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Consulting Engineers

3879 TOWN LINE SUBDIVISION

Township of Severn

Traffic Review

prepared by:

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1 Introduction

C.C. Tatham & Associates Ltd. was retained by High Level Construction to review the proposed 19-unit residential subdivision development from a transportation perspective, addressing the parking supply, site traffic volumes, site access operations and the potential impacts to the adjacent road network.

The development site is located at 3879 Town Line in the Township of Severn. The site has an area of 10.6 hectares (26 acres) with approximately 90 metres of frontage on Town Line. The property is bordered by Town Line to the west, Millwood Road residences to the north and open space to the east and south. The site location is illustrated in Figure 1.

2 Existing Conditions

This chapter will describe the road network, traffic volumes and operations for the existing conditions.

2.1 Road Network

The road network to be addressed by this study consists of Town Line, Old Coldwater Road and Highway 12, and the following intersections:

- Highway 12 with Town Line; and
- Old Coldwater Road with Town Line.

Photographs of the road system are provided in Figure 2.

Road Sections

In the vicinity of the subject site, Highway 12 is a provincial highway with one travel lane in each direction. The alignment of the road is relatively flat with a slight horizontal curvature. The posted speed limit on the highway is 80 km/h. The assumed planning capacity of Highway 12 is 1100 vehicles per hour per lane, given its provincial highway classification.

Town Line is a local Township of Severn road, providing an approximate 6.5 metre driving platform (hard surfaced) with minimal gravel shoulders which are primarily overgrown. The alignment of the road is relatively straight and flat through the immediate study area and across the frontage of the development parcel. The posted speed limit on Town Line is 50 km/h in the study area. Town Line is a boundary road between the Townships of Severn and Oro-Medonte. The assumed planning capacity for a road reflective of Town Line is 400 vphpl.

Old Coldwater Road is a local Township of Oro-Medonte road, providing an approximate width of 5 to 6 metres. While Old Coldwater continues north approximately 1.15 kilometres where it connects with Highway 12, the road is marked as “Dead End” at either end as it is not winter maintained in its entirety. Old Coldwater Road serves 3 to 4 residences and 2 industrial buildings (albeit 1 has its primary access via Highway 12) While not posted, the speed limit on Old Coldwater Road would be 50 km/h also.

Key Intersections

The intersection of Highway 12 with Town Line is a 3-leg intersection with stop control on Town Line. There is a separate right turn taper (approximately 60 metres in length) on the north approach, in addition to the through lane. The remaining legs both have single shared lane approaches.

The intersection of Old Coldwater Road with Town Line is also a 3-leg intersection, under stop control on Old Coldwater Road. Each approach provides a single shared approach lane.

As indicated in Figure 2, the intersections are approximately 25 metres apart, measured centre of intersection to centre of intersection.

2.2 Existing Traffic Volumes

To determine existing traffic volumes, traffic counts were conducted at the intersection of Highway 12 with Town Line on September 7, 2017 during the AM and PM peak hour periods (7:00 to 9:00 and 16:00 to 18:00). The traffic count details are provided in Appendix A, whereas the associated peak hour volumes are illustrated in Figure 3. While the turning volumes to/from Old Coldwater Road were not specifically counted, the overall volumes on Coldwater Road were. Over the 4-hour count period, 13 vehicles were observed on Old Coldwater road. As such, the majority of volumes turning to/from Highway 12 via Town Line are destined to continue along Town Line.

Given the seasonal nature of the area, consideration has been given to summer traffic volumes. As per published MTO average annual daily traffic (AADT) and summer average daily traffic (SADT) traffic volumes for the adjacent section of Highway 12 over the 5-year period 2011 to 2016 (2016 data is the most current data available), a summer factor of 15% has been considered (ie. the September traffic volumes on Highway 12 have been increased 15%). Given the local nature of both Town Line and Old Coldwater Road, no adjustments have been made to traffic volumes on these roads. The resulting 2017 summer traffic estimates are also provided in Figure 3. It is noted that the summer volumes have been carried through the analysis to reflect the most conservative approach.

2.3 Existing Traffic Operations

Intersection Operations

The assessment of existing conditions provides the baseline from which the future operations (ie. with the subject development) can be assessed. The capacity, and hence operations, of a road system is effectively dictated by its intersections. As such, the analysis focused on the intersection of Highway 12 with Town Lines. The analysis is based on the 2017 traffic volumes, the existing configuration and intersection control and procedures outlined in the *2000 Highway Capacity Manual*¹ (using Synchro v.9 software). The review considers the average delay (measured in seconds), level of service (LOS) and volume to capacity (v/c) for the critical stop controlled movements. A summary of the analyses is provided in Table 1. Level of service A corresponds to the best operating condition with minimal delays whereas level of service F corresponds to poor operations resulting from high intersection delays. A v/c ratio of less than 1.0 indicates the intersection movement/approach is operating at less than capacity while a v/c equal to or greater than 1.0 indicates capacity has been reached. Detailed operations worksheets for the existing traffic conditions are included in Appendix B.

¹ *Highway Capacity Manual*. Transportation Research Board, Washington DC, 2010.

Table 1: Intersection Operations – 2017 Conditions

Intersection and Movement	Control	Weekday AM Peak Hour			Weekday PM Peak Hour			
		delay	LOS	v/c	delay	LOS	v/c	
Highway 12 & Town Line	WB	stop	24	C	0.39	23	C	0.25

Based on the existing volumes, the subject intersection provides good levels of service (LOS C) during both peak hours, with average delays. As such, no improvements are required to support the existing conditions.

Road Section Operations

As previously noted, the following lane capacities have been assumed for the adjacent road network:

- Highway 12: 1100 vphpl (highway); and
- Town Line: 400 vphpl (local road)

The existing road section capacity operations are summarized in Table 2 (the analysis considers the peak hour peak directional volumes and the above noted assumed planning capacities).

Table 2: Road Section Operations – 2017 Conditions

Road & Lanes per Direction	Capacity ¹	Traffic Volumes		Volume to Capacity		
		NB/EB	SB/WB	NB/EB	SB/WB	
Highway 12	1	1100	629	657	0.57	0.60
Town Line	1	400	140	111	0.35	0.28

¹ Capacity reflects vehicles per direction per hour

As indicated, the road network is operating at 60% of capacity or less (i.e. $v/c \leq 0.60$), thus indicating that the network has reserve capacity (even with consideration for summer volumes). No improvements are recommended to address capacity under existing conditions.

3 Proposed Development

3.1 Site Location

As illustrated in Figure 1, the proposed development site is located at 3879 Town Line in the Township of Severn.

3.2 Proposed Development

The proposed development will consist of the following:

- 19 single family homes;
- a 1.08 hectare (2.67 acre) stormwater management block; and
- a 2.57 hectare (6.35 acre) open space block.

A draft plan of subdivision is provided in Figure 4.

3.3 Site Access

A single road access to Town Line (Street A) will be provided within a 20 metre right-of-way, which is intended to become a Township of Severn road upon assumption. The intersection with Street A will be approximately 100 metres north of the Town Line intersection with Highway 12 (measured centre to centre).

3.4 Parking

Parking provisions will be provided in accordance with the Township requirements for each residential lot (between driveway and garage parking).

3.5 Site Traffic

Trip Generation

The number of vehicle trips to be generated by the proposed residential development has been determined based on the development size, land use and trip generation rates provided in the *ITE Trip Generation Manual, 9th Edition*. Based on the proposed residential use, the *single family detached* (ITE code 210) land-use has been applied to development. The associated trip rates and trip estimates are provided in Table 3. The rates represent the weekday AM and PM peak hour of the adjacent street.

Table 3: Trip Generation

Land Use	rate/ estimate	Weekday AM Peak Hour			Weekday PM Peak Hour		
		In	Out	Total	In	Out	Total
single family detached units	units	0.19	0.56	0.75	0.63	0.37	1.00
(ITE code 210)	19	4	11	14	12	7	19

As indicated, the proposed development is expected to generate 14 trips during the weekday AM peak hour and 19 trips during the weekday PM peak hour.

Trip Distribution & Assignment

Given the proximity of the site to Highway 12, and to consider the maximum increase in traffic volumes on Highway 12, all site traffic is assumed to travel to/from Highway 12 (as opposed to/from the north via Town Line). The distribution along Highway 12 is premised on the existing travel patterns realized through the intersection count (namely, the majority of travel is destined to/from the south towards the City of Orillia and/or Highway 11).

The resulting site generated traffic volumes assigned to the road network are illustrated in Figure 5.

4 Transportation Impacts

4.1 Future Horizon Year

Given the limited number of residential units to be constructed, a 5-year horizon (2022) has been considered to assess the transportation impacts. While it is typical that a comprehensive traffic impact study consider 5 and 10 year horizons beyond full build-out, such is not considered necessary for this review given the limited traffic volumes.

4.2 Future Traffic Volumes

The 2022 future traffic volumes are based on the 2017 summer volumes, adjusted to consider anticipated growth in the area and the site traffic associated with the subject development.

Assumed Growth

As per the Highway 12 historic traffic volumes, summer traffic volumes have not realized a net increase over the 10-year period 2006 to 2016; in many years, the volumes decreased, to be followed by an increase in the next year. Similar patterns have occurred over the more recent years as well.

To ensure a conservative approach, an annual growth rate of 2% on Highway 12 has been assumed, which was also applied to those volumes on Town Line. This translates to a 10% increase in volumes over the 5-year planning horizon assumed. The corresponding background traffic volumes (withouth the subject development) are provided in Figure 6.

2022 Total Traffic Volumes

The 2022 future total traffic volumes (2022 background volumes + site volumes) are also illustrated in Figure 6.

4.3 Future Traffic Operations

4.3.1 Intersection Operations

The operations of the Highway 12 intersection with Town Line were again investigated to consider the impact of the additional trips generated by the proposed development. The results of the operational review are provided in Table 4 whereas detailed worksheets are provided in Appendix C.

As indicated, the intersection will continue to offer acceptable levels of service (LOS D) with average delays of 33 seconds or less during the peak hours. As such, no intersection improvements are required to accommodate the proposed development.

Table 4: Intersection Operations – 2022 Conditions

Intersection and Movement	Control	Weekday AM Peak Hour			Weekday PM Peak Hour		
		delay	LOS	v/c	delay	LOS	v/c
Highway 12 & Town Line	WB stop	33	D	0.54	29	D	0.35

4.3.2 Road Section Operations

The road section capacity operations have been reviewed based on the projected 2022 volumes and the assumed capacity of the existing road network, the results of which are summarized in Table 5.

Table 5: Road Section Operations – 2022 Conditions

Road & Lanes per Direction	Capacity ¹	Traffic Volumes		Volume to Capacity		
		NB/EB	SB/WB	NB/EB	SB/WB	
Highway 12	1	1100	706	737	0.64	0.67
Town Line	1	400	167	134	0.42	0.33

¹ Capacity reflects vehicles per direction per hour

As noted, the study area road network is expected to operate at 67% of capacity or less (ie. $v/c \leq 0.67$) given the projected total volumes. Thus the road network has considerable excess reserve capacity to accommodate additional traffic volumes. No improvements are required to increase the road section capacity to accommodate the additional traffic associated with the proposed development.

4.3.3 Access Operations

In terms of the access operations, given the limited volumes to/from Street A coupled with the reduced volumes on Town Line, intersection operations will be acceptable.

Given the proximity of the Street A intersection to that of Highway 12, the presence of traffic queues on Town Line at Highway 12 have also been considered (in that a significant queue could impede exit from Street A). Based on the 2022 traffic operations (as per the worksheets provided in Appendix C), the following queues are realized:

- AM peak hour westbound queue: 22 metres (approximately 3 vehicles); and
- PM peak hour westbound queue: 11 metres (approximately 1.5 vehicles).

As previously noted, the intersections are approximately 100 metres apart (centre to centre), which thus affords a separation distance to accommodate traffic queues of approximately 80 metres. As such, the noted queues can be accommodated without implications to the Street A intersection.

4.4 Turn Lane Requirements

The volumes accessing the site are not such that would impede through traffic or cause undue safety concerns on Town Line or Highway 12. Exclusive turn lanes are neither recommended nor warranted to accommodate the projected site volumes.

4.5 Sight Line Assessment

Based on MTO geometric design standards, the minimum stopping sight distance requirements are as follows:

- 85 metres for a 60 km/h design speed (posted 50 km/h + 10 km/h for lower speed roads); and
- 185 metres for a 100 km/h design speed (posted 80 km/h + 20 km/h for higher speed roads).

The above provide sufficient distances for an approaching motorist travelling at the design speed to observe a stationary hazard in the road (ie. a vehicle stopped to completed a turn) and bring their vehicle to a complete stop prior to the hazard.

At the Street A intersection with Town Line, sight lines to/from the north exceed the 85 metre requirement given the relatively straight and flat alignment of Town Line. To/from the south, the intersection at Highway 12 is visible. Given the proximity of the intersections, it must also be recognized that those approaching Street A from Highway 12 are not likely to be travelling at 50 km/h having just passed through the intersection.

At the Town Line intersection with Highway 12 (which is an existing intersection), sight lines of 185 metres and greater are available in both directions (the limit of the 185 metre requirement is illustrated in Figure 7).

As such, no improvements to address sight line constraints are required.

5 Summary

This review has addressed the transportation impacts associated with the proposed residential subdivision to be located at 3879 Town Line in the Township of Severn. The development will consist of 19 detached residential dwellings. Upon full build-out, the development is expected to generate 14 new trips during the weekday AM peak hour and 19 new trips during the weekday PM peak hour, which is not considered significant.

In addressing the study area traffic operations, the key intersection of Highway 12 with Town Line will continue to provide acceptable operating conditions with consideration for future growth, including that of the subject site. With respect to road section operations, the adjacent road network is expected to operate at 67% or less of its capacity given the projected total volumes. As such, no improvements to the road network or the key intersection are considered necessary to accommodate the volumes generated by the site. Furthermore, the road network and study area intersection have excess capacity to accommodate additional future growth within the area.

In considering the relatively low trip generation of the site and the excess reserve capacity on Town Line, the site access intersection (Street A with Town Line) is expected to offer good operations.

The available sight lines were reviewed at the proposed site access and at the Town Line intersection with Highway 12 to ensure that adequate sight distances are provided with respect to MTO design requirements. In all instances, the sight lines were found to exceed the minimum sight distance requirements and therefore no improvements are required to address such.




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3879 Town Line Subdivision, Traffic Review

Site Location

Figure
1





Looking north along Highway 12 to Town Line Road and Old Coldwater Road intersections



Looking south along Highway 12 to Town Line Road and Old Coldwater Road intersections

source: Google Streetview



Looking west along Town Line to Old Coldwater Road and Highway 12

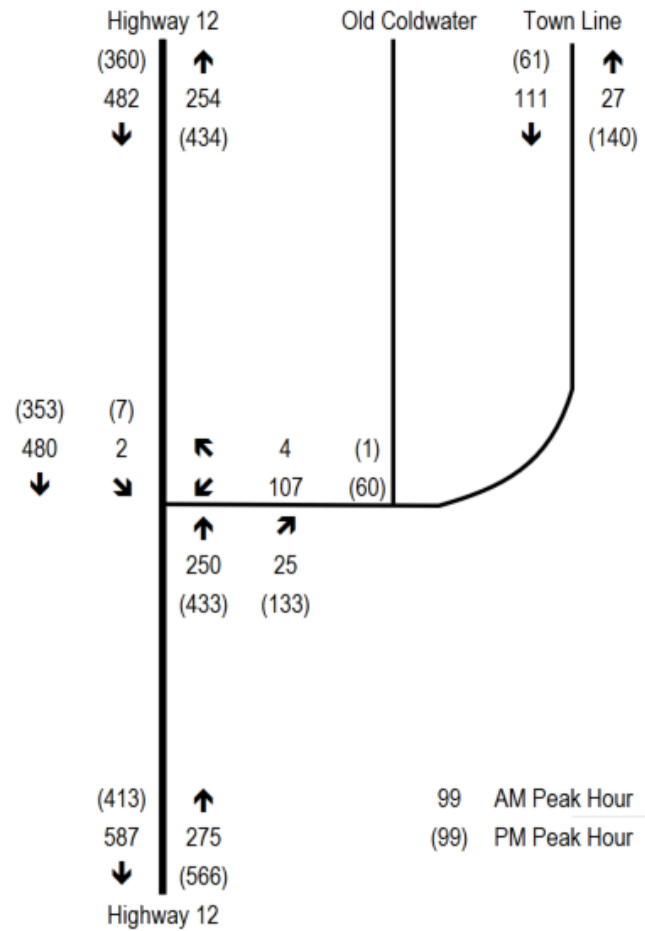
source: Google Streetview



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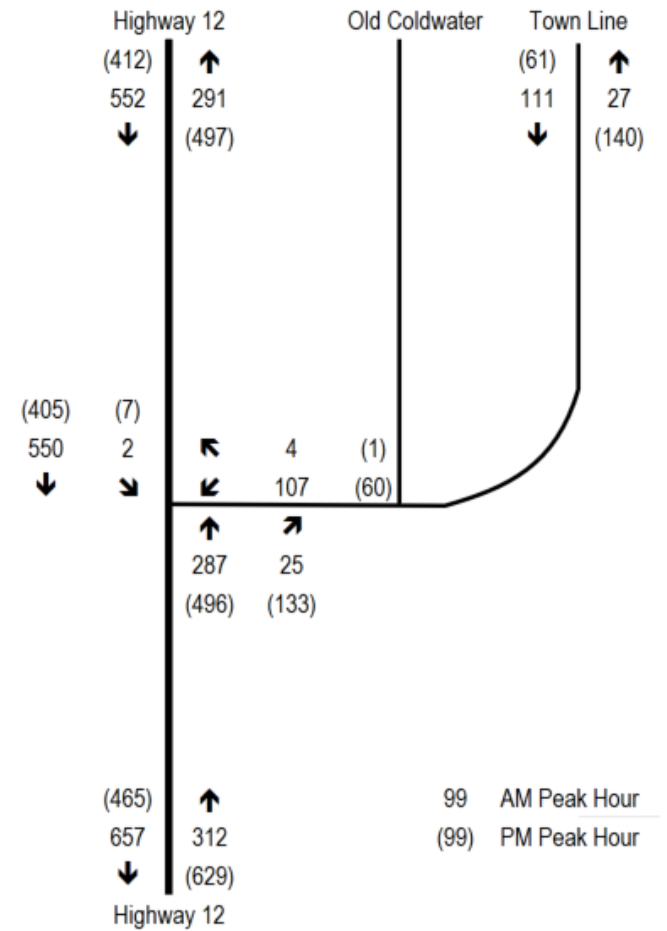
3879 Town Line Subdivision, Traffic Review Area Road Network

**Figure
2b**



2017 Traffic Counts

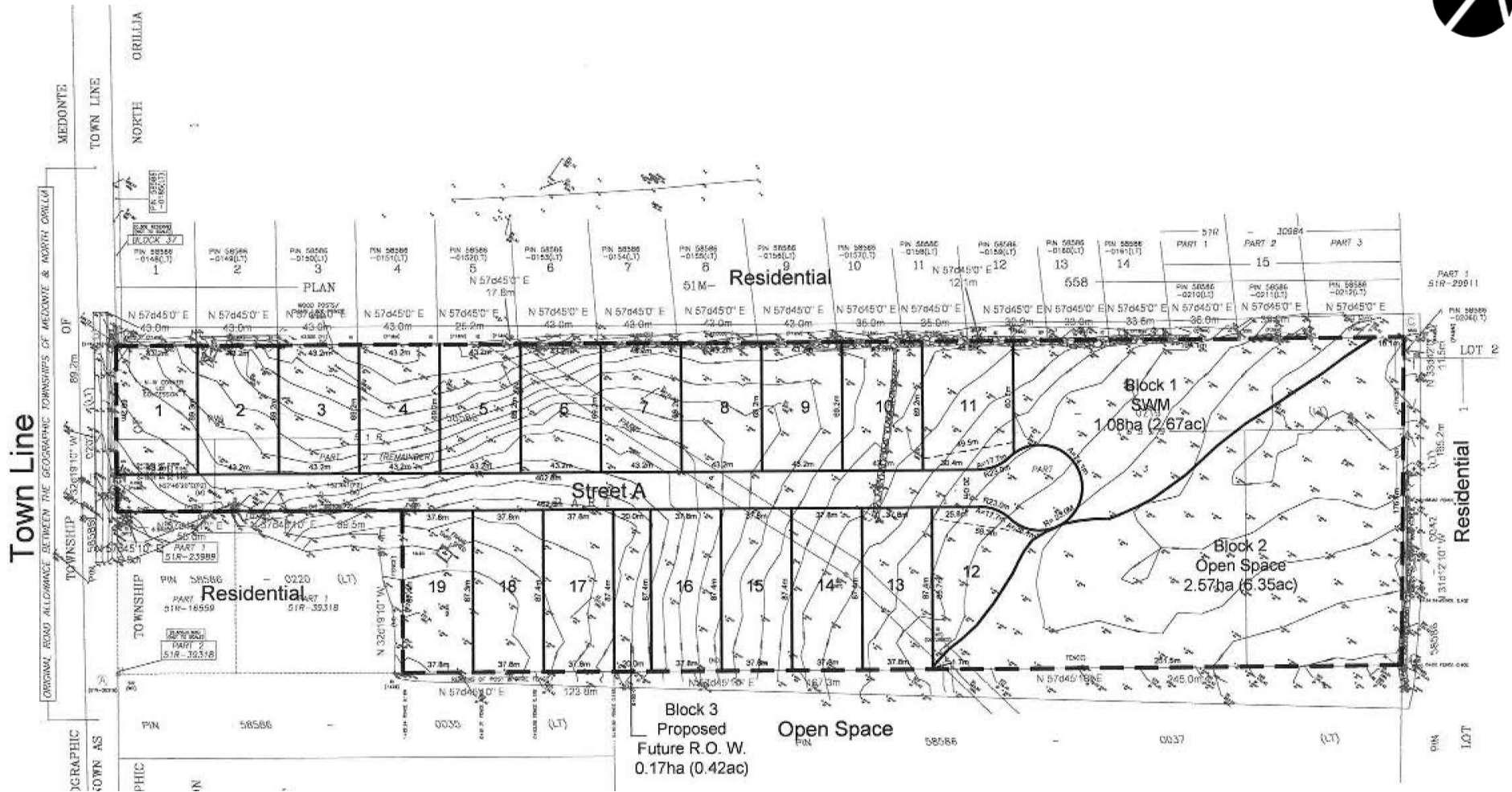
Date: Sept 7, 2017
 Peaks: 7:30 to 8:30 & 16:45 to 17:45

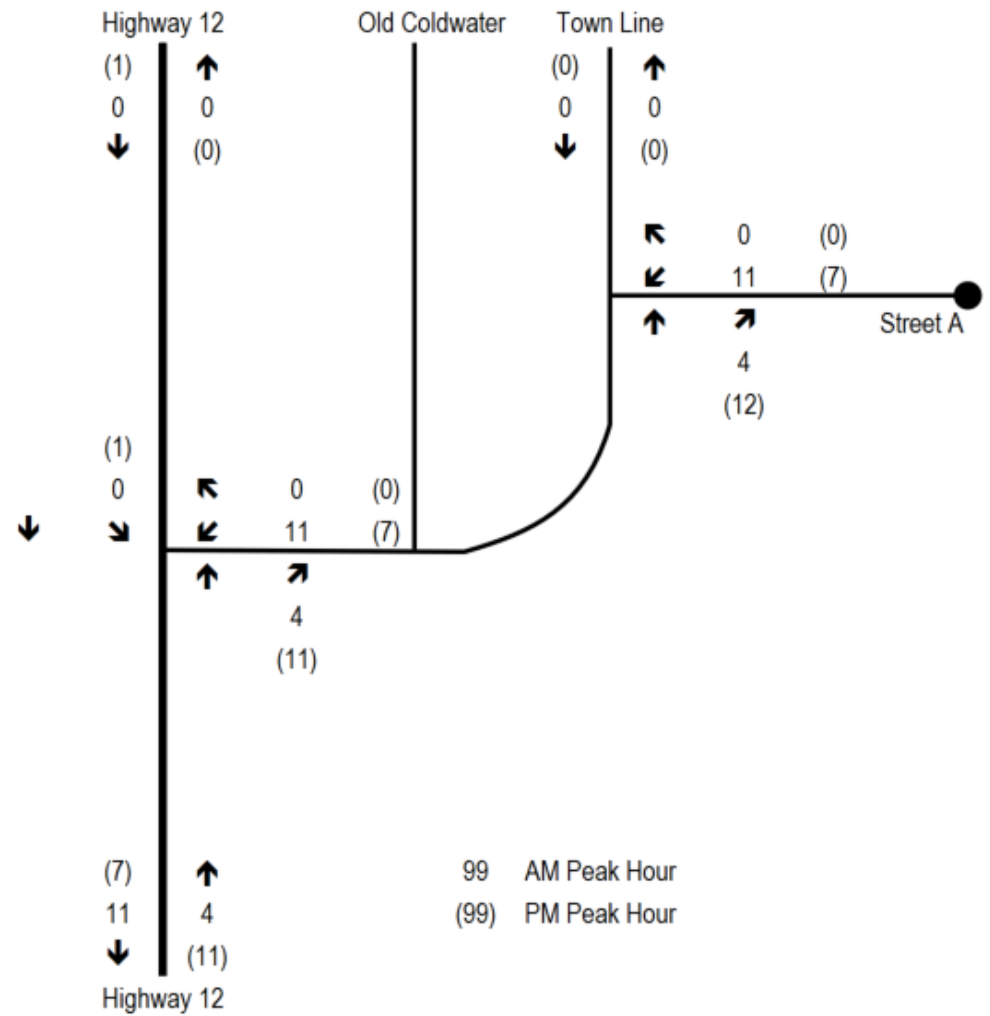


2017 Summer Counts

summer factor 15%







Site Volumes

3879 Town Line Subdivision, Traffic Review

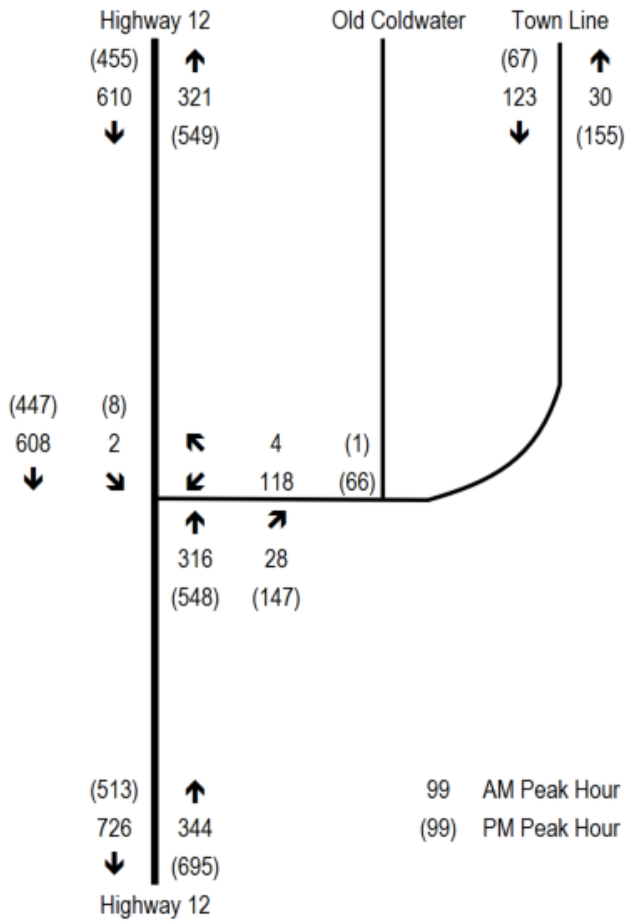
Site Generated Traffic

Figure

5

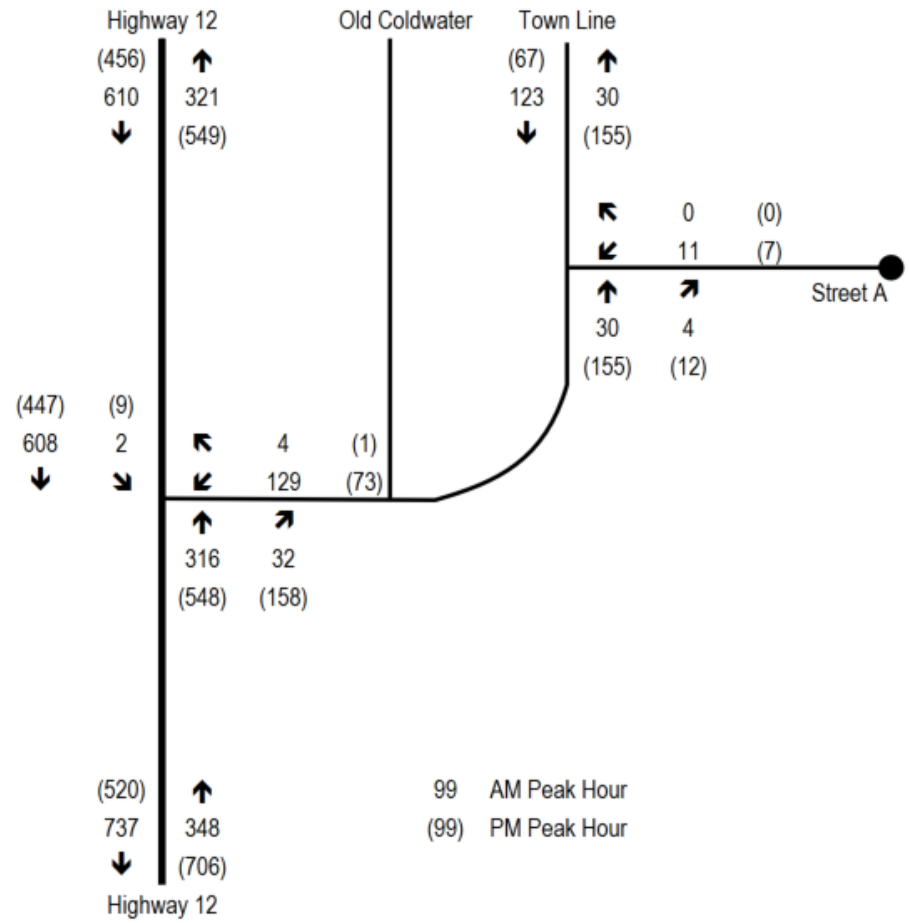


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2022 Background Volumes

annual growth 2%
 growth factor 1.10



2022 Total Volumes

(Background + Site Volumes)



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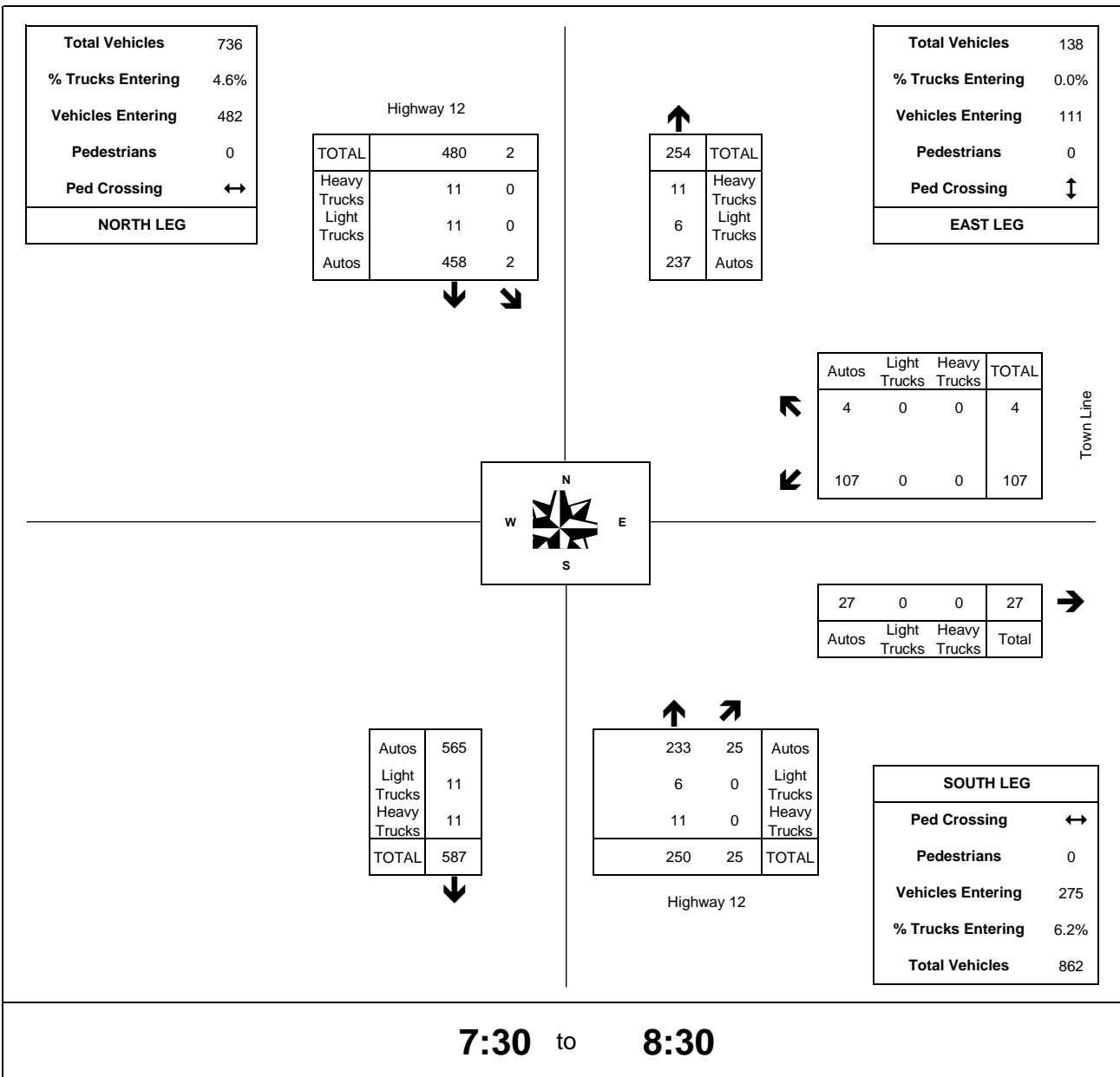


**APPENDIX A:
TRAFFIC COUNTS**



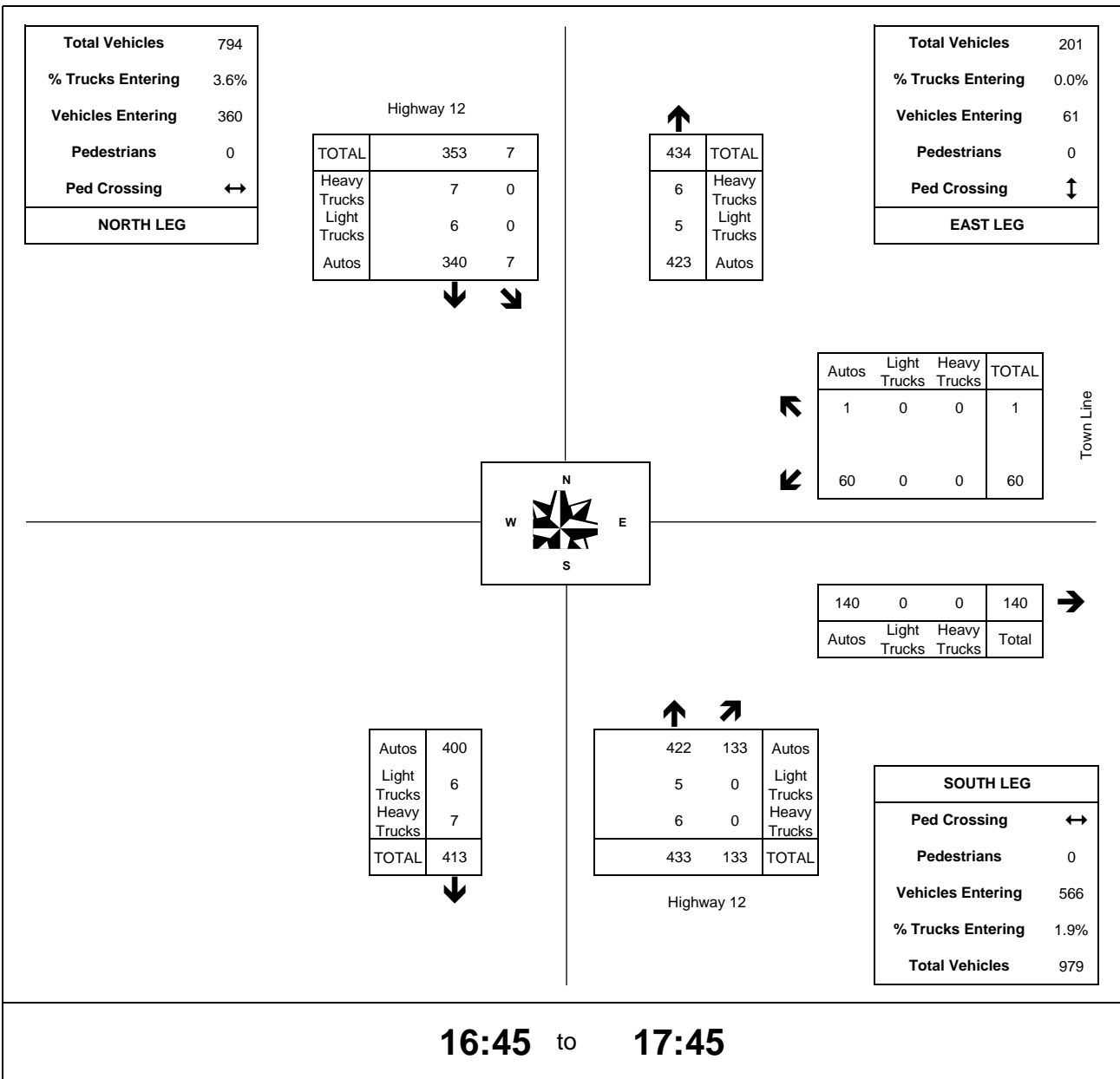
INTERSECTION COUNT AM PEAK HOUR

GENERAL INFORMATION			
Surveyor Name	Dillon Bickell	Jurisdiction/Date	Marchmont Sept 7, 2017
Weather Conditions	Sunny, Clear	Major Street	Highway 12 N-S
Project Name	3879 Town Line Subdivision	Minor Street	Town Line E-W
Project Number	315836	Intersection Control	stop control on minor street
Additional Comments Old Coldwater Road intersects Town Line just east of Highway 12 intersection			



INTERSECTION COUNT PM PEAK HOUR

GENERAL INFORMATION			
Surveyor Name	Dillon Bickell	Jurisdiction/Date	Marchmont Sept 7, 2017
Weather Conditions	Sunny, Clear	Major Street	Highway 12 N-S
Project Name	3879 Town Line Subdivision	Minor Street	Town Line E-W
Project Number	315836	Intersection Control	stop control on minor street
Additional Comments Old Coldwater Road intersects Town Line just east of Highway 12 intersection			





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Traffic Volumes

1988-2016

King's Highways / Secondary Highways / Tertiary Roads

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Abstract:

This annual publication contains averaged traffic volume information and accident rate information for each of the sections of highway under MTO jurisdiction.

Key Words:

Annual Average Daily Traffic volume (AADT), Summer Average Daily Traffic volume (SADT), Summer Average Weekday Traffic volume (SAWDT), Winter Average Daily Traffic volume (WADT), Accident Rate (AR)

INTRODUCTION

This publication contains information pertaining to traffic volumes on roads under Provincial jurisdiction as of December 31, 2016. The publication is divided into two parts.

OVERALL SYSTEM SUMMARIES

The information in this section is included for policy analysis and program planning purposes. It includes summaries about the overall Provincial Highways system. The system indicators are developed from travel experience, accident data and highway geometrics.

TRAFFIC VOLUME INFORMATION

A detailed listing outlining the 26 year history (1988-2013) of traffic volumes on Provincial Highways (King's, Secondary, Tertiary Roads and the 7000 series highways) is provided.

The highway network is divided into approximately 1831 sections for reporting purposes. Seasonal traffic volume variations are estimated for each section reported. Although local conditions cause variations in the volume within the sections, the volumes shown are considered to adequately represent the section.

On highways that overlap another highway, for instance Highway 35 and Highway 115, the volume information is referenced to the lower number highway. When an overlap occurs between a freeway and non-freeway, reference is made to the freeway route number. The freeways are Highway 400 to Highway 427 and the QEW.

The following are definitions to reading the listings:

Location Description: A statement identifying the start or ending point of a section. Some frequently used abbreviations include:

BDY	boundary
BR	bridge
C	concession
CTY	county
DIST	district
KM	kilometres
AVE	avenue
REG	regional
HWY	highway
IC	interchange
JCT	junction
L	lot
LN	line
LTS	limits
NA	non assumed*
OH	overhead
OP	overpass
PKWY	parkway
R	river
RD	road
ST	street
TWP	township
UP	underpass

*Non Assumed – indicates that the roadway is not under provincial jurisdiction therefore contact the corresponding regional municipality for traffic volume information.

Distance (KM)

The length of the section in kilometres reported to one decimal place.

Pattern Type

One of 14 pattern types that represent the seasonal variation of the traffic flow on the section indicated. A graphical presentation of these pattern types has been included on the following page.

The 14 pattern types represent the traffic flow variation on the whole network. They include:

Variation Types

LOW	UC	urban commuter
	SC	suburban commuter
	C	commuter
INTER	IC	intermediate commuter
	CR	commuter recreation
	IR	intermediate recreation
	CTR	commuter tourist recreation
	IT	intermediate tourist
HIGH	LT	low tourist
	T	tourist
	HT	high tourist
	LR	low recreation
	R	recreation
	HR	high recreation
	UNKN	unknown
	UNCL	unclassified
	NEW	new volume section

The first three are generally referred to as Low Variation Curves (or commuter travel); the next five as Intermediate Variation Curves

(a blend of all types of traffic); and the last six as High Variation Curves. For the last group, the first three represent tourist travel and the second three, recreational travel; this sub-grouping is distinguished by the relationship of weekend to weekday traffic.

There are two additional codes in the pattern type column. "UNC" indicates that the AADT was calculated using adjustment factors from an unclassified (i.e. new) permanent counting station. "NEW" indicates that this is a new volume section and there is insufficient data to assign a pattern type.

AADT

Annual Average Daily Traffic; defined as the average twenty four hour, two way traffic for the period January 1st to December 31st.

SADT

Summer Average Daily Traffic; defined as the average twenty four hour, two way traffic for the period July 1st to August 31st including weekends.

SAWDT

Summer Average Weekday Traffic; defined as the average twenty four hour, two way traffic for the period July 1st to August 31st, excluding weekends.

WADT

Winter Average Daily Traffic; defined as the average twenty four hour, two way traffic for the period January 1st to March 31st, plus December 1st to December 31st, including weekends.

Highway	Location Description	Dist. (KM)	Year	Pattern Type	AADT	SADT	SAWDT	WADT	AR
			2000	CR	16,200	21,700	21,900	12,200	2.0
			2001	CR	16,700	22,400	22,500	12,500	2.5
			2002	CR	18,800	27,400	26,000	13,000	2.1
			2003	CR	18,200	26,600	25,300	12,600	1.3
			2004	CR	19,000	27,300	26,000	13,200	3.0
			2005	CR	19,500	25,900	26,100	14,700	2.8
			2006	CR	20,400	27,900	27,200	15,000	1.6
			2007	CR	20,800	25,200	25,200	17,500	1.7
			2008	CR	21,900	26,500	26,300	18,500	3.0
			2009	CR	22,000	26,500	25,500	18,600	1.8
			2010	CR	23,400	28,000	27,100	19,800	1.3
			2011	CR	20,000	23,400	23,600	17,800	N/A
			2012	CR	24,000	28,800	28,300	20,400	N/A
			2013	CR	19,500	23,400	24,000	16,600	N/A
			2014	CR	19,900	23,500	23,300	16,900	N/A
			2015	CR	21,400	25,300	25,000	18,200	N/A
			2016	CR	21,900	25,800	25,600	18,600	N/A
12	S JCT HWY 11-ORILLIA BYPASS (OVERLAP HWY 11)	2.3							
12	N JCT HWY 11 - COLDWATER RD-ORILLIA	3.1	1988	IC	10,000	11,500	11,200	8,700	1.3
			1989	IC	10,500	12,000	11,800	9,300	1.1
			1990	IC	10,700	13,300	12,600	9,300	0.6
			1991	IC	11,000	13,800	13,700	9,500	0.5
			1992	IC	11,200	13,700	13,300	9,700	0.4
			1993	IC	11,300	14,200	13,600	9,600	0.6
			1994	IC	11,600	14,800	14,200	9,800	1.0
			1995	IC	11,900	15,200	14,600	10,000	1.4
			1996	IC	12,000	15,400	14,800	10,100	0.9
			1997	IC	12,500	16,000	15,400	10,500	0.6
			1998	IC	12,800	16,300	15,600	10,800	0.8
			1999	IC	13,600	17,100	16,500	11,500	0.8
			2000	IC	13,700	17,300	16,600	11,600	0.7
			2001	IC	14,100	17,800	17,100	11,800	1.0
			2002	IC	14,500	18,300	17,500	12,200	1.2

Highway	Location Description	Dist. (KM)	Year	Pattern Type	AADT	SADT	SAWDT	WADT	AR
			2003	IC	14,900	18,800	18,000	12,700	1.1
			2004	IC	15,000	18,600	17,900	12,700	1.1
			2005	IC	14,800	18,300	17,600	12,600	0.9
			2006	IC	16,000	17,800	17,900	14,200	1.6
			2007	IC	15,300	17,000	17,500	13,500	1.2
			2008	IC	15,900	17,600	17,000	14,000	1.2
			2009	IC	13,800	15,300	15,400	12,200	1.4
			2010	IC	16,100	17,800	18,000	14,300	0.9
			2011	IC	16,400	18,000	18,700	14,700	N/A
			2012	IC	16,600	18,500	17,800	14,800	N/A
			2013	IC	16,900	18,800	18,600	15,000	N/A
			2014	IC	17,200	19,000	18,900	15,300	N/A
			2015	IC	17,400	19,300	19,100	15,500	N/A
			2016	IC	17,700	19,600	19,400	15,700	N/A
12	WAINMAN LINE(N)-ORO-MEDONTE LINE 15 NORTH (S)	2.5	1988	IC	8,100	9,300	9,100	7,100	1.3
			1989	IC	8,500	9,700	9,600	7,500	1.1
			1990	IC	9,150	11,400	10,700	7,900	1.2
			1991	IC	9,400	11,800	11,700	8,100	1.3
			1992	IC	9,700	11,900	11,500	8,400	0.8
			1993	IC	10,100	12,600	12,100	8,500	0.7
			1994	IC	10,000	12,800	12,200	8,450	0.8
			1995	IC	10,300	13,200	12,700	8,700	0.5
			1996	IC	10,600	13,600	13,000	8,950	0.5
			1997	IC	10,900	13,500	12,900	9,250	0.6
			1998	IC	11,200	13,700	13,100	9,500	0.5
			1999	IC	10,900	13,400	12,800	9,250	0.6
			2000	IC	11,400	14,000	13,400	9,650	0.9
			2001	IC	11,600	14,300	13,600	11,600	0.3
			2002	IC	11,800	14,500	13,800	10,000	1.0
			2003	IC	12,000	14,800	14,000	10,200	0.9
			2004	IC	12,200	14,900	14,300	10,300	0.9
			2005	IC	12,400	15,000	14,500	10,400	0.8
			2006	IC	12,600	15,300	14,700	10,600	1.0

Highway	Location Description	Dist. (KM)	Year	Pattern Type	AADT	SADT	SAWDT	WADT	AR
			2007	IC	12,800	15,500	15,500	10,800	0.7
			2008	IC	13,000	15,700	15,600	11,000	1.1
			2009	IC	13,200	15,900	15,300	11,200	0.6
			2010	IC	13,400	16,100	15,500	11,300	0.7
			2011	IC	13,000	15,200	15,300	11,500	N/A
			2012	IC	13,700	16,400	16,100	11,600	N/A
			2013	IC	13,900	16,700	17,100	11,800	N/A
			2014	IC	14,000	15,600	15,400	12,500	N/A
			2015	IC	14,300	15,900	15,700	12,700	N/A
			2016	IC	14,500	16,000	15,900	12,900	N/A
12	DIVISION RD W (N)	10.6	1988	C	5,450	6,300	6,100	4,750	0.8
			1989	C	5,700	6,500	6,400	5,000	1.4
			1990	C	5,950	8,600	8,300	4,300	1.1
			1991	C	6,100	8,500	8,200	4,500	0.8
			1992	C	6,300	8,700	8,500	4,850	0.7
			1993	C	6,550	8,200	7,900	5,500	0.6
			1994	C	6,750	8,650	8,250	5,700	0.8
			1995	C	7,000	8,950	8,600	5,900	0.8
			1996	C	7,300	9,350	9,000	6,150	0.7
			1997	C	7,450	9,550	9,150	6,300	0.8
			1998	C	7,650	9,700	9,350	6,450	0.5
			1999	C	7,700	9,700	9,300	6,500	0.8
			2000	C	7,850	9,900	9,500	6,600	0.8
			2001	C	8,000	10,100	9,700	6,700	0.6
			2002	C	8,050	10,200	9,750	6,800	1.0
			2003	C	8,950	11,300	10,800	7,600	0.6
			2004	C	9,900	12,300	11,800	8,400	0.3
			2005	C	11,500	14,200	13,700	9,750	0.5
			2006	C	9,500	11,800	11,300	8,050	0.4
			2007	C	9,750	10,800	11,200	8,600	0.4
			2008	C	9,950	11,000	10,700	8,750	0.7
			2009	C	10,200	11,300	11,400	9,050	0.4
			2010	C	9,000	11,000	10,500	7,650	0.3

Highway	Location Description	Dist. (KM)	Year	Pattern Type	AADT	SADT	SAWDT	WADT	AR
			2011	C	8,000	9,750	9,350	6,800	N/A
			2012	C	10,300	12,400	12,300	8,750	N/A
			2013	C	9,250	11,300	11,700	7,850	N/A
			2014	C	10,400	11,400	11,100	9,350	N/A
			2015	C	9,500	10,500	10,200	8,550	N/A
			2016	C	10,500	11,600	11,300	9,450	N/A
12	SIMCOE RD 19-MOONSTONE RD(S)/STAGECOACH RD(N)	3.2	1988	CTR	3,900	5,000	4,750	3,250	0.7
			1989	CTR	3,950	5,000	4,750	3,350	0.9
			1990	CTR	4,000	5,800	5,500	2,900	0.2
			1991	CTR	4,150	5,800	5,600	3,050	1.0
			1992	CTR	4,200	5,800	5,600	3,200	0.6
			1993	CTR	4,400	5,500	5,300	3,700	1.4
			1994	CTR	4,600	5,900	5,600	3,900	0.9
			1995	CTR	4,750	6,100	5,850	4,000	0.5
			1996	CTR	4,900	6,250	6,050	4,150	0.9
			1997	CTR	5,000	6,400	6,150	4,200	1.2
			1998	CTR	5,150	6,550	6,300	4,350	0.2
			1999	CTR	5,300	6,700	6,400	4,450	0.2
			2000	CTR	5,450	6,850	6,600	4,600	0.5
			2001	CTR	5,550	7,000	6,700	4,650	0.6
			2002	CTR	5,700	7,200	6,900	4,800	0.5
			2003	CTR	5,850	7,350	7,100	4,950	0.4
			2004	CTR	6,000	7,450	7,150	5,100	1.0
			2005	CTR	6,100	7,550	7,250	5,150	0.4
			2006	CTR	6,050	7,500	7,200	5,150	0.6
			2007	CTR	6,200	7,700	7,600	5,250	1.0
			2008	CTR	6,300	7,800	7,650	5,350	1.4
			2009	CTR	6,400	7,850	7,550	5,450	1.2
			2010	CTR	6,200	6,850	6,900	5,500	0.3
			2011	CTR	6,650	7,300	7,550	5,950	N/A
			2012	CTR	6,750	7,500	7,200	6,000	N/A
			2013	CTR	6,850	7,600	7,550	6,100	N/A
			2014	CTR	6,950	7,750	7,650	6,200	N/A

**APPENDIX B:
EXISTING OPERATIONS**

1: Highway 12 & Town Line
 HCM Unsignalized Intersection Capacity Analysis

2017 Summer
 AM Peak Hour



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	107	4	287	25	2	550
Future Volume (Veh/h)	107	4	287	25	2	550
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)	116	4	312	27	2	598
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	914	312			339	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	914	312			339	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	61	99			100	
cM capacity (veh/h)	299	721			1204	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1		
Volume Total	120	312	27	600		
Volume Left	116	0	0	2		
Volume Right	4	0	27	0		
cSH	305	1700	1700	1204		
Volume to Capacity	0.39	0.18	0.02	0.00		
Queue Length 95th (m)	13.5	0.0	0.0	0.0		
Control Delay (s)	24.3	0.0	0.0	0.0		
Lane LOS	C			A		
Approach Delay (s)	24.3	0.0	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			2.8			
Intersection Capacity Utilization			43.4%		ICU Level of Service	A
Analysis Period (min)	15					

1: Highway 12 & Town Line
 HCM Unsignalized Intersection Capacity Analysis

2017 Summer
 PM Peak Hour



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	60	1	496	133	7	405
Future Volume (Veh/h)	60	1	496	133	7	405
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)	65	1	539	145	8	440
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	995	539			684	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	995	539			684	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	76	100			99	
cM capacity (veh/h)	266	537			895	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	66	539	145	448
Volume Left	65	0	0	8
Volume Right	1	0	145	0
cSH	268	1700	1700	895
Volume to Capacity	0.25	0.32	0.09	0.01
Queue Length 95th (m)	7.1	0.0	0.0	0.2
Control Delay (s)	22.8	0.0	0.0	0.3
Lane LOS	C		A	
Approach Delay (s)	22.8	0.0	0.3	
Approach LOS	C			

Intersection Summary			
Average Delay		1.4	
Intersection Capacity Utilization		37.0%	ICU Level of Service
Analysis Period (min)		15	A

**APPENDIX C:
FUTURE OPERATIONS**

1: Highway 12 & Town Line
 HCM Unsignalized Intersection Capacity Analysis











2022 Summer Total
 AM Peak Hour



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	R	T	R	L	T
Traffic Volume (veh/h)	129	4	316	32	2	608
Future Volume (Veh/h)	129	4	316	32	2	608
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)	140	4	343	35	2	661
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	1008	343			378	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1008	343			378	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	47	99			100	
cM capacity (veh/h)	263	693			1164	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1		
Volume Total	144	343	35	663		
Volume Left	140	0	0	2		
Volume Right	4	0	35	0		
cSH	267	1700	1700	1164		
Volume to Capacity	0.54	0.20	0.02	0.00		
Queue Length 95th (m)	22.1	0.0	0.0	0.0		
Control Delay (s)	33.2	0.0	0.0	0.0		
Lane LOS	D			A		
Approach Delay (s)	33.2	0.0		0.0		
Approach LOS	D					
Intersection Summary						
Average Delay			4.1			
Intersection Capacity Utilization			47.6%		ICU Level of Service	A
Analysis Period (min)			15			

1: Highway 12 & Town Line
 HCM Unsignalized Intersection Capacity Analysis

2022 Summer Total
 PM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	73	1	548	158	9	447
Future Volume (Veh/h)	73	1	548	158	9	447
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)	79	1	596	172	10	486
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	1102	596			768	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1102	596			768	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	65	100			99	
cM capacity (veh/h)	228	498			833	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1		
Volume Total	80	596	172	496		
Volume Left	79	0	0	10		
Volume Right	1	0	172	0		
cSH	230	1700	1700	833		
Volume to Capacity	0.35	0.35	0.10	0.01		
Queue Length 95th (m)	11.1	0.0	0.0	0.3		
Control Delay (s)	28.8	0.0	0.0	0.3		
Lane LOS	D			A		
Approach Delay (s)	28.8	0.0		0.3		
Approach LOS	D					
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization			41.5%		ICU Level of Service	A
Analysis Period (min)			15			