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Consulting

A Division of NextEng Consulting Group Inc.

Transportation Planning

Traffic Impact Assessment

Parking Assessment

Site Access Design & Review

Site Servicing and Grading

Stormwater Management

Municipal Road Design

## Transportation Study

### PROPOSED RESIDENTIAL DEVELOPMENT

154/164 Cemetery Road  
TOWN OF UXBRIDGE

OCT 2016  
Project No: NT-16-091

October 24, 2016

Moorefield Properties Ltd.  
c/o Groundswell Urban Planners Inc.  
30 West Beaver Creek Road, Unit 109  
Richmond Hill, ON L4B 3K1

**Attention: Ms. Mary Filipetto, BAA Senior Planner**

**Re: Transportation Impact Study  
Proposed Residential Site Plan / Plan of Condominium  
154/164 Cemetery Road, Town of Uxbridge  
Our Project No. NT-16-091**

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NexTrans Consulting (A Division of NextEng Consulting Group Inc.) is pleased to present the enclosed Transportation Impact Study in support of an Official Plan Amendment and Rezoning application(s) for the above noted property.

The subject property is currently occupied by a farm and associated buildings and is located at the southwest corner of Cemetery Road and Toronto Street South intersection. The development plan is to provide 56 condominium townhouse units and 12 apartment units. A total of three vehicular entrances will be provided via Cemetery Road with two private roads servicing the condominium townhouse units and one private road servicing the apartment units.

The study concludes that the proposed development can adequately be accommodated by the existing transportation network with minimal traffic impact to the adjacent public roadways. Furthermore, the proposed site accesses will operate at excellent levels of services.

We trust the enclosed sufficiently addresses your needs. Should you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

**NEXTRANS ENGINEERING**



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**TABLE OF CONTENTS**

**1.0 INTRODUCTION ..... 4**

**2.0 EXISTING TRAFFIC CONDITIONS ..... 5**

**2.1. Existing Road Network.....5**

**2.2. Public Transit.....6**

**2.3. Data Collection.....7**

**2.4. Existing Capacity Analysis .....8**

        2.4.1. Evaluation of Existing Capacity Analysis at Signalized Intersection ..... 8

        2.4.2. Evaluation of Existing Capacity Analysis at Unsignalized Intersection ..... 9

**3.0 FUTURE (2021) BACKGROUND CONDITIONS ..... 11**

**4.0 SITE TRAFFIC TRIP GENERATION TRIP DISTRIBUTION / ASSIGNMENT ..... 13**

**5.0 FUTURE (2021) TOTAL TRAFFIC CONDITIONS..... 15**

**6.0 SITE ACCESS & ON-SITE REVIEW ..... 18**

**7.0 PARKING ASSESSMENT ..... 19**

**CONCLUSION ..... 19**

## LIST OF FIGURES

Figure 1-1 Site Location  
Figure 1-2 Proposed Site Plan  
Figure 2-1 Transit Routes  
Figure 2-2 Existing Traffic Volumes / Lane Configuration  
Figure 2-3 Average Control Delay Outputs for Southbound Shared-Lane Configuration during PM Peak Hour (Synchro vs. Automated Computer-Based Video Survey)  
Figure 3-1 Future (2021) Background Traffic Volumes  
Figure 4-1 Site Traffic Volumes  
Figure 5-1 Future (2021) Total Traffic Volumes  
Figure 6-1 Signage Plan  
Figure 6-2 AutoTURN Analysis (MSUTAC-1999)  
Figure 9-1 Transit Routes

## LIST OF TABLES

Table 2.1 – Existing Traffic Level of Service  
Table 2.2 – Optimized Signal Timing  
Table 2.3 – Signalized Intersection Level of Service (2010 HCM)  
Table 3.1 – Future (2021) Background Traffic Level of Services  
Table 4.1 – Site Traffic Trip Generation  
Table 4.2 – Site Traffic Trip Distribution  
Table 5.1 – Future (2021) Total Traffic Levels of Service  
Table 7.1 – Township of Uxbridge Zoning By-law No. 81-19 Parking Requirements

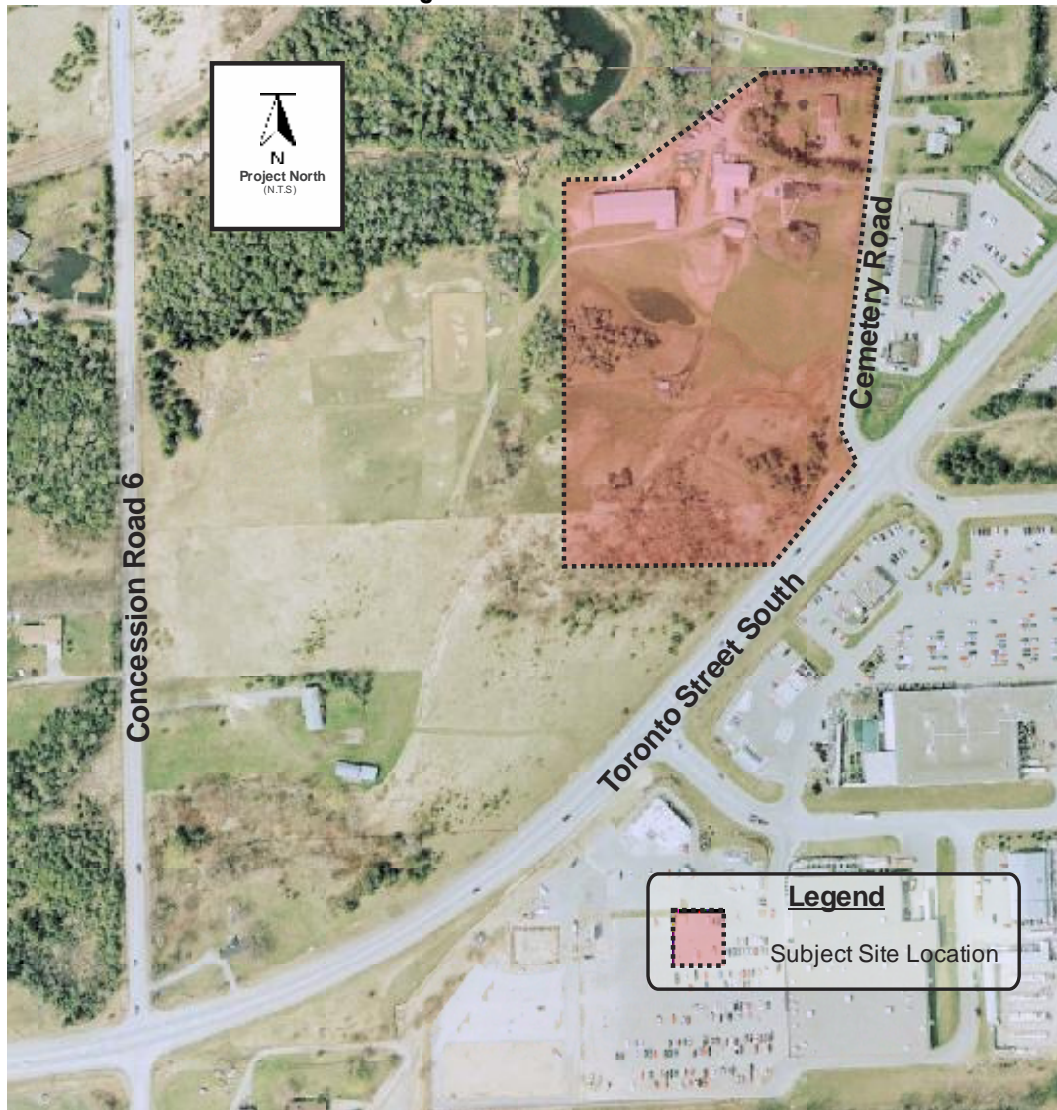
## APPENDICES

Appendix A – Proposed Site Plan  
Appendix B – Existing Traffic Data & Signal Timing Plan  
Appendix C – Existing Traffic Level of Service  
Appendix D – Control Delay Data Sheet (Video Survey)  
Appendix E – Spectrum Traffic Inc. Computer-Based Video (Traffic Counts)  
Appendix F – Gap Study Analysis  
Appendix G – Future (2021) Background Traffic Level of Service Calculations  
Appendix H – Future (2021) Total Traffic Level of Service Calculations

## 1.0 INTRODUCTION

NexTrans Consulting (A Division of NextEng Consulting Group Inc.) is pleased to present the enclosed Transportation Impact Study in support of an Official Plan Amendment and Rezoning application(s) for the proposed condominium townhouse and apartment development. The subject property is currently occupied by a farm and associated buildings and is located at the southwest corner of Cemetery Road and Toronto Street South intersection in the Town of Uxbridge, herein referred to as the “subject site”. **Figure 1-1** illustrates the subject site location.

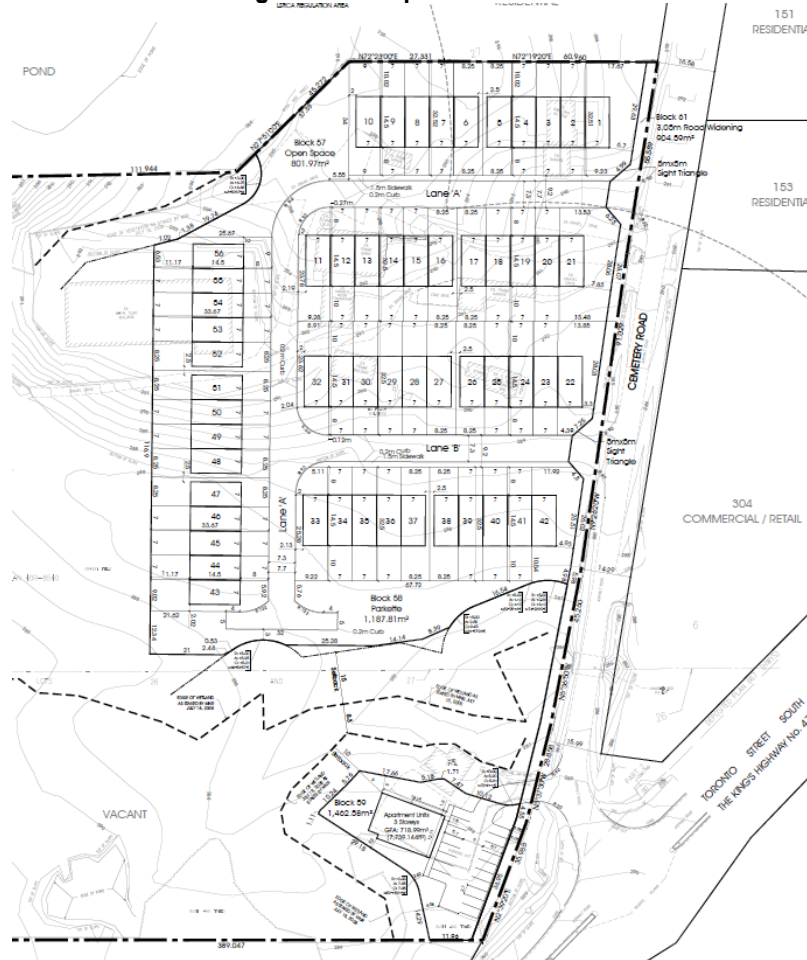
**Figure 1-1: Site Location**



The development plan is to provide 56 condominium townhouse units and 12 apartment units. A total of three vehicular entrances will be provided via Cemetery Road with two private roads servicing the condominium townhouse units and one private road servicing the apartment units. At a minimum, two (2) car parking spaces will be provided for each unit in a garage and lead in driveway portion for the 56 condominium townhouse units. In addition, a total of 18 surface/outdoor tenant and visitor parking spaces will be proposed to the apartment building.

The proposed Site Plan is provided in **Figure 1-2, Appendix A** also provides a larger scale version of the proposed site plan.

**Figure 1-2: Proposed Site Plan**



## 2.0 EXISTING TRAFFIC CONDITIONS

### 2.1. Existing Road Network

The subject lands are located at the southwest quadrant of Toronto Street and Cemetery Road intersection. The road network description is as follows:

**Toronto Street South (Highway 47)** is an east-west major arterial road consisting of a 3-lane cross-section within the vicinity of the subject site. It is under the jurisdictional control of the Durham Region and maintains a posted speed limit of 80 km/h (i.e. westbound) and 50 km/h (i.e. eastbound) in the vicinity of the subject site.

**Concession Road 6** is an north-south minor arterial road under the jurisdiction of the Durham Region. Concessions Road 6 has a two (2) lane cross section and maintains a posted speed limit of 60 km/h in the vicinity of the subject site. Concessions Road 6 meets Toronto Street South as a signalized intersection.



**Cemetery Road** is north-south local road under the jurisdiction of the Township of Uxbridge. Cemetery Road has a two (2) lane cross section and maintains a posted speed limit of 50 km/h in the vicinity of the subject site. Cemetery Road meets Toronto Street as a unsignalized intersection.

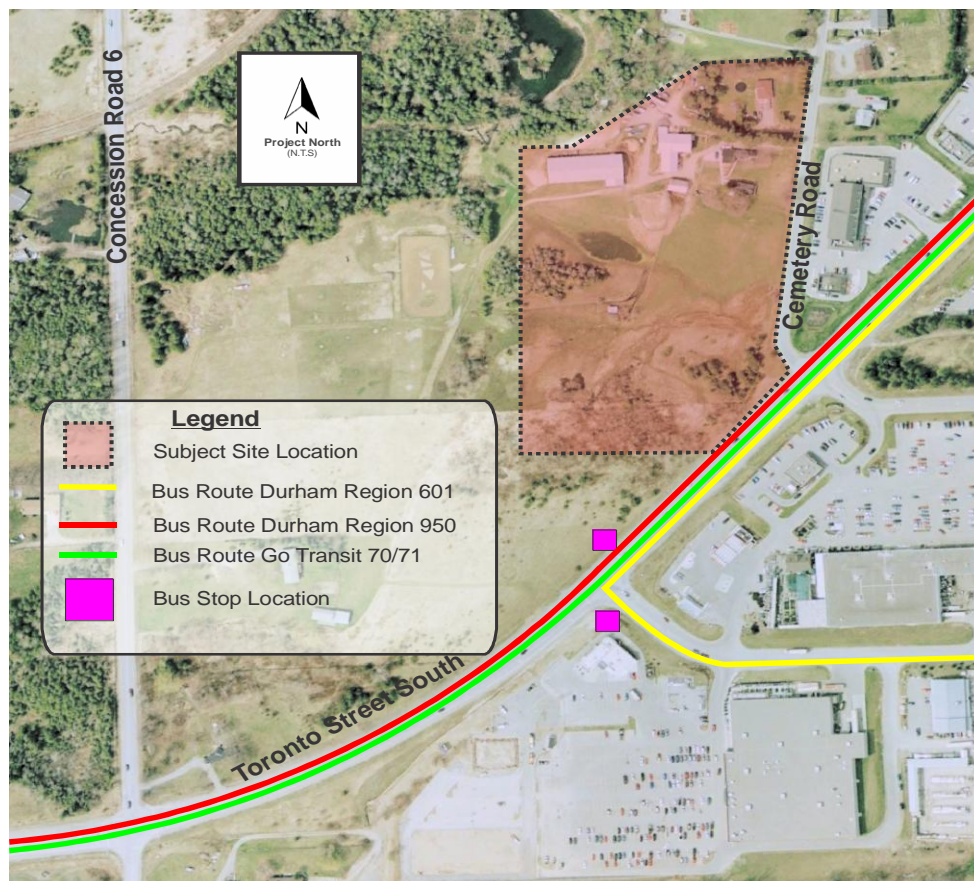
## 2.2. Public Transit

The subject site is well serviced by a number of surface transit routes provided by Durham Region Transit (DRT) and GO Transit. The route servicing in the immediate area are described below

- **Route 601 (Brock Community Bus):** This route is a regional route servicing greater northern Durham Region including Uxbridge, Sunderland, Cannington, and Beaverton. Servicing runs from Monday to Friday, and from 10:00am until 7:00pm.
- **Route 950 (Uxbridge, Port Perry, DC/UIOT):** This route is a regional route servicing greater southern Durham Region including Uxbridge, Port Perry, and the University of Ontario Institute of Technology. Servicing runs from Monday to Friday, and from 10:00am until 11:30pm.
- **GO Transit Route 70/71:** These bus routes run in a general north-south direction servicing between Uxbridge and Union Station within the City of Toronto including Stouffville, Markham, etc. Servicing runs from 4:30am until 1:00am Monday to Friday and on Weekends from 6:00am until 1:00am.

The transit routes currently servicing the immediate area are illustrated in **Figure 2-1**.

**Figure 2-1 – Transit Routes**

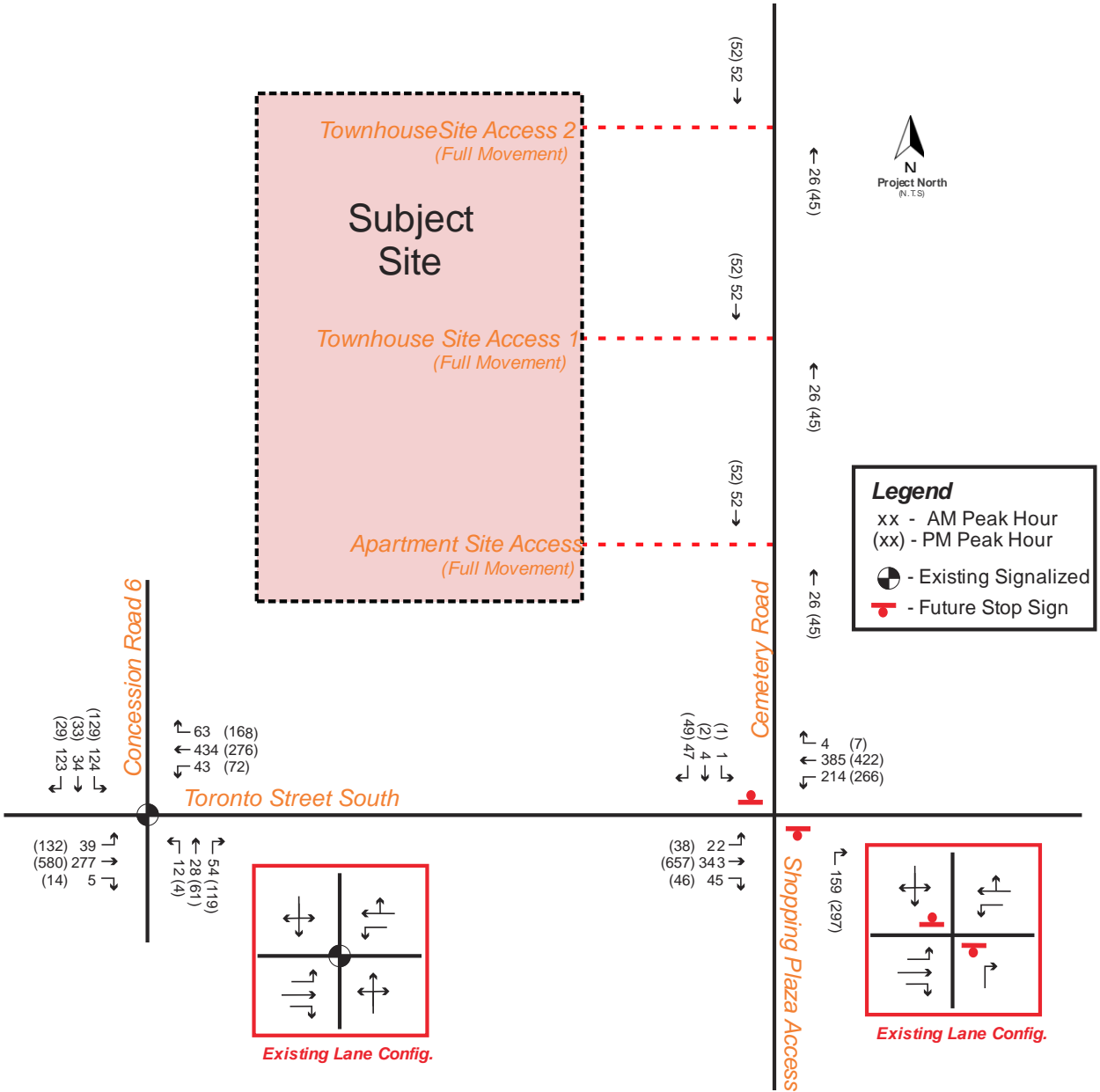


**2.3. Data Collection**

The study area includes the intersection of Concession Road 6 / Toronto Street South and Cemetery Road / Toronto Street South as well as the proposed site access. Spectrum Traffic Data Inc. on behalf of NexTrans Engineering undertook a turning movement count at the subject study area intersections during the weekday AM (7:00-10:00) and PM (4:00-7:00) peak time periods on Wednesday, October 05, 2016. The detailed traffic data and signal timing plans are provided in **Appendix B**.

The existing road network and existing traffic volumes during the weekday AM and PM peak hours are illustrated in Figure 2-2:

**Figure 2-2: Existing Traffic Volumes / Lane Configurations**





## 2.4. Existing Capacity Analysis

Capacity analysis at the study area intersections were carried out using Synchro version 8. **Table 2.1** summarizes the existing Levels of Service for these intersections. A detailed capacity analysis is provided in **Appendix C**.

**Table 2.1: Existing Traffic Levels of Service**

Intersections	Key Movements	AM Peak Hour Period		AM Peak Hour Period Optimized Timing		PM Peak Hour Period		PM Peak Hour Period Optimized Timing	
		LOS (v/c)	Delay (Sec)	LOS (v/c)	Delay (Sec)	LOS (v/c)	Delay (Sec)	LOS (v/c)	Delay (Sec)
Concession Rd 6 / Toronto St S (Signalized)	<b>OVERALL</b>	<b>C (0.66)</b>	<b>34.4</b>	<b>C (0.66)</b>	<b>22.3</b>	<b>F (0.76)</b>	<b>106.5</b>	<b>C (0.64)</b>	<b>23.8</b>
	EBL	<b>F (0.99)</b>	<b>120.4</b>	D (0.72)	39.2	<b>F (1.60)</b>	<b>334.0</b>	D (0.81)	40.6
	EBT	B (0.51)	19.2	B (0.44)	16.7	<b>F (1.25)</b>	<b>155.8</b>	C (0.83)	27.3
	EBR	B (0.01)	15.4	B (0.01)	13.5	B (0.01)	18.9	B (0.01)	13.3
	WBL	B (0.17)	16.6	B (0.14)	14.4	E (0.82)	61.8	C (0.63)	26.8
	WBTR	<b>D (0.96)</b>	<b>49.2</b>	C (0.83)	28.3	<b>F (1.05)</b>	<b>81.0</b>	C (0.70)	21.3
	NBLTR	B (0.13)	10.5	B (0.14)	12.9	A (0.28)	9.2	B (0.26)	15.0
	SBLTR	B (0.43)	14.1	B (0.50)	17.9	B (0.35)	10.3	B (0.46)	18.5
Cemetery Rd / Plaza Entrance / Toronto St S (unsignalized)	EBL	A (0.02)	8.3	-	-	A (0.04)	8.4	-	-
	WBL	A (0.24)	9.2	-	-	B (0.34)	11.3	-	-
	NBR	B (0.30)	12.7	-	-	D (0.71)	30.3	-	-
	SBLTR	D (0.33)	27.0	-	-	<b>F (0.77)</b>	<b>93.9</b>	-	-

As summarized in Table 2.1, it is shown that during existing traffic conditions, the Concession Road 6 / Toronto Street intersection operates at an overall LOS 'F' during the afternoon peak hour with critical volume to capacity ratios (>1.00) for three individual movements. It is theoretically not possible to have a v/c ratio above 1.00 under existing conditions since the traffic volumes were collected on site and the existing signal timing plan and cycle length were incorporated into the analysis. In addition, the Cemetery Road / Toronto Street / Plaza Entrance operates at a failing level of service for the southbound shared-lane configuration during the afternoon peak hour. The existing failing level of services experienced at the two study area intersections will be evaluated in the following **Section 2.4.1** and **Section 2.4.2**, respectively.

### 2.4.1. Evaluation of Existing Capacity Analysis at Signalized Intersection

It is our opinion that the Synchro parameters used in the analysis are conservatively high (i.e. Left Turn Factor (perm), Ideal Satd. Flow (vphpl), critical gap values, etc.). However, rather than adjusting the analysis parameters, the signal timing was optimized during both AM and PM peak hour by increasing the cycle length to 90-seconds to ensure all movements are operating below v/c ratio of 1.00 as detailed in **Table 2.2**.

**Table 2.2: Optimized Signal Timing**

Time of Day	Cycle Length	Highway 47 N/S (sec.)		Concessions 6 E/W (sec.)	
AM Peak & PM Peak	90 seconds	Green	30.8	Min Green	8
		Amber	5.7	Max Green	46.2
		All Red	1.5	Amber	3.7
				All Red	2.1
				Veh Ext.	3.0

The optimized results are also provided in **Table 2.1** under ‘Optimized Timing’ and detailed output analysis sheets can be found in **Appendix C**. Consequently, the Concession Road 6 / Toronto Street intersection operates at an overall LOS ‘C’ or better with all individual movements operating below capacity during the morning and afternoon peak hour.

It is recommended the Region of Durham optimize the signal timing based on timings provided in **Table 2.2**. The optimized signal timing will be carried forward to future background and future total analysis during both peak hour periods.

**2.4.2. Evaluation of Existing Capacity Analysis at Unsignalized Intersection**

The existing traffic volumes were analyzed using Synchro 8.0 software and were based on the existing lane configuration of the study area road network and traffic controls. The methodology of the software follows the procedures described and outlined in the Highway Capacity Manual, HCM 2000, published by the Transportation Research Board. Based on **Table 2.1** Synchro outputs, the southbound shared-lane configuration via Cemetery Road experiences an average control delay of 27.0 and 93.9 seconds during the morning and afternoon peak hour, respectively. Synchro ‘Control Delay’ represents the average delay per vehicle in seconds during the peak hour period. In addition, Level of Services are determined based on Synchro ‘Control Delay’ as detailed in **Table 2.3** in accordance to the Synchro 8.0 software.

**Table 2.3: Signalized Intersection Level of Service (2010 HCM)**

**Table 4-1 Signalized Intersection Level of Service (2010 HCM)**

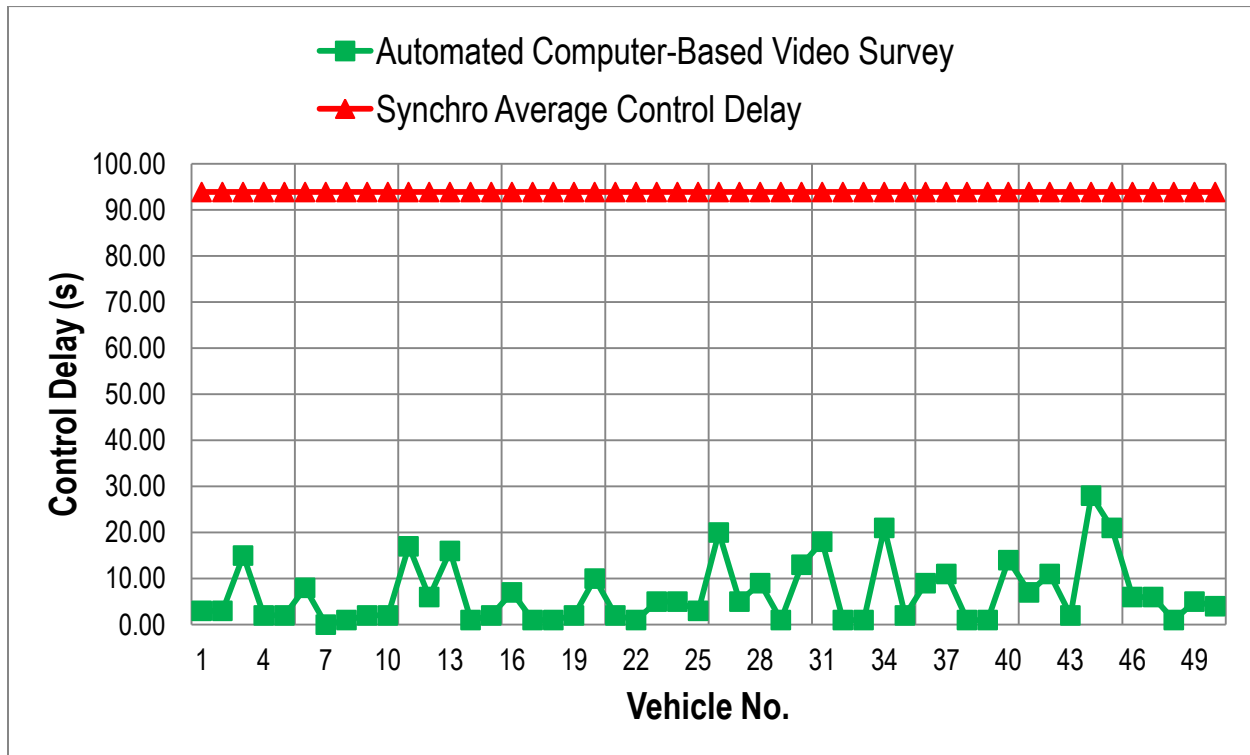
Control Delay Per Vehicle (s)	LOS by Volume to Capacity Ratio	
	≤1	>1
≤10	A	F
>10 and ≤20	B	F
>20 and ≤35	C	F
>35 and ≤55	D	F
>55 and ≤80	E	F
>80	F	F

It is our experience that Synchro is overly conservative when assessing level of service at un-signalized two-way stop controlled intersections. Factors such as platooning and gap opportunities are not considered in the analysis as those parameters do not appear in the Synchro inputs for two way stop control analysis. In order to address this shortcoming and provide an accurate assessment of level of service and volume to capacity at unsignalized locations, Nexttrans has opted to employ video based turning movement counts. The videos allow for queuing, turning delay and gap study analysis. Using the videos provided by Spectrum Traffic Data Inc., we have reviewed the videos to determine the control delays per vehicle during both peak hour periods to calculate an average control delay for the southbound shared-lane configuration. The surveyed control delay data sheet experienced during the AM and PM peak hours are detailed in **Appendix D**. The computer-based video is provided in **Appendix E** for reference purposes.

Based on the surveyed results, the average control delay during the morning and afternoon peak hour periods for the southbound shared-lane configuration is 9.0 and 7.0 seconds, respectively. As expected, the Synchro analysis for

the existing condition is 300% and over 1000% overly conservative during the morning and afternoon peak hours, respectively. Based on the results summarized in **Table 2.3**, the southbound shared-lane configuration currently operate at excellent LOS 'A' during both peak hour periods. **Figure 2-3** graphically illustrates the comparison of the average control delay obtained from Synchro output versus the automated computer-based video surveyed control delay per vehicle during the afternoon peak hour. It is also important to note, no more than three (3) vehicles were observed at one time during both peak hour periods lasting less than 28 seconds.

**Figure 2-3 : Average Control Delay Outputs for Southbound Shared-Lane Configuration during PM Peak Hour (Synchro vs. Automated Computer-Based Video Survey)**



The delay study confirms our view that Synchro is conservatively high when analyzing two way stop controls. Based on our review of the video, it is evident that significant gap opportunities exist in the stream of traffic which are not accounted for in Synchro. In order to quantify the gap opportunities, and thus the actual capacity for southbound turning movements, a gap study was undertaken by Spectrum Traffic Data Inc. The detailed results are provided in **Appendix F**.

The gap study indicates that for the southbound right turn from minor, there are 406 and 449 available gaps, during the AM and PM peak hours, respectively. The gap study also indicates that for the southbound left from minor there are 181 and 102 available gaps during the AM and PM peak hours, respectively. The results of the gap study confirm that there are plenty of gap opportunities for traffic to exit the minor leg of the intersection.

In order to put the existing analysis in perspective, the actual v/c ratio may now be calculated for the southbound right during the PM peak hour as follows:

$$\text{Volume to Capacity Ratio } \left(\frac{v}{c}\right) = \frac{\text{Total Southbound right-turning vehicles}}{\text{Total Vehicle Gap Opportunities}}$$

$$\frac{v}{c} \text{ ratio} = \frac{50}{449} = 0.11$$

The exercise indicates that the Synchro analysis underestimates the capacity of the southbound right turn by at least 700% during the critical PM peak hour.

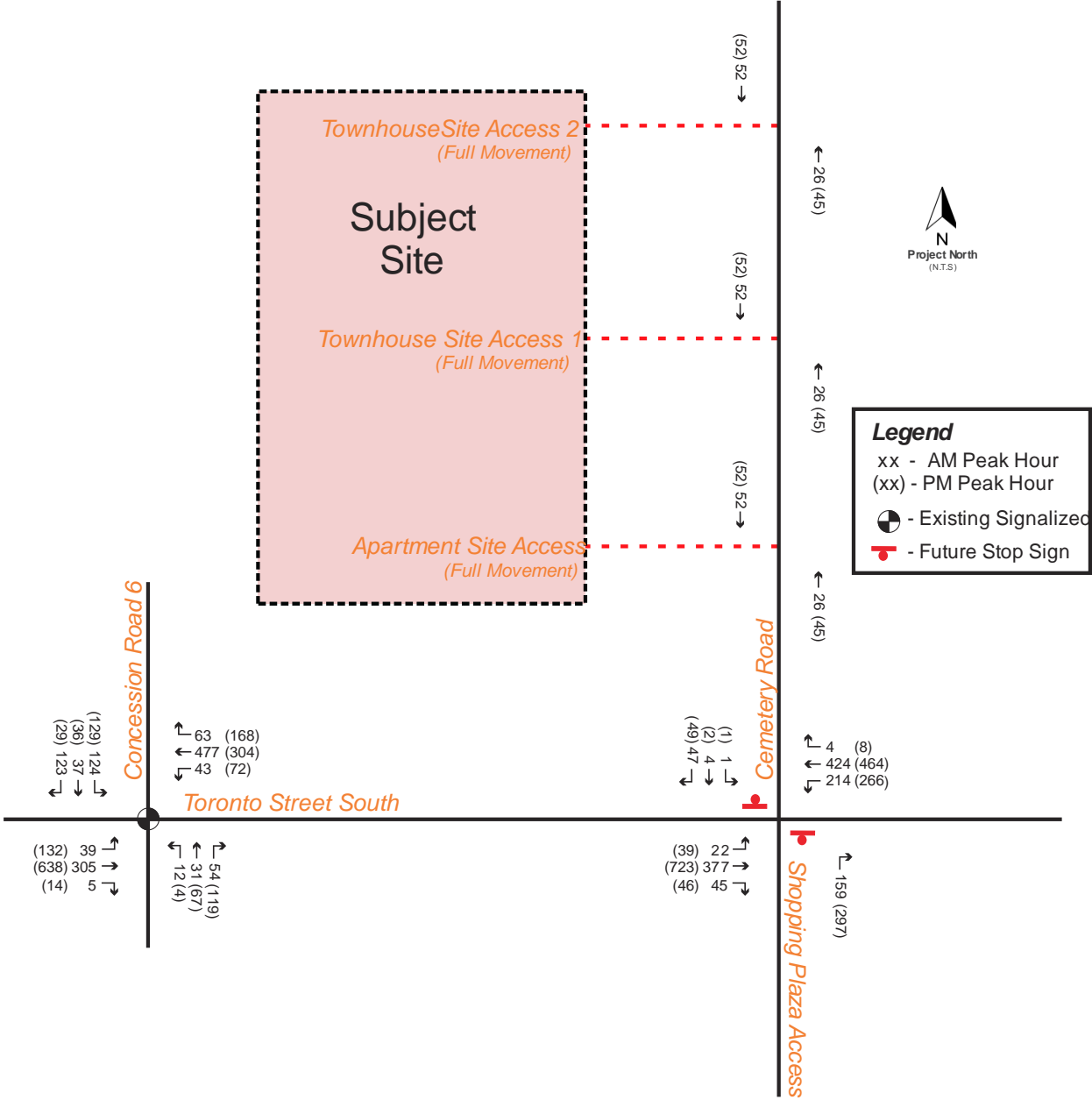
While the delay and gap study of the existing condition clearly demonstrates good level of service and ample capacity for the southbound shared movement, it is not possible to carry forward these observations in any quantitative sense to the future background or future total conditions since observations can only be made in the present, not the future. However, we may make some qualitative assumptions based on the conditions that would change both turning delay and gap opportunities in the future. Primarily, the factor that would impact unsignalized operations the greatest would be changes in the flow of traffic on Toronto St, and thus gap opportunities, due to future background growth. The Synchro unsignalized analysis will be brought forward in the following sections unchanged, but discussed in the context of the observations made in the existing condition.

### 3.0 FUTURE (2021) BACKGROUND CONDITIONS

A five (5)-year (2021) horizon period was selected for analysis, which generally coincides with the full build out of the proposed development. As mentioned earlier, a 2% growth rate per annum for the through traffic at the study area intersections was applied.

The future (2021) background traffic volumes are provided in **Figure 3-1**. **Table 3.1** summarizes the level of service at the given intersections under future background traffic conditions. Detailed output analysis can be found in **Appendix G**.

Figure 3-1: Future (2021) Background Traffic Volumes





**Table 3.1: Future (2021) Background Traffic Levels of Service**

Intersections	Key Movements	AM Peak Hour Period Optimized Timing		PM Peak Hour Period Optimized Timing	
		LOS (v/c)	Delay (Sec)	LOS (v/c)	Delay (Sec)
Concession Rd 6 / Toronto St (Signalized)	<b>OVERALL</b>	<b>C (0.69)</b>	<b>23.8</b>	<b>C (0.68)</b>	<b>25.2</b>
	EBL	D (0.78)	50.1	D (0.80)	38.5
	EBT	B (0.46)	16.5	C (0.86)	29.0
	EBR	B (0.01)	13.1	B (0.01)	12.7
	WBL	B (0.14)	14.0	D (0.73)	37.8
	WBTR	C (0.85)	29.4	C (0.70)	21.0
	NBLTR	B (0.15)	14.3	B (0.29)	16.7
	SBLTR	B (0.52)	19.9	C (0.50)	21.0
Cemetery Rd / Plaza Entrance / Toronto St (unsignalized)	EBL	A (0.03)	8.5	A (0.04)	8.5
	WBL	A (0.24)	9.4	B (0.36)	12.0
	NBR	B (0.31)	13.2	E (0.77)	38.4
	SBLTR	D (0.37)	30.9	<b>F (1.12)</b>	<b>221.8</b>

As summarized in Table 3.1, the Concessions Road 6 and Toronto Street South intersections is operating at excellent levels of service and operating at overall LOS 'C' or better during peak hour time periods. Furthermore, all individual turning movements are operating below capacity and acceptable LOS with no critical movements identified.

The Cemetery Road and Toronto Street South intersection Operates at LOS F (v/c 1.12) with a delay of 221.8 seconds, compared to LOS F (v/c 0.77) with delay of 93.9 seconds. These results are nonsensical, particularly in view of the fact that there is only a 5% increase in through volumes on Toronto St and no vehicles per hour increase (for the southbound left, through and right turn movements) during the critical PM peak hour. Due to the limitations in Synchro and inability to accurately reflect gap opportunities, the formulae are extremely sensitive to small increases in traffic. It can be safely assumed based on an existing v/c for the southbound left of 0.11 that future background at the subject intersection will continue to operate at good levels of service.

#### 4.0 SITE TRAFFIC TRIP GENERATION TRIP DISTRIBUTION / ASSIGNMENT

According to the site plan, the proposed development consists of 56 condominium townhouse units and a 12 unit apartment building. Trip generation forecasts were undertaken using the information contained in the *Trip Generation Manual, 9<sup>th</sup> Edition* published by the Institute of Transportation Engineers (ITE) for "Residential Condominium/Townhouse" (LUC 230) and "Apartment" (LUC 220). The expected trip generation calculation is provided in **Table 4.1**.

**Table 4.1: Site Traffic Trip Generation**

Land Use (Size)	Parameter	Weekday AM Peak Hour			Weekday PM Peak Hour		
		In	Out	Total	In	Out	Total
Residential Condominium/Townhouse (56 Units)	Gross Rate	0.09	0.48	0.57	0.55	0.27	0.82
	New Trips	5	27	32	31	15	46
Apartment (12 Units)	Gross Rate	0.08	0.42	0.50	0.42	0.16	0.58
	New Trips	1	5	6	5	2	7
<b>Total Trips</b>		<b>6</b>	<b>32</b>	<b>38</b>	<b>36</b>	<b>17</b>	<b>53</b>

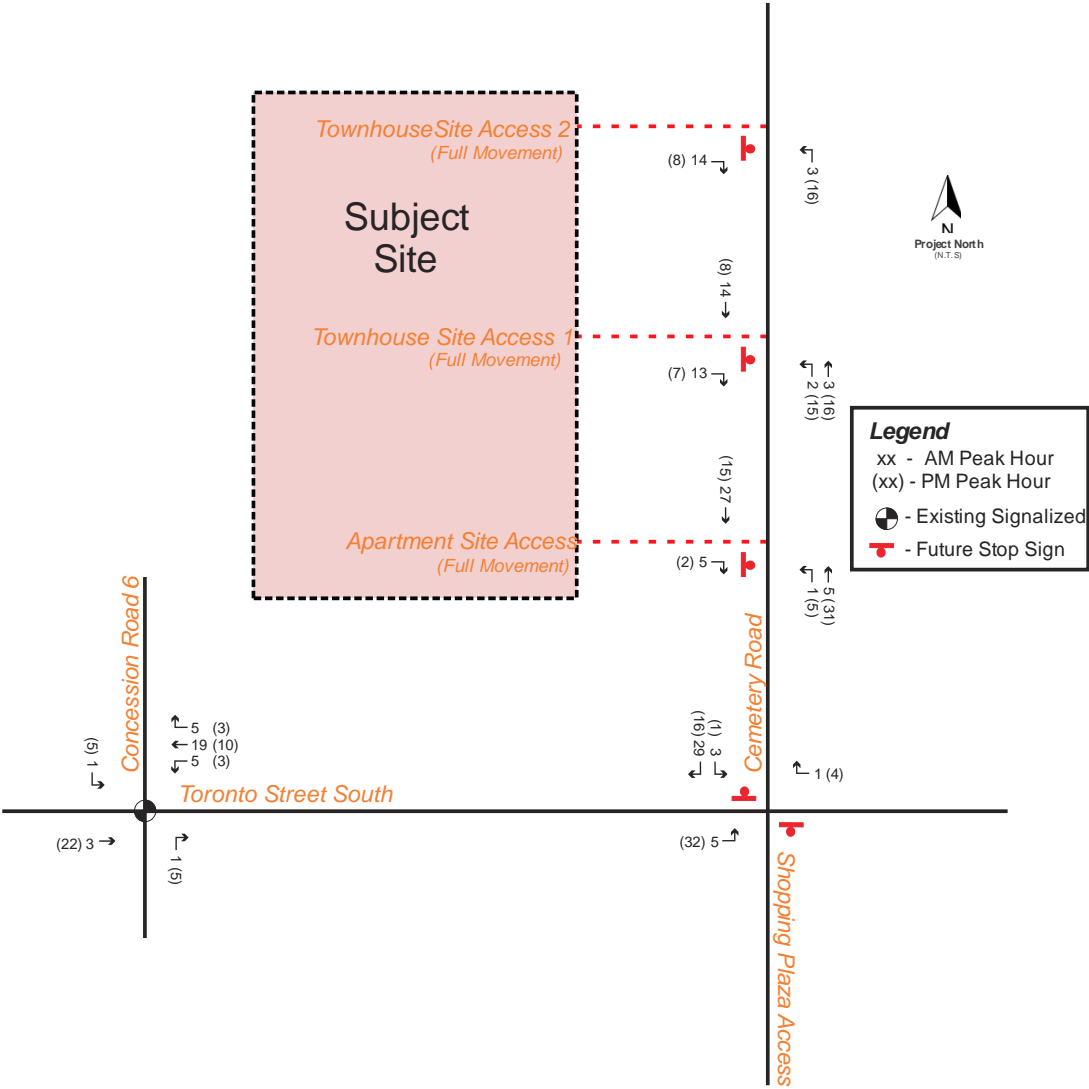
Based on the trip generation calculations, the proposed residential development is expected to generate 38 two-way trips (6 inbound and 32 outbound) during the weekday morning peak hour and 36 two-way trips (36 inbound and 17 outbound) during the afternoon peak hour. To remain conservative, no trip reductions were applied to account for transit or other modes of transport.

Provided in **Table 4.2** are the assumptions for the trip distribution rates. It is based on the information extracted from the 2011 Transportation Tomorrow Survey (TTS) and the existing road pattern. The site traffic volumes are illustrated in **Figure 4-1**.

**Table 4.2: Site Traffic Trip Distribution**

Direction	Via	Trips In	Trips Out
North	Concessions Rd 6	15%	15%
South	Concessions Rd 6	15%	15%
East	Toronto St	10%	10%
West	Toronto St	60%	60%
<b>Total</b>		<b>100%</b>	<b>100%</b>

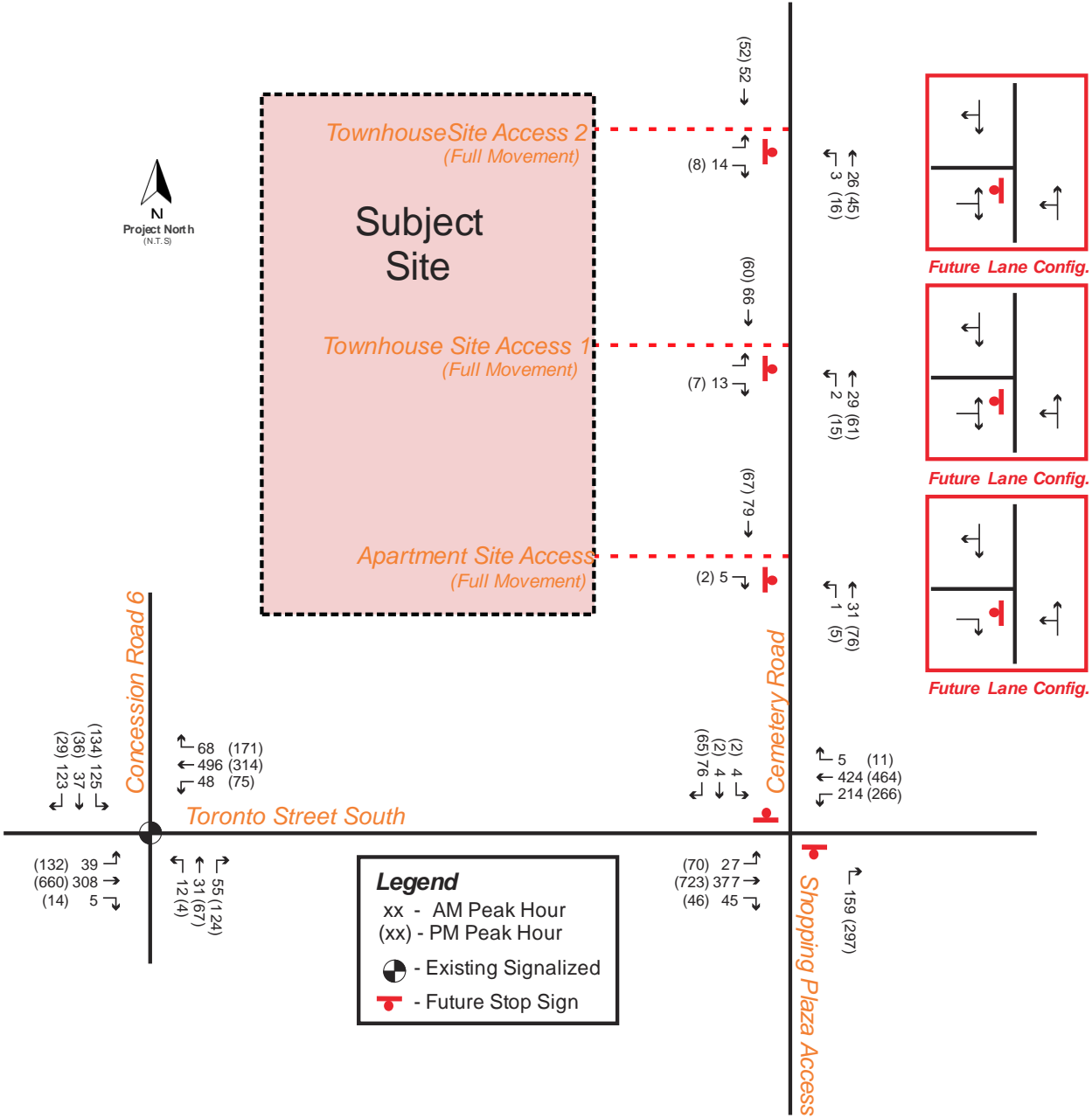
Figure 4-1: Site Traffic Volumes



### 5.0 FUTURE (2021) TOTAL TRAFFIC CONDITIONS

Future (2021) total traffic was determined by adding site generated traffic to future background traffic volumes during the weekday AM and PM peak hours, and is illustrated in **Figure 5-1**. **Table 5.1** summarizes the level of services at the intersections under future total traffic conditions. Detailed analysis outputs are provided in **Appendix H**.

Figure 5-1: Future (2021) Total Traffic Volumes



**Table 5.1: Future (2021) Total Traffic Levels of Service**

Intersections	Key Movements	AM Peak Hour Period Optimized Timing		PM Peak Hour Period Optimized Timing	
		LOS (v/c)	Delay (Sec)	LOS (v/c)	Delay (Sec)
Concession Rd 6 / Toronto St (Signalized)	<b>OVERALL</b>	<b>C (0.71)</b>	<b>24.8</b>	C (0.71)	26.5
	EBL	E (0.82)	59.9	D (0.81)	40.2
	EBT	B (0.45)	16.1	C (0.87)	30.0
	EBR	B (0.01)	12.8	B (0.01)	12.5
	WBL	B (0.15)	13.8	D (0.81)	51.8
	WBTR	C (0.86)	30.2	C (0.71)	21.0
	NBLTR	B (0.16)	15.0	B (0.30)	17.4
	SBLTR	C (0.54)	21.1	C (0.53)	22.4
Cemetery Rd / Plaza Entrance / Toronto St (unsignalized)	EBL	A (0.03)	8.5	A (0.08)	8.7
	WBL	A (0.25)	9.4	B (0.36)	12.0
	NBR	B (0.31)	13.2	E (0.77)	38.4
	SBLTR	<b>F (0.72)</b>	<b>64.2</b>	<b>F (2.34)</b>	<b>772.1</b>
Site Access (Apartment) / Cemetery Rd (unsignalized)	EBR	A (0.01)	8.7	A (<0.01)	8.6
	NBLT	A (<0.01)	0.2	A (<0.01)	0.5
Site Access 1 (Townhouse) / Cemetery Rd (unsignalized)	EBLR	A (0.01)	8.7	A (0.01)	8.6
	NBLT	A (<0.01)	0.5	A (0.01)	1.5
Site Access 2 (Townhouse) / Cemetery Rd (unsignalized)	EBLR	A (0.02)	8.6	A (0.01)	8.6
	NBLT	A (<0.01)	0.8	A (0.01)	2.0

Based on the results from Table 5.1, it is shown that during future total traffic operations the Concession Road 6 and Toronto Street South intersection has negligible change over the future background conditions indicating the site traffic volumes generated by the proposed development will have minimal impacts to the operation of the study area intersection. As mentioned earlier, it is recommended the Region of Durham optimize the signal timing based on timings provided in **Table 2.2**.

The Cemetery Road and Toronto Street South intersection operates at LOS F (v/c 2.34) with a delay of 772.1 seconds (13 minutes), compared to LOS F (v/c 1.12) with delay of 221.8 seconds. These results are nonsensical, particularly in view of the fact that there is only a 5% increase in through volumes on Toronto Street and 17 vehicle per hour increase (for the southbound left-through-right movement) during the critical PM peak hour. Due to the limitations in Synchro and inability to accurately reflect gap opportunities, the formulae are extremely sensitive to small increases in traffic. It can be safely assumed based on an existing v/c for the southbound left of 0.10 that future total condition at the subject intersection will continue to operate at good levels of service. As a qualitative check, assuming that the gap opportunities in the future total are marginally decreased by 10% (a conservative assumption), the v/c for the southbound right turn movement would be  $65 / 0.9 * 449$ , or 0.16, compared to 0.11 in the observed existing conditions. On this basis, we believe that unsignalized operations due to background and development growth will be negligible.



The proposed site driveways are expected to operate within capacity and excellent level of service with no critical movements were identified.

## 6.0 SITE ACCESS & ON-SITE REVIEW

Based on the site plan provided, three full movement vehicular entrances will be provided via Cemetery Road with two private roads servicing the condominium townhouse units and one private road servicing the apartment units. Due to the close proximity of the apartment entrance via Cemetery Road and the Cemetery Road / Toronto Street intersection, it is recommended the apartment entrance be designated as right-out only for the outbound movement. Furthermore, to avoid back of queue spillage onto the intersection from northbound left-turning movements, it is recommended a "DO NOT BLOCK DRIVEWAY" sign be placed on the westside of Cemetery road directing southbound drivers on approach to Cemetery Road / Toronto intersection to not block the apartment entrance driveway.

As a result, in accordance to Ontario Traffic Manuel (OTM) Book 5, we recommend appropriate signage for no left-turn (Rb-12) sign inside the property of the apartment entrance. In addition, it is recommended to place a STOP (Ra-1) sign inside the property for all three private roads servicing the condominium townhouse and apartment units. **Figure 6-1** illustrates the recommended signages at the apartment entrance.

**Figure 6-1: Signage Plan**



As mentioned earlier, no more than three (3) vehicles were observed at one time during both peak hour periods lasting less than 15 seconds. As a result, there will be negligible impact with respect to back of queue spillage in both directions of Cemetery particularly with the recommended signages indicated in **Figure 6-1**.

An AutoTURN analysis was undertaken to confirm the adequacy of the turning radius and the site circulation available for a typical 10m Garbage Truck/Fire Truck (MSU TAC-1999) provided in **Figure 6-2**. As detailed in **Figure 6-2**, the MSUTAC-1999 deigns vehicle can manoeuvre within the proposed site with ease.

## 7.0 PARKING ASSESSMENT

We have reviewed the existing Township of Uxbridge Zoning By-law No. 81-19 and the applicable parking rate as outlined in this by-law for the development proposal is as follow:

- Residential Condominium Townhouse Units – 1.0 parking spaces per dwelling unit
- Residential Apartment – 1.5 parking spaces per dwelling unit

Based on the above noted parking rate, the parking requirement for the proposed development is detailed in **Table 7.1**.

**Table 7.1 – Township of King Zoning By-law No. 81-19 Parking Requirements**

Land Use	No. Units	Parking Rates	Parking Requirement	Parking Provided	Difference
Condominium Townhouse	56	1.0 spaces per unit	56	112	+56
Apartment	12	1.5 spaces per unit	18	18	-

In accordance with the parking provisions outlined in the existing Township of Uxbridge Zoning By-law No. 81-19, the proposed condominium townhouse and apartment development space is required to provide **56 and 18 vehicle parking spaces**. In comparing the provided parking supply with By-Law requirements, the condominium townhouse has a surplus of 56 parking spaces whereas the provided apartment parking spaces meets the By-law requirements.

On this basis, the overall parking supply is sufficient as it meets the requirements of the existing Township of Uxbridge Zoning By-law No. 81-19.

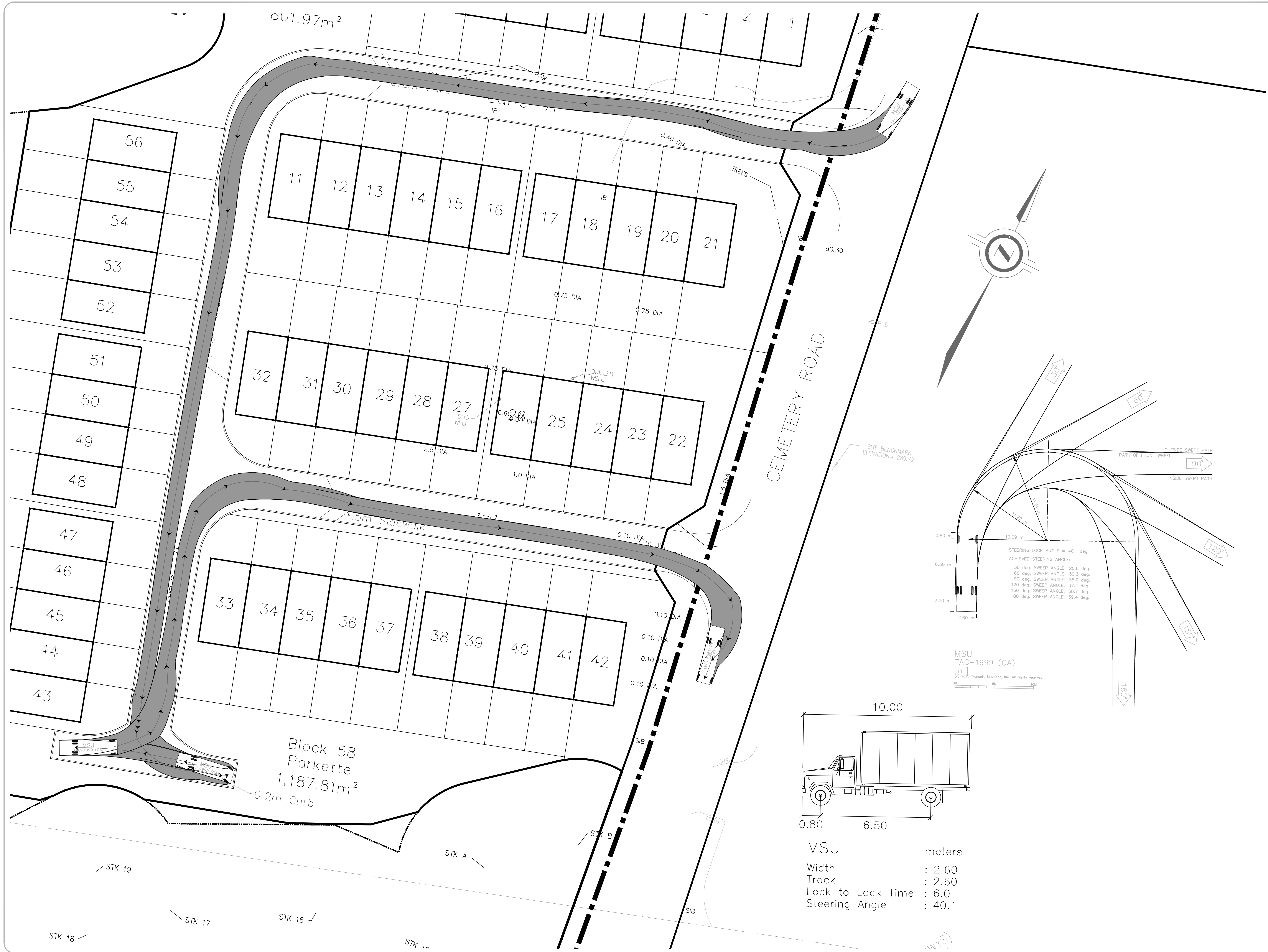
## CONCLUSION

The findings and conclusions of our analysis are as follows:

- The subject development application proposes to develop 56 condominium townhouse units and 12 apartment units.
- The proposed development is expected to generate 38 two-way trips (6 inbound and 32 outbound) during the weekday morning peak hour and 36 two-way trips (36 inbound and 17 outbound) during the afternoon peak hour.
- A total of three vehicular entrances will be provided via Cemetery Road with two private roads servicing the condominium townhouse units and one private road servicing the apartment units

- It is recommended the Region of Durham optimize the signal timing by increasing the cycle length to 90-seconds at the Concessions Road 6 and Toronto Street South intersection.
- It is our experience that Synchro is overly conservative when assessing level of service at un-signalized two-way stop controlled intersections. Based on Control Delay and Gap Study analysis, the existing condition clearly demonstrates good level of service and ample capacity for the southbound shared movement at the Toronto Street South and Cemetery Road intersection. Due to the limitations in Synchro and inability to accurately reflect gap opportunities, the formulae are extremely sensitive to small increases in traffic. It can be safely assumed based on an existing v/c for the southbound left of 0.10 that future total condition at the subject intersection will continue to operate at good levels of service.
- The proposed site driveways via Cemetery Road is expected to operate within capacity and excellent level of service with no critical movements identified.
- Site traffic will have negligible impact to the operations of the Cemetery Road / Toronto Street South intersection.
- It was also determined that the proposed parking supply for the proposed condominium townhouse and apartment developments meets the Township of Uxbridge Zoning By-law No. 81-19 requirements.
- The garbage loading and on-site circulation design is appropriate and meets City standards.
- Garbage and emergency vehicles will be able to circulate within the proposed site and exit the site in a cab forward manner.
- In accordance to Ontario Traffic Manual (OTM) Book 5, we recommend appropriate signage for no left-turn (Rb-12) sign inside the property of the apartment entrance. In addition, it is recommended to place a STOP (Ra-1) sign inside the property for all three private roads servicing the condominium townhouse and apartment units.
- A “DO NOT BLOCK DRIVEWAY” sign be placed on the westside of Cemetery road directing southbound drivers on approach to Cemetery Road / Toronto intersection to not block the apartment entrance driveway.





BENCHMARK

REVISIONS

NO.	REVISION	DATE	BY

STAMP

CIVIL CONSULTANT:



Suite 204, 15260 Yonge Street, Aurora ON L4G 1N4  
 Tel: 416-274-7036, Fax: 877-957-2929  
 Web: www.nextrans.ca

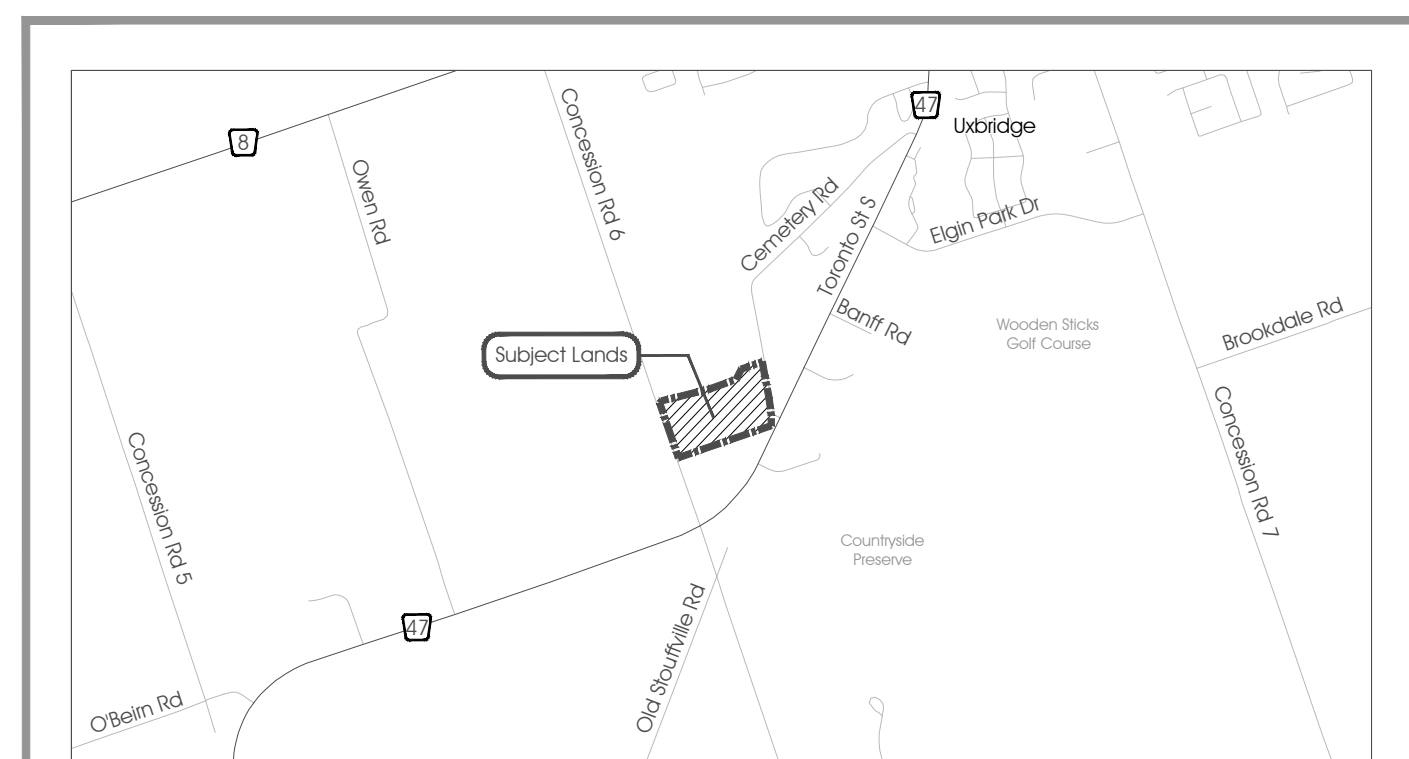
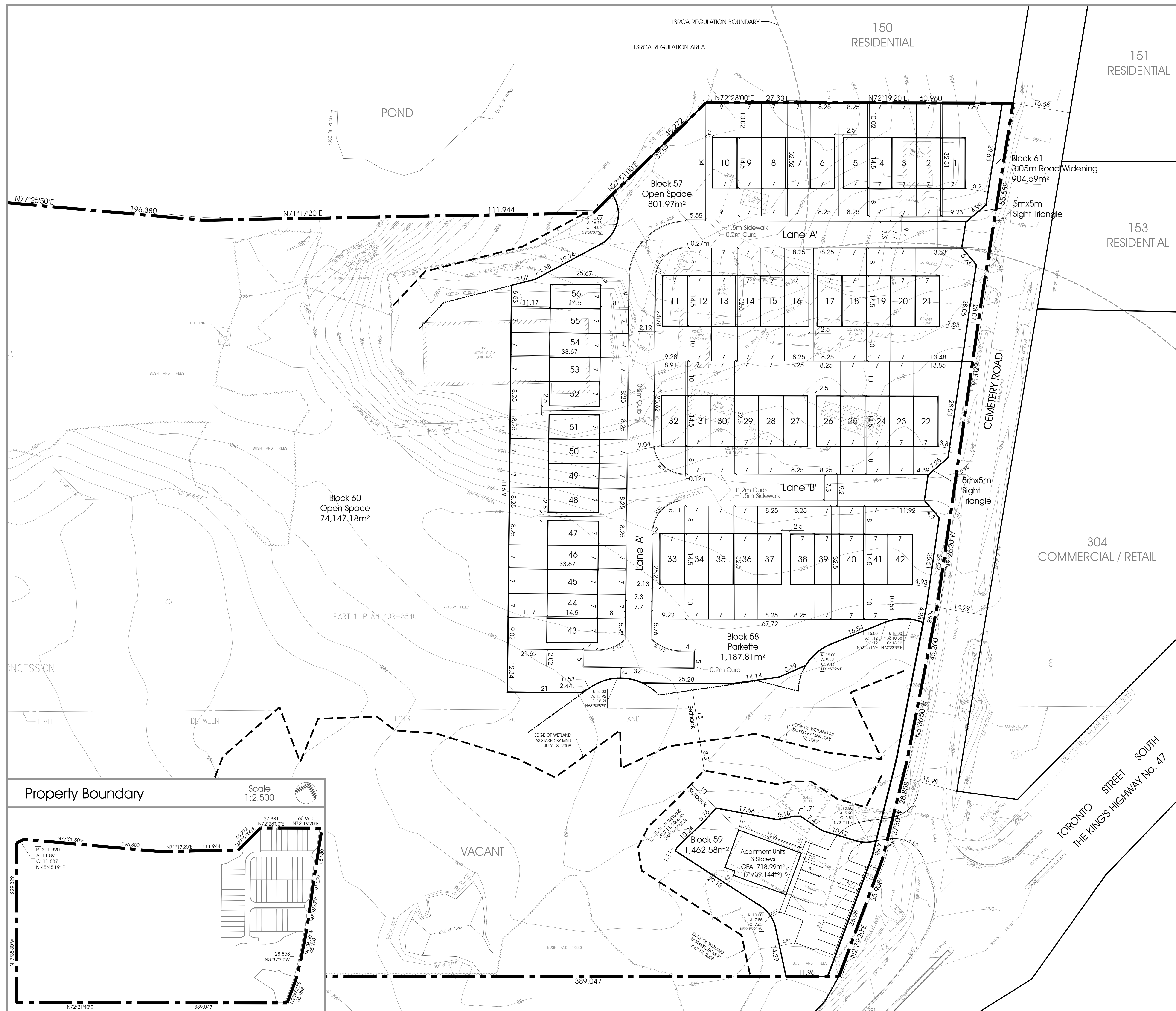
PROJECT NAME:  
 TOWNHOUSE CONDOMINIUM &  
 APARTMENT DEVELOPMENT  
 CEMETERY ROAD  
 TOWN OF UXBRIDGE

DRAWING TITLE:  
 AutoTURN Analysis  
 (MSU TAC-1999)

DESIGN BY: A.S.	DATE: October 24, 2016
CHECKED BY: R.P.	PROJECT NO. NT-16-091
DRAWN BY: A.S.	DRAWING NO. Figure 6-2
SCALE: NTS	

## **Appendix A - Proposed Site Plan**





KEY PLAN - Uxbridge Scale 1:30,000

**SCHEDULE OF LAND USE**

Proposed Land Use	Lot / Block	Units	m <sup>2</sup>	ac	ha	%
Townhomes	1-56	56	14,549.16	3.60	1.455	15.2
Common Element	57,58		1,989.79	0.49	0.199	2.1
Apartment Units	59	12	1,462.58	0.36	0.146	1.5
Open Space	60		74,147.18	18.32	7.415	77.5
Road Widening	61		904.59	0.22	0.090	0.9
Lanes 'A' and 'B'	Lanes A & B		2,626.86	0.65	0.263	2.8
<b>Total</b>		<b>68</b>	<b>95,680.16</b>	<b>23.64</b>	<b>9.568</b>	<b>100</b>

**LEGEND**

	SUBJECT LANDS		SETBACKS FROM ENVIRONMENTAL CONSTRAINTS
	ENVIRONMENTAL CONSTRAINTS		LSRCA REGULATION BOUNDARY

**SITE STATS**

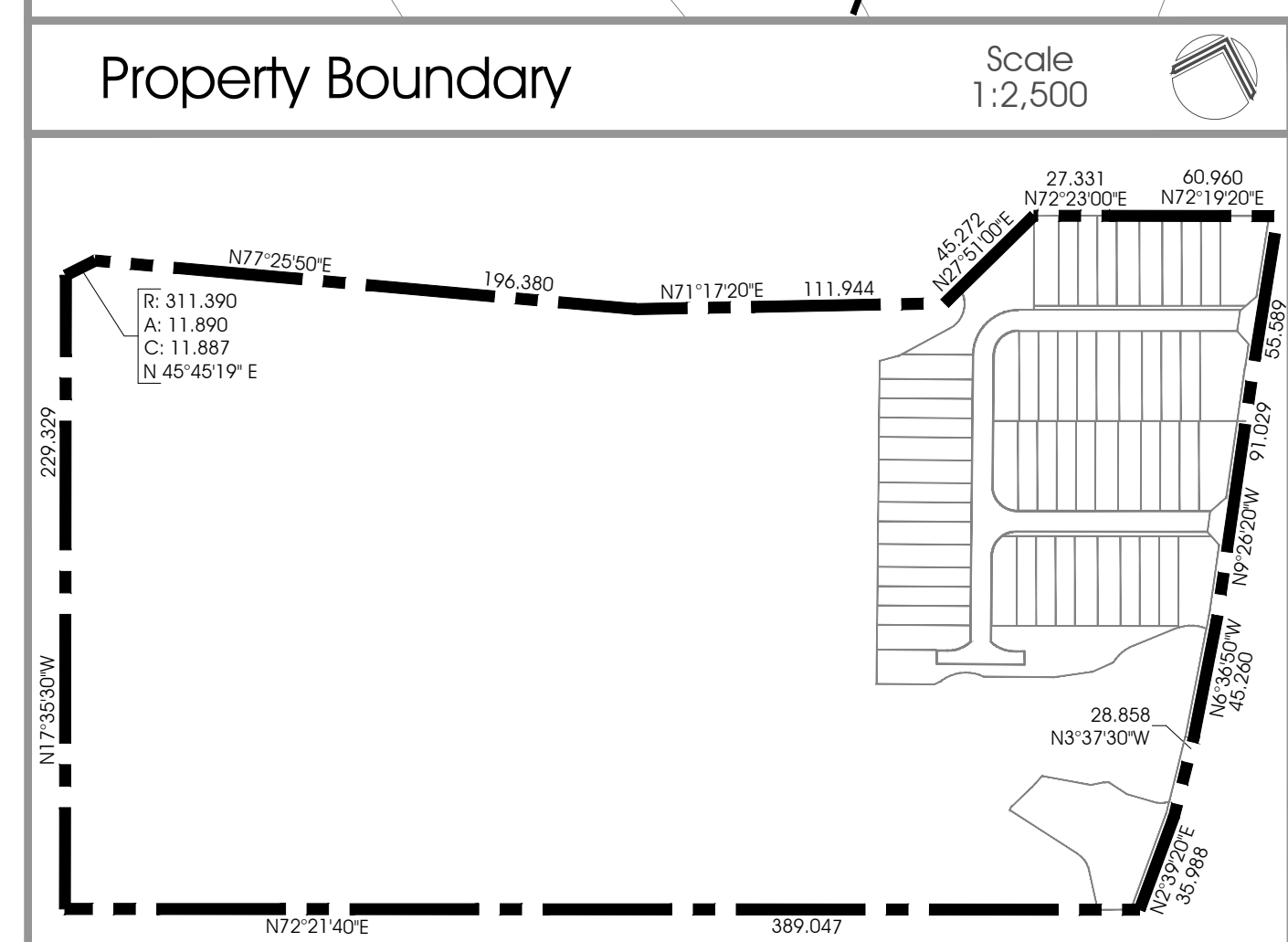
	Required (RM Zone)	Provided
<b>Townhomes (Lots 1-56)</b>		
Total Units	n/a	56
Internal Unit Lot Area	260m <sup>2</sup>	227.5m <sup>2</sup>
End Unit Lot Area	300m <sup>2</sup>	268.13m <sup>2</sup>
Corner Unit Lot Area	496m <sup>2</sup>	362.91m <sup>2</sup>
Internal Unit Lot Frontage	8.5m	7.0m
End Unit Lot Frontage	10.0m	8.25m
Corner Unit Lot Frontage	16.0m	10.33m
Max. Lot Coverage	30%	44.6%
Landscaped Open Space	30%	44.8%
Parking	56 (1 space / unit)	112
<b>Apartment Units (Block 59)</b>		
Total Units	n/a	12
Lot Area	1,644m <sup>2</sup>	1,462.58m <sup>2</sup>
Lot Frontage	30m	42.84m
Front Yard Setback	10m	19.40m
Interior Yard Setback	5m	3.2m
Rear Yard Setback	10m	9.0m
Max. Lot Coverage	40%	16.4%
Landscaped Open Space	30%	50.8%
Height	10m	±9.5m
Parking	18 (1.5 spaces / unit)	18

No.	REVISION	DATE

Note: All dimensions are shown in metres.

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**Draft Concept Plan**

154 & 164 CEMETERY RD  
 (PT OF LOTS 26 & 27 CONCESSION 6)  
 TOWNSHIP OF UXBRIDGE  
 REGIONAL MUNICIPALITY OF DURHAM

Scale 1:500

PROJECT No. 16-18

DRAWING No. 01a

DESIGN: BR, MF

DRAWN: AM

DATE: OCT. 20, 2016

30 WEST BEAVER CREEK ROAD, UNIT 109  
 BUCKINGHAM HILL, ONTARIO L8B 3K1  
 T: 905-997-8254 F: 905-997-9924  
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## **Appendix B - Existing Traffic Data & Signal Timing Plan**



**Turning Movement Count (1 - CEMETERY RD & TORONTO ST S)**

Start Time	E Approach TORONTO ST S					S Approach PLAZA ENTRANCE					W Approach TORONTO ST S					N Approach CEMETERY RD					Int. Total (15 min)	Int. Total (1 hr)
	Right E:N	Thru E:W	Left E:S	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	Peds W:	Approach Total	Right N:W	Thru N:S	Left N:E	Peds N:	Approach Total		
07:00:00	0	83	43	0	126	15	0	0	0	15	1	25	2	0	28	17	2	1	0	20	189	
07:15:00	0	111	45	0	156	20	0	1	1	21	3	33	1	0	37	20	2	0	0	22	236	
07:30:00	0	99	47	0	146	27	0	0	0	27	11	61	4	0	76	17	0	0	0	17	266	
07:45:00	5	107	50	0	162	26	0	0	0	26	7	79	4	0	90	15	0	3	0	18	296	987
08:00:00	1	98	49	0	148	33	0	0	0	33	6	77	7	0	90	13	0	1	0	14	285	1083
08:15:00	1	99	42	0	142	50	0	0	1	50	10	79	7	0	96	11	4	0	0	15	303	1150
08:30:00	0	101	66	0	167	32	0	0	0	32	14	92	5	0	111	8	0	0	0	8	318	1202
08:45:00	2	87	57	0	146	44	0	0	0	44	15	95	3	0	113	15	0	0	0	15	318	1224
***BREAK***																						
16:00:00	4	83	62	1	149	78	0	0	5	78	14	144	8	0	166	8	1	0	0	9	402	
16:15:00	3	98	42	0	143	83	0	0	2	83	8	149	7	0	164	6	1	2	0	9	399	
16:30:00	5	104	62	0	171	78	0	0	2	78	12	146	9	0	167	3	1	0	0	4	420	
16:45:00	1	97	57	0	155	69	0	0	0	69	10	174	10	0	194	13	1	1	0	15	433	1654
17:00:00	1	112	53	0	166	76	0	0	1	76	8	166	11	0	185	22	0	0	0	22	449	1701
17:15:00	0	109	54	0	163	74	0	0	0	74	16	171	8	0	195	11	0	0	0	11	443	1745
17:30:00	1	83	46	0	130	78	0	0	0	78	15	151	13	0	179	11	2	0	0	13	400	1725
17:45:00	1	97	50	0	148	79	0	0	0	79	12	165	16	0	193	7	1	0	0	8	428	1720
<b>Grand Total</b>	<b>25</b>	<b>1568</b>	<b>825</b>	<b>1</b>	<b>2418</b>	<b>862</b>	<b>0</b>	<b>1</b>	<b>12</b>	<b>863</b>	<b>162</b>	<b>1807</b>	<b>115</b>	<b>0</b>	<b>2084</b>	<b>197</b>	<b>15</b>	<b>8</b>	<b>0</b>	<b>220</b>	<b>5585</b>	<b>-</b>
<b>Approach %</b>	1%	64.8%	34.1%	-	-	99.9%	0%	0.1%	-	-	7.8%	86.7%	5.5%	-	-	89.5%	6.8%	3.6%	-	-	-	-
<b>Totals %</b>	0.4%	28.1%	14.8%	-	43.3%	15.4%	0%	0%	-	15.5%	2.9%	32.4%	2.1%	-	37.3%	3.5%	0.3%	0.1%	-	3.9%	-	-
<b>Heavy</b>	2	60	15	-	-	9	0	0	-	-	4	77	2	-	-	0	0	0	-	-	-	-
<b>Heavy %</b>	8%	3.8%	1.8%	-	-	1%	0%	0%	-	-	2.5%	4.3%	1.7%	-	-	0%	0%	0%	-	-	-	-
<b>Bicycles</b>	0	0	0	-	-	2	0	0	-	-	0	0	1	-	-	0	0	0	-	-	-	-
<b>Bicycle %</b>	0%	0%	0%	-	-	0.2%	0%	0%	-	-	0%	0%	0.9%	-	-	0%	0%	0%	-	-	-	-



**Peak Hour: 08:00 AM - 09:00 AM Weather: Clear (16 °C)**

Start Time	E Approach TORONTO ST S					S Approach PLAZA ENTRANCE					W Approach TORONTO ST S					N Approach CEMETERY RD					Int. Total (15 min)
	Right	Thru	Left	Peds	Approach Total	Right	Thru	Left	Peds	Approach Total	Right	Thru	Left	Peds	Approach Total	Right	Thru	Left	Peds	Approach Total	
08:00:00	1	98	49	0	148	33	0	0	0	33	6	77	7	0	90	13	0	1	0	14	285
08:15:00	1	99	42	0	142	50	0	0	1	50	10	79	7	0	96	11	4	0	0	15	303
08:30:00	0	101	66	0	167	32	0	0	0	32	14	92	5	0	111	8	0	0	0	8	318
08:45:00	2	87	57	0	146	44	0	0	0	44	15	95	3	0	113	15	0	0	0	15	318
<b>Grand Total</b>	<b>4</b>	<b>385</b>	<b>214</b>	<b>0</b>	<b>603</b>	<b>159</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>159</b>	<b>45</b>	<b>343</b>	<b>22</b>	<b>0</b>	<b>410</b>	<b>47</b>	<b>4</b>	<b>1</b>	<b>0</b>	<b>52</b>	<b>1224</b>
<b>Approach%</b>	0.7%	63.8%	35.5%	-	-	100%	0%	0%	-	-	11%	83.7%	5.4%	-	-	90.4%	7.7%	1.9%	-	-	-
<b>Totals %</b>	0.3%	31.5%	17.5%	-	49.3%	13%	0%	0%	-	13%	3.7%	28%	1.8%	-	33.5%	3.8%	0.3%	0.1%	-	4.2%	-
<b>PHF</b>	0.5	0.95	0.81	-	0.9	0.8	0	0	-	0.8	0.75	0.9	0.79	-	0.91	0.78	0.25	0.25	-	0.87	-
<b>Heavy</b>	2	28	3	-	33	3	0	0	-	3	1	28	2	-	31	0	0	0	-	0	-
<b>Heavy %</b>	50%	7.3%	1.4%	-	5.5%	1.9%	0%	0%	-	1.9%	2.2%	8.2%	9.1%	-	7.6%	0%	0%	0%	-	0%	-
<b>Lights</b>	2	357	211	-	570	156	0	0	-	156	44	315	20	-	379	47	4	1	-	52	-
<b>Lights %</b>	50%	92.7%	98.6%	-	94.5%	98.1%	0%	0%	-	98.1%	97.8%	91.8%	90.9%	-	92.4%	100%	100%	100%	-	100%	-
<b>Single-Unit Trucks</b>	0	12	3	-	15	2	0	0	-	2	1	15	1	-	17	0	0	0	-	0	-
<b>Single-Unit Trucks %</b>	0%	3.1%	1.4%	-	2.5%	1.3%	0%	0%	-	1.3%	2.2%	4.4%	4.5%	-	4.1%	0%	0%	0%	-	0%	-
<b>Buses</b>	2	12	0	-	14	1	0	0	-	1	0	8	1	-	9	0	0	0	-	0	-
<b>Buses %</b>	50%	3.1%	0%	-	2.3%	0.6%	0%	0%	-	0.6%	0%	2.3%	4.5%	-	2.2%	0%	0%	0%	-	0%	-
<b>Articulated Trucks</b>	0	4	0	-	4	0	0	0	-	0	0	5	0	-	5	0	0	0	-	0	-
<b>Articulated Trucks %</b>	0%	1%	0%	-	0.7%	0%	0%	0%	-	0%	0%	1.5%	0%	-	1.2%	0%	0%	0%	-	0%	-
<b>Pedestrians</b>	-	-	-	0	-	-	-	1	-	-	-	-	-	0	-	-	-	-	0	-	-
<b>Pedestrians%</b>	-	-	-	0%	-	-	-	100%	-	-	-	-	0%	-	-	-	-	-	0%	-	-
<b>Bicycles on Crosswalk</b>	-	-	-	0	-	-	-	0	-	-	-	-	0	-	-	-	-	-	0	-	-
<b>Bicycles on Crosswalk%</b>	-	-	-	0%	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-
<b>Bicycles on Road</b>	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	-
<b>Bicycles on Road%</b>	-	-	-	0%	-	-	-	0%	-	-	-	-	0%	-	-	-	-	-	0%	-	-



**Peak Hour: 04:30 PM - 05:30 PM Weather: Clear (19 °C)**

Start Time	E Approach TORONTO ST S					S Approach PLAZA ENTRANCE					W Approach TORONTO ST S					N Approach CEMETERY RD					Int. Total (15 min)
	Right	Thru	Left	Peds	Approach Total	Right	Thru	Left	Peds	Approach Total	Right	Thru	Left	Peds	Approach Total	Right	Thru	Left	Peds	Approach Total	
16:30:00	5	104	62	0	171	78	0	0	2	78	12	146	9	0	167	3	1	0	0	4	420
16:45:00	1	97	57	0	155	69	0	0	0	69	10	174	10	0	194	13	1	1	0	15	433
17:00:00	1	112	53	0	166	76	0	0	1	76	8	166	11	0	185	22	0	0	0	22	449
17:15:00	0	109	54	0	163	74	0	0	0	74	16	171	8	0	195	11	0	0	0	11	443
<b>Grand Total</b>	<b>7</b>	<b>422</b>	<b>226</b>	<b>0</b>	<b>655</b>	<b>297</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>297</b>	<b>46</b>	<b>657</b>	<b>38</b>	<b>0</b>	<b>741</b>	<b>49</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>52</b>	<b>1745</b>
<b>Approach%</b>	1.1%	64.4%	34.5%	-	-	100%	0%	0%	-	-	6.2%	88.7%	5.1%	-	-	94.2%	3.8%	1.9%	-	-	-
<b>Totals %</b>	0.4%	24.2%	13%	-	37.5%	17%	0%	0%	-	17%	2.6%	37.7%	2.2%	-	42.5%	2.8%	0.1%	0.1%	-	3%	-
<b>PHF</b>	0.35	0.94	0.91	-	0.96	0.95	0	0	-	0.95	0.72	0.94	0.86	-	0.95	0.56	0.5	0.25	-	0.59	-
<b>Heavy</b>	0	10	1	-	11	0	0	0	-	0	1	17	0	-	18	0	0	0	-	0	-
<b>Heavy %</b>	0%	2.4%	0.4%	-	1.7%	0%	0%	0%	-	0%	2.2%	2.6%	0%	-	2.4%	0%	0%	0%	-	0%	-
<b>Lights</b>	7	412	225	-	644	297	0	0	-	297	45	640	38	-	723	49	2	1	-	52	-
<b>Lights %</b>	100%	97.6%	99.6%	-	98.3%	100%	0%	0%	-	100%	97.8%	97.4%	100%	-	97.6%	100%	100%	100%	-	100%	-
<b>Single-Unit Trucks</b>	0	7	1	-	8	0	0	0	-	0	1	12	0	-	13	0	0	0	-	0	-
<b>Single-Unit Trucks %</b>	0%	1.7%	0.4%	-	1.2%	0%	0%	0%	-	0%	2.2%	1.8%	0%	-	1.8%	0%	0%	0%	-	0%	-
<b>Buses</b>	0	2	0	-	2	0	0	0	-	0	0	3	0	-	3	0	0	0	-	0	-
<b>Buses %</b>	0%	0.5%	0%	-	0.3%	0%	0%	0%	-	0%	0%	0.5%	0%	-	0.4%	0%	0%	0%	-	0%	-
<b>Articulated Trucks</b>	0	1	0	-	1	0	0	0	-	0	0	2	0	-	2	0	0	0	-	0	-
<b>Articulated Trucks %</b>	0%	0.2%	0%	-	0.2%	0%	0%	0%	-	0%	0%	0.3%	0%	-	0.3%	0%	0%	0%	-	0%	-
<b>Pedestrians</b>	-	-	-	0	-	-	-	2	-	-	-	-	0	-	-	-	-	0	-	-	-
<b>Pedestrians%</b>	-	-	-	0%	-	-	-	66.7%	-	-	-	-	0%	-	-	-	-	0%	-	-	-
<b>Bicycles on Crosswalk</b>	-	-	-	0	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-	-
<b>Bicycles on Crosswalk%</b>	-	-	-	0%	-	-	-	33.3%	-	-	-	-	0%	-	-	-	-	0%	-	-	-
<b>Bicycles on Road</b>	0	0	0	0	-	0	0	0	-	-	0	0	0	-	-	0	0	0	-	0	-
<b>Bicycles on Road%</b>	-	-	-	0%	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-

Peak Hour: 08:00 AM - 09:00 AM Weather: Clear (16 °C)



Peak Hour: 04:30 PM - 05:30 PM Weather: Clear (19 °C)







**Turning Movement Count (2 . CONCESSION RD 6 & TORONTO ST S)**

Start Time	N Approach CONCESSION RD 6					E Approach TORONTO ST S					S Approach CONCESSION RD 6					W Approach TORONTO ST S					Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	Peds W:	Approach Total		
07:00:00	40	2	18	0	60	9	111	9	0	129	8	5	3	0	16	0	24	2	0	26	231	
07:15:00	55	4	15	0	74	15	140	6	0	161	9	2	7	0	18	0	32	11	0	43	296	
07:30:00	46	8	27	0	81	10	121	10	0	141	13	6	1	0	20	0	51	6	0	57	299	
07:45:00	34	4	33	0	71	14	125	12	0	151	15	9	6	0	30	1	72	13	0	86	338	1164
08:00:00	26	11	25	0	62	11	116	9	0	136	12	5	1	0	18	1	68	2	0	71	287	1220
08:15:00	35	8	31	0	74	17	95	13	0	125	12	4	2	0	18	3	62	5	0	70	287	1211
08:30:00	28	11	35	0	74	21	98	9	0	128	15	10	3	0	28	0	75	19	0	94	324	1236
08:45:00	21	5	32	0	58	27	86	14	0	127	18	8	0	0	26	1	68	5	0	74	285	1183
***BREAK***																						
16:00:00	12	7	42	0	61	34	49	9	0	92	26	9	2	0	37	11	133	21	0	165	355	
16:15:00	11	6	27	0	44	37	63	14	0	114	26	11	0	0	37	4	130	30	0	164	359	
16:30:00	4	4	29	0	37	35	75	18	0	128	31	16	0	0	47	10	139	30	0	179	391	
16:45:00	7	9	34	0	50	27	56	22	2	105	25	14	2	0	41	4	155	33	0	192	388	1493
17:00:00	4	14	27	0	45	52	72	18	0	142	14	16	2	0	32	5	140	43	0	188	407	1545
17:15:00	7	7	37	0	51	48	79	15	0	142	49	17	0	0	66	2	140	26	0	168	427	1613
17:30:00	11	3	31	0	45	41	69	17	0	127	31	14	0	0	45	3	145	30	0	178	395	1617
17:45:00	6	4	30	0	40	37	57	14	0	108	25	11	0	0	36	0	153	38	0	191	375	1604
<b>Grand Total</b>	<b>347</b>	<b>107</b>	<b>473</b>	<b>0</b>	<b>927</b>	<b>435</b>	<b>1412</b>	<b>209</b>	<b>2</b>	<b>2056</b>	<b>329</b>	<b>157</b>	<b>29</b>	<b>0</b>	<b>515</b>	<b>45</b>	<b>1587</b>	<b>314</b>	<b>0</b>	<b>1946</b>	<b>5444</b>	<b>-</b>
<b>Approach%</b>	37.4%	11.5%	51%	-	-	21.2%	68.7%	10.2%	-	-	63.9%	30.5%	5.6%	-	-	2.3%	81.6%	16.1%	-	-	-	-
<b>Totals %</b>	6.4%	2%	8.7%	-	17%	8%	25.9%	3.8%	-	37.8%	6%	2.9%	0.5%	-	9.5%	0.8%	29.2%	5.8%	-	35.7%	-	-
<b>Heavy</b>	12	4	9	-	-	4	64	5	-	-	7	6	3	-	-	4	69	18	-	-	-	-
<b>Heavy %</b>	3.5%	3.7%	1.9%	-	-	0.9%	4.5%	2.4%	-	-	2.1%	3.8%	10.3%	-	-	8.9%	4.3%	5.7%	-	-	-	-
<b>Bicycles</b>	0	0	1	-	-	0	0	0	-	-	0	0	0	-	-	1	1	0	-	-	-	-
<b>Bicycle %</b>	0%	0%	0.2%	-	-	0%	0%	0%	-	-	0%	0%	0%	-	-	2.2%	0.1%	0%	-	-	-	-



**Peak Hour: 07:45 AM - 08:45 AM Weather: Clear (16 °C)**

Start Time	N Approach CONCESSION RD 6					E Approach TORONTO ST S					S Approach CONCESSION RD 6					W Approach TORONTO ST S					Int. Total (15 min)
	Right	Thru	Left	Peds	Approach Total	Right	Thru	Left	Peds	Approach Total	Right	Thru	Left	Peds	Approach Total	Right	Thru	Left	Peds	Approach Total	
07:45:00	34	4	33	0	71	14	125	12	0	151	15	9	6	0	30	1	72	13	0	86	338
08:00:00	26	11	25	0	62	11	116	9	0	136	12	5	1	0	18	1	68	2	0	71	287
08:15:00	35	8	31	0	74	17	95	13	0	125	12	4	2	0	18	3	62	5	0	70	287
08:30:00	28	11	35	0	74	21	98	9	0	128	15	10	3	0	28	0	75	19	0	94	324
<b>Grand Total</b>	<b>123</b>	<b>34</b>	<b>124</b>	<b>0</b>	<b>281</b>	<b>63</b>	<b>434</b>	<b>43</b>	<b>0</b>	<b>540</b>	<b>54</b>	<b>28</b>	<b>12</b>	<b>0</b>	<b>94</b>	<b>5</b>	<b>277</b>	<b>39</b>	<b>0</b>	<b>321</b>	<b>1236</b>
<b>Approach%</b>	43.8%	12.1%	44.1%	-	-	11.7%	80.4%	8%	-	-	57.4%	29.8%	12.8%	-	-	1.6%	86.3%	12.1%	-	-	-
<b>Totals %</b>	10%	2.8%	10%	22.7%	5.1%	35.1%	3.5%	43.7%	4.4%	2.3%	1%	7.6%	0.4%	22.4%	3.2%	26%	-	-	-	-	-
<b>PHF</b>	0.88	0.77	0.89	0.95	0.75	0.87	0.83	0.89	0.9	0.7	0.5	0.78	0.42	0.92	0.51	0.85	-	-	-	-	-
<b>Heavy</b>	5	2	5	12	1	22	1	24	3	2	0	5	2	21	6	29	-	-	-	-	-
<b>Heavy %</b>	4.1%	5.9%	4%	4.3%	1.6%	5.1%	2.3%	4.4%	5.6%	7.1%	0%	5.3%	40%	7.6%	15.4%	9%	-	-	-	-	-
<b>Lights</b>	118	32	119	269	62	412	42	516	51	26	12	89	3	256	33	292	-	-	-	-	-
<b>Lights %</b>	95.9%	94.1%	96%	95.7%	98.4%	94.9%	97.7%	95.6%	94.4%	92.9%	100%	94.7%	60%	92.4%	84.6%	91%	-	-	-	-	-
<b>Single-Unit Trucks</b>	2	2	5	9	1	9	1	11	0	0	0	0	0	10	4	14	-	-	-	-	-
<b>Single-Unit Trucks %</b>	1.6%	5.9%	4%	3.2%	1.6%	2.1%	2.3%	2%	0%	0%	0%	0%	0%	3.6%	10.3%	4.4%	-	-	-	-	-
<b>Buses</b>	3	0	0	3	0	9	0	9	3	2	0	5	2	6	2	10	-	-	-	-	-
<b>Buses %</b>	2.4%	0%	0%	1.1%	0%	2.1%	0%	1.7%	5.6%	7.1%	0%	5.3%	40%	2.2%	5.1%	3.1%	-	-	-	-	-
<b>Articulated Trucks</b>	0	0	0	0	0	4	0	4	0	0	0	0	0	5	0	5	-	-	-	-	-
<b>Articulated Trucks %</b>	0%	0%	0%	0%	0%	0.9%	0%	0.7%	0%	0%	0%	0%	0%	1.8%	0%	1.6%	-	-	-	-	-
<b>Pedestrians</b>	-	-	-	0	-	-	-	0	-	-	0	-	-	-	-	0	-	-	0	-	-
<b>Pedestrians%</b>	-	-	-	0%	-	-	0%	-	-	0%	-	-	-	0%	-	-	-	0%	-	-	-
<b>Bicycles on Road</b>	0	0	1	-	0	0	0	-	0	0	0	-	0	0	0	-	0	0	0	-	-
<b>Bicycles on Road%</b>	-	-	-	0%	-	-	0%	-	-	-	0%	-	-	-	0%	-	-	-	0%	-	-



**Peak Hour: 04:45 PM - 05:45 PM Weather: Clear (19 °C)**

Start Time	N Approach CONCESSION RD 6					E Approach TORONTO ST S					S Approach CONCESSION RD 6					W Approach TORONTO ST S					Int. Total (15 min)
	Right	Thru	Left	Peds	Approach Total	Right	Thru	Left	Peds	Approach Total	Right	Thru	Left	Peds	Approach Total	Right	Thru	Left	Peds	Approach Total	
16:45:00	7	9	34	0	50	27	56	22	2	105	25	14	2	0	41	4	155	33	0	192	388
17:00:00	4	14	27	0	45	52	72	18	0	142	14	16	2	0	32	5	140	43	0	188	407
17:15:00	7	7	37	0	51	48	79	15	0	142	49	17	0	0	66	2	140	26	0	168	427
17:30:00	11	3	31	0	45	41	69	17	0	127	31	14	0	0	45	3	145	30	0	178	395
<b>Grand Total</b>	<b>29</b>	<b>33</b>	<b>129</b>	<b>0</b>	<b>191</b>	<b>168</b>	<b>276</b>	<b>72</b>	<b>2</b>	<b>516</b>	<b>119</b>	<b>61</b>	<b>4</b>	<b>0</b>	<b>184</b>	<b>14</b>	<b>580</b>	<b>132</b>	<b>0</b>	<b>726</b>	<b>1617</b>
<b>Approach%</b>	15.2%	17.3%	67.5%	-	-	32.6%	53.5%	14%	-	-	64.7%	33.2%	2.2%	-	-	1.9%	79.9%	18.2%	-	-	-
<b>Totals %</b>	1.8%	2%	8%	11.8%	10.4%	17.1%	4.5%	31.9%	7.4%	3.8%	0.2%	11.4%	0.9%	35.9%	8.2%	44.9%	-	-	-	-	-
<b>PHF</b>	0.66	0.59	0.87	0.94	0.81	0.87	0.82	0.91	0.61	0.9	0.5	0.7	0.7	0.94	0.77	0.95	-	-	-	-	-
<b>Heavy</b>	2	1	0	3	2	8	1	11	2	1	2	5	1	16	1	18	-	-	-	-	-
<b>Heavy %</b>	6.9%	3%	0%	1.6%	1.2%	2.9%	1.4%	2.1%	1.7%	1.6%	50%	2.7%	7.1%	2.8%	0.8%	2.5%	-	-	-	-	-
<b>Lights</b>	27	32	129	188	166	268	71	505	117	60	2	179	13	564	131	708	-	-	-	-	-
<b>Lights %</b>	93.1%	97%	100%	98.4%	98.8%	97.1%	98.6%	97.9%	98.3%	98.4%	50%	97.3%	92.9%	97.2%	99.2%	97.5%	-	-	-	-	-
<b>Single-Unit Trucks</b>	2	0	0	2	2	5	1	8	2	1	0	3	1	10	1	12	-	-	-	-	-
<b>Single-Unit Trucks %</b>	6.9%	0%	0%	1%	1.2%	1.8%	1.4%	1.6%	1.7%	1.6%	0%	1.6%	7.1%	1.7%	0.8%	1.7%	-	-	-	-	-
<b>Buses</b>	0	1	0	1	0	2	0	2	0	0	2	2	0	2	0	2	-	-	-	-	-
<b>Buses %</b>	0%	3%	0%	0.5%	0%	0.7%	0%	0.4%	0%	0%	50%	1.1%	0%	0.3%	0%	0.3%	-	-	-	-	-
<b>Articulated Trucks</b>	0	0	0	0	0	1	0	1	0	0	0	0	0	4	0	4	-	-	-	-	-
<b>Articulated Trucks %</b>	0%	0%	0%	0%	0%	0.4%	0%	0.2%	0%	0%	0%	0%	0%	0.7%	0%	0.6%	-	-	-	-	-
<b>Pedestrians</b>	-	-	-	0	-	-	-	2	-	-	-	0	-	-	-	0	-	-	0	-	-
<b>Pedestrians%</b>	-	-	-	0%	-	-	100%	-	-	-	0%	-	-	-	0%	-	-	0%	-	-	-
<b>Bicycles on Road</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Bicycles on Road%</b>	-	-	-	0%	-	-	0%	-	-	-	0%	-	-	-	0%	-	-	-	0%	-	-

Peak Hour: 07:45 AM - 08:45 AM Weather: Clear (16 °C)



Peak Hour: 04:45 PM - 05:45 PM Weather: Clear (19 °C)







October 6<sup>th</sup>, 2016

Nextrans  
15260 Yonge Street, Suite 204  
AURORA ON L4G 1N4

**The Regional  
Municipality  
of Durham**

Works Department  
Traffic Operations Centre

101 CONSUMERS DR.  
P.O. BOX 623  
WHITBY ON L1N 6A3  
CANADA  
905-666-8118  
1-866-786-8116  
Fax: 905-666-8826  
E-mail:  
[traffic@durham.ca](mailto:traffic@durham.ca)

[www.durham.ca](http://www.durham.ca)

**C. R. Curtis, P.Eng, MBA**  
Commissioner of Works

**ATTENTION: Annosan Srikantha**

**RE: Highway 47 @ Concession 6  
Signal Timings – AM, PM and Saturday Peaks  
Our File: 904-T02-2016**

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Attached is a detailed summary of the signal timings for the above-noted intersection, as requested October 4<sup>th</sup>, 2016.

The signal timings at this location can vary by time of day depending on the signal program in effect from the Region's Advanced Traffic Management System.

I trust this information will be of assistance to you.

Yours truly,

A handwritten signature in cursive script that reads 'Meg Haley'.

Meg Haley  
Traffic Engineering Analyst

MH/ra

Encl.



## Signal Timings – AM, PM and Saturday Peaks

### Highway 47 @ Concession 6

This intersection operates in a semi-actuated mode of control with Highway 47 assigned as the main street.

### Weekday Program

Time Of Day	Cycle Length (sec.)	Highway 47 N/S (sec.)		Concession 6 E/W (sec.)	
06:00 to 09:00 AM Peak	70	Green	33.4	Min Green	8.0
		Amber	5.7	Max Green	23.6
		All Red	1.5	Amber	3.7
				All Red	2.1
				Veh Ext.	3.0
15:00 to 19:00 PM Peak	70	Green	38.3	Min Green	8.0
		Amber	5.7	Max Green	18.7
		All Red	1.5	Amber	3.7
				All Red	2.1
				Veh Ext.	3.0

### Weekend Program

Time Of Day	Cycle Length (sec.)	Highway 47 N/S (sec.)		Concession 6 E/W (sec.)	
09:00 to 19:00	70	Green	38.3	Min Green	8.0
		Amber	5.7	Max Green	18.7
		All Red	1.5	Amber	3.7
				All Red	2.1
				Veh Ext.	3.0



## **Appendix C - Existing Traffic Level of Service Calculations**

# HCM Signalized Intersection Capacity Analysis

## 3: Concession Rd 6 & Toronto St

2016-10-24



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	277	5	43	434	63	12	28	54	124	34	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Frt	1.00	1.00	0.85	1.00	0.98			0.93			0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1289	1759	1404	1770	1778			1673			1679	
Flt Permitted	0.17	1.00	1.00	0.49	1.00			0.90			0.80	
Satd. Flow (perm)	230	1759	1404	914	1778			1527			1378	
Peak-hour factor, PHF	0.51	0.92	0.42	0.83	0.87	0.75	0.50	0.70	0.90	0.89	0.77	0.88
Adj. Flow (vph)	76	301	12	52	499	84	24	40	60	139	44	140
RTOR Reduction (vph)	0	0	8	0	9	0	0	31	0	0	39	0
Lane Group Flow (vph)	76	301	4	52	574	0	0	93	0	0	284	0
Heavy Vehicles (%)	40%	8%	15%	2%	5%	2%	0%	7%	6%	4%	6%	4%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	23.6	23.6	23.6	23.6	23.6			33.4			33.4	
Effective Green, g (s)	23.6	23.6	23.6	23.6	23.6			33.4			33.4	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34			0.48			0.48	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	77	593	473	308	599			728			657	
v/s Ratio Prot		0.17			0.32							
v/s Ratio Perm	c0.33		0.00	0.06				0.06			c0.21	
v/c Ratio	0.99	0.51	0.01	0.17	0.96			0.13			0.43	
Uniform Delay, d1	23.0	18.6	15.4	16.3	22.7			10.2			12.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	97.4	0.7	0.0	0.3	26.5			0.4			2.1	
Delay (s)	120.4	19.2	15.4	16.6	49.2			10.5			14.1	
Level of Service	F	B	B	B	D			B			B	
Approach Delay (s)		38.9			46.6			10.5			14.1	
Approach LOS		D			D			B			B	





















### Intersection Summary

HCM 2000 Control Delay	34.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	69.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 6: Plaza Entrance/Cemetery Rd & Toronto St/Toronto St

2016-10-24

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	22	343	45	214	385	4	0	0	159	1	4	47
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.90	0.75	0.81	0.95	0.50	0.25	0.25	0.80	0.25	0.25	0.78
Hourly flow rate (vph)	28	381	60	264	405	8	0	0	199	4	16	60
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	413			441			1438	1378	381	1573	1434	409
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	413			441			1438	1378	381	1573	1434	409
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			76			100	100	70	92	84	91
cM capacity (veh/h)	1109			1124			72	109	666	51	101	647
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1					
Volume Total	28	381	60	264	413	199	80					
Volume Left	28	0	0	264	0	0	4					
Volume Right	0	0	60	0	8	199	60					
cSH	1109	1700	1700	1124	1700	666	243					
Volume to Capacity	0.02	0.22	0.04	0.24	0.24	0.30	0.33					
Queue Length 95th (m)	0.6	0.0	0.0	7.3	0.0	10.0	11.1					
Control Delay (s)	8.3	0.0	0.0	9.2	0.0	12.7	27.0					
Lane LOS	A			A		B	D					
Approach Delay (s)	0.5			3.6		12.7	27.0					
Approach LOS						B	D					
Intersection Summary												
Average Delay			5.2									
Intersection Capacity Utilization		43.2%		ICU Level of Service	A							
Analysis Period (min)		15										

# HCM Signalized Intersection Capacity Analysis

## 3: Concession Rd 6 & Toronto St

2016-10-24



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	132	580	14	72	276	168	4	61	119	129	33	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Frt	1.00	1.00	0.85	1.00	0.94			0.90			0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00			1.00			0.97	
Satd. Flow (prot)	1787	1845	1509	1787	1749			1656			1767	
Flt Permitted	0.21	1.00	1.00	0.21	1.00			0.99			0.68	
Satd. Flow (perm)	402	1845	1509	402	1749			1643			1241	
Peak-hour factor, PHF	0.77	0.94	0.70	0.82	0.87	0.81	0.50	0.90	0.61	0.87	0.59	0.66
Adj. Flow (vph)	171	617	20	88	317	207	8	68	195	148	56	44
RTOR Reduction (vph)	0	0	15	0	34	0	0	22	0	0	11	0
Lane Group Flow (vph)	171	617	5	88	490	0	0	249	0	0	237	0
Heavy Vehicles (%)	1%	3%	7%	1%	3%	1%	50%	2%	2%	0%	3%	7%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	18.7	18.7	18.7	18.7	18.7			38.3			38.3	
Effective Green, g (s)	18.7	18.7	18.7	18.7	18.7			38.3			38.3	
Actuated g/C Ratio	0.27	0.27	0.27	0.27	0.27			0.55			0.55	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	107	492	403	107	467			898			679	
v/s Ratio Prot		0.33			0.28							
v/s Ratio Perm	c0.42		0.00	0.22				0.15			c0.19	
v/c Ratio	1.60	1.25	0.01	0.82	1.05			0.28			0.35	
Uniform Delay, d1	25.6	25.6	18.9	24.1	25.6			8.5			8.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	308.4	130.2	0.0	37.7	55.3			0.8			1.4	
Delay (s)	334.0	155.8	18.9	61.8	81.0			9.2			10.3	
Level of Service	F	F	B	E	F			A			B	
Approach Delay (s)		190.2			78.2			9.2			10.3	
Approach LOS		F			E			A			B	

### Intersection Summary

HCM 2000 Control Delay	106.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	83.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 6: Plaza Entrance/Cemetery Rd & Toronto St/Toronto St

2016-10-24



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	38	657	46	266	422	7	0	0	297	1	2	49
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.86	0.94	0.72	0.91	0.94	0.35	0.25	0.25	0.95	0.25	0.50	0.56
Hourly flow rate (vph)	44	699	64	292	449	20	0	0	313	4	4	88
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	469			763			1910	1841	699	2143	1895	459
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	469			763			1910	1841	699	2143	1895	459
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			66			100	100	29	47	91	86
cM capacity (veh/h)	1103			859			30	48	443	8	45	606

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total	44	699	64	292	469	313	96
Volume Left	44	0	0	292	0	0	4
Volume Right	0	0	64	0	20	313	88
cSH	1103	1700	1700	859	1700	443	125
Volume to Capacity	0.04	0.41	0.04	0.34	0.28	0.71	0.77
Queue Length 95th (m)	1.0	0.0	0.0	12.1	0.0	43.2	35.4
Control Delay (s)	8.4	0.0	0.0	11.3	0.0	30.3	93.9
Lane LOS	A			B		D	F
Approach Delay (s)	0.5			4.4		30.3	93.9
Approach LOS						D	F

### Intersection Summary

Average Delay	11.2
Intersection Capacity Utilization	66.3%
ICU Level of Service	C
Analysis Period (min)	15

# HCM Signalized Intersection Capacity Analysis

## 3: Concession Rd 6 & Toronto St

2016-10-24



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	277	5	43	434	63	12	28	54	124	34	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Frt	1.00	1.00	0.85	1.00	0.98			0.93			0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1289	1759	1404	1770	1778			1673			1679	
Flt Permitted	0.20	1.00	1.00	0.51	1.00			0.90			0.80	
Satd. Flow (perm)	274	1759	1404	957	1778			1522			1378	
Peak-hour factor, PHF	0.51	0.92	0.42	0.83	0.87	0.75	0.50	0.70	0.90	0.89	0.77	0.88
Adj. Flow (vph)	76	301	12	52	499	84	24	40	60	139	44	140
RTOR Reduction (vph)	0	0	7	0	9	0	0	32	0	0	27	0
Lane Group Flow (vph)	76	301	5	52	574	0	0	92	0	0	296	0
Heavy Vehicles (%)	40%	8%	15%	2%	5%	2%	0%	7%	6%	4%	6%	4%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	28.2	28.2	28.2	28.2	28.2			31.2			31.2	
Effective Green, g (s)	28.2	28.2	28.2	28.2	28.2			31.2			31.2	
Actuated g/C Ratio	0.39	0.39	0.39	0.39	0.39			0.43			0.43	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	106	685	546	372	692			655			593	
v/s Ratio Prot		0.17			c0.32							
v/s Ratio Perm	0.28		0.00	0.05				0.06			c0.21	
v/c Ratio	0.72	0.44	0.01	0.14	0.83			0.14			0.50	
Uniform Delay, d1	18.7	16.3	13.5	14.3	19.9			12.5			14.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	20.5	0.5	0.0	0.2	8.3			0.4			3.0	
Delay (s)	39.2	16.7	13.5	14.4	28.3			12.9			17.9	
Level of Service	D	B	B	B	C			B			B	
Approach Delay (s)		21.0			27.1			12.9			17.9	
Approach LOS		C			C			B			B	

### Intersection Summary

HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	72.4	Sum of lost time (s)	13.0
Intersection Capacity Utilization	69.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 6: Plaza Entrance/Cemetery Rd & Toronto St/Toronto St

2016-10-24























Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	22	343	45	214	385	4	0	0	159	1	4	47
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.90	0.75	0.81	0.95	0.50	0.25	0.25	0.80	0.25	0.25	0.78
Hourly flow rate (vph)	28	381	60	264	405	8	0	0	199	4	16	60
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	413			441			1438	1378	381	1573	1434	409
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	413			441			1438	1378	381	1573	1434	409
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			76			100	100	70	92	84	91
cM capacity (veh/h)	1109			1124			72	109	666	51	101	647
<b>Direction, Lane #</b>												
	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1					
Volume Total	28	381	60	264	413	199	80					
Volume Left	28	0	0	264	0	0	4					
Volume Right	0	0	60	0	8	199	60					
cSH	1109	1700	1700	1124	1700	666	243					
Volume to Capacity	0.02	0.22	0.04	0.24	0.24	0.30	0.33					
Queue Length 95th (m)	0.6	0.0	0.0	7.3	0.0	10.0	11.1					
Control Delay (s)	8.3	0.0	0.0	9.2	0.0	12.7	27.0					
Lane LOS	A			A		B	D					
Approach Delay (s)	0.5			3.6		12.7	27.0					
Approach LOS						B	D					
<b>Intersection Summary</b>												
Average Delay			5.2									
Intersection Capacity Utilization			43.2%		ICU Level of Service		A					
Analysis Period (min)			15									



# HCM Signalized Intersection Capacity Analysis

## 3: Concession Rd 6 & Toronto St

2016-10-24

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Volume (vph)	132	580	14	72	276	168	4	61	119	129	33	29		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00			
Frt	1.00	1.00	0.85	1.00	0.94			0.90			0.98			
Flt Protected	0.95	1.00	1.00	0.95	1.00			1.00			0.97			
Satd. Flow (prot)	1787	1845	1509	1787	1749			1656			1767			
Flt Permitted	0.28	1.00	1.00	0.18	1.00			0.99			0.68			
Satd. Flow (perm)	520	1845	1509	345	1749			1641			1234			
Peak-hour factor, PHF	0.77	0.94	0.70	0.82	0.87	0.81	0.50	0.90	0.61	0.87	0.59	0.66		
Adj. Flow (vph)	171	617	20	88	317	207	8	68	195	148	56	44		
RTOR Reduction (vph)	0	0	12	0	32	0	0	90	0	0	8	0		
Lane Group Flow (vph)	171	617	8	88	492	0	0	181	0	0	240	0		
Heavy Vehicles (%)	1%	3%	7%	1%	3%	1%	50%	2%	2%	0%	3%	7%		
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA			
Protected Phases		4			8			2			6			
Permitted Phases	4		4	8			2			6				
Actuated Green, G (s)	30.1	30.1	30.1	30.1	30.1			31.3			31.3			
Effective Green, g (s)	30.1	30.1	30.1	30.1	30.1			31.3			31.3			
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40			0.42			0.42			
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2			
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0			
Lane Grp Cap (vph)	210	746	610	139	707			690			519			
v/s Ratio Prot		c0.33			0.28									
v/s Ratio Perm	0.33		0.01	0.26				0.11			c0.19			
v/c Ratio	0.81	0.83	0.01	0.63	0.70			0.26			0.46			
Uniform Delay, d1	19.7	19.8	13.3	17.7	18.4			14.0			15.5			
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00			
Incremental Delay, d2	20.9	7.5	0.0	9.1	3.0			0.9			3.0			
Delay (s)	40.6	27.3	13.3	26.8	21.3			15.0			18.5			
Level of Service	D	C	B	C	C			B			B			
Approach Delay (s)		29.8			22.1			15.0			18.5			
Approach LOS		C			C			B			B			
<b>Intersection Summary</b>														
HCM 2000 Control Delay			23.8									HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio			0.64											
Actuated Cycle Length (s)			74.4								13.0		Sum of lost time (s)	
Intersection Capacity Utilization			83.9%										ICU Level of Service	E
Analysis Period (min)			15											

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 6: Plaza Entrance/Cemetery Rd & Toronto St/Toronto St

2016-10-24



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	38	657	46	266	422	7	0	0	297	1	2	49
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.86	0.94	0.72	0.91	0.94	0.35	0.25	0.25	0.95	0.25	0.50	0.56
Hourly flow rate (vph)	44	699	64	292	449	20	0	0	313	4	4	88
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	469			763			1910	1841	699	2143	1895	459
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	469			763			1910	1841	699	2143	1895	459
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			66			100	100	29	47	91	86
cM capacity (veh/h)	1103			859			30	48	443	8	45	606

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total	44	699	64	292	469	313	96
Volume Left	44	0	0	292	0	0	4
Volume Right	0	0	64	0	20	313	88
cSH	1103	1700	1700	859	1700	443	125
Volume to Capacity	0.04	0.41	0.04	0.34	0.28	0.71	0.77
Queue Length 95th (m)	1.0	0.0	0.0	12.1	0.0	43.2	35.4
Control Delay (s)	8.4	0.0	0.0	11.3	0.0	30.3	93.9
Lane LOS	A			B		D	F
Approach Delay (s)	0.5			4.4		30.3	93.9
Approach LOS						D	F

### Intersection Summary

Average Delay	11.2
Intersection Capacity Utilization	66.3%
ICU Level of Service	C
Analysis Period (min)	15

## **Appendix D – Control Delay Data Sheet (Video Survey)**

**AM PEAK HOUR (8:00 AM-9:00 PM)**

<b>Veh No.</b>	<b>Movement</b>	<b>Stop</b>	<b>Depart</b>	<b>Delay (min)</b>
				0:00:00
1	Left	7:59:55	8:00:06	0:00:11
2	Right	8:01:15	8:01:39	0:00:24
3	Right	8:01:21	8:01:42	0:00:21
4	Right	8:01:25	8:01:46	0:00:21
5	Right	8:01:36	8:01:51	0:00:15
6	Right	8:01:50	8:02:03	0:00:13
7	Right	8:03:08	8:03:15	0:00:07
8	Right	8:06:38	8:06:42	0:00:04
9	Right	8:07:34	8:07:36	0:00:02
10	Right	8:07:35	8:07:38	0:00:03
11	Right	8:10:08	8:10:58	0:00:50
12	Right	8:10:28	8:11:02	0:00:34
13	Right	8:11:42	8:11:44	0:00:02
14	Right	8:12:46	8:12:57	0:00:11
15	Right	8:14:23	8:14:28	0:00:05
16	Through	8:14:45	8:15:03	0:00:18
17	Right	8:14:48	8:15:05	0:00:17
18	Right	8:15:35	8:15:37	0:00:02
19	Right	8:17:19	8:17:20	0:00:01
20	Through	8:17:26	8:17:28	0:00:02
21	Right	8:17:31	8:17:47	0:00:16
22	Right	8:19:16	8:19:17	0:00:01
23	Right	8:21:22	8:21:25	0:00:03
24	Through	8:22:05	8:22:13	0:00:08
25	Right	8:22:16	8:22:22	0:00:06
26	Right	8:24:53	8:24:56	0:00:03
27	Right	8:25:43	8:25:54	0:00:11
28	Right	8:27:40	8:27:43	0:00:03
29	Right	8:28:25	8:28:27	0:00:02
30	Through	8:28:41	8:28:51	0:00:10
31	Right	8:29:56	8:29:58	0:00:02
32	Right	8:30:21	8:30:25	0:00:04
33	Right	8:31:16	8:31:18	0:00:02
34	Right	8:32:50	8:33:11	0:00:21
35	Right	8:33:43	8:33:46	0:00:03
36	Right	8:33:49	8:34:03	0:00:14
37	Right	8:34:26	8:34:27	0:00:01
38	Left	8:38:38	8:39:00	0:00:22
39	Right	8:42:04	8:42:22	0:00:18
40	Right	8:47:59	8:48:02	0:00:03
41	Right	8:48:32	8:48:35	0:00:03
42	Right	8:50:00	8:50:05	0:00:05
43	Right	8:50:14	8:50:16	0:00:02
44	Right	8:50:33	8:50:35	0:00:02
45	Right	8:51:08	8:51:22	0:00:14
46	Right	8:52:20	8:52:25	0:00:05
47	Right	8:52:37	8:52:38	0:00:01
48	Right	8:52:39	8:52:56	0:00:17
49	Right	8:53:20	8:53:23	0:00:03
50	Right	8:55:02	8:55:12	0:00:10
51	Right	8:56:29	8:56:32	0:00:03
52	Right	8:57:05	8:57:07	0:00:02
53	Right	8:57:47	8:57:49	0:00:02
54	Left	8:57:51	8:57:52	0:00:01
55	Left	8:58:20	8:58:23	0:00:03
56	Right	8:59:18	8:59:35	0:00:17
57	Right	8:59:59	9:00:06	0:00:07

Avg Control Delay      0:00:09

**PM PEAK HOUR (4:30 AM-5:30 PM)**

<b>Veh No.</b>	<b>Movement</b>	<b>Stop</b>	<b>Depart</b>	<b>Delay (min)</b>
1	Right	4:31:05	4:31:08	0:00:03
2	Right	4:32:08	4:32:11	0:00:03
3	Through	4:34:18	4:34:33	0:00:15
4	Right	4:39:04	4:39:06	0:00:02
5	Right	4:45:22	4:45:24	0:00:02
6	Right	4:45:46	4:45:54	0:00:08
7	Through	4:47:49	4:47:49	0:00:00
8	Right	4:48:44	4:48:45	0:00:01
9	Right	4:50:55	4:50:57	0:00:02
10	Right	4:51:18	4:51:20	0:00:02
11	Right	4:53:28	4:53:45	0:00:17
12	Right	4:54:12	4:54:18	0:00:06
13	Right	4:54:28	4:54:44	0:00:16
14	Right	4:56:55	4:56:56	0:00:01
15	Right	4:57:56	4:57:58	0:00:02
16	Left	4:59:15	4:59:22	0:00:07
17	Right	5:00:17	5:00:18	0:00:01
18	Right	5:00:51	5:00:52	0:00:01
19	Right	5:01:55	5:01:57	0:00:02
20	Right	5:02:22	5:02:32	0:00:10
21	Right	5:02:40	5:02:42	0:00:02
22	Right	5:02:56	5:02:57	0:00:01
23	Right	5:04:26	5:04:31	0:00:05
24	Right	5:04:46	5:04:51	0:00:05
25	Right	5:05:35	5:05:38	0:00:03
26	Right	5:05:36	5:05:56	0:00:20
27	Right	5:05:55	5:06:00	0:00:05
28	Right	5:06:07	5:06:16	0:00:09
29	Right	5:06:29	5:06:30	0:00:01
30	Right	5:06:42	5:06:55	0:00:13
31	Right	5:06:45	5:07:03	0:00:18
32	Right	5:07:56	5:07:57	0:00:01
33	Right	5:08:05	5:08:06	0:00:01
34	Right	5:09:29	5:09:50	0:00:21
35	Right	5:10:09	5:10:11	0:00:02
36	Right	5:11:45	5:11:54	0:00:09
37	Right	5:14:25	5:14:36	0:00:11
38	Right	5:14:41	5:14:42	0:00:01
39	Right	5:14:51	5:14:52	0:00:01
40	Right	5:16:20	5:16:34	0:00:14
41	Right	5:17:45	5:17:52	0:00:07
42	Right	5:18:54	5:19:05	0:00:11
43	Right	5:19:25	5:19:27	0:00:02
44	Right	5:20:45	5:21:13	0:00:28
45	Right	5:21:33	5:21:54	0:00:21
46	Right	5:23:40	5:23:46	0:00:06
47	Right	5:25:14	5:25:20	0:00:06
48	Right	5:26:17	5:26:18	0:00:01
49	Right	5:27:51	5:27:56	0:00:05
50	Right	5:29:23	5:29:27	0:00:04

**Avg Control Delay**

**0:00:07**

**Appendix E – Spectrum Traffic Data Inc.  
Computer-Based Video (Turning Movement  
Count)**

## **Appendix F – Gap Study Analysis**



Study Name Cemetary Rd / Toronto St Gap Study  
 Start Date 10/05/2016  
 Start Time 8:00

Left from Minor

	2.0 - 4.0	4.0 - 6.0	6.0 - 8.0	8.0 - 10.0	10.0 - 12.0	12.0 - 14.0	14.0 - 16.0	16.0 - 18.0	18.0 - 20.0	20.0 - 22.0	22.0 - 24.0	24.0 - 26.0	26.0 - 28.0	28.00+	Critical Gaps (7.1 sec)	Follow-up Gaps (3.5 sec)	Total Gaps
8:00	57	22	9	4	4	3	1	4	1	1	2	0	0	0	22	31	53
8:15	41	24	20	5	4	3	5	2	2	0	0	1	0	0	26	29	55
8:30	75	26	11	13	3	1	0	0	1	0	0	0	0	0	23	6	29
8:45	61	29	14	6	4	2	1	0	1	2	0	0	1	0	22	22	44
16:30	98	29	10	5	0	2	0	0	0	0	1	0	0	0	14	6	20
16:45	95	22	5	3	4	2	1	0	0	0	0	0	1	0	14	12	26
17:00	104	18	11	6	1	1	0	0	0	3	0	0	0	0	15	14	29
17:15	71	23	12	2	3	1	0	2	0	0	0	0	0	1	12	15	27

Study Name Cemetary Rd / Toronto St Gap Study  
 Start Date 10/05/2016  
 Start Time 8:00

Southbound Right from Minor

	2.0 - 4.0	4.0 - 6.0	6.0 - 8.0	8.0 - 10.0	10.0 - 12.0	12.0 - 14.0	14.0 - 16.0	16.0 - 18.0	18.0 - 20.0	20.0 - 22.0	22.0 - 24.0	24.0 - 26.0	26.0 - 28.0	28.00+	Critical Gaps (6.2 sec)	Follow-up Gaps (3.3 sec)	Total Gaps
8:00	34	20	9	4	5	2	2	2	2	3	2	1	2	2	35	76	111
8:15	29	14	16	8	7	4	6	3	1	1	1	1	0	2	43	66	109
8:30	41	27	14	12	6	2	0	3	1	1	2	0	1	0	40	45	85
8:45	35	21	14	10	7	3	3	1	0	1	2	0	2	1	44	57	101
16:30	46	19	14	3	3	2	8	4	1	0	0	3	0	2	36	66	102
16:45	32	22	9	6	6	5	2	2	4	1	0	0	2	2	39	81	120
17:00	36	14	14	13	7	6	3	1	0	1	1	1	0	3	50	63	113
17:15	45	18	12	9	3	6	4	2	0	0	0	0	1	5	41	73	114

## **Appendix G - Future (2021) Background Traffic Level of Service Calculations**

# HCM Signalized Intersection Capacity Analysis

## 3: Concession Rd 6 & Toronto St

2016-10-27



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	305	5	43	477	63	12	31	54	124	37	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Frt	1.00	1.00	0.85	1.00	0.98			0.94			0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1289	1759	1404	1770	1780			1676			1681	
Flt Permitted	0.18	1.00	1.00	0.48	1.00			0.90			0.80	
Satd. Flow (perm)	240	1759	1404	902	1780			1526			1379	
Peak-hour factor, PHF	0.51	0.92	0.42	0.83	0.87	0.75	0.50	0.70	0.90	0.89	0.77	0.88
Adj. Flow (vph)	76	332	12	52	548	84	24	44	60	139	48	140
RTOR Reduction (vph)	0	0	7	0	8	0	0	32	0	0	27	0
Lane Group Flow (vph)	76	332	5	52	624	0	0	96	0	0	300	0
Heavy Vehicles (%)	40%	8%	15%	2%	5%	2%	0%	7%	6%	4%	6%	4%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	31.1	31.1	31.1	31.1	31.1			31.3			31.3	
Effective Green, g (s)	31.1	31.1	31.1	31.1	31.1			31.3			31.3	
Actuated g/C Ratio	0.41	0.41	0.41	0.41	0.41			0.42			0.42	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	98	725	579	372	734			633			572	
v/s Ratio Prot		0.19			c0.35							
v/s Ratio Perm	0.32		0.00	0.06				0.06			c0.22	
v/c Ratio	0.78	0.46	0.01	0.14	0.85			0.15			0.52	
Uniform Delay, d1	19.1	16.0	13.1	13.8	20.0			13.8			16.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	31.0	0.5	0.0	0.2	9.3			0.5			3.4	
Delay (s)	50.1	16.5	13.1	14.0	29.4			14.3			19.9	
Level of Service	D	B	B	B	C			B			B	
Approach Delay (s)		22.5			28.2			14.3			19.9	
Approach LOS		C			C			B			B	

### Intersection Summary

HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	75.4	Sum of lost time (s)	13.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 6: Plaza Entrance/Cemetery Rd & Toronto St/Toronto St

2016-10-27



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	22	377	45	214	424	4	0	0	159	1	4	47
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.90	0.75	0.81	0.95	0.50	0.25	0.25	0.80	0.25	0.25	0.78
Hourly flow rate (vph)	28	419	60	264	446	8	0	0	199	4	16	60
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	454			479			1517	1457	419	1651	1513	450
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	454			479			1517	1457	419	1651	1513	450
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			76			100	100	69	91	82	90
cM capacity (veh/h)	1070			1089			62	97	634	44	89	613
<b>Direction, Lane #</b>												
	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1					
Volume Total	28	419	60	264	454	199	80					
Volume Left	28	0	0	264	0	0	4					
Volume Right	0	0	60	0	8	199	60					
cSH	1070	1700	1700	1089	1700	634	217					
Volume to Capacity	0.03	0.25	0.04	0.24	0.27	0.31	0.37					
Queue Length 95th (m)	0.6	0.0	0.0	7.6	0.0	10.7	12.8					
Control Delay (s)	8.5	0.0	0.0	9.4	0.0	13.2	30.9					
Lane LOS	A			A		B	D					
Approach Delay (s)	0.5			3.4		13.2	30.9					
Approach LOS						B	D					
<b>Intersection Summary</b>												
Average Delay			5.2									
Intersection Capacity Utilization		45.0%			ICU Level of Service		A					
Analysis Period (min)			15									



# HCM Signalized Intersection Capacity Analysis

## 3: Concession Rd 6 & Toronto St

2016-10-27



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	132	638	14	72	304	168	4	67	119	129	36	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Frt	1.00	1.00	0.85	1.00	0.94			0.90			0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00			1.00			0.97	
Satd. Flow (prot)	1787	1845	1509	1787	1754			1661			1768	
Flt Permitted	0.26	1.00	1.00	0.15	1.00			0.99			0.67	
Satd. Flow (perm)	498	1845	1509	283	1754			1645			1215	
Peak-hour factor, PHF	0.77	0.94	0.70	0.82	0.87	0.81	0.50	0.90	0.61	0.87	0.59	0.66
Adj. Flow (vph)	171	679	20	88	349	207	8	74	195	148	61	44
RTOR Reduction (vph)	0	0	11	0	28	0	0	87	0	0	8	0
Lane Group Flow (vph)	171	679	9	88	528	0	0	190	0	0	245	0
Heavy Vehicles (%)	1%	3%	7%	1%	3%	1%	50%	2%	2%	0%	3%	7%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	33.3	33.3	33.3	33.3	33.3			31.2			31.2	
Effective Green, g (s)	33.3	33.3	33.3	33.3	33.3			31.2			31.2	
Actuated g/C Ratio	0.43	0.43	0.43	0.43	0.43			0.40			0.40	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	213	792	648	121	753			662			489	
v/s Ratio Prot		c0.37			0.30							
v/s Ratio Perm	0.34		0.01	0.31				0.12			c0.20	
v/c Ratio	0.80	0.86	0.01	0.73	0.70			0.29			0.50	
Uniform Delay, d1	19.2	20.0	12.7	18.3	18.0			15.6			17.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	19.2	9.1	0.0	19.4	3.0			1.1			3.6	
Delay (s)	38.5	29.0	12.7	37.8	21.0			16.7			21.0	
Level of Service	D	C	B	D	C			B			C	
Approach Delay (s)		30.5			23.3			16.7			21.0	
Approach LOS		C			C			B			C	

### Intersection Summary

HCM 2000 Control Delay	25.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	77.5	Sum of lost time (s)	13.0
Intersection Capacity Utilization	86.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 6: Plaza Entrance/Cemetery Rd & Toronto St/Toronto St

2016-10-27



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	38	723	46	266	464	7	0	0	297	1	2	49
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.86	0.94	0.72	0.91	0.94	0.35	0.25	0.25	0.95	0.25	0.50	0.56
Hourly flow rate (vph)	44	769	64	292	494	20	0	0	313	4	4	88
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None					None						
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	514			833			2025	1956	769	2258	2010	504
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	514			833			2025	1956	769	2258	2010	504
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			64			100	100	23	14	89	85
cM capacity (veh/h)	1062			809			24	40	404	5	37	572

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total	44	769	64	292	514	313	96
Volume Left	44	0	0	292	0	0	4
Volume Right	0	0	64	0	20	313	88
cSH	1062	1700	1700	809	1700	404	85
Volume to Capacity	0.04	0.45	0.04	0.36	0.30	0.77	1.12
Queue Length 95th (m)	1.0	0.0	0.0	13.2	0.0	52.2	53.2
Control Delay (s)	8.5	0.0	0.0	12.0	0.0	38.4	221.8
Lane LOS	A			B		E	F
Approach Delay (s)	0.4			4.3		38.4	221.8
Approach LOS						E	F

Intersection Summary			
Average Delay		17.7	
Intersection Capacity Utilization	69.8%		ICU Level of Service C
Analysis Period (min)	15		

## **Appendix H - Future (2021) Total Traffic Level of Service Calculations**

# HCM Signalized Intersection Capacity Analysis

## 3: Concession Rd 6 & Toronto St

2016-10-27



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	308	5	48	496	68	12	31	55	125	37	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Frt	1.00	1.00	0.85	1.00	0.98			0.94			0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1289	1759	1404	1770	1779			1675			1681	
Flt Permitted	0.16	1.00	1.00	0.49	1.00			0.90			0.80	
Satd. Flow (perm)	221	1759	1404	904	1779			1524			1377	
Peak-hour factor, PHF	0.51	0.92	0.42	0.83	0.87	0.75	0.50	0.70	0.90	0.89	0.77	0.88
Adj. Flow (vph)	76	335	12	58	570	91	24	44	61	140	48	140
RTOR Reduction (vph)	0	0	7	0	7	0	0	33	0	0	27	0
Lane Group Flow (vph)	76	335	5	58	654	0	0	96	0	0	301	0
Heavy Vehicles (%)	40%	8%	15%	2%	5%	2%	0%	7%	6%	4%	6%	4%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	32.7	32.7	32.7	32.7	32.7			31.2			31.2	
Effective Green, g (s)	32.7	32.7	32.7	32.7	32.7			31.2			31.2	
Actuated g/C Ratio	0.43	0.43	0.43	0.43	0.43			0.41			0.41	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	93	747	597	384	756			618			558	
v/s Ratio Prot		0.19			c0.37							
v/s Ratio Perm	0.34		0.00	0.06				0.06			c0.22	
v/c Ratio	0.82	0.45	0.01	0.15	0.86			0.16			0.54	
Uniform Delay, d1	19.5	15.7	12.7	13.6	20.1			14.5			17.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	40.4	0.4	0.0	0.2	10.1			0.5			3.7	
Delay (s)	59.9	16.1	12.8	13.8	30.2			15.0			21.1	
Level of Service	E	B	B	B	C			B			C	
Approach Delay (s)		23.9			28.9			15.0			21.1	
Approach LOS		C			C			B			C	





















### Intersection Summary

HCM 2000 Control Delay	24.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	76.9	Sum of lost time (s)	13.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 6: Plaza Entrance/Cemetary Rd & Toronto St/Toronto St

2016-10-27

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	27	377	45	214	424	5	0	0	159	4	4	76
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.90	0.75	0.81	0.95	0.50	0.25	0.25	0.80	0.25	0.25	0.78
Hourly flow rate (vph)	34	419	60	264	446	10	0	0	199	16	16	97
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	456			479			1567	1471	419	1665	1526	451
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	456			479			1567	1471	419	1665	1526	451
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			76			100	100	69	62	82	84
cM capacity (veh/h)	1069			1089			53	94	634	42	87	612
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1					
Volume Total	34	419	60	264	456	199	129					
Volume Left	34	0	0	264	0	0	16					
Volume Right	0	0	60	0	10	199	97					
cSH	1069	1700	1700	1089	1700	634	180					
Volume to Capacity	0.03	0.25	0.04	0.24	0.27	0.31	0.72					
Queue Length 95th (m)	0.8	0.0	0.0	7.6	0.0	10.7	36.0					
Control Delay (s)	8.5	0.0	0.0	9.4	0.0	13.2	64.2					
Lane LOS	A			A		B	F					
Approach Delay (s)	0.6			3.4		13.2	64.2					
Approach LOS						B	F					
Intersection Summary												
Average Delay			8.8									
Intersection Capacity Utilization		46.8%		ICU Level of Service		A						
Analysis Period (min)		15										



# HCM Unsignalized Intersection Capacity Analysis

## 10: Cemetery Rd & Site Access 1 (Townhouse)

2016-10-27



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	13	2	29	66	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	14	2	32	72	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	108	72	72			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	108	72	72			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	889	991	1528			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	14	34	72			
Volume Left	0	2	0			
Volume Right	14	0	0			
cSH	991	1528	1700			
Volume to Capacity	0.01	0.00	0.04			
Queue Length 95th (m)	0.3	0.0	0.0			
Control Delay (s)	8.7	0.5	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.7	0.5	0.0			
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay			1.2			
Intersection Capacity Utilization			13.5%		ICU Level of Service	A
Analysis Period (min)			15			

# HCM Unsignalized Intersection Capacity Analysis

## 12: Cemetary Rd/Cemetery Rd & Site Access (Apartment)

2016-10-27



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	5	1	31	79	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	5	1	34	86	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	122	86	86			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	122	86	86			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	873	973	1510			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	5	35	86			
Volume Left	0	1	0			
Volume Right	5	0	0			
cSH	973	1510	1700			
Volume to Capacity	0.01	0.00	0.05			
Queue Length 95th (m)	0.1	0.0	0.0			
Control Delay (s)	8.7	0.2	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.7	0.2	0.0			
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay			0.4			
Intersection Capacity Utilization			14.2%		ICU Level of Service	A
Analysis Period (min)			15			

# HCM Unsignalized Intersection Capacity Analysis

## 14: Cemetery Rd & Site Access 2 (Townhouse)

2016-10-27



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	14	3	26	52	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	15	3	28	57	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	91	57	57			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	91	57	57			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	100			
cM capacity (veh/h)	907	1010	1548			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	15	32	57			
Volume Left	0	3	0			
Volume Right	15	0	0			
cSH	1010	1548	1700			
Volume to Capacity	0.02	0.00	0.03			
Queue Length 95th (m)	0.4	0.1	0.0			
Control Delay (s)	8.6	0.8	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.6	0.8	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization			13.9%	ICU Level of Service	A	
Analysis Period (min)			15			

# HCM Signalized Intersection Capacity Analysis

## 3: Concession Rd 6 & Toronto St

2016-10-27



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	132	660	14	75	314	171	4	67	124	134	36	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Frt	1.00	1.00	0.85	1.00	0.94			0.90			0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00			1.00			0.97	
Satd. Flow (prot)	1787	1845	1509	1787	1755			1659			1769	
Flt Permitted	0.26	1.00	1.00	0.14	1.00			0.99			0.65	
Satd. Flow (perm)	482	1845	1509	260	1755			1644			1189	
Peak-hour factor, PHF	0.77	0.94	0.70	0.82	0.87	0.81	0.50	0.90	0.61	0.87	0.59	0.66
Adj. Flow (vph)	171	702	20	91	361	211	8	74	203	154	61	44
RTOR Reduction (vph)	0	0	11	0	27	0	0	91	0	0	7	0
Lane Group Flow (vph)	171	702	9	91	545	0	0	194	0	0	252	0
Heavy Vehicles (%)	1%	3%	7%	1%	3%	1%	50%	2%	2%	0%	3%	7%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	34.4	34.4	34.4	34.4	34.4			31.2			31.2	
Effective Green, g (s)	34.4	34.4	34.4	34.4	34.4			31.2			31.2	
Actuated g/C Ratio	0.44	0.44	0.44	0.44	0.44			0.40			0.40	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8			7.2			7.2	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	210	807	660	113	768			652			471	
v/s Ratio Prot		c0.38			0.31							
v/s Ratio Perm	0.35		0.01	0.35				0.12			c0.21	
v/c Ratio	0.81	0.87	0.01	0.81	0.71			0.30			0.53	
Uniform Delay, d1	19.3	20.1	12.5	19.2	18.0			16.2			18.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	20.9	9.9	0.0	32.6	3.0			1.2			4.3	
Delay (s)	40.2	30.0	12.5	51.8	21.0			17.4			22.4	
Level of Service	D	C	B	D	C			B			C	
Approach Delay (s)		31.5			25.3			17.4			22.4	
Approach LOS		C			C			B			C	

### Intersection Summary

HCM 2000 Control Delay	26.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	78.6	Sum of lost time (s)	13.0
Intersection Capacity Utilization	88.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

# HCM Unsignalized Intersection Capacity Analysis

## 6: Plaza Entrance/Cemetary Rd & Toronto St/Toronto St

2016-10-27



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	70	723	46	266	464	11	0	0	297	2	2	65
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.86	0.94	0.72	0.91	0.94	0.35	0.25	0.25	0.95	0.25	0.50	0.56
Hourly flow rate (vph)	81	769	64	292	494	31	0	0	313	8	4	116
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	525			833			2128	2042	769	2339	2090	509
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	525			833			2128	2042	769	2339	2090	509
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	92			64			100	100	23	0	87	80
cM capacity (veh/h)	1052			809			18	34	404	4	31	568

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total	81	769	64	292	525	313	128
Volume Left	81	0	0	292	0	0	8
Volume Right	0	0	64	0	31	313	116
cSH	1052	1700	1700	809	1700	404	55
Volume to Capacity	0.08	0.45	0.04	0.36	0.31	0.77	2.34
Queue Length 95th (m)	2.0	0.0	0.0	13.2	0.0	52.2	103.1
Control Delay (s)	8.7	0.0	0.0	12.0	0.0	38.4	772.1
Lane LOS	A			B		E	F
Approach Delay (s)	0.8			4.3		38.4	772.1
Approach LOS						E	F

### Intersection Summary

Average Delay	53.0
Intersection Capacity Utilization	70.7%
ICU Level of Service	C
Analysis Period (min)	15

# HCM Unsignalized Intersection Capacity Analysis

## 10: Cemetery Rd & Site Access 1 (Townhouse)

2016-10-27



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	7	15	61	60	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	8	16	66	65	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	164	65	65			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	164	65	65			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	818	999	1537			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	8	83	65			
Volume Left	0	16	0			
Volume Right	8	0	0			
cSH	999	1537	1700			
Volume to Capacity	0.01	0.01	0.04			
Queue Length 95th (m)	0.2	0.3	0.0			
Control Delay (s)	8.6	1.5	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.6	1.5	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization		20.7%		ICU Level of Service		A
Analysis Period (min)			15			



# HCM Unsignalized Intersection Capacity Analysis

## 12: Cemetary Rd/Cemetery Rd & Site Access (Apartment)

2016-10-27



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	2	5	76	67	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2	5	83	73	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	166	73	73			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	166	73	73			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	821	989	1527			
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>NB 1</b>	<b>SB 1</b>			
Volume Total	2	88	73			
Volume Left	0	5	0			
Volume Right	2	0	0			
cSH	989	1527	1700			
Volume to Capacity	0.00	0.00	0.04			
Queue Length 95th (m)	0.1	0.1	0.0			
Control Delay (s)	8.6	0.5	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.6	0.5	0.0			
Approach LOS	A					
<b>Intersection Summary</b>						
Average Delay			0.4			
Intersection Capacity Utilization			13.5%	ICU Level of Service		A
Analysis Period (min)			15			

# HCM Unsignalized Intersection Capacity Analysis

## 14: Cemetery Rd & Site Access 2 (Townhouse)

2016-10-27



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	8	16	45	52	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	9	17	49	57	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	140	57	57			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	140	57	57			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	843	1010	1548			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	9	66	57			
Volume Left	0	17	0			
Volume Right	9	0	0			
cSH	1010	1548	1700			
Volume to Capacity	0.01	0.01	0.03			
Queue Length 95th (m)	0.2	0.3	0.0			
Control Delay (s)	8.6	2.0	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.6	2.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization		19.9%		ICU Level of Service		A
Analysis Period (min)			15			