKS			CYCLISTS			Peds	Total	Total	Grand Total												
	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	Peds	Total	Total	Grand Total												
7:00	1	0	0	0	0	0	0	1	2	77	0	0	5	0	0	0	0	84	2	0	0	0	0	0	0	0	0	2	1	191	14	0	0	1	213	301							
7:15	0	0	0	0	0	0	0	0	0	2	1	86	0	0	7	0	0	0	0	94	2	0	5	0	0	0	0	0	0	0	7	0	268	21	0	8	1	0	0	0	0	298	401
7:30	0	0	0	0	0	0	0	0	1	3	115	0	0	4	0	0	0	0	122	1	0	2	1	0	1	0	0	0	1	6	0	276	15	0	9	0	0	0	0	0	302	431	
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PM																																											
16:00	0	0	2	0	0	0	0	0	4	6	2	231	11	0	8	0	0	0	0	252	28	3	6	0	0	1	0	0	0	1	39	2	150	6	0	4	0	0	0	0	0	162	459
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17:30	2	0	1	0	0	0	0	0	3	1	287	17	0	1	0	0	0	0	306	2	0	0	0	0	0	0	0	0	2	193	11	0	3	0	0	0	0	0	0	521	485		
17:45	1	0	2	0	0	0	0	0	3	6	0	279	16	0	5	0	0	0	0	300	1	4	0	0	0	0	0	0	5	3	160	7	0	3	1	0	0	0	0	174	485		
18:00	0	0	2	0	0	0	0	0	1	3	0	271	20	0	1	0	0	0	0	292	5	3	1	0	0	0	0	0	9	1	182	8	0	3	0	0	0	0	0	194	498		
18:15	1	0	2	0	0	0	0	0	3	6	1	290	25	0	3	0	0	0	0	319	3	2	1	0	0	0	0	0	6	0	147	1	0	4	0	0	0	0	0	153	484		



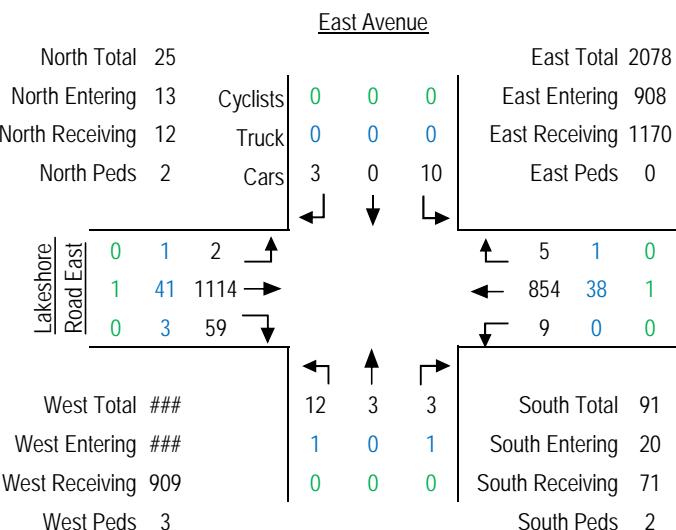
Turning Movement Count Diagram

Intersection: Lakeshore Road East & East Avenue

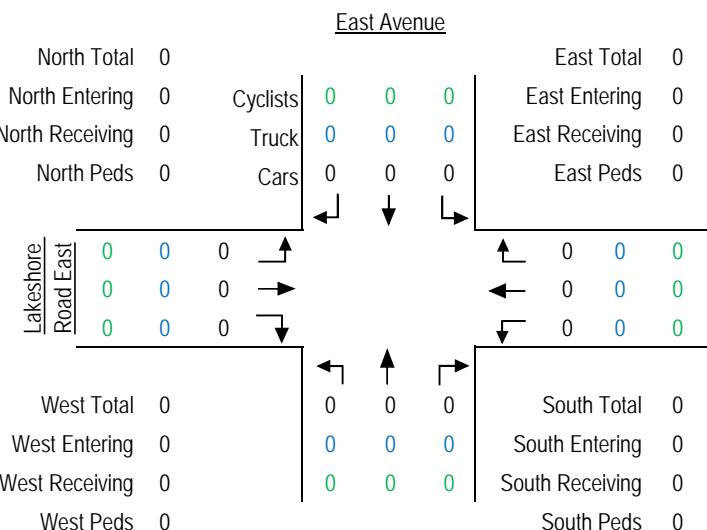
Municipality: Mississauga, Ontario

Date: Wednesday, November 13, 2019

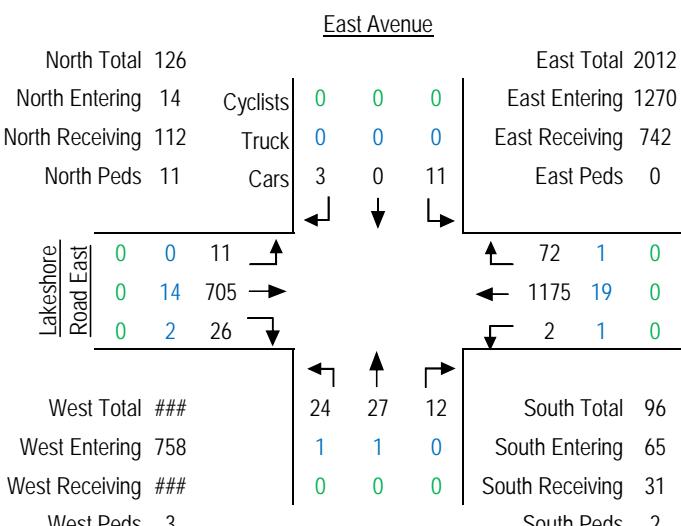
AM Peak Hour: 8:00 to 9:00



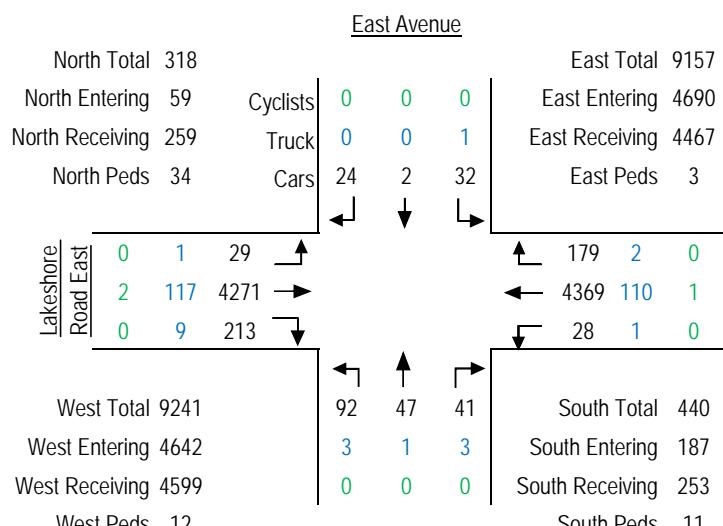
MD Peak Hour: - to -



PM Peak Hour: 16:30 to 17:30



Total 5-Hour Count



Trans-Plan Transportation Inc.

Site ID Code:

Intersection Location:

Municipality

Count Date:

Call Date:

Weather and Temperature:

Surveyor:

Lakeshore Road East & Montbeck Crescent
Mississauga, Ontario
Wednesday, November 20, 2019
Clear, 8 degrees
TP

AM	NORTH APPROACH												SOUTH APPROACH												WEST APPROACH																						
	CAR TRUCKS				CYCLISTS				CAR TRUCKS				CYCLISTS				CAR TRUCKS				CYCLISTS				CAR TRUCKS				CYCLISTS				CAR TRUCKS														
	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R	L	T	R											
7:00	7	0	1	0	0	0	0	0	0	2	10	0	77	0	0	6	0	0	0	0	0	83	3	0	5	0	1	0	0	5	1	225	0	0	5	1	233	338									
7:15	1	0	0	0	0	0	0	0	0	5	6	3	105	0	0	4	0	0	0	0	0	112	3	0	5	1	0	0	0	0	0	0	295	3	0	8	1	308	435								
7:30	0	0	0	0	0	0	0	0	0	2	2	3	135	2	0	5	0	0	0	0	0	145	1	0	7	0	0	0	0	0	0	0	0	2	10	1	309	1	0	7	0	318	475				
7:45	3	0	2	0	0	0	0	0	0	0	1	6	2	138	3	0	11	0	0	0	0	0	154	2	0	6	0	0	0	0	0	0	0	336	1	0	6	0	345	513							
8:00	1	0	0	0	0	0	0	0	0	0	4	5	2	192	5	0	8	0	0	0	0	0	208	0	0	5	0	0	0	0	0	0	0	329	5	0	6	0	343	565							
8:15	0	1	0	0	0	0	0	0	0	0	1	3	2	216	8	1	12	0	0	0	0	0	239	0	0	8	0	0	0	0	0	0	0	302	1	0	15	0	324	574							
8:30	1	0	2	0	0	0	0	0	0	0	5	8	4	160	6	0	8	0	0	0	0	0	178	1	1	6	0	0	0	0	0	0	0	320	8	0	13	0	349	543							
8:45	1	0	2	0	0	0	0	0	0	3	6	4	163	1	0	13	0	0	0	0	0	181	4	2	6	0	1	0	0	0	0	0	13	2	243	2	0	19	0	266	466						
9:00	1	0	1	0	0	0	0	0	0	7	9	5	141	0	0	9	0	0	0	0	0	155	1	2	7	0	0	0	0	0	0	0	10	1	221	3	0	9	0	234	408						
9:15	0	0	1	0	0	0	0	0	0	2	3	5	104	1	0	7	0	0	2	0	0	119	3	0	5	0	0	0	0	0	0	0	193	7	0	9	0	210	340								
PM												PM												PM												PM											
16:00	1	0	1	0	0	0	0	0	0	5	7	8	264	8	0	9	0	0	0	0	0	289	1	0	5	0	0	0	0	0	0	0	6	2	191	5	0	5	0	203	505						
16:15	0	0	2	0	0	0	0	0	0	2	12	287	5	1	5	0	0	0	0	0	310	1	0	5	0	0	0	0	0	0	0	1	7	2	188	6	0	3	0	199	518						
16:30	0	0	1	0	0	0	0	0	0	2	3	10	295	4	0	8	0	0	0	0	0	317	0	0	4	0	1	0	0	0	0	0	1	6	3	194	8	0	4	0	209	535					
16:45	0	0	2	0	0	0	0	0	0	5	7	12	281	2	0	4	0	0	0	0	0	299	0	2	8	0	0	0	0	0	0	0	5	212	8	0	16	0	230	552							
17:00	2	0	3	0	0	0	0	0	0	5	11	244	7	0	5	0	0	0	0	0	267	2	0	4	0	0	0	0	0	0	0	6	9	202	10	0	8	0	231	509							
17:15	0	1	0	0	0	0	0	0	0	2	3	6	268	5	1	0	0	0	0	0	280	2	0	7	0	0	0	0	0	0	0	3	254	6	0	4	0	267	560								
17:30	1	0	1	0	0	0	0	0	0	2	4	10	276	5	0	3	0	0	0	0	0	294	0	0	5	0	0	0	0	0	0	0	1	6	8	230	10	0	2	0	250	554					
17:45	0	0	1	0	0	0	0	0	0	3	4	8	248	2	0	3	0	0	0	0	0	261	3	1	3	0	0	0	0	0	0	0	2	231	6	1	8	0	250	524							
18:00	0	0	3	0	0	0	0	0	0	5	8	11	298	9	0	1	0	0	0	0	0	319	1	0	7	0	0	0	0	0	0	0	4	12	6	253	3	0	4	0	267	606					
18:15	0	0	1	0	0	0	0	0	0	5	6	10	254	4	0	3	0	0	0	0	0	272	1	0	5	0	0	0	0	0	0	0	4	0	10	1	190	3	0	4	0	199	487				



Turning Movement Count Diagram

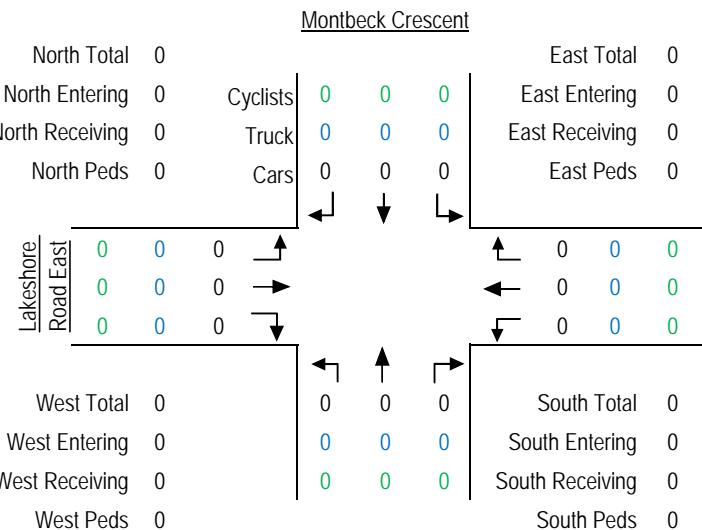
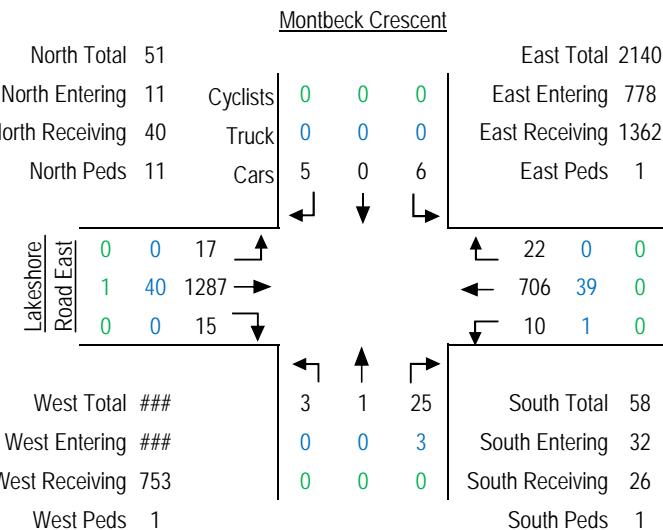
Intersection: Lakeshore Road East & Montbeck Crescent

Municipality: Mississauga, Ontario

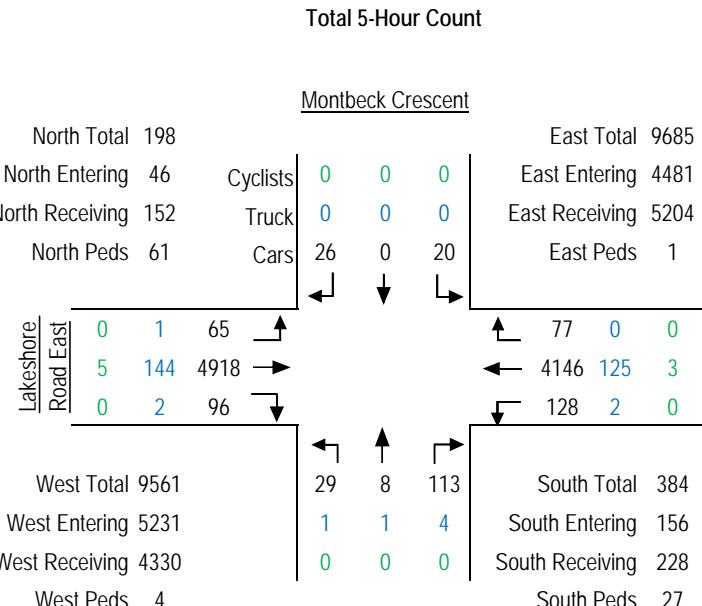
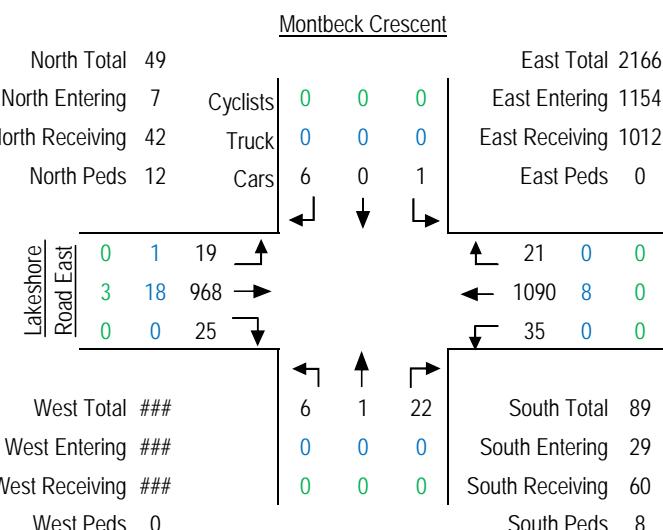
Date: Wednesday, November 20, 2019

AM Peak Hour: 7:45 to 8:45

MD Peak Hour: - to -



PM Peak Hour: 17:15 to 18:15



Trans-Plan Transportation Inc.

Site ID Code:

Intersection Location:

Municipality

Count Date:

卷之三

Weather and Empera

Surveyor:

Montbeck Crescent & Byngmount Avenue
Mississauga, Ontario
Wednesday, November 13, 2019
Clear, -4 degrees
TP



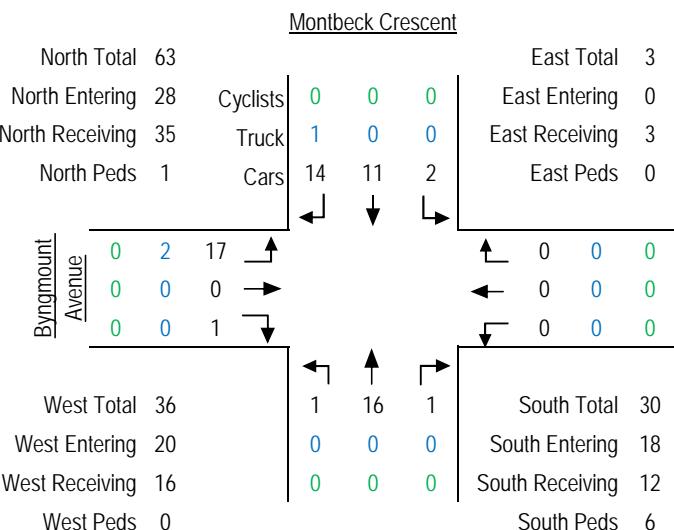
Turning Movement Count Diagram

Intersection: Montbeck Crescent & Byngmount Avenue

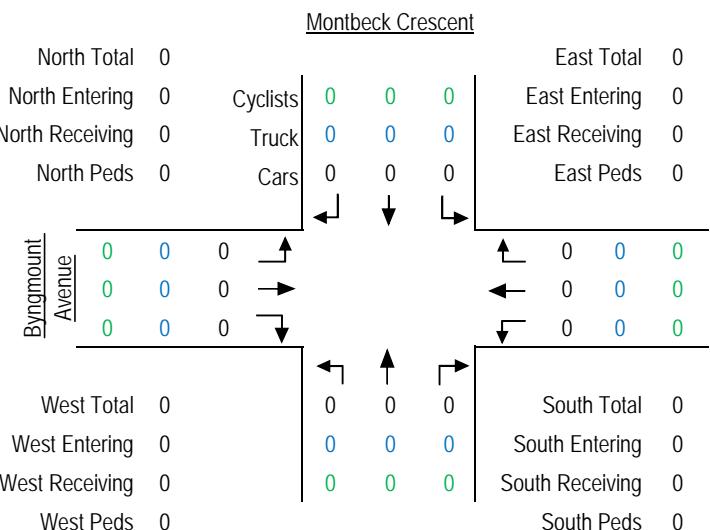
Municipality: Mississauga, Ontario

Date: Wednesday, November 13, 2019

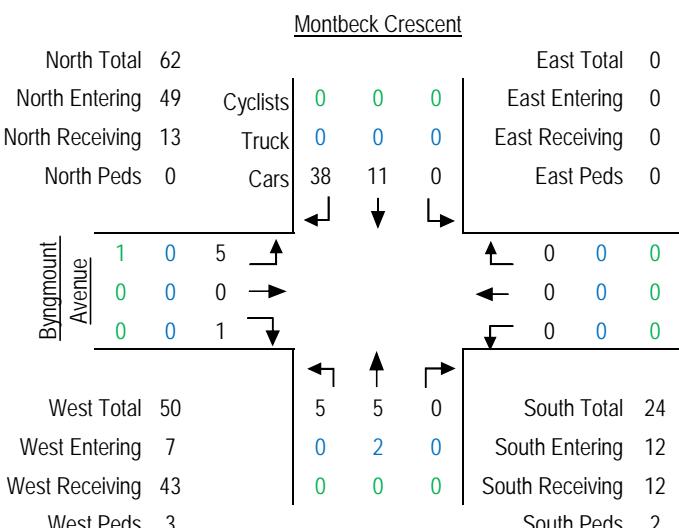
AM Peak Hour: 8:00 to 9:00



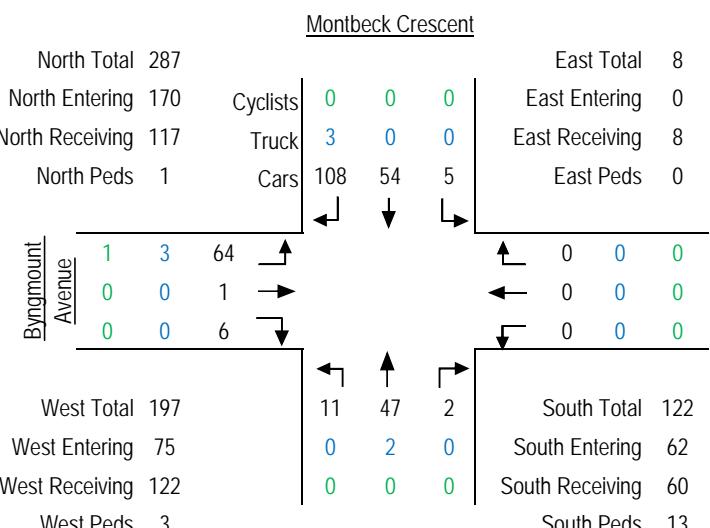
MD Peak Hour: - to -



PM Peak Hour: 16:00 to 17:00



Total 5-Hour Count



Trans-Plan Transportation Inc.

Site ID Code:

Intersection Location:

Municipality:

Count Date:

Weather and Temperature:

Wealth and Welfare.

East Avenue & Rangeview Road
Mississauga, Ontario
Wednesday, November 20, 2019
Clear, 8 degrees



Turning Movement Count Diagram

Intersection: East Avenue & Rangeview Road

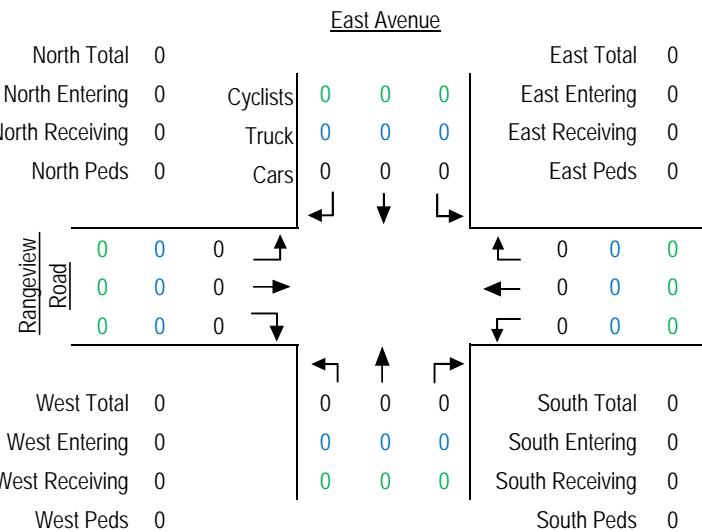
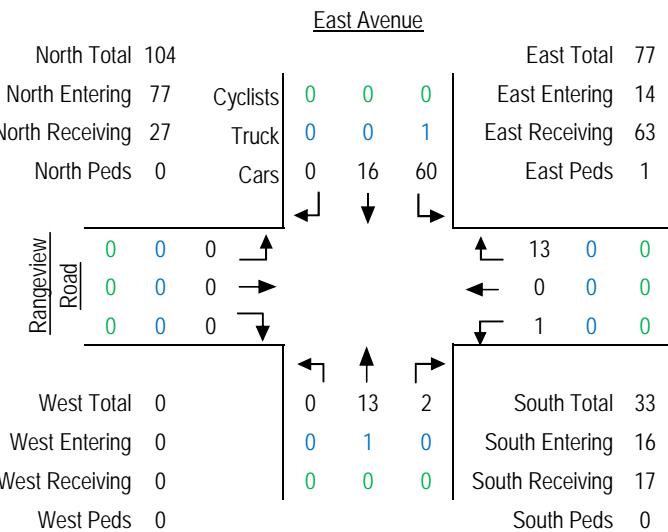
Municipality: Mississauga, Ontario

Intersection ID:

Date: Wednesday, November 20, 2019

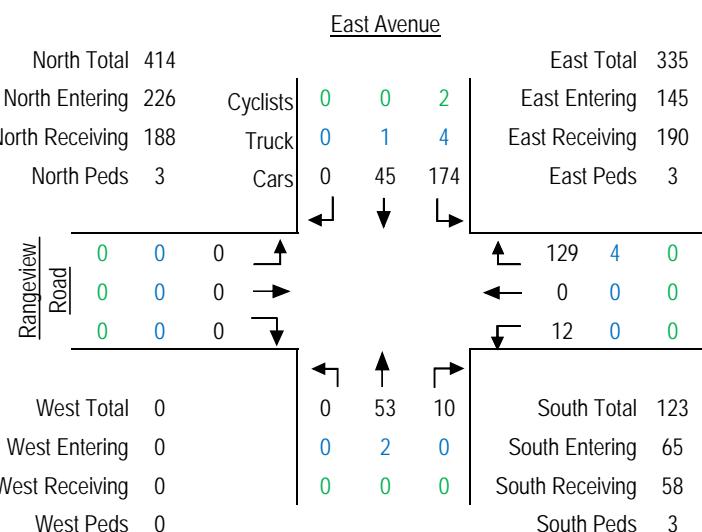
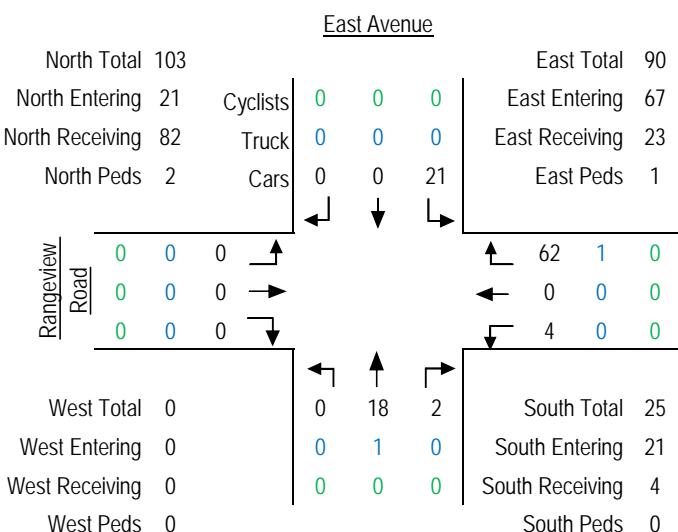
AM Peak Hour: 7:45 to 8:45

MD Peak Hour: - to -



PM Peak Hour: 16:00 to 17:00

Total 5-Hour Count



Signal Timing Report

Runtime: 2019-11-28 11:37:39

Device: 0102

Region:		Mississauga		Signal ID:		0102		Location:		LAKESHORE ROAD E at East Avenue			
Phase	Units	1	2	3	4	5	6	7	8				
Walk	Sec	0	8	0	14	0	0	0	0				
Ped Clear	Sec	0	10	0	21	0	0	0	0				
Min Green	Sec	0	8	0	8	0	0	0	0				
Passage	Sec	0.0	3.0	0.0	4.0	0.0	0.0	0.0	0.0				
Maximum 1	Sec	0	40	0	20	0	0	0	0				
Maximum 2	Sec	0	40	0	20	0	0	0	0				
Yellow Change	Sec	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0				
Red Clearance	Sec	0.0	2.0	0.0	3.5	0.0	0.0	0.0	0.0				
Red Revert	Sec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Added Initial	Sec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Max Initial	Sec	0	0	0	0	0	0	0	0				
Time Before	Sec	0	0	0	0	0	0	0	0				
Cars Before	Veh	0	0	0	0	0	0	0	0				
Time To Reduce	Sec	0	0	0	0	0	0	0	0				
Reduce By	Sec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Min Gap	Sec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Dynamic Max Limit	Sec	0	0	0	0	0	0	0	0				
Dynamic Max Step	Sec	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
[P2] Start Up	Enum	other	redClear	other	phaseNotOn	other	other	other	other				
[P2] Options	Bit	0	Enabled	0	Enabled	0	0	0	0				
			Non-Actuated 1										
			Max Veh Recall										
			Ped Recall										
			Act Rest In Walk										
[P2] Ring	Ring	0	1	0	1	0	0	0	0				
[P2] Concurrency	Phase (.)	()	()	()	()	()	()	()	()				
Coord Pattern	Units	1	2	3	4	5	6	7	8				
Cycle Time	Sec	120	100	120	0	0	0	0	0				
Offset	Sec	54	81	64	0	0	0	0	0				
Split	Split	1	2	3	0	0	0	0	0				
Sequence	Sequence	1	1	1	0	0	0	0	0				
Coord Split	Units	1	2	3	4	5	6	7	8				
Split 1 - Mode	Enum	none	none	none	none	none	none	none	none				
Split 1 - Time	Sec	0	68	0	52	0	0	0	0				
Split 1 - Coord	Enum	false	true	false	false	false	false	false	false				
Split 2 - Mode	Enum	none	none	none	none	none	none	none	none				
Split 2 - Time	Sec	0	50	0	50	0	0	0	0				
Split 2 - Coord	Enum	false	true	false	false	false	false	false	false				
Split 3 - Mode	Enum	none	none	none	none	none	none	none	none				
Split 3 - Time	Sec	0	68	0	52	0	0	0	0				
Split 3 - Coord	Enum	false	true	false	false	false	false	false	false				
TB Schedule	Units	1	2	3	4	5	6	7	8				
Month	Bit	JFMAMJJASOND	JFMAMJJASOND	JFMAMJJASOND	J-----	-F-----	--A-----	--M-----	--J----				
Day of Week	Bit	-MTWTF-	S-----	-----S	SMTWTFS	SMTWTFS	SMTWTFS	SMTWTFS	SMTWTFS				
Day of Month	Bit	123456789012345	123456789012345	123456789012345	1-----	-----8-----	-----9-----	-----0-----	1-----				
		678901234567890	678901234567890	678901234567890	-----	-----	-----	-----	-----				
Day Plan	Number	1	3	2	3	3	3	3	3				
TB Schedule	Units	9	10	11	12	13	14	15	16				
Month	Bit	-----A---	-----S---	-----O--	-----D	-----D	-----D	0	0				
Day of Week	Bit	SMTWTFS	SMTWTFS	SMTWTFS	SMTWTFS	SMTWTFS	SMTWTFS	SMTWTFS	SMTWTFS				
Day of Month	Bit	---5-----	-2-----	-----4-----	-----	-----	-----	0	0				
Day Plan	Number	3	3	3	3	3	3	0	0				
TB Dayplan	Units	1	2	3	4	5	6	7	8				
Plan 1 Hour	Hour	0	6	9	15	19	3	0	0				
Plan 1 Minute	Min	0	0	30	0	30	0	0	0				
Plan 1 Action	Number	8	1	2	3	2	7	0	0				
Plan 2 Hour	Hour	0	7	3	0	0	0	0	0				
Plan 2 Minute	Min	0	0	0	0	0	0	0	0				
Plan 2 Action	Number	8	2	7	0	0	0	0	0				
Plan 3 Hour	Hour	0	8	23	3	0	0	0	0				
Plan 3 Minute	Min	0	0	0	0	0	0	0	0				
Plan 3 Action	Number	8	2	8	7	0	0	0	0				
TB Action	Units	1	2	3	4	5	6	7	8				
Pattern	Enum	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5	Pattern 6	Free	Free				
Aux. Functions	Bit	0	0	0	0	0	0	0	0				
Spec. Functions	Bit	0	0	0	0	0	0	0	0				



APPENDIX B

Transportation Tomorrow Survey Data

Transportation Tomorrow Survey Data

Location	Volume	Direction Relative to Site
PD 1 of Toronto	3170	E
PD 2 of Toronto	273	E
PD 3 of Toronto	324	E
PD 4 of Toronto	400	E
PD 5 of Toronto	113	E
PD 6 of Toronto	78	E
PD 7 of Toronto	781	E
PD 8 of Toronto	1161	E
PD 9 of Toronto	362	E
PD 10 of Toronto	210	E
PD 11 of Toronto	139	E
PD 12 of Toronto	50	E
PD 13 of Toronto	126	E
PD 14 of Toronto	23	E
PD 16 of Toronto	24	E
Ajax	24	E
Oshawa	69	E
Newmarket	27	E
Richmond Hill	41	E
Markham	34	E
King	23	E
Vaughan	331	N
Caledon	90	N
Brampton	464	N
Mississauga	10370	N
Milton	50	N
Oakville	585	W
Burlington	60	W
Dundas	19	W
Glanbrook	138	W
Hamilton	106	W
Niagara-on-the-Lake	13	W
St. Catharines	45	W
Kitchener	16	W
City of Guelph	18	W
Orangeville	15	W
Hastings	13	W
Muskoka	18	N
Brantford	22	W
External	31	





APPENDIX C

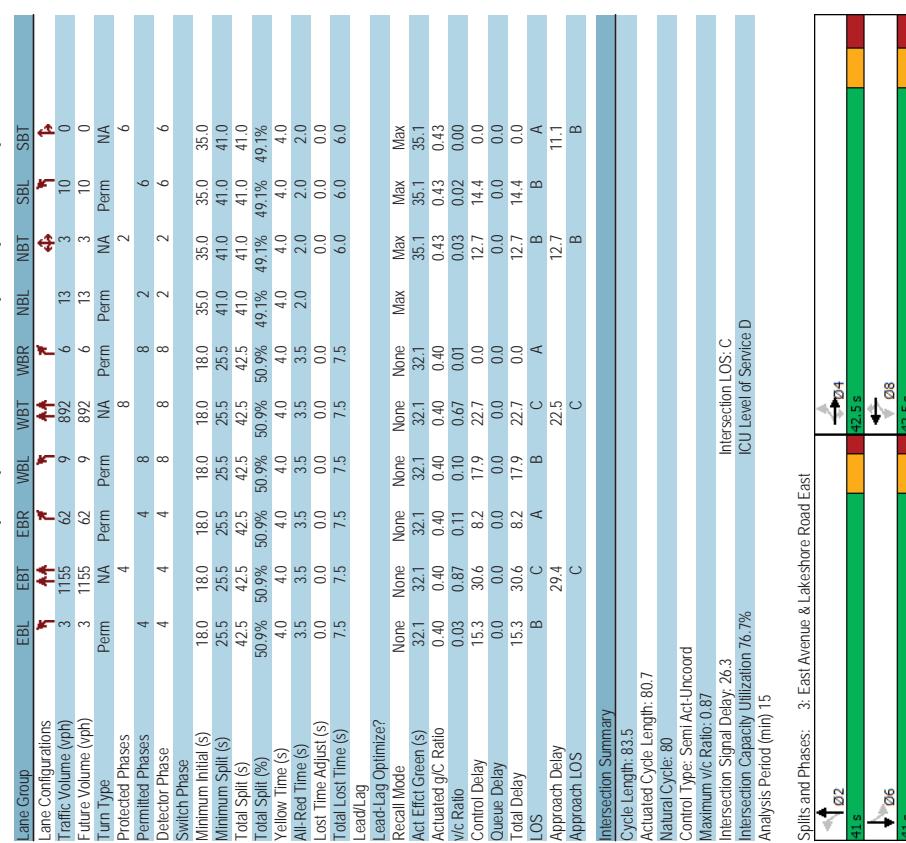
Capacity and Queue Analysis Summary Sheets

HCM Unsignalized Intersection Capacity Analysis											
1: Montebello Crescent/West Avenue & Lakeshore Road East						<Existing> AM Peak Hour					
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	17	1327	15	11	745	22	3	1	28	6	0
Traffic Volume (veh/h)	17	1327	15	11	745	22	3	1	28	6	0
Future Volume (veh/h)											5
Sign Control	Free						Stop				
Grade	0%						0%				
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	18	1382	16	11	776	23	3	1	29	6	0
Pedestrians	1				1		1			11	
Lane Width (m)	3.6				3.6		3.6				3.6
Walking Speed (m/s)	1.2				1.2		1.2			1.2	
Percent Blockage	0				0		0			1	
Right turn flare (veh)											0
Median type	None				None						None
Upstream signal (m)					223						
pX, platoon unblocked	0.81				1399		1843	2259	701	1578	0.81
vC, platoon unblocked	810										412
vC1, stage 1 conf vol											20
vC2, stage 2 conf vol											20
vCU, unblocked vol	312				1399		1580	2091	701	1255	2086
IC, single (s)	4.1				4.3		7.5	6.5	7.1	6.5	6.9
IC, 2 stage (s)											4.1
If (S)	2.2				2.3		3.5	4.0	3.4	3.5	4.0
p0 queue free %	98				98		95	98	92	93	100
cM capacity (veh/h)	1017				450		58	41	361	91	41
Direction, Lane #	EB1	EB2	EB3	WB1	WB2	WB3	NB1	NB2	SB1		
Volume Total	18	921	477	11	517	282	3	30	11		
Volume Left	18	0	0	0	0	3	0	6			
Volume Right	0	0	16	0	0	23	0	29	5		
cSH	1017	1700	1700	450	1700	1700	58	286	154		
Volume to Capacity	0.02	0.54	0.28	0.02	0.30	0.17	0.05	0.10	0.07		
Queue Length 95th (m)	0.4	0.0	0.0	0.0	0.0	0.0	1.3	2.8	1.8		
Control Delay (s)	8.6	0.0	0.0	132	0.0	0.0	70.2	19.0	30.2		
Lane LOS	A	B	C	D	E	F	G	H	I	J	K
Approach Delay (s)	0.1		0.2		23.7		30.2				
Approach LOS					C	D				A	
Intersection Summary											
Average Delay	0.6									3.0	
Intersection Capacity Utilization	50.1%									15.1%	
Analysis Period (min)	15									15	
ICU Level of Service										A	

HCM Unsignalized Intersection Capacity Analysis											
2: Montebello Crescent & Byngmount Avenue						<Existing> AM Peak Hour					
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	17	1327	15	11	745	22	3	1	28	6	0
Traffic Volume (veh/h)	17	1327	15	11	745	22	3	1	28	6	0
Future Volume (veh/h)							Stop				
Sign Control	Free						Stop				
Grade	0%						0%				
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	18	1382	16	11	776	23	3	1	29	6	0
Pedestrians	1				1		1			11	
Lane Width (m)	3.6				3.6		3.6				3.6
Walking Speed (m/s)	1.2				1.2		1.2			1.2	
Percent Blockage	0				0		0			1	
Right turn flare (veh)											0
Median type	None				None						None
Upstream signal (m)											
pX, platoon unblocked	0.81				1399		1843	2259	701	1578	0.81
vC, platoon unblocked	810										412
vC1, stage 1 conf vol											20
vC2, stage 2 conf vol											20
vCU, unblocked vol	312				1399		1580	2091	701	1255	2086
IC, single (s)	4.1				4.3		7.5	6.5	7.1	6.5	6.9
IC, 2 stage (s)											4.1
If (S)	2.2				2.3		3.5	4.0	3.4	3.5	4.0
p0 queue free %	98				98		95	98	92	93	100
cM capacity (veh/h)	1017				450		58	41	361	91	41
Direction, Lane #	EB1	EB2	EB3	WB1	WB2	WB3	NB1	NB2	SB1		
Volume Total	18	921	477	11	517	282	3	30	11		
Volume Left	18	0	0	0	0	3	0	6			
Volume Right	0	0	16	0	0	23	0	29	5		
cSH	1017	1700	1700	450	1700	1700	58	286	154		
Volume to Capacity	0.02	0.54	0.28	0.02	0.30	0.17	0.05	0.10	0.07		
Queue Length 95th (m)	0.4	0.0	0.0	0.0	0.0	0.0	1.3	2.8	1.8		
Control Delay (s)	8.6	0.0	0.0	132	0.0	0.0	70.2	19.0	30.2		
Lane LOS	A	B	C	D	E	F	G	H	I	J	K
Approach Delay (s)	0.1		0.2		23.7		30.2				
Approach LOS					C	D				A	
Intersection Summary											
Average Delay	0.6									3.0	
Intersection Capacity Utilization	50.1%									15.1%	
Analysis Period (min)	15									15	
ICU Level of Service										A	

Timings
3: East Avenue & Lakeshore Road East

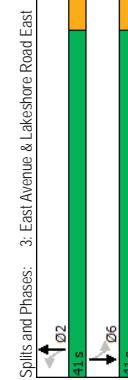
<Existing> AM Peak Hour
12-13-2019



HCM Signalized Intersection Capacity Analysis
3: East Avenue & Lakeshore Road East

<Existing> AM Peak Hour
12-13-2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	SBL	SBT	SBR	
Lane Configurations	3	1155	62	9	892	6	13	3	10	0	3
Traffic Volume (vph)	3	1155	62	9	892	6	13	3	10	0	3
Future Volume (vph)	3	1155	62	9	892	6	13	3	10	0	3
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA			
Protected Phases	4	4	4	8	8	2	2	6	6		
Permitted Phases	4	4	4	8	8	2	2	6	6		
Detector Phase	4	4	4	8	8	2	2	6	6		
Switch Phase											
Minimum Initial (s)	18.0	18.0	18.0	18.0	18.0	35.0	35.0	35.0			
Minimum Split (s)	28.5	28.5	28.5	28.5	28.5	41.0	41.0	41.0			
Total Split (s)	42.5	42.5	42.5	42.5	42.5	41.0	41.0	41.0			
Total Split (%)	50.9%	50.9%	50.9%	50.9%	50.9%	49.1%	49.1%	49.1%			
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
All Red Time (s)	3.5	3.5	3.5	3.5	3.5	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)	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0			
Leaflet Lag											
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	Max	Max	Max			
Act Elct Green (s)	32.1	32.1	32.1	32.1	32.1	35.1	35.1	35.1			
Actuated GC Ratio	0.40	0.40	0.40	0.40	0.40	0.43	0.43	0.43			
v/c Ratio	0.03	0.03	0.03	0.03	0.03	0.01	0.01	0.01			
Control Delay	15.3	30.6	8.2	17.9	22.7	0.0	12.7	14.4	0.0		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Total Delay	15.3	30.6	8.2	17.9	22.7	0.0	12.7	14.4	0.0		
LOS	B	C	A	B	C	A	B	B	A		
Approach Delay	29.4	225	225	225	225	12.7	11.1	11.1			
Approach LOS	C	C	C	B	B	B	B	B			
Intersection Summary											
Cycle Length: 83.5											
Actuated Cycle Length: 80.7											
Natural Cycle: 80											
Control Type: Semi Act-Uncoord											
Maximum v/c Ratio: 0.87											
Intersection Signal Delay: 26.3											
Intersection Capacity Utilization: 76.7%											
Analysis Period (min) 15											

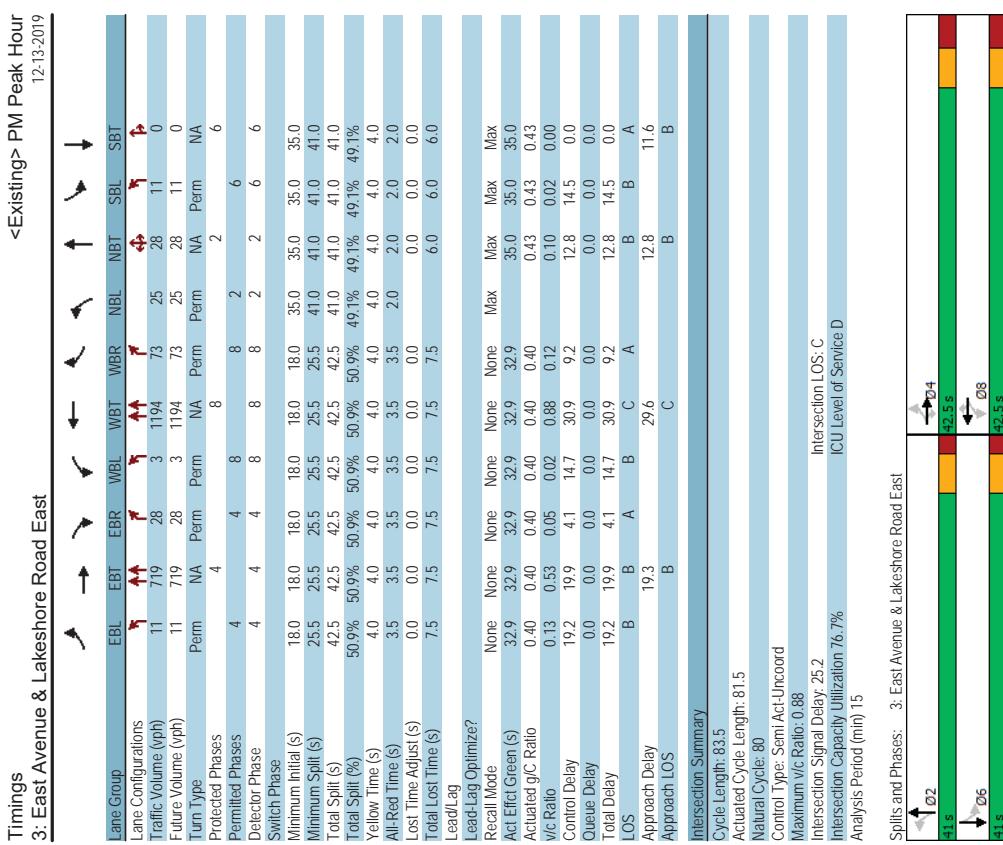


HCM 2000 Control Delay: 25.0
HCM 2000 Volume to Capacity ratio: 0.43
Actuated Cycle Length (s): 80.6
Intersection Capacity Utilization: 76.7%
Analysis Period (min): 15
C Critical Lane Group

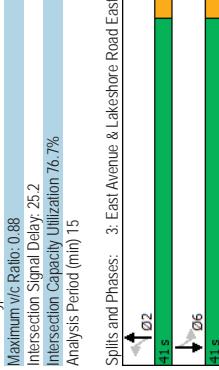
HCM 2000 Level of Service: C
Sum of lost time (s): 13.5
ICU Level of Service: D

HCM Unsignalized Intersection Capacity Analysis											
1: Montebello Crescent/West Avenue & Lakeshore Road East						<Existing> PM Peak Hour					
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	20	986	25	1098	21	6	1	22	1	0	6
Traffic Volume (veh/h)	20	986	25	1098	21	6	1	22	1	0	6
Future Volume (Veh/h)											
Sign Control	Free						Stop				
Grade	0%						0%				
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	22	1060	27	38	1181	23	6	1	24	1	0
Pedestrians							8		12		
Lane Width (m)							3.6				3.6
Walking Speed (m/s)							1.2				1.2
Percent Blockage							1				0
Right turn flare (veh)							1				
Median type	None						None				
Upstream signal (m)		223									
pX, platoon/unlocked	0.67										
vC, conflicting volume	12.16										
vC1, stage 1 conf vol											
vC2, stage 2 conf vol											
vCu, unblocked vol	340										
IC, single (s)	4.1										
IC, 2 stage (s)	4.2										
If (S)	2.2										
p0 queue free %	97										
cM capacity (veh/h)	793										
Direction, Lane #	EB1	EB2	EB3	WB1	WB2	WB3	NB1	NB2	NB3	SB1	
Volume Total	22	707	380	38	787	417	6	25	7		
Volume Left	22	0	0	38	0	0	6	0	1		
Volume Right	0	0	27	0	23	0	24	6			
cSH	783	1700	1700	641	1700	1700	86	301	297		
Volume to Capacity	0.03	0.42	0.22	0.06	0.46	0.25	0.07	0.08	0.02		
Queue Length 95th (m)	0.7	0.0	0.0	1.5	0.0	0.0	1.8	2.2	0.6		
Control Delay (s)	9.7	0.0	0.0	11.0	0.0	0.0	49.9	18.0	17.4		
Lane LOS	A	B	C	E	C	C	F	C	C		
Approach Delay (s)	0.2		0.3		24.2		17.4				
Approach LOS											
Intersection Summary											
Average Delay	0.6										
Intersection Capacity Utilization	41.0%										
Analysis Period (min)	15										
ICU Level of Service	A										

HCM Unsignalized Intersection Capacity Analysis											
2: Montebello Crescent & Byngmount Avenue						<Existing> PM Peak Hour					
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	20	986	25	1098	21	6	1	22	1	0	6
Traffic Volume (veh/h)	20	986	25	1098	21	6	1	22	1	0	6
Future Volume (Veh/h)											
Sign Control	Free						Stop				
Grade	0%						0%				
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	22	1060	27	38	1181	23	6	1	24	1	0
Pedestrians							8		12		
Lane Width (m)							3.6				3.6
Walking Speed (m/s)							1.2				1.2
Percent Blockage							1				
Right turn flare (veh)							1				
Median type	None						None				
Upstream signal (m)		223									
pX, platoon/unlocked	0.67										
vC, conflicting volume	12.16										
vC1, stage 1 conf vol											
vC2, stage 2 conf vol											
vCu, unblocked vol	340										
IC, single (s)	4.1										
IC, 2 stage (s)	4.2										
If (S)	2.2										
p0 queue free %	97										
cM capacity (veh/h)	793										
Direction, Lane #	EB1	EB2	EB3	WB1	WB2	WB3	NB1	NB2	NB3	SB1	
Volume Total	22	707	380	38	787	417	6	25	7		
Volume Left	22	0	0	38	0	0	6	0	1		
Volume Right	0	0	27	0	23	0	24	6			
cSH	783	1700	1700	641	1700	1700	86	301	297		
Volume to Capacity	0.03	0.42	0.22	0.06	0.46	0.25	0.07	0.08	0.02		
Queue Length 95th (m)	0.7	0.0	0.0	1.5	0.0	0.0	1.8	2.2	0.6		
Control Delay (s)	9.7	0.0	0.0	11.0	0.0	0.0	49.9	18.0	17.4		
Lane LOS	A	B	C	E	C	C	F	C	C		
Approach Delay (s)	0.2		0.3		24.2		17.4				
Approach LOS											
Intersection Summary											
Average Delay	0.6										
Intersection Capacity Utilization	41.0%										
Analysis Period (min)	15										
ICU Level of Service	A										



<Existing> PM Peak Hour										<Existing> PM Peak Hour											
3: East Avenue & Lakeshore Road East										3: East Avenue & Lakeshore Road East											
Lane Group	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBT	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	SBL	SBT	
Lane Configurations	11	719	28	3	1194	73	25	28	11	0	11	719	28	3	1194	73	25	28	12	11	0
Traffic Volume (vph)	11	719	28	3	1194	73	25	28	11	0	11	719	28	3	1194	73	25	28	12	11	0
Future Volume (vph)											1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA											
Protected Phases	4	4	4	8	8	2	2	6	6	6											
Permitted Phases	4	4	4	8	8	2	2	6	6	6											
Detector Phase	4	4	4	8	8	2	2	6	6	6											
Switch Phase																					
Minimum Initial (%)	18.0	18.0	18.0	18.0	18.0	35.0	35.0	35.0	35.0	35.0											
Minimum Split (%)	28.5	28.5	28.5	28.5	28.5	41.0	41.0	41.0	41.0	41.0											
Total Split (%)	42.5	42.5	42.5	42.5	42.5	41.0	41.0	41.0	41.0	41.0											
Total Split (%)	50.9%	50.9%	50.9%	50.9%	50.9%	49.1%	49.1%	49.1%	49.1%	49.1%											
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0											
All Red Time (s)	3.5	3.5	3.5	3.5	3.5	2.0	2.0	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	0.0	0.0											
Total Lost Time (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0	6.0											
Leaflet lag																					
Lead-Lag Optimize?																					
Recall Mode	None	None	None	None	None	Max	Max	Max	Max	Max											
Act Elct Green (s)	32.9	32.9	32.9	32.9	32.9	35.0	35.0	35.0	35.0	35.0											
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40											
vic Ratio	0.13	0.53	0.05	0.02	0.88	0.12	0.10	0.02	0.00	0.00											
Control Delay	19.2	19.9	4.1	14.7	30.9	9.2	12.8	14.5	0.0	12.8											
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0											
Total Delay	19.2	19.9	4.1	14.7	30.9	9.2	12.8	14.5	0.0	12.8											
LOS	B	B	A	B	C	A	B	B	A	B											
Approach Delay	19.3	29.6	29.6	29.6	29.6	12.8	11.6	12.8	11.6	12.8											
Approach LOS	B	C	B	B	B	B	B	B	B	B											
Intersection Summary																					
Cycle Length: 83.5																					
Actualized Cycle Length: 81.5																					
Natural Cycle: 80																					
Control Type: Semi Act-Uncoordinated																					
Maximum Vic Ratio: 0.88																					
Intersection Signal Delay: 25.2																					
Intersection Capacity Utilization: 76.7%																					
Analysis Period (min): 15																					
Spills and Phases: 3: East Avenue & Lakeshore Road East																					



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HCM Signalized Intersection Capacity Analysis
3: East Avenue & Lakeshore Road East
12-13-2019

<Existing> PM Peak Hour

Intersection Summary

HCM 2000 Control Delay	24.1
HCM 2000 Volume to Capacity ratio	0.47
Actuated Cycle Length (s)	81.6
Intersection Capacity Utilization	76.7%
Analysis Period (min)	15
C Critical Lane Group	B

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HCM Unsignalized Intersection Capacity Analysis
1: Montbeck Crescent/Nest Avenue & Lakeshore Road East
<Background> AM Peak Hour
12-13-2019

HCM Unsignalized Intersection Capacity Analysis
1: Montbeck Crescent/Nest Avenue & Lakeshore Road East
<Background> AM Peak Hour
12-13-2019

<Background> AM Peak Hour												
12-13-2019												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	19	0	1	0	0	0	1	16	1	2	11	15
Traffic Volume (Veh/h)	19	0	1	0	0	0	1	16	1	2	11	15
Future Volume (Veh/h)	19	0	1	0	0	0	1	16	1	2	11	15
Sign Control	Stop	Stop	Stop	Free			Free			Free		
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	23	0	1	0	0	0	1	19	1	2	13	18
Pedestrians								6				
Lane Width (m)								3.6				
Walking Speed (m/s)								1.2				
Percent Blockage								1				
Right turn flare (veh)												0
Median type												None
Median storage (veh)												None
Upstream signal (m)												
PX, platform unblocked												
VC, conflicting volume												
vc1, stage 1 con vol												
vc2, stage 2 con vol												
vcU, unblocked vol												
IC, single (S)	7.2	6.5	6.2	7.1	6.5	6.2	4.1					4.1
IC, 2 stage (S)												
IF (S)	3.6	4.0	3.3	3.5	4.0	3.3	2.2					2.2
p0 queue free %	98	100	100	100	100	100	100					100
cM capacity (Veh/h)	928	846	1048	941	837	1062	1595					1609
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume, Total	24	0	21	33								
Volume Left	23	0	1	2								
Volume Right	1	0	1	18								
cSH	932	1700	1595	1609								
Volume to Capacity	0.03	0.00	0.00	0.00								
Queue length 95th (m)	0.6	0.0	0.0	0.0								
Control Delay (s)	9.0	0.0	0.4	0.4								
Lane LOS	A	A	A	A								
Approach Delay (s)	9.0	0.0	0.4	0.4								
Approach LOS	A	A	A	A								
Intersection Summary												
Average Delay								3.0				A
Intersection Capacity Utilization								15.1%				
Analysis Period (min)								15				

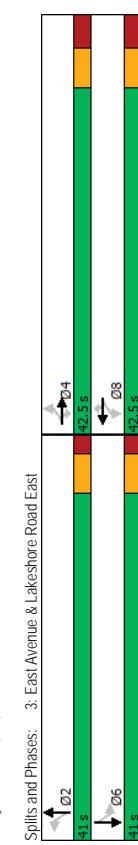
HCM Unsignalized Intersection Capacity Analysis
2: Montbeck Crescent & Byngmount Avenue

HCM Unsignalized Intersection Capacity Analysis
2: Montbeck Crescent & Byngmount Avenue

Timings
3: East Avenue & Lakeshore Road East

HCM Signalized Intersection Capacity Analysis
3: East Avenue & Lakeshore Road East
<Background> AM Peak Hour
12-13-2019

	EBL	EBC	EBR	WBL	WBC	WBR	NBL	NBC	NBR	SBL	SBC	SBR
Lane Group 0												
Lane Configurations												
Traffic Volume (vph)	3	1285	62	9	1025	6	13	3	10	0		3
Future Volume (vph)	3	1285	62	9	1025	6	13	3	10	0		3
Turn Type												
Protected Phases	4			8		8		2		6		
Permitted Phases	4	4	4	8	8	8	2	2	6	6		
Detector Phase	4	4	4	8	8	8	2	2	6	6		
Switch Phase												
Minimum Initial (s)	18.0	18.0	18.0	18.0	18.0	18.0	35.0	35.0	35.0			
Minimum Split (s)	28.5	28.5	28.5	28.5	28.5	28.5	41.0	41.0	41.0			
Total Split (s)	42.5	42.5	42.5	42.5	42.5	42.5	41.0	41.0	41.0			
Total Split (%)	50.9%	50.9%	50.9%	50.9%	50.9%	50.9%	49.1%	49.1%	49.1%			
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
All Red Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	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	0.0			
Total Lost Time (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0			
Leaf/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	Max	Max	Max	Max			
Act Elct Green (s)	34.3	34.3	34.3	34.3	34.3	35.0	35.0	35.0	35.0			
v/c Ratio	0.41	0.41	0.41	0.41	0.41	0.41	0.42	0.42	0.42			
Control Delay	15.7	36.4	8.2	18.1	24.4	0.0	12.7	14.4	0.0			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Total Delay	15.7	36.4	8.2	18.1	24.4	0.0	12.7	14.4	0.0			
LOS	B	D	A	B	C	A	B	B	A			
Approach Delay	35.1			24.2			12.7		11.1			
Approach LOS	D	C	C	B	B	B	B	B	B			
Intersection Summary												
Cycle Length: 83.5												
Actuated Cycle Length: 82.8												
Natural Cycle: 30												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.93												
Intersection Signal Delay: 30.1												
Intersection Capacity Utilization: 76.7%												
Analysis Period (min) 15												
Spills and Phases: 3: East Avenue & Lakeshore Road East												
↓ 02												
↓ 15												
↓ 06												
↓ 415												
↑ 04												
↑ 2.5												
↑ 08												
↑ 42.5												



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HCM Signalized Intersection Capacity Analysis
3: East Avenue & Lakeshore Road East
<Background> AM Peak Hour
12-13-2019

Movement	EBL	EBC	EBR	WBL	WBC	WBR	NBL	NBC	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	1285	62	9	1025	6	13	3	10	0		3
Future Volume (vph)	3	1285	62	9	1025	6	13	3	10	0		3
Turn Type												
Protected Phases	4			8		8		2		6		
Permitted Phases	4	4	4	8	8	8	2	2	6	6		
Detector Phase	4	4	4	8	8	8	2	2	6	6		
Switch Phase												
Minimum Initial (s)	18.0	18.0	18.0	18.0	18.0	18.0	35.0	35.0	35.0			
Minimum Split (s)	28.5	28.5	28.5	28.5	28.5	28.5	41.0	41.0	41.0			
Total Split (s)	42.5	42.5	42.5	42.5	42.5	42.5	41.0	41.0	41.0			
Total Split (%)	50.9%	50.9%	50.9%	50.9%	50.9%	50.9%	49.1%	49.1%	49.1%			
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			
All Red Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	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	0.0			
Total Lost Time (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0			
Leaf/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	Max	Max	Max	Max			
Act Elct Green (s)	34.3	34.3	34.3	34.3	34.3	35.0	35.0	35.0	35.0			
v/c Ratio	0.41	0.41	0.41	0.41	0.41	0.41	0.42	0.42	0.42			
Control Delay	15.7	36.4	8.2	18.1	24.4	0.0	12.7	14.4	0.0			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Total Delay	15.7	36.4	8.2	18.1	24.4	0.0	12.7	14.4	0.0			
LOS	B	D	A	B	C	A	B	B	A			
Approach Delay	35.1			24.2			12.7		11.1			
Approach LOS	D	C	C	B	B	B	B	B	B			
Intersection Summary												
Cycle Length: 83.5												
Actuated Cycle Length: 82.8												
Natural Cycle: 30												
Control Type: Semi Act-Uncoord												
Maximum v/c Ratio: 0.93												
Intersection Signal Delay: 30.1												
Intersection Capacity Utilization: 76.7%												
Analysis Period (min) 15												
Spills and Phases: 3: East Avenue & Lakeshore Road East												
↓ 02												
↓ 15												
↓ 06												
↓ 415												
↑ 04												
↑ 2.5												
↑ 08												
↑ 42.5												

	HCM 2000 Control Delay	28.5	HCM 2000 Level of Service	C
Actualized Cycle Length (s)		0.48		
Intersection Capacity Utilization		82.7	Sum of lost time (s)	13.5
Analysis Period (min)		76.7%	ICU Level of Service	D
C Critical Lane Group		15		

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HCM Unsignalized Intersection Capacity Analysis
1: Montbeck Crescent/West Avenue & Lakeshore Road East

HCM Unsignalized Intersection Capacity Analysis
1: Montbeck Crescent/West Avenue & Lakeshore Road East

<Background> PM Peak Hour
12:13:2019

HCM Unsignedized Intersection Capacity Analysis
2: Montbeck Crescent & Bymount Avenue
<Background> PM Peak Hour
12-13-2019

HCM Unsignedized Intersection Capacity Analysis
2: Montbeck Crescent & Bymount Avenue
<Background> PM Peak Hour
12-13-2019

Timings 3: East Avenue & Lakeshore Road East											
<Background> PM Peak Hour 12:13:2019											
<Background> PM Peak Hour 12:13:2019											
Movement	EBL	EBC									
Lane Configurations	11	1056	28	3	1194	73	25	28	11	0	0
Traffic Volume (vph)	11	1056	28	3	1194	73	25	28	11	0	3
Future Volume (vph)											
Turn Type	Perm	NA	NA								
Protected Phases	4	4	4	8	8	2	2	6	6	6	6
Permitted Phases	4	4	4	8	8	2	2	6	6	6	6
Detector Phase	4	4	4	8	8	2	2	6	6	6	6
Switch Phase											
Minimum Initial (s)	18.0	18.0	18.0	18.0	18.0	35.0	35.0	35.0	35.0	35.0	35.0
Minimum Split (s)	28.5	28.5	28.5	28.5	28.5	41.0	41.0	41.0	41.0	41.0	41.0
Total Split (s)	42.5	42.5	42.5	42.5	42.5	41.0	41.0	41.0	41.0	41.0	41.0
Total Split (%)	50.9%	50.9%	50.9%	50.9%	50.9%	49.1%	49.1%	49.1%	49.1%	49.1%	49.1%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All Red Time (s)	3.5	3.5	3.5	3.5	3.5	2.0	2.0	2.0	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	0.0	0.0	0.0
Total Lost Time (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0	6.0	6.0
Leaflet Lag											
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	Max	Max	Max	Max	Max	Max
Act Elct Green (s)	32.9	32.9	32.9	32.9	32.9	35.0	35.0	35.0	35.0	35.0	35.0
v/c Ratio	0.40	0.40	0.40	0.40	0.40	0.43	0.43	0.43	0.43	0.43	0.43
Control Delay	192	25.5	4.1	16.0	30.9	9.2	12.8	14.5	0.0	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	192	25.5	4.1	16.0	30.9	9.2	12.8	14.5	0.0	0.0	0.0
LOS	B	C	A	B	C	A	B	B	A	B	B
Approach Delay	24.9	29.6	29.6	29.6	29.6	12.8	11.6	11.6	11.6	11.6	11.6
Approach LOS	C	C	C	B	B	B	B	B	B	B	B
Intersection Summary											
Cycle Length: 83.5											
Actualized Cycle Length: 81.5											
Natural Cycle: 80											
Control Type: Semi Act-Uncoord											
Maximum v/c Ratio: 0.88											
Intersection Signal Delay: 26.9											
Intersection Capacity Utilization: 76.7%											
Analysis Period (min) 15											
Spills and Phases: 3: East Avenue & Lakeshore Road East											
11s	02	04	22.5	22.5	06	08	41s	42.4s			

<Background> PM Peak Hour 12:13:2019											
HCM Signalized Intersection Capacity Analysis 3: East Avenue & Lakeshore Road East											
Movement	EBL	EBC									
Lane Configurations	11	1056	28	3	1194	73	25	28	11	0	0
Traffic Volume (vph)	11	1056	28	3	1194	73	25	28	11	0	3
Future Volume (vph)											
Turn Type	Perm	NA	NA								
Protected Phases	4	4	4	8	8	2	2	6	6	6	6
Permitted Phases	4	4	4	8	8	2	2	6	6	6	6
Detector Phase	4	4	4	8	8	2	2	6	6	6	6
Switch Phase											
Minimum Initial (s)	18.0	18.0	18.0	18.0	18.0	35.0	35.0	35.0	35.0	35.0	35.0
Minimum Split (s)	28.5	28.5	28.5	28.5	28.5	41.0	41.0	41.0	41.0	41.0	41.0
Total Split (s)	42.5	42.5	42.5	42.5	42.5	41.0	41.0	41.0	41.0	41.0	41.0
Total Split (%)	50.9%	50.9%	50.9%	50.9%	50.9%	49.1%	49.1%	49.1%	49.1%	49.1%	49.1%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All Red Time (s)	3.5	3.5	3.5	3.5	3.5	2.0	2.0	2.0	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	0.0	0.0	0.0
Total Lost Time (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0	6.0	6.0
Leaflet Lag											
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	Max	Max	Max	Max	Max	Max
Act Elct Green (s)	32.9	32.9	32.9	32.9	32.9	35.0	35.0	35.0	35.0	35.0	35.0
v/c Ratio	0.40	0.40	0.40	0.40	0.40	0.43	0.43	0.43	0.43	0.43	0.43
Control Delay	192	25.5	4.1	16.0	30.9	9.2	12.8	14.5	0.0	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	192	25.5	4.1	16.0	30.9	9.2	12.8	14.5	0.0	0.0	0.0
LOS	B	C	A	B	C	A	B	B	A	B	B
Approach Delay	24.9	29.6	29.6	29.6	29.6	12.8	11.6	11.6	11.6	11.6	11.6
Approach LOS	C	C	C	B	B	B	B	B	B	B	B
Intersection Summary											
Cycle Length: 83.5											
Actualized Cycle Length: 81.5											
Natural Cycle: 80											
Control Type: Semi Act-Uncoord											
Maximum v/c Ratio: 0.88											
Intersection Signal Delay: 26.9											
Intersection Capacity Utilization: 76.7%											
Analysis Period (min) 15											
Spills and Phases: 3: East Avenue & Lakeshore Road East											
11s	02	04	22.5	22.5	06	08	41s	42.4s			

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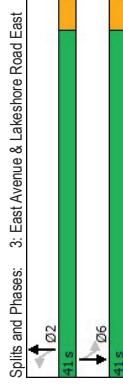
HCM Unsignalized Intersection Capacity Analysis							
1: Montdeck Crescent/West Avenue & Lakeshore Road East				<Total> AM Peak Hour			
Movement	EBL	EBT	EBR	WBL	WBT	WBR	<Total>
Lane Configurations	17	1333	15	11	989	22	3
Traffic Volume (veh/h)	17	1333	15	11	989	22	3
Future Volume (veh/h)							0
Sign Control	Free						5
Grade	0%						0%
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	18	1389	16	11	1030	23	3
Pedestrians	1			1		1	11
Lane Width (m)	3.6			3.6		3.6	3.6
Walking Speed (m/s)	1.2			1.2		1.2	1.2
Percent Blockage	0			0		0	1
Right turn flare (veh)							0
Median type	None			None			None
Median storage (veh)							
Upstream signal (m)	0.74			223			
pX, platoon unblocked	1064			1406			
vC1, conflicting volume				1977			
vC2, stage 1 conf vol				2520			
vC2, stage 2 conf vol				704			
vCu, unblocked vol	399						
IC, single (s)	4.1			1406			
IC, 2 stage (s)				1626			
IF (s)	2.2			2.3			
p0 queue free %	98			98			
cM capacity (veh/h)	863			447			
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1 NB 2 SB 1
Volume Total	18	926	479	11	687	366	3 30 11
Volume Left	18	0	0	11	0	3	0 6
Volume Right	0	0	16	0	23	0	29 5
cSH	863	1700	1700	447	1700	1700	49 104
Volume to Capacity	0.02	0.54	0.28	0.02	0.40	0.22	0.06 0.11
Queue Length 95th (m)	0.5	0.0	0.0	0.6	0.0	0.0	1.5 3.2 2.8
Control Delay (s)	9.3	0.0	0.0	13.3	0.0	0.0	83.2 21.4 43.6
Lane LOS	A	B	C	D	E	F	A A A
Approach LOS	0.1		0.1		0.1	0.1	
Intersection Summary							
Average Delay	0.7						
Intersection Capacity Utilization	50.3%						
Analysis Period (min)	15						
ICU Level of Service	A						

HCM Unsignalized Intersection Capacity Analysis							
2: Montdeck Crescent & Byngmount Avenue				<Total> AM Peak Hour			
Movement	EBL	EBT	EBR	WBL	WBT	WBR	<Total>
Lane Configurations	17	1333	15	11	989	22	3
Traffic Volume (veh/h)	17	1333	15	11	989	22	3
Future Volume (veh/h)							0
Sign Control	Free				Stop		5
Grade	0%				0%		0%
Peak Hour Factor	0.96				0.96		0.96
Hourly flow rate (vph)	18	1389	16	11	1030	23	3
Pedestrians	1			1		1	11
Lane Width (m)	3.6			3.6		3.6	3.6
Walking Speed (m/s)	1.2			1.2		1.2	1.2
Percent Blockage	0			0		0	1
Right turn flare (veh)							0
Median type	None			None			None
Median storage (veh)							
Upstream signal (m)	0.74			223			
pX, platoon unblocked	1064			1406			
vC1, conflicting volume				1977			
vC2, stage 1 conf vol				2520			
vC2, stage 2 conf vol				704			
vCu, unblocked vol	399						
IC, single (s)	4.1			1406			
IC, 2 stage (s)				1626			
IF (s)	2.2			2.3			
p0 queue free %	98			98			
cM capacity (veh/h)	863			447			
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1 NB 2 SB 1
Volume Total	18	926	479	11	687	366	3 30 11
Volume Left	18	0	0	11	0	3	0 6
Volume Right	0	0	16	0	23	0	29 5
cSH	863	1700	1700	447	1700	1700	49 104
Volume to Capacity	0.02	0.54	0.28	0.02	0.40	0.22	0.06 0.11
Queue Length 95th (m)	0.5	0.0	0.0	0.6	0.0	0.0	1.5 3.2 2.8
Control Delay (s)	9.3	0.0	0.0	13.3	0.0	0.0	83.2 21.4 43.6
Lane LOS	A	B	C	D	E	F	A A A
Approach LOS	0.1		0.1		0.1		
Intersection Summary							
Average Delay	0.7						
Intersection Capacity Utilization	50.3%						
Analysis Period (min)	15						
ICU Level of Service	A						

Timings
3: East Avenue & Lakeshore Road East

<Total> AM Peak Hour
3: East Avenue & Lakeshore Road East
03-27-2020

	EBL	EFT	EBR	WBL	WBT	WBR	NBL	NBT	NBL	NBT	WBL	WBT	NBL	NBT	SBL	SBT	
Lane Group																	
Lane Configurations																	
Traffic Volume (vph)	3	1285	68	16	1025	6	31	3	10	0	1285	68	16	1025	6	3	
Future Volume (vph)	3	1285	68	16	1025	6	31	3	10	0	1285	68	16	1025	6	3	
Turn Type	Perm	NA	1900	1900	1900	1900	1900	1900									
Protected Phases	4	4	4	8	8	2	2	2	6	6	7.5	7.5	7.5	7.5	6.0	6.0	
Permitted Phases	4	4	4	8	8	2	2	2	6	6	1.00	0.95	1.00	0.95	1.00	1.00	
Detector Phase	4	4	4	8	8	2	2	2	6	6	1.00	1.00	0.98	1.00	1.00	0.99	
Switch Phase											1.00	1.00	1.00	1.00	1.00	1.00	
Minimum Initial (s)	18.0	18.0	18.0	18.0	18.0	35.0	35.0	35.0	35.0	35.0	1.00	1.00	0.85	1.00	1.00	0.85	
Minimum Split (s)	28.5	28.5	28.5	28.5	28.5	41.0	41.0	41.0	41.0	41.0	0.95	1.00	0.95	1.00	0.97	0.95	
Total Split (s)	42.5	42.5	42.5	42.5	42.5	42.5	41.0	41.0	41.0	41.0	13.56	34.71	15.00	18.05	34.71	13.47	
Total Split (%)	50.9%	50.9%	50.9%	50.9%	50.9%	49.1%	49.1%	49.1%	49.1%	49.1%	0.15	1.00	0.12	1.00	0.88	0.72	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	220	347.1	15.00	222	347.1	13.47	
All-Red Time (s)	3.5	3.5	3.5	3.5	3.5	2.0	2.0	2.0	2.0	2.0	0.96	0.96	0.96	0.96	0.96	0.96	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Adj. Flow (vph)	3	1339	71	17	1068	6
Total Lost Time (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0	6.0	0.0	0	0	0	0	0	
Lead/Lag											Lane Group Flow (vph)	3	1339	48	17	1068	2
Lead-Lag Optimize?											Confil. Peds. (#/hr)	2	0	23	0	4	0
Recall Mode	None	None	None	None	None	Max	Max	Max	Max	Max	Heavy Vehicles (%)	33%	4%	5%	0%	4%	17%
Act Effct Green (s)	34.3	34.3	34.3	34.3	34.3	35.0	35.0	35.0	35.0	35.0	Permit Phases	4	NA	Permit	NA	Permit	2
Actuated g/C Ratio	0.41	0.41	0.41	0.41	0.41	0.41	0.42	0.42	0.42	0.42	Protected Phases	4	4	4	4	8	2
v/c Ratio	0.03	0.03	0.03	0.11	0.18	0.74	0.01	0.10	0.02	0.00	Permitted Phases	4	NA	Permit	NA	Permit	6
Control Delay	15.7	36.4	8.7	21.6	24.4	0.0	12.5	14.4	0.0	0.0	Actuated Green, G (s)	34.2	34.2	34.2	34.2	34.2	6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Effective Green, g (s)	34.2	34.2	34.2	34.2	34.2	35.0
Total Delay	15.7	36.4	8.7	21.6	24.4	0.0	12.5	14.4	0.0	0.0	Uniform Delay, d ₁	14.4	23.2	14.7	15.4	20.5	35.0
LOS	B	D	A	C	C	A	B	B	A	A	Progression Factor	0.41	0.41	0.41	0.41	0.41	0.42
Approach Delay	35.0	35.0	24.2	12.5	11.1	12.5	11.1	12.5	11.1	11.1	Incremental Delay, d ₂	0.2	1.13	0.1	1.00	1.00	0.42
Approach LOS	C	C	C	B	B	B	B	B	B	B	Delay (s)	14.6	34.5	14.7	16.4	22.7	13.8
Intersection Summary											Level of Service	B	C	B	C	B	B
Cycle Length: 83.5											Intersection LOS: C						
Actuated Cycle Length: 82.8											ICU Level of Service D						
Natural Cycle: 80											Analysis Period (min) 15						
Control Type: Semi Act-Uncoord											Approach LOS	C	C	C	C	B	B
Maximum v/c Ratio: 0.33											Approach LOS	C	C	C	C	B	B
Intersection Signal Delay: 28.3											Intersection Summary						
Intersection Capacity Utilization: 76.7%											HCM 2000 Control Delay	28.3					
Analysis Period (min) 15											HCM 2000 Volume to Capacity ratio	0.50					
Spills and Phases: 3: East Avenue & Lakeshore Road East											Actuated Cycle Length (s)	82.7					
02	115	115	115	115	115	115	115	115	115	115	Intersection Capacity Utilization	76.7%					
06	415	415	415	415	415	415	415	415	415	415	Analysis Period (min)	15					
08	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	c Critical Lane Group						
08	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5							



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HCM Unsignedized Intersection Capacity Analysis												<Total> PM Peak Hour							
4: East Avenue & Site Access												03-27-2020							
Movement	EBL	EBR	NBL	NBT	SBT	SBR													
Lane Configurations	W	2	1	35	71	13													
Traffic Volume (veh/h)	37	2	1	35	71	13													
Future Volume (veh/h)	37	2	1	35	71	13													
Sign Control	Stop			Free	Free														
Grade	0%			0%	0%														
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92													
Hourly flow rate (vph)	40	2	1	38	77	14													
Pedestrians																			
Lane Width (m)																			
Walking Speed (m/s)																			
Percent Blockage																			
Right turn flare (veh)																			
Median type																			
Median storage (veh)																			
Upstream signal (m)																			
pX, platoon unblocked																			
vC, conflicting volume																			
vc1, stage 1 conf vol																			
vc2, stage 2 conf vol																			
vcU, unblocked vol																			
IC, single (s)																			
IC, 2 stage (s)																			
IF (s)																			
p0 queue free %																			
cM capacity (veh/h)																			
Direction, Lane #	EB 1	NB 1	SB 1																
Volume Total	42	39	91																
Volume Left	40	1	0																
Volume Right	2	0	14																
cSH	875	1504	1700																
Volume to Capacity	0.05	0.00	0.05																
Queue Length 95th (m)	1.2	0.0	0.0																
Control Delay (s)	9.3	0.2	0.0																
Lane LOS	A	A	A																
Approach Delay (s)	9.3	0.2	0.0																
Approach LOS	A																		
Intersection Summary																			
Average Delay		2.3																	
Intersection Capacity Utilization		14.5%																	
Analysis Period (min)		15																	

<Total> AM Peak Hour			03-27-2020		
1: Montdeck Crescent/West Avenue & Lakeshore Road East			03-27-2020		
Movement	EBL	EBR	NBL	NBT	SBR
Lane Configurations	W	2	1	35	71
Traffic Volume (veh/h)	37	2	1	35	71
Future Volume (veh/h)	37	2	1	35	71
Sign Control	Stop			Free	Free
Grade	0%			0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	2	1	38	77
Pedestrians					
Lane Width (m)					
Walking Speed (m/s)					
Percent Blockage					
Right turn flare (veh)					
Median type					
Median storage (veh)					
Upstream signal (m)					
pX, platoon unblocked					
vC, conflicting volume					
vc1, stage 1 conf vol					
vc2, stage 2 conf vol					
vcU, unblocked vol					
IC, single (s)					
IC, 2 stage (s)					
IF (s)					
p0 queue free %					
cM capacity (veh/h)					
Direction, Lane #	EB 1	NB 1	SB 1		
Volume Total	22	825	440	38	839
Volume Left	22	0	38	0	6
Volume Right	0	0	27	0	23
cSH	729	1700	549	1700	50
Volume to Capacity	0.03	0.49	0.26	0.49	0.26
Queue Length 95th (m)	0.7	0.0	0.18	0.0	0.31
Control Delay (s)	10.1	0.0	0.120	0.0	86.3
Lane LOS	B		B		C
Approach Delay (s)	0.2		0.3		35.9
Approach LOS			E		C
Intersection Summary					
Average Delay					0.7
Intersection Capacity Utilization					43.0%
Analysis Period (min)					15

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HCM Signalized Intersection Capacity Analysis												
3: East Avenue & Lakeshore Road East												
<Total> PM Peak Hour 03-27-2020												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBR		
Lane Configurations	11	1056	46	23	1194	73	37	28	25	11	0	3
Traffic Volume (vph)	11	1056	46	23	1194	73	37	28	25	11	0	3
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphol)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0	6.0	6.0	6.0
Total Lost time (s)	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Firb. ped/pikes	1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	1.00	1.00	0.99	1.00
Firb. ped/pikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fit	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.96	1.00	0.85	1.00
Fit Protected	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.98	1.00	0.95	1.00
Satd. Flow (prot)	1805	3539	1472	1356	3539	1528	1740	1805	1592	1592	1592	1592
Fit Permitted	0.12	1.00	1.00	0.13	1.00	1.00	0.90	0.90	0.70	1.00	0.70	1.00
Satd. Flow (perm)	230	3539	1472	189	3539	1528	1602	1323	1323	1323	1323	1323
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	12	1112	48	24	1257	77	39	29	26	12	0	3
R/TOR Reduction (vph)	0	0	23	0	0	23	0	15	0	0	2	0
Lane Group Flow (vph)	12	1112	25	24	1257	54	0	79	0	12	1	0
Conf. Ped. (#/hr)	11	1112	2	2	11	3	1%	4%	4%	0%	0%	3
Heavy Vehicles (%)	0%	2%	7%	33%	2%	1%	4%	4%	0%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	NA	NA	NA
Protected Phases	4	4	8	8	2	2	6	6	6	6	6	6
Permitted Phases	4	4	8	8	2	2	6	6	6	6	6	6
Actuated Green, G (s)	33.0	33.0	33.0	33.0	33.0	33.0	35.1	35.1	35.1	35.1	35.1	35.1
Effective Green, g (s)	33.0	33.0	33.0	33.0	33.0	33.0	35.1	35.1	35.1	35.1	35.1	35.1
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40	0.43	0.43	0.43	0.43	0.43	0.43
Clearance Time (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Emission (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	93	1431	595	76	1431	617	689	569	684	684	684	684
V/S Ratio Prot	0.31	0.31	0.36	0.36	0.13	0.04	0.05	0.01	0.00	0.00	0.00	0.00
V/S Ratio Perm	0.05	0.05	0.02	0.13	0.04	0.04	0.05	0.01	0.01	0.01	0.01	0.01
Vic Ratio	0.13	0.78	0.04	0.32	0.88	0.09	0.11	0.02	0.00	0.00	0.00	0.00
Uniform Delay, d ^f	15.3	21.1	14.7	16.6	22.4	15.0	13.9	13.4	13.3	13.3	13.3	13.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d ²	0.6	2.7	0.0	2.4	6.4	0.1	0.3	0.1	0.0	0.0	0.0	0.0
Delay (s)	15.9	23.8	14.7	19.0	28.9	15.1	14.3	13.4	13.3	13.3	13.3	13.3
Level of Service	B	C	B	B	C	B	B	B	B	B	B	B
Approach Delay (s)	23.4	27.9	14.3	14.3	14.3	13.4	13.4	13.4	13.4	13.4	13.4	13.4
Approach LOS	C	C	C	C	C	B	B	B	B	B	B	B
Intersection Summary												
HCM 2000 Control Delay	25.3											
HCM 2000 Volume to Capacity ratio	0.48											
Actuated Cycle Length (s)												
Intersection Capacity Utilization												
Analysis Period (min)												
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis												
4: East Avenue & Site Access												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBR		
Lane Configurations	11	1056	46	23	1194	73	37	28	25	11	0	3
Traffic Volume (vph)	11	1056	46	23	1194	73	37	28	25	11	0	3
Future Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphol)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0	6.0	6.0	6.0
Total Lost time (s)	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Firb. ped/pikes	1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	1.00	1.00	0.99	1.00
Firb. ped/pikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fit	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.96	1.00	0.85	1.00
Fit Protected	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.98	1.00	0.95	1.00
Satd. Flow (prot)	1805	3539	1472	1356	3539	1528	1740	1805	1592	1592	1592	1592
Fit Permitted	0.12	1.00	1.00	0.13	1.00	1.00	0.90	0.90	0.70	1.00	0.70	1.00
Satd. Flow (perm)	230	3539	1472	189	3539	1528	1602	1323	1323	1323	1323	1323
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	12	1112	48	24	1257	77	39	29	26	12	0	3
R/TOR Reduction (vph)	0	0	23	0	0	23	0	15	0	0	2	0
Lane Group Flow (vph)	12	1112	25	24	1257	54	0	79	0	12	1	0
Conf. Ped. (#/hr)	11	1112	2	2	11	3	1%	4%	4%	0%	0%	3
Heavy Vehicles (%)	0%	2%	7%	33%	2%	1%	4%	4%	0%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	NA	NA	NA
Protected Phases	4	4	8	8	2	2	6	6	6	6	6	6
Permitted Phases	4	4	8	8	2	2	6	6	6	6	6	6
Actuated Green, G (s)	33.0	33.0	33.0	33.0	33.0	33.0	35.1	35.1	35.1	35.1	35.1	35.1
Effective Green, g (s)	33.0	33.0	33.0	33.0	33.0	33.0	35.1	35.1	35.1	35.1	35.1	35.1
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40	0.43	0.43	0.43	0.43	0.43	0.43
Clearance Time (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Emission (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	93	1431	595	76	1431	617	689	569	684	684	684	684
V/S Ratio Prot	0.31	0.31	0.36	0.36	0.13	0.04	0.05	0.01	0.00	0.00	0.00	0.00
V/S Ratio Perm	0.05	0.05	0.02	0.13	0.04	0.04	0.05	0.01	0.01	0.01	0.01	0.01
Vic Ratio	0.13	0.78	0.04	0.32	0.88	0.09	0.11	0.02	0.00	0.00	0.00	0.00
Uniform Delay, d ^f	15.3	21.1	14.7	16.6	22.4	15.0	13.9	13.4	13.3	13.3	13.3	13.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d ²	0.6	2.7	0.0	2.4	6.4	0.1	0.3	0.1	0.0	0.0	0.0	0.0
Delay (s)	15.9	23.8	14.7	19.0	28.9	15.1	14.3	13.4	13.3	13.3	13.3	13.3
Level of Service	B	C	B	B	C	B	B	B	B	B	B	B
Approach Delay (s)	23.4	27.9	14.3	14.3	14.3	13.4	13.4	13.4	13.4	13.4	13.4	13.4
Approach LOS	C	C	C	C	C	B	B	B	B	B	B	B
Intersection Summary												
HCM 2000 Control Delay	25.3											
HCM 2000 Volume to Capacity ratio	0.48											
Actuated Cycle Length (s)												
Intersection Capacity Utilization												
Analysis Period (min)												
c Critical Lane Group												

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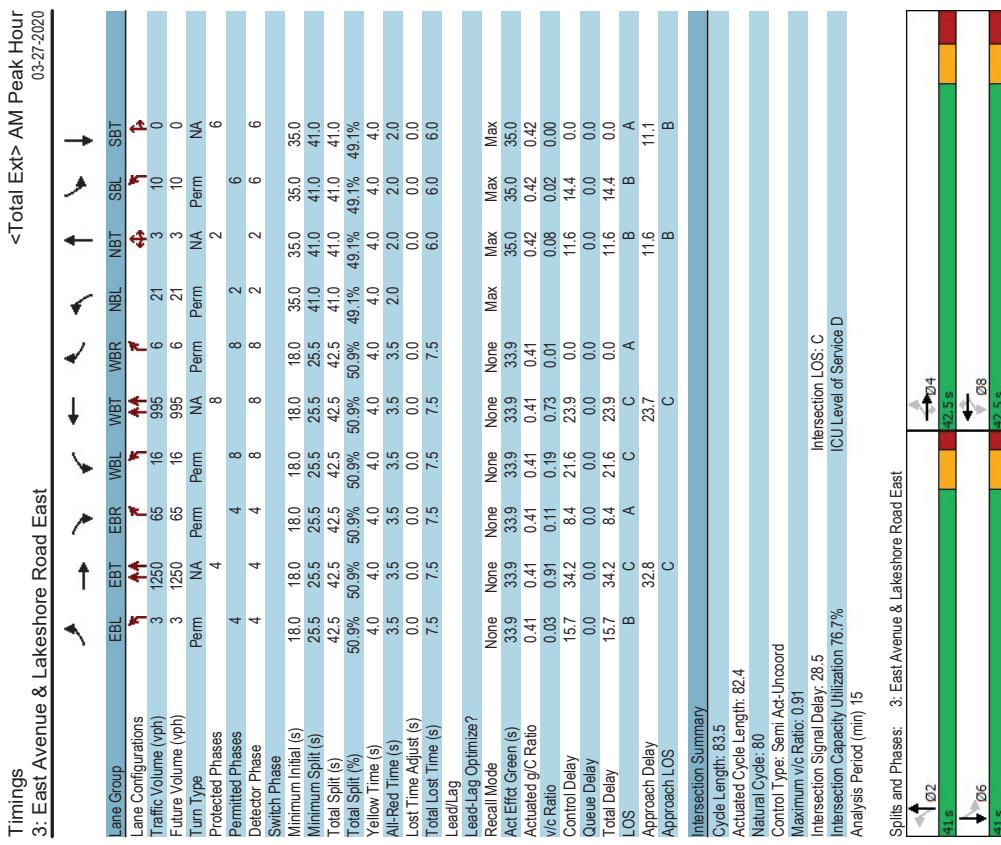


Byngmount Extension

HCM Unsignedized Intersection Capacity Analysis										<Total Ext> AM Peak Hour									
1: Montbeck Crescent/West Avenue & Lakeshore Road East										3:27-2020									
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR							
Lane Configurations	17	1305	44	6	954	22	38	1	18	6	0	5							
Traffic Volume (veh/h)	17	1305	44	6	954	22	38	1	18	6	0	5							
Future Volume (veh/h)																			
Sign Control	Free												Stop						
Grade	0%						0%						0%						
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	18	1359	46	6	994	23	40	1	19	6	0	5							
Pedestrians	1				1			1					11						
Lane Width (m)	3.6				3.6			3.6					3.6						
Walking Speed (m/s)	1.2				1.2			1.2					1.2						
Percent Blockage	0				0			0					1						
Right turn flare (veh)																			
Median type	None				None								None						
Median storage (veh)																			
Upstream signal (m)	0.75				1406			1934					2459						
pX, platoon unblocked																			
vC1, conflicting volume	1028																		
vC2, stage 1 conf vol																			
vC2, stage 2 conf vol																			
vCu, unblocked vol	387				1406			1587					2283						
IC, single (s)	4.1							7.5					7.1						
IC, 2 stage (s)																			
IF (s)	2.2				2.3			3.5					4.0						
p0 queue free %	98				99			25					95						
cM capacity (veh/h)	884				447			54					29						
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3				EB 1	WB 1	NB 1	SB 1			
Volume Total	18	906	499	6	663	354	40	20	11				24	48	21	62			
Volume Left	18	0	0	6	0	0	40	0	6				17	2	1	37			
Volume Right	0	0	46	0	23	0	19	5					1	42	7	14			
cSH	884	1700	447	1700	54	229	123						757	1020	1603	1609			
Volume to Capacity	0.02	0.53	0.29	0.01	0.39	0.21	0.75	0.09	0.09				0.03	0.05	0.00	0.02			
Queue Length 95th (m)	0.5	0.0	0.0	0.3	0.0	0.0	24.9	2.3	2.3				0.8	1.2	0.0	0.6			
Control Delay (s)	9.2	0.0	0.0	13.2	0.0	0.0	176.2	22.2	37.0				9.9	8.7	0.3	4.4			
Lane LOS	A	B	C	D	E	F	G	H	I				A	A	A	A			
Approach Delay (s)	0.1		0.1		124.9		37.0						9.9	8.7	0.3	4.4			
Approach LOS													A	A	A	A			
Intersection Summary																			
Average Delay	3.2																		
Intersection Capacity Utilization	50.5%												A						
Analysis Period (min)	15																		

HCM Unsignedized Intersection Capacity Analysis										<Total Ext> AM Peak Hour									
2: Montbeck Crescent & Byngmount Avenue										3:27-2020									
Movement	EBL	E BT	E BR	W BL	W BT	W BR	N BL	N BT	N BR	S BL	S BT	S BR							
Lane Configurations	17	1305	44	6	954	22	38	1	18	6	0	5							
Traffic Volume (veh/h)	17	1305	44	6	954	22	38	1	18	6	0	5							
Future Volume (veh/h)													Stop						
Sign Control	Free												0%						
Grade	0%												0%						
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	18	1359	46	6	994	23	40	1	19	6	0	5							
Pedestrians	1				1			1					11						
Lane Width (m)	3.6				3.6			3.6					3.6						
Walking Speed (m/s)	1.2				1.2			1.2					1.2						
Percent Blockage	0				0			0					1						
Right turn flare (veh)																			
Median type	None				None								None						
Median storage (veh)																			
Upstream signal (m)	0.75				1406			1934					2459						
pX, platoon unblocked																			
vC1, conflicting volume	1028																		
vC2, stage 1 conf vol																			
vC2, stage 2 conf vol																			
vCu, unblocked vol	387				1406			1587					2283						
IC, single (s)	4.1				4.3			7.5					7.1						
IC, 2 stage (s)																			
IF (s)	2.2				2.3			3.5					4.0						
p0 queue free %	98				99			25					95						
cM capacity (veh/h)	884				447			54					29						
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	NB 3				EB 1	WB 1	NB 1	SB 1			
Volume Total	18	906	499	6	663	354	40	20	11				24	48	21	62			
Volume Left	18	0	0	6	0	0	40	0	6				17	2	1	37			
Volume Right	0	0	46	0	23	0	19	5					1	42	7	14			
cSH	884	1700	447	1700	54	229	123						757	1020	1603	1609			
Volume to Capacity	0.02	0.53	0.29	0.01	0.39	0.21	0.75	0.09	0.09				0.03	0.05	0.00	0.02			
Queue Length 95th (m)	0.5	0.0	0.0	0.3	0.0	0.0	24.9	2.3	2.3				0.8	1.2	0.0	0.6			
Control Delay (s)	9.2	0.0	0.0	13.2	0.0	0.0	176.2	22.2	37.0				9.9	8.7	0.3	4.4			
Lane LOS	A	B	C	D	E	F	G	H	I				A	A	A	A			
Approach Delay (s)	0.1		0.1	124.9		37.0							9.9	8.7	0.3	4.4			
Approach LOS													A	A	A	A			
Intersection Summary																			
Average Delay	3.2																		
Intersection Capacity Utilization	50.5%																		
Analysis Period (min)	15																		

HCM Unsignedized Intersection Capacity Analysis										<Total Ext> AM Peak Hour									
2: Montbeck Crescent & Byngmount Avenue										3:27-2020									
Movement	EBL	E BT	E BR	W BL	W BT	W BR	N BL	N BT	N BR	S BL	S BT	S BR							
Lane Configurations	17	1305	44	6	954	22	38	1	18	6	0	5							
Traffic Volume (veh/h)	17	1305	44	6															



HCM Signalized Intersection Capacity Analysis

3: East Avenue & Lakeshore Road East

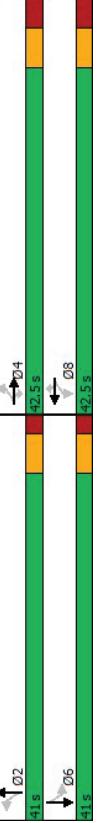
<Total Ext> AM Peak Hour 03-27-2020

Movement	EBL	EBT	EBC	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	3	1250	65	16	995	6	21	3	10	0	3
Traffic Volume (vph)	3	1250	65	16	995	6	21	3	10	0	3
Future Volume (vph)											
Turn Type	Perm	NA	NA								
Protected Phases	4	4	4	8	8	2	2	6	6	6	6
Permitted Phases	4	4	4	8	8	2	2	6	6	6	6
Detector Phase	4	4	4	8	8	2	2	6	6	6	6
Switch Phase											
Minimum Initial (s)	18.0	18.0	18.0	18.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Minimum Split (s)	28.5	28.5	28.5	28.5	41.0	41.0	41.0	41.0	41.0	41.0	41.0
Total Split (s)	42.5	42.5	42.5	42.5	42.5	42.5	41.0	41.0	41.0	41.0	41.0
Total Split (%)	50.9%	50.9%	50.9%	50.9%	49.1%	49.1%	49.1%	49.1%	49.1%	49.1%	49.1%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.5	3.5	3.5	3.5	2.0	2.0	2.0	2.0	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	0.0	0.0	0.0
Total Lost Time (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0	6.0	6.0
Lead/Lag											
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	33.9	33.9	33.9	33.9	33.9	35.0	35.0	35.0	35.0	35.0	35.0
Actuated g/C Ratio	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
v/c Ratio	0.03	0.91	0.11	0.19	0.73	0.01	0.08	0.02	0.00	0.00	0.00
Control Delay	15.7	34.2	8.4	21.6	23.9	0.0	11.6	14.4	0.0	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.7	34.2	8.4	21.6	23.9	0.0	11.6	14.4	0.0	0.0	0.0
LOS	B	C	A	C	C	A	B	B	A	B	C
Approach Delay	32.8		23.7				11.6	11.1			
Approach LOS	C		C				B	B			
Intersection Summary											
Cycle Length: 83.5											
Actuated Cycle Length: 82.4											
Natural Cycle: 80											
Control Type: Semi Act-Uncoord											
Maximum v/c Ratio: 0.91											
Intersection Signal Delay: 28.5											
Intersection Capacity Utilization: 76.7%											
Analysis Period (min) 15											

HCM Unsignalized Intersection Capacity Analysis 4: East Avenue & Byngmount Avenue								<Total Ext> AM Peak Hour										
Movement	EBL	EBR	NBL	NBT	SBT	SBR		EBL	EBR	NBL	NBT	WB	WBT	NBL	NBT	NRB	SBL	SBR
Lane Configurations	27	37	31	35	71	10												
Traffic Volume (veh/h)	27	37	31	35	71	10												
Future Volume (veh/h)																		
Sign Control	Stop				Free											Stop		
Grade	0%				0%													
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92												
Hourly flow rate (vph)	29	40	34	38	77	11												
Pedestrians																		
Lane Width (m)																		
Walking Speed (m/s)																		
Percent Blockage																		
Right turn flare (veh)																		
Median type																		
Median storage (veh)																		
Upstream signal (m)																		
pX, platoon unblocked																		
vC, conflicting volume																		
vc1, stage 1 conf vol																		
vc2, stage 2 conf vol																		
VCu, unblocked vol																		
IC, single (s)																		
IC, 2 stage (s)																		
IF (s)																		
p0 queue free %																		
cM capacity (veh/h)																		
Direction, Lane #	EB 1	NB 1	SB 1					EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1		
Volume Total	69	72	88					22	800	465	22	817	431	41	16	7		
Volume Left	29	34	0					22	0	22	0	0	41	0	1			
Volume Right	40	0	11					0	65	0	0	23	0	15	6			
cSH	885	1508	1700					744	1700	549	1700	1700	59	193	264			
Volume to Capacity	0.08	0.02	0.05					0.03	0.47	0.27	0.04	0.48	0.25	0.69	0.08	0.03		
Queue Length 95th (m)	2.0	0.6	0.0					0.7	0.40	0.0	0.10	0.0	0.0	0.23	2.1	0.7		
Control Delay (s)	9.4	3.6	0.0					10.0	0.0	0.0	11.8	0.0	0.0	150.5	25.3	19.0		
Lane LOS	A	A	A					A			B			F	D	C		
Approach Delay (s)	9.4	3.6	0.0					0.2			0.2			115.4	19.0			
Approach LOS	A	A	A											F	C			
Intersection Summary								Average Delay								2.7		
Intersection Capacity Utilization								<Total Ext> PM Peak Hour								48.2%		
Analysis Period (min)								Intersection Capacity Utilization								15	ICU Level of Service	A

HCM Unsignalized Intersection Capacity Analysis 1: Montdeck Crescent/West Avenue & Lakeshore Road East								<Total Ext> PM Peak Hour										
Movement	EBL	EBR	NBL	NBT	SBT	SBR		EBL	EBR	NBL	NBT	WB	WBT	NBL	NBT	SBT	SBR	
Lane Configurations	27	37	31	35	71	10												
Traffic Volume (veh/h)	27	37	31	35	71	10												
Future Volume (veh/h)																		
Sign Control	Stop				Free													
Grade	0%				0%													
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92												
Hourly flow rate (vph)	29	40	34	38	77	11												
Pedestrians																		
Lane Width (m)																		
Walking Speed (m/s)																		
Percent Blockage																		
Right turn flare (veh)																		
Median type																		
Median storage (veh)																		
Upstream signal (m)																		
pX, platoon unblocked																		
vC, conflicting volume																		
vc1, stage 1 conf vol																		
vc2, stage 2 conf vol																		
VCu, unblocked vol																		
IC, single (s)																		
IC, 2 stage (s)																		
IF (s)																		
p0 queue free %																		
cM capacity (veh/h)																		
Direction, Lane #	EB 1	NB 1	SB 1					EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1		
Volume Total	69	72	88					22	800	465	22	817	431	41	16	7		
Volume Left	29	34	0					22	0	22	0	0	41	0	1			
Volume Right	40	0	11					0	65	0	0	23	0	15	6			
cSH	885	1508	1700					744	1700	549	1700	1700	59	193	264			
Volume to Capacity	0.08	0.02	0.05					0.03	0.47	0.27	0.04	0.48	0.25	0.69	0.08	0.03		
Queue Length 95th (m)	2.0	0.6	0.0					0.7	0.40	0.0	0.10	0.0	0.0	0.23	2.1	0.7		
Control Delay (s)	9.4	3.6	0.0					10.0	0.0	0.0	11.8	0.0	0.0	150.5	25.3	19.0		
Lane LOS	A	A	A					A			B			F	D	C		
Approach Delay (s)	9.4	3.6	0.0					0.2			0.2			115.4	19.0			
Approach LOS	A	A	A											F	C			
Intersection Summary								Average Delay								2.7		
Intersection Capacity Utilization								<Total Ext> PM Peak Hour								48.2%		
Analysis Period (min)								Intersection Capacity Utilization								15	ICU Level of Service	A

HCM Unsignalized Intersection Capacity Analysis								<Total Ext> PM Peak Hour							
2: Montbeck Crescent & Byngmount Avenue				>				<				>			
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT				
Lane Configurations	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop				
Sign Control	1	4	1	7	8	32	5	3	4	35	4				
Traffic Volume (vph)	1	4	1	7	8	32	5	3	4	35	4	30			
Future Volume (vph)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96			
Hourly flow rate (vph)	1	4	1	7	8	33	5	3	4	36	4	31			
Direction Lane #	EB1	WB1	NB1	SB1											
Volume Total (vph)	6	48	12	71											
Volume Left (vph)	1	7	5	36											
Volume Right (vph)	1	33	4	31											
Had (s)	-0.07	-0.38	0.01	-0.16											
Departure Headway (s)	4.0	3.7	4.1	3.9											
Degree Utilization, x	0.01	0.05	0.01	0.08											
Capacity (vehi/h)	864	949	886	916											
Control Delay(s)	7.1	6.9	7.1	7.2											
Approach Delay(s)	A	A	A	A											
Approach LOS															
Intersection Summary															
Delay	7.1														
Level of Service	A														
Intersection Capacity Utilization	17.1%														
Analysis Period (min)	15														

Timings								<Total Ext> PM Peak Hour							
3: East Avenue & Lakeshore Road East								03-27-2020							
<Total Ext> PM Peak Hour															
Lane Group								Lane Configurations							
EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	Traffic Volume (vph)	11	1023	36	23	1154	73	31
Sign Control	Stop	Future Volume (vph)	11	1023	36	23	1154	73	31						
Future Volume (vph)	1	4	1	7	8	32	5	3	4	35	4	30			
Turn Type								Turn Type							
Protected Phases								Protected Phases	4	4	4	4	8	8	2
Permitted Phases								Permitted Phases	4	4	4	4	8	8	2
Detector Phase								Detector Phase	4	4	4	4	8	8	2
Switch Phase								Switch Phase							
Minimum Initial (s)								Minimum Initial (s)	180	180	180	180	180	180	350
Total Split (s)								Total Split (s)	25.5	25.5	25.5	25.5	25.5	25.5	35.0
Total Split (%)								Total Split (%)	50.9%	50.9%	50.9%	50.9%	49.1%	49.1%	
Yellow Time (s)								Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)								All-Red Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	4.0
Lost Time Adjust (s)								Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)								Total Lost Time (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0
Lead/Lag (s)								Lead/Lag							
Lead-Lag Optimize?								Lead-Lag Optimize?							
Recall Mode								Recall Mode	None	None	None	None	None	None	Max
Act Effect Green (s)								Act Effect Green (s)	32.1	32.1	32.1	32.1	32.1	32.1	35.1
Actuated g/C Ratio								Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40	0.43
v/C Ratio								v/C Ratio	0.13	0.77	0.06	0.30	0.86	0.12	0.02
Control Delay								Control Delay	19.0	25.2	5.3	27.8	29.8	9.2	11.6
Queue Delay								Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay								Total Delay	19.0	25.2	5.3	27.8	29.8	9.2	11.6
LOS								LOS	B	C	A	C	A	B	A
Approach Delay								Approach Delay	24.4			28.5		11.6	11.6
Approach LOS								Approach LOS	C			C		B	B
Intersection Summary															
Cycle Length: 83.5								Cycle Length: 83.5							
Actuated Cycle Length: 80.7								Actuated Cycle Length: 80.7							
Natural Cycle: 75								Natural Cycle: 75							
Control Type: Semi Act-Uncoord								Control Type: Semi Act-Uncoord							
Maximum v/c Ratio: 0.86								Maximum v/c Ratio: 0.86							
Intersection Signal Delay: 25.0								Intersection Signal Delay: 25.0							
Intersection Capacity Utilization 76.7%								Intersection Capacity Utilization 76.7%							
Analysis Period (min) 15								Analysis Period (min) 15							
Intersection LOS: C															
ICU Level of Service D															
Splits and Phases: 3: East Avenue & Lakeshore Road East															
															

HCM Signalized Intersection Capacity Analysis										<Total Ext> PM Peak Hour										
3: East Avenue & Lakeshore Road East										03-27-2020										
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	NBL	NBT	NBR	SBT	SBR
Lane Configurations	11	1023	36	23	1154	73	31	28	25	11	0	3								
Traffic Volume (vph)	11	1023	36	23	1154	73	31	28	25	11	0	3	19	35	42	86	31	28		
Future Volume (vph)													19	35	42	86	31	28		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900								
Total Lost time (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0	6.0	6.0	6.0								
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00								
Firb. ped/pikes	1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	1.00								
Firb. ped/pedilikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00								
Fit																				
Fit Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.96	1.00	0.95	1.00								
Satd. Flow (prot)	1805	3539	1473	1356	3539	1528	1740	1805	1592	1740	1805	1592								
Fit Permitted	0.12	1.00	1.00	0.14	1.00	1.00	0.92	1.00	0.92	1.00	0.92	1.00								
Satd. Flow (perm)	237	3539	1473	204	3539	1528	1623	1330	1592	1623	1330	1592								
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95								
Adj. Flow (vph)	12	1077	38	24	1215	77	33	29	26	12	0	3								
R/TOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0								
Lane Group Flow (vph)	12	1077	15	24	1215	54	0	15	0	12	1	0								
Confli. Peds. (#/hr)	11	12	1077	2	2	11	3	0	73	0	12	1								
Heavy Vehicles (%)	0%	2%	7%	33%	2%	1%	4%	4%	0%	0%	0%	0%								
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA								
Protected Phases	4	4	4	8	8	2	2	6	6	6	6	6								
Permitted Phases																				
Actuated Green, G (s)	32.1	32.1	32.1	32.1	32.1	32.1	35.1	35.1	35.1	35.1	35.1	35.1								
Effective Green, g (s)	32.1	32.1	32.1	32.1	32.1	32.1	35.1	35.1	35.1	35.1	35.1	35.1								
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40	0.43	0.43	0.43	0.43	0.43	0.43								
Clearance Time (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0	6.0	6.0	6.0								
Vehicle Emission (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0								
Lane Grp Cap (vph)	94	1407	585	81	1407	607	705	578	692	705	578	692								
v/s Ratio Prot	0.30	0.30	0.34	0.34	0.34	0.34	0.05	0.05	0.05	0.05	0.05	0.05								
v/s Ratio Perm	0.05	0.01	0.12	0.04	0.04	0.04	0.10	0.10	0.02	0.02	0.02	0.02								
vic Ratio	0.13	0.77	0.30	0.86	0.09	0.11	0.07	0.07	0.07	0.07	0.07	0.07								
Uniform Delay, d _U	15.4	21.0	14.8	16.6	22.3	15.2	13.5	13.0	12.9	13.5	13.0	12.9								
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00								
Incremental Delay, d ₂	0.6	2.5	0.4	2.0	5.7	0.1	0.3	0.1	0.0	0.1	0.0	0.0								
Delay (s)	16.0	23.6	14.8	18.6	28.0	15.2	13.8	13.1	12.9	13.8	13.1	12.9								
Level of Service	B	C	B	B	C	B	B	B	B	B	B	B								
Approach Delay (s)	23.2	27.1	C	C	C	C	13.8	13.0	13.0	13.8	13.0	13.0								
Approach LOS																				
Intersection Summary																				
HCM2000 Control Delay	24.8																			
HCM2000 Volume to Capacity ratio	0.47																			
Actuated Cycle Length (s)																				
Intersection Capacity Utilization	80.7																			
Analysis Period (min)	76.7%																			
c Critical Lane Group	15																			

HCM Unsignalized Intersection Capacity Analysis										<Total Ext> PM Peak Hour										
4: East Avenue & Byngmount Avenue										03-27-2020										
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	NBL	NBT	NBR	SBT	SBR
Lane Configurations	11	1023	36	23	1154	73	31	28	25	11	0	3	19	35	42	86	31	28		
Traffic Volume (vph)	11	1023	36	23	1154	73	31	28	25	11	0	3	19	35	42	86	31	28		
Future Volume (vph)																				
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900								
Total Lost time (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0	6.0	6.0	6.0								
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00								
Firb. ped/pikes	1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	1.00								
Firb. ped/pedilikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00								
Fit																				
Fit Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.96	1.00	0.95	1.00								
Satd. Flow (prot)	1805	3539	1473	204	3539	1528	1623	1330	1592	1623	1330	1592								
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95								
Adj. Flow (vph)	12	1077	38	24	1215	77	33	29	26	12	0	3								
R/TOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0								
Lane Group Flow (vph)	12	1077	15	24	1215	54	0	15	0	73	0	12	1							
Confli. Peds. (#/hr)	11	12	1077	2	2	11	3	0	0	12	1	0								
Heavy Vehicles (%)	0%	2%	7%	33%	2%	1%	4%	4%	0%	0%	0%	0%								
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA								
Protected Phases	4	4	4	8	8	2	2	6	6	6	6	6								
Permitted Phases																				
Actuated Green, G (s)	32.1	32.1	32.1	32.1	32.1	32.1	35.1	35.1	35.1	35.1	35.1	35.1								
Effective Green, g (s)	32.1	32.1	32.1	32.1	32.1	32.1	35.1	35.1	35.1	35.1	35.1	35.1								
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40	0.43	0.43	0.43	0.43	0.43	0.43								
Clearance Time (s)	7.5	7.5	7.5	7.5	7.5	7.5	6.0	6.0	6.0	6.0	6.0	6.0								
Vehicle Emission (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0								
Lane Grp Cap (vph)	94	1407	585	81	1407	607	705	578	692	705	578	692								
v/s Ratio Prot	0.30	0.30	0.34	0.34	0.34	0.34	0.05	0.05												



Queue Reports

Queuing and Blocking Report
<Total> AM Peak Hour

12-13-2019

Queuing and Blocking Report
<Total> AM Peak Hour

12-13-2019

Intersection: 1: Montbeck Crescent/West Avenue & Lakeshore Road East

Movement	EB	EB	FB	FB	WB	WB	NB	NB	SB
Directions Served	L	T	TR	L	R	TR	LTR		
Maximum Queue (m)	13.4	8.9	22.5	8.8	8.9	23.6	8.6		
Average Queue (m)	2.5	0.3	0.7	1.4	1.6	6.4	2.5		
95th Queue (m)	9.4	2.9	7.4	6.7	6.8	18.2	8.5		
Link Distance (m)	205.8	205.8			67.2	127.2			
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)	10.0				15.0	20.0			
Storage Blk Time (%)	4	0			1				
Queuing Penalty (veh)	28	0			0				

Intersection: 2: Montbeck Crescent & Byngmount Avenue

Movement	EB	SB
Directions Served	LTR	LTR
Maximum Queue (m)	23.7	9.0
Average Queue (m)	4.9	0.3
95th Queue (m)	15.5	3.0
Link Distance (m)	90.2	67.2
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: East Avenue & Lakeshore Road East

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	T	R	LTR	L	TR	
Maximum Queue (m)	21.9	122.6	99.3	37.5	32.3	95.7	89.7	27.3	35.3	8.3	7.0	
Average Queue (m)	1.5	81.4	77.0	15.1	5.2	80.0	56.1	3.8	9.1	3.0	0.8	
95th Queue (m)	8.7	109.7	104.4	40.0	18.8	106.2	82.1	18.4	23.1	9.0	4.3	
Link Distance (m)	200.3	200.3			91.1	91.1			50.0		92.6	
Upstream Blk Time (%)					5	0						
Queuing Penalty (veh)					0	0						
Storage Bay Dist (m)	15.0				30.0	25.0			20.0			
Storage Blk Time (%)	0	49	35	0	3	43		26	0			
Queuing Penalty (veh)	2	1	25	1	15	8	2	0				

Queuing and Blocking Report
<Total> PM Peak Hour

12-13-2019

Queuing and Blocking Report
<Total> PM Peak Hour

12-13-2019

Intersection: 1: Montbeck Crescent/West Avenue & Lakeshore Road East

Movement	EB	EB	WB	NB	NB	SB
Directions Served	L	TR	L	T	TR	LTR
Maximum Queue (m)	8.8	6.5	13.1	9.0	14.8	8.5
Average Queue (m)	3.6	0.4	4.1	0.9	5.3	2.6
95th Queue (m)	10.2	3.1	11.4	5.3	12.7	8.6
Link Distance (m)	205.8				67.2	127.2
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)	10.0		15.0	20.0		
Storage Blk Time (%)	4		0	0		
Queuing Penalty (veh)	25		2	0		

Intersection: 2: Montbeck Crescent & Byngmount Avenue

Movement	EB	EB	WB	NB	NB	SB
Directions Served		LTR				
Maximum Queue (m)	8.8					
Average Queue (m)	0.6					
95th Queue (m)	4.1					
Link Distance (m)	902					
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 3: East Avenue & Lakeshore Road East

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	T	T	R	LTR	L
Maximum Queue (m)	7.4	76.1	78.8	37.5	32.5	102.4	95.7	27.5	32.9
Average Queue (m)	2.0	53.2	50.9	10.5	14.4	86.2	63.1	11.6	12.9
95th Queue (m)	7.1	72.6	70.3	32.7	36.5	107.7	86.9	28.0	26.6
Link Distance (m)	200.1	200.1			91.1	91.1			54.7
Upstream Blk Time (%)					7	1			
Queuing Penalty (veh)					0	0			
Storage Bay Dist (m)	15.0	44	23	30.0	25.0		20.0	20.0	
Storage Blk Time (%)	5	12	0	40	12	0	20	0	
Queuing Penalty (veh)									



APPENDIX D

Level of Service Definitions

LEVEL OF SERVICE ANALYSIS AT SIGNALIZED INTERSECTIONS

To assist in clarifying the arithmetic analysis associated with traffic engineering, it is often useful to refer to “Level of Service”. The term Level of Service implies a qualitative measure of traffic flow at an intersection. It is dependent upon vehicle delay and vehicle queue lengths at the approaches. Specifically, Level of Service criteria are stated in terms of the average stopped delay per vehicle for a 15-minute analysis period. The following table describes the characteristics of each level:

<u>Level of Service</u>	<u>Features</u>	<u>Stopped Delay per Vehicle (sec)</u>
A	At this level of service, almost no signal phase is fully utilized by traffic. Very seldom does a vehicle wait longer than one red indication. The approach appears open, turning movements are easily made and drivers have freedom of operation.	≤ 5.0
B	At this level, an occasional signal phase is fully utilized and many phases approach full use. Many drivers begin to feel somewhat restricted within platoons of vehicles approaching the intersection.	$> 5.0 \text{ and } \leq 15.0$
C	At this level, the operation is stable though with more frequent fully utilized signal phases. Drivers feel more restricted and occasionally may have to wait more than one red signal indication, and queues may develop behind turning vehicles. This level is normally employed in urban intersection design.	$> 15.0 \text{ and } \leq 25.0$
D	At this level, the motorist experiences increasing restriction and instability of flow. There are substantial delays to approaching vehicles during short peaks within the peak period, but there are enough cycles with lower demand to permit occasional clearance of developing queues and prevent excessive backups.	$> 25.0 \text{ and } \leq 40.0$
E	At this level, capacity is reached. There are long queues of vehicles waiting upstream of the intersection and delays to vehicles may extend to several signal cycles.	$> 40.0 \text{ and } \leq 60.0$
F	At this level, saturation occurs, with vehicle demand exceeding the available capacity.	> 60.0

LEVEL OF SERVICE ANALYSIS AT UNSIGNALIZED INTERSECTIONS⁽¹⁾

The term "level of service" implies a qualitative measure of traffic flow at an intersection. It is dependent upon the vehicle delay and vehicle queue lengths at approaches. The level of service at unsignalized intersections is often related to the delay accumulated by flows on the minor streets, caused by all other conflicting movements. The following table describes the characteristics of each level.

Level of Service	Features
A	Little or no traffic delay occurs. Approaches appear open, turning movements are easily made, and drivers have freedom of operation.
B	Short traffic delays occur. Many drivers begin to feel somewhat restricted in terms of freedom of operation.
C	Average traffic delays occur. Operations are generally stable, but drivers emerging from the minor street may experience difficulty in completing their movement. This may occasionally impact on the stability of flow on the major street.
D	Long traffic delays occur. Motorists emerging from the minor street experience significant restriction and frustration. Drivers on the major street will experience congestion and delay as drivers emerging from the minor street interfere with the major through movements.
E	Very long traffic delays occur. Operations approach the capacity of the intersection.
F	Saturation occurs, with vehicle demand exceeding the available capacity. Very long traffic delays occur.

⁽¹⁾ Highway Capacity Manual - Special Report No. 209, Transportation Research Board, 1985.



APPENDIX E

Gap Study Surveys

Start Time of Gap (Hour:Min)	Duration of Available Traffic Gaps		Left Turn from Major Road		Right Turn from Minor Road		Left Turn from Minor	
	Eastbound Open (Seconds)	Both Directions Open (Seconds)	Critical	Follow-Up	Critical	Follow-Up	Critical	Follow-Up
			4.1	2.2	6.2	3.3	7.1	3.5
07:45:00		22	1	8	1	4	1	4
07:45:25		72	0	0	0	0	1	18
07:46:42		134	1	59	1	38	1	36
07:48:45		135	0	0	0	0	1	36
07:50:50		120	1	52	1	34	1	32
07:52:42		30	1	11	1	7	1	6
07:53:28		19	1	6	1	3	1	3
07:53:50		25	1	9	1	5	1	5
07:54:20		10	1	2	1	1	1	0
07:54:32		35	1	14	1	8	1	7
07:55:20		40	1	16	1	10	1	9
07:56:10		18	1	6	1	3	1	3
07:56:32		28	1	10	1	6	1	5
07:57:10		15	1	4	1	2	1	2
07:57:30		80	1	34	1	22	1	20
07:59:10		30	1	11	1	7	1	6
08:00:00		25	1	9	1	5	1	5
08:00:45		20	1	7	1	4	1	3
08:01:20		67	1	28	1	18	1	17
08:02:35		135	1	59	1	39	1	36
08:05:40		11	1	3	1	1	1	1
08:05:57		9	1	2	1	0	1	0
08:06:20		25	1	9	1	5	1	5
08:06:50		8	1	1	1	0	1	0
08:07:00		12	1	3	1	1	1	1
08:07:30		40	1	16	1	10	1	9
08:08:28		30	1	11	1	7	1	6
08:09:17		33	1	13	1	8	1	7
08:09:55		35	1	14	1	8	1	7
08:10:35		40	1	16	1	10	1	9
08:11:30		35	1	14	1	8	1	7
08:12:14		38	1	15	1	9	1	8
08:12:55		45	1	18	1	11	1	10
08:13:46		55	1	23	1	14	1	13
08:14:41		13	1	4	1	2	1	1
08:14:57		180	1	79	1	52	1	49
08:18:50		90	1	39	1	25	1	23
08:20:45		15	1	4	1	2	1	2
08:21:08		60	1	25	1	16	1	15
08:22:22		13	1	4	1	2	1	1
08:22:41		94	1	40	1	26	1	24
08:24:34		28	1	10	1	6	1	5
08:25:10		18	1	6	1	3	1	3
08:25:33		42	1	17	1	10	1	9
08:26:45		13	1	4	1	2	1	1
08:27:07		13	1	4	1	2	1	1
08:27:19		16	1	5	1	2	1	2
08:27:53		12	1	3	1	1	1	1
08:28:08		165	1	73	1	48	1	45
08:31:08		170	1	75	1	49	1	46
08:34:10		10	1	2	1	1	1	0
08:34:37		23	1	8	1	5	1	4
08:35:05		45	1	18	1	11	1	10
08:36:00		31	1	12	1	7	1	6
08:36:33		32	1	12	1	7	1	7
08:37:05		65	1	27	1	17	1	16
08:38:40		49	1	20	1	12	1	11
08:39:51		29	1	11	1	6	1	6
08:40:37		38	1	15	1	9	1	8
08:41:21		62	1	26	1	16	1	15
08:42:34		124	1	54	1	35	1	33
		59	1100	59	682	61	680	
		1159		741		741		

Start Time of Gap (Hour:Min)	Duration of Available Traffic Gaps		Left Turn from Major Road		Right Turn from Minor Road		Left Turn from Minor	
	Eastbound Open (Seconds)	Both Directions Open (Seconds)	Critical 4.1 (Seconds)	Follow-Up 2.2 (Seconds)	Critical 6.2 (Seconds)	Follow-Up 3.3 (Seconds)	Critical 7.1 (Seconds)	Follow-Up 3.5 (Seconds)
04:00:21		39	1	15	1	9	1	9
04:01:14		14	0	0	0	0	1	1
04:01:31		24	1	9	1	5	1	4
04:02:00		17	0	0	0	0	1	2
04:02:42	58		1	24	1	15	0	0
04:03:40	40		1	16	1	10	0	0
04:04:22		18	1	6	1	3	1	3
04:04:55		20	1	7	1	4	1	3
04:05:17		23	1	8	1	5	1	4
04:05:43		8	1	1	1	0	1	0
04:05:53		47	1	19	1	12	1	11
04:06:46		11	1	3	1	1	1	1
04:07:00		8	1	1	1	0	1	0
04:07:20		12	1	3	1	1	1	1
04:07:37		82	1	35	1	22	1	21
04:09:08		58	1	24	1	15	1	14
04:10:12		81	1	34	1	22	1	21
04:11:41		66	1	28	1	18	1	16
04:12:53		57	1	24	1	15	1	14
04:14:00		24	1	9	1	5	1	4
04:14:28		42	1	17	1	10	1	9
04:15:14		44	1	18	1	11	1	10
04:16:02		79	1	34	1	22	1	20
04:17:30		28	1	10	1	6	1	5
04:18:18		32	1	12	1	7	1	7
04:19:00		220	1	98	1	64	1	60
04:23:05		43	1	17	1	11	1	10
04:24:07		83	1	35	1	23	1	21
04:25:40		18	1	6	1	3	1	3
04:26:02		248	1	110	1	73	1	68
04:30:36		11	1	3	1	1	1	1
04:30:54		66	1	28	1	18	1	16
04:32:09		77	1	33	1	21	1	19
04:33:37		28	1	10	1	6	1	5
04:34:15		43	1	17	1	11	1	10
04:35:06		12	1	3	1	1	1	1
04:35:21		57	1	24	1	15	1	14
04:36:22		198	1	88	1	58	1	54
04:39:46		34	1	13	1	8	1	7
04:40:29		52	1	21	1	13	1	12
04:41:28		22	1	8	1	4	1	4
04:42:01		26	1	9	1	6	1	5
04:42:34		11	1	3	1	1	1	1
04:42:49		24	1	9	1	5	1	4
04:43:17		18	1	6	1	3	1	3
04:43:42		14	1	4	1	2	1	1
04:43:58		140	1	61	1	40	1	37
04:46:37		14	1	4	1	2	1	1
04:47:05		47	1	19	1	12	1	11
04:48:15		7	1	1	1	0	0	0
04:48:25		125	1	54	1	36	1	33
04:50:41		46	1	19	1	12	1	11
04:51:29		49	1	20	1	12	1	11
04:52:24		7	1	1	1	0	0	0
04:52:34		66	1	28	1	18	1	16
04:53:45		54	1	22	1	14	1	13
04:54:43		11	1	3	1	1	1	1
04:54:57		6	1	0	0	0	0	0
04:55:06		54	1	22	1	14	1	13
04:46:10		41	1	16	1	10	1	9
04:56:58		162	1	71	1	47	1	44
		59	1243	58	783	56	699	
		1302		841		755		

Base values of t_c and t_f for passenger cars are given in Exhibit 17-5. The values are based on studies throughout the United States and are representative of a broad range of conditions. Base values of t_c and t_f for a six-lane major street are assumed to be the same as those for a four-lane major street. Adjustments are made to account for the presence of heavy vehicles, approach grade, T-intersections, and two-stage gap acceptance. The critical gap is computed separately for each minor movement by Equation 17-1.

$$t_{c,x} = t_{c,base} + t_{c,HV} P_{HV} + t_{c,G} G - t_{c,T} - t_{3,LT} \quad (17-1)$$

where

- $t_{c,x}$ = critical gap for movement x (s),
- $t_{c,base}$ = base critical gap from Exhibit 17-5 (s),
- $t_{c,HV}$ = adjustment factor for heavy vehicles (1.0 for two-lane major streets and 2.0 for four-lane major streets) (s),
- P_{HV} = proportion of heavy vehicles for minor movement,
- $t_{c,G}$ = adjustment factor for grade (0.1 for Movements 9 and 12 and 0.2 for Movements 7, 8, 10, and 11) (s),
- G = percent grade divided by 100,
- $t_{c,T}$ = adjustment factor for each part of a two-stage gap acceptance process (1.0 for first or second stage; 0.0 if only one stage) (s), and
- $t_{3,LT}$ = adjustment factor for intersection geometry (0.7 for minor-street left-turn movement at three-leg intersection; 0.0 otherwise) (s).

$t_{c,T}$ is applicable to Movements 7, 8, 10, and 11

EXHIBIT 17-5. BASE CRITICAL GAPS AND FOLLOW-UP TIMES FOR TWSC INTERSECTIONS

Vehicle Movement	Base Critical Gap, $t_{c,base}$ (s)		Base Follow-up Time, $t_{f,base}$ (s)
	Two-Lane Major Street	Four-Lane Major Street	
Left turn from major	4.1	4.1	2.2
Right turn from minor	6.2	6.9	3.3
Through traffic on minor	6.5	6.5	4.0
Left turn from minor	7.1	7.5	3.5

Base factors for a six-lane major street are assumed to be the same as those for a four-lane major street

The follow-up time is computed for each minor movement using Equation 17-2. Adjustments are made for the presence of heavy vehicles.

$$t_{f,x} = t_{f,base} + t_{f,HV} P_{HV} \quad (17-2)$$

where

- $t_{f,x}$ = follow-up time for minor movement x (s),
- $t_{f,base}$ = base follow-up time from Exhibit 17-5 (s),
- $t_{f,HV}$ = adjustment factor for heavy vehicles (0.9 for two-lane major streets and 1.0 for four-lane major streets), and
- P_{HV} = proportion of heavy vehicles for minor movement.

Values from Exhibit 17-5 are considered typical. If smaller values for t_c and t_f are observed, capacity will be increased. If larger values for t_c and t_f are used, capacity will be decreased. More accurate capacity estimates will be produced if field measurements of the critical gap and follow-up time can be made.

It should be noted that the critical gap data for multilane sites account for the actual lane distribution of traffic flows measured at each site. This accounts for the higher value of critical gap for the minor-street right turn (6.9 s) compared with the value for the minor through movement (6.5 s).

POTENTIAL CAPACITY

The gap acceptance model used in this method computes the potential capacity of each minor traffic stream in accordance with Equation 17-3 (6, 7).



APPENDIX F

City of Mississauga Parking Excerpts

3.1.2 Required Number of Parking Spaces
3.1.2.1 Required Number of Parking Spaces for Residential Uses

Off-street **parking spaces** for residential **uses** shall be provided in accordance with Table 3.1.2.1 - Required Number of Parking Spaces for Residential Uses.

Table 3.1.2.1 - Required Number of Parking Spaces for Residential Uses

Column	A	B
Line 1.0	TYPE OF USE	MINIMUM OFF-STREET PARKING REGULATIONS
2.0	Condominium Apartment <i>(0207-2008), (0174-2017)</i>	1.00 resident space per bachelor unit 1.25 resident spaces per one-bedroom unit 1.40 resident spaces per two-bedroom unit 1.75 resident spaces per three-bedroom unit 0.20 visitor spaces per unit
3.0	Rental Apartment <i>(0207-2008), (0174-2017)</i>	1.00 resident space per bachelor unit 1.18 resident spaces per one-bedroom unit 1.36 resident spaces per two-bedroom unit 1.50 resident spaces per three-bedroom unit 0.20 visitor spaces per unit
4.0	Apartment (within CC1 to CC4 zones) <i>(0207-2008), (0174-2017)</i>	1.0 resident space per unit 0.15 visitor spaces per unit ⁽¹⁾ For the visitor component, a shared parking arrangement may be used for the calculation of required visitor/non-residential parking in accordance with the following: the greater of 0.15 visitor spaces per unit ⁽¹⁾⁽²⁾ or Parking required for all non-residential uses , located in the same building or on the same lot as the residential use , except banquet hall/conference centre/convention centre, entertainment establishment, overnight accommodation, place of religious assembly, recreational establishment and restaurant . ⁽¹⁾⁽²⁾ Parking for banquet hall/conference centre/convention centre, entertainment establishment, overnight accommodation, place of religious assembly, recreational establishment and restaurant shall not be included in the above shared parking arrangement and shall be provided in accordance with applicable regulations contained in Table 3.1.2.2 of this By-law.
5.0	Detached Dwelling, Linked Dwelling, Semi-Detached, Street Townhouse Dwelling <i>(0297-2013), (0174-2017)</i>	2.0 spaces per unit
6.0	Condominium Detached Dwelling, Condominium Semi-Detached, Condominium Townhouse Dwelling, Detached Dwelling on a CEC - Private Road, Semi-Detached on a CEC - Private Road, Townhouse Dwelling on a CEC - Private Road <i>(0174-2017)</i>	2.0 resident spaces per unit 0.25 visitor spaces per unit
7.0	Duplex, Triplex <i>(0174-2017)</i>	1.25 spaces per unit
8.0	Dwelling units located above a commercial development with a maximum height of three storeys	1.25 spaces per unit
9.0	Group Home	2.0 spaces

Table 3.1.2.1 continued on next page

Parking Guidelines for Public and Private Non-Profit Housing
October 2005

Minimum Parking Guidelines for Peel Living Developments (Per Dwelling Unit)									
Market	Family Apartments		Seniors Apartments		Family Multiple Horizontal				
	Resident	Visitor	Total	Resident	Visitor	Total	Resident	Visitor	Total
Market									
One-Bedroom Unit	0.75	0.20	0.95	0.38	0.10	0.48	0.81	0.25	1.06
Two-Bedroom Unit	0.90	0.20	1.10	0.72	0.10	0.82	0.94	0.25	1.19
Three-Bedroom Unit	1.14	0.20	1.34	--	--	--	0.98	0.25	1.23
Four-Bedroom Unit	1.21	0.20	1.41	--	--	--	1.95	0.25	2.20
Shallow Subsidy									
One-Bedroom Unit	0.40	0.20	0.60	0.33	0.10	0.43	0.75	0.25	1.00
Two-Bedroom Unit	0.60	0.20	0.80	0.60	0.10	0.70	0.75	0.25	1.00
Three-Bedroom Unit	0.74	0.20	0.94	--	--	--	0.75	0.25	1.00
Four-Bedroom Unit	1.10	0.20	1.30	--	--	--	1.95	0.25	2.20
Deep Subsidy									
One-Bedroom Unit	0.31	0.20	0.51	0.17	0.10	0.27	0.45	0.25	0.70
Two-Bedroom Unit	0.50	0.20	0.70	0.30	0.10	0.40	0.45	0.25	0.70
Three-Bedroom Unit	0.70	0.20	0.90	--	--	--	0.61	0.25	0.86
Four-Bedroom Unit	0.97	0.20	1.17	--	--	--	0.73	0.25	0.98



APPENDIX G

Driver Sight Line Review

Table 9.9.4: Design Intersection Sight Distance – Case B1, Left Turn From Stop

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance for Passenger Cars	
		Calculated (m)	Design (m)
20	20	41.7	45
30	35	62.6	65
40	50	83.4	85
50	65	104.3	105
60	85	125.1	130
70	105	146.0	150
80	130	166.8	170
90	160	187.7	190
100	185	208.5	210
110	220	229.4	230
120	250	250.2	255
130	285	271.1	275

Note: Intersection sight distance shown is for a stopped passenger car to turn left onto a two-lane highway with no median and grades 3% or less. For other conditions, the time gap should be adjusted and the sight distance recalculated.

Sight distance design for left turns at divided-highway intersections should consider multiple design vehicles and median width. If the design vehicle used to determine sight distance for a divided-highway intersection is larger than a passenger car, then sight distance for left turns will need to be checked for that selected design vehicle and for smaller design vehicles as well. If the divided-highway median is wide enough to store the design vehicle with a clearance to the through lanes of approximately 1 m at both ends of the vehicle, no separate analysis for the departure sight triangle for left turns is needed on the minor-road approach for the near roadway to the left. In most cases, the departure sight triangle for right turns (case B2) will provide sufficient sight distance for a passenger car to cross the near roadway to reach the median. Possible exceptions are addressed in the discussion of case B3.

Table 9.9.6: Design Intersection Sight Distance – Case B2, Right Turn from Stop, and Case B3, Crossing Maneuver

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance for Passenger Cars	
		Calculated (m)	Design (m)
20	20	36.1	40
30	35	54.2	55
40	50	72.3	75
50	65	90.4	95
60	85	108.4	110
70	105	126.5	130
80	130	144.6	145
90	160	162.6	165
100	185	180.7	185
110	220	198.8	200
120	250	216.8	220
130	285	234.9	235

Note: Intersection sight distance shown is for a stopped passenger car to turn right onto or to cross a two-lane highway with no median and with grades of 3% or less. For other conditions, the time gap should be adjusted and the sight distance recalculated.

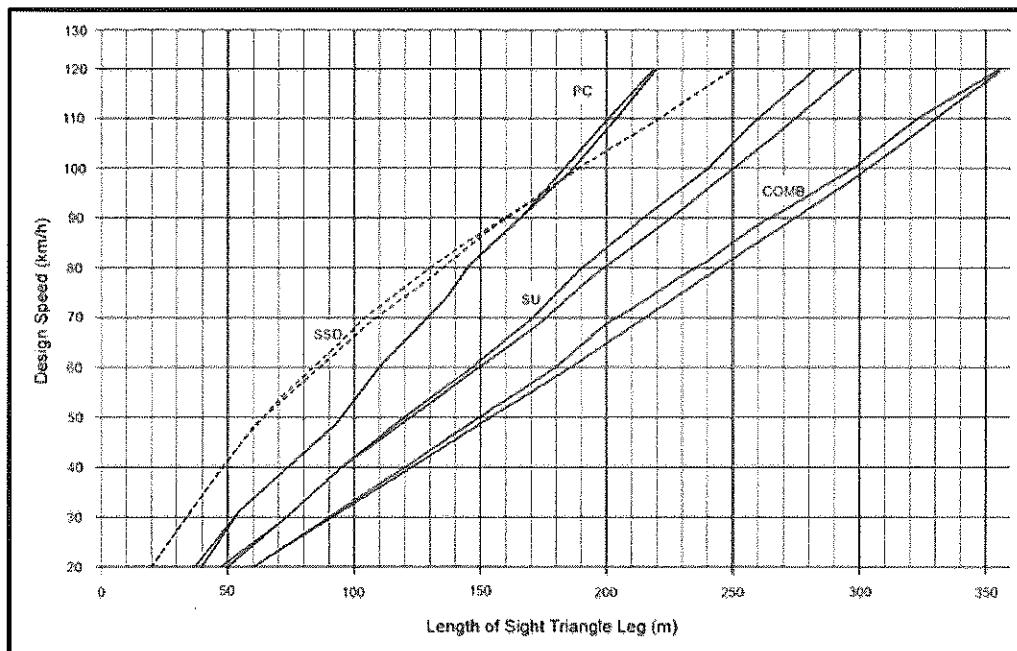


Figure 9.9.5: Intersection Sight Distance – Case B2, Right Turn from Stop, and Case B3, Crossing Maneuver (Calculated and Design Values Plotted)

958 - 960 East Avenue, Mississauga - Proposed 7-Storey Mixed-Use Development

Proposed Driveway - Looking North

(Approximately 85m of available sight distance to Lakeshore Road East)



Proposed Driveway - Looking South

(Approximately 230m of available sight distance to limit of roadway)

