

# CARLETON AND LANARK SUBDIVISION TOWNLINE ROAD EAST CARLETON PLACE, ONTARIO

## TRAFFIC IMPACT STUDY

November 16, 2022

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CONSULTING TRANSPORTATION ENGINEERS  
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Prepared for:

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## TABLE OF CONTENTS

	PAGE
1. INTRODUCTION .....	1
1.1 Purpose and Scope of Work .....	1
2. ADJACENT ROADS AND INTERSECTIONS .....	3
3. PROPOSED CARLETON AND LANARK SUBDIVISION .....	6
4. TRAFFIC ANALYSIS .....	8
4.1 Trip Generation .....	8
4.2 Trip Distribution .....	10
5. TRAFFIC IMPACT .....	10
5.1 Background Traffic .....	10
5.2 Total Traffic .....	12
5.3 Traffic Analysis .....	12
5.4 Site Accesses .....	21
6. FINDINGS AND RECOMMENDATIONS .....	22
APPENDIX .....	24

## LIST OF FIGURES

1.1 SITE LOCATION PLAN .....	2
2.1 EXISTING PEAK AM AND PM HOUR TRAFFIC COUNTS .....	7
3.1 CONCEPTUAL SITE PLAN .....	9
4.1 PEAK AM AND PM HOUR SITE GENERATED TRIPS .....	11
5.1 2026 PEAK AM AND PM HOUR BACKGROUND TRAFFIC .....	13
5.2 2031 PEAK AM AND PM HOUR BACKGROUND TRAFFIC .....	14
5.3 2026 PEAK AM AND PM HOUR TOTAL TRAFFIC .....	15
5.4 2031 PEAK AM AND PM HOUR TOTAL TRAFFIC .....	16

## LIST OF TABLES

3.1 INVENTORY OF DWELLING UNITS .....	8
4.1 TRIP GENERATION RATES - Multifamily Housing (Low-Rise) .....	8
4.2 PEAK HOUR SITE TRIPS GENERATED .....	10
5.1 LANARK/TOWNLINE INTERSECTION – LOS & Delay .....	17
5.2 CARLETON/TOWNLINE INTERSECTION – LOS & Delay .....	19
5.3 ST. PAUL/TOWNLINE INTERSECTION – LOS & Delay .....	20
5.4 RAMSAY/TOWNLINE INTERSECTION – LOS & Delay .....	21

# **CARLETON AND LANARK SUBDIVISION TOWNLINER ROAD EAST CARLETON PLACE, ONTARIO**

## **TRAFFIC IMPACT STUDY**

### **1. INTRODUCTION**

Inverness Homes have proposed the development of 6.741 hectares of vacant land along the north side of Townline Road East in the Town of Carleton Place. The subdivision would be located approximately 670 m west of the intersection of Townline Road East and McNeely Avenue. Figure 1.1 shows the location of the proposed subdivision.

The subdivision will form the extension of Carleton Street and Lanark Street, and will consist of 248 semi-detached homes, townhomes, and stacked townhomes. Access to the subdivision will be from the Carleton/Townline and Lanark/Townline intersections. The semi-detached and townhouse units will have individual driveways and garages, and the stacked townhouse units will have a community parking lot. The subdivision is expected to be completed by the year 2026.

The firm of D. J. Halpenny & Associates Ltd. has been retained by Inverness Homes to prepare a Traffic Impact Study (TIS) report for the proposed subdivision. The report will examine the impact that the site will have on the operation of the adjacent roads and intersections, and identify any modifications to the municipal road network which would be triggered by the development.

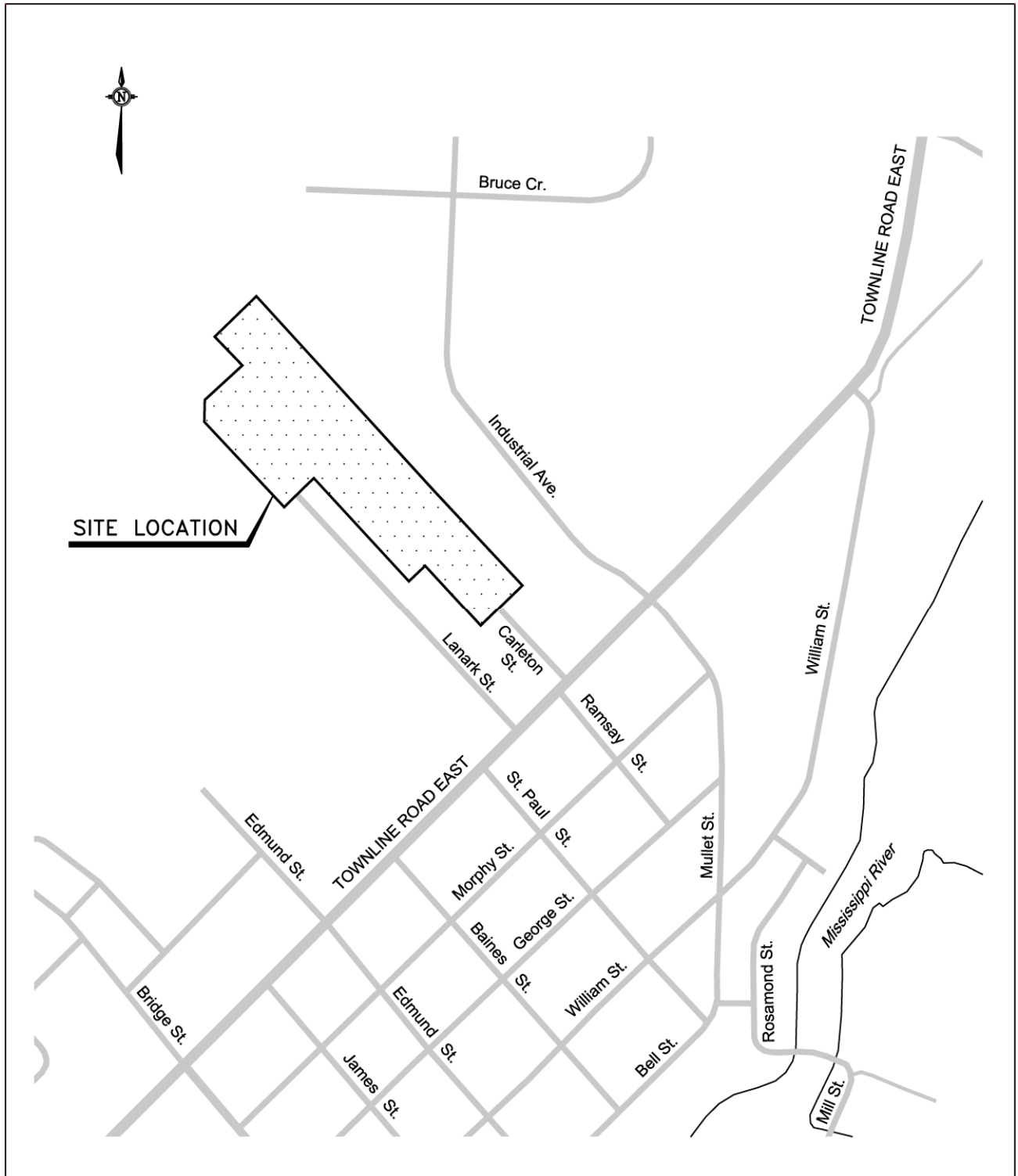
#### **1.1 Purpose and Scope of Work**

The purpose of the Traffic Impact Study (TIS) will be to examine the intersections within the study area which would be impacted by the expected trips from the proposed Carleton and Lanark Subdivision. Following correspondence with staff of the Town of Carleton Place and of Lanark County, the study area will consist of the following intersections:

- Lanark Street and Townline Road East
- Carleton Street and Townline Road East
- St. Paul Street and Townline Road East (located 35 m west of Lanark Street)
- Ramsay Street and Townline Road East (located 10 m west of Carleton Street)

The analysis will be conducted for the above intersections utilizing the existing traffic counts, and at both the completion of the subdivision by 2026, and at the year 2031 which represents five years beyond completion. With traffic counts showing reduced traffic due to COVID-19 and altered traffic patterns due to the temporary closure of the

**FIGURE 1.1**  
**SITE LOCATION PLAN**



NOT TO SCALE

Central Bridge for construction, it was discussed with Town staff that the TIS study would utilize the existing and future traffic volumes as documented in the Town of Carleton Place's *Transportation Master Plan*, March 2022 (TMP). The time period would be the weekday peak AM and PM hour which are expected to be the peak traffic periods for the residents of the proposed subdivision and of the background traffic.

## 2. ADJACENT ROADS AND INTERSECTIONS

### Roadways

The Carleton Street and Lanark Street access roads will connect to Townline Road East south of the site. Townline Road East is an arterial road under the jurisdiction of the County of Lanark which designates the road as County Road 7B. Townline Road East is a two-lane east-west road connecting County Road 29 to the east to Townline Road West at Bridge Street. There is a shared back-to-back centre left turn lane extending from Joseph Street 980 m west of Lanark Street, to Mullett Street 185 m east of Lanark Street. The road is a two lane urban roadway with sidewalks along both sides of the road and no parking restrictions. The speed limit is posted at 50 km./h. past the site, which reduces to 40 km./h. approximately 90 m west of Lanark Street.

The Carleton and Lanark Subdivision will be constructed along Carleton Street and Lanark Street on the north side of Townline Road East. Both roads are two lane north-south local streets which have only one connection each to Townline Road East. Both roads have posted "No Exit" signs with no posted speed limits. Carleton Street is approximately 95 m in length and has a rural cross section with no sidewalks. Lanark Street is approximately 300 m in length with the 160 m portion north of Townline Road East having an urban cross section with a sidewalk along the east side of the road, and the remaining portion having a rural cross section and no sidewalks.

St. Paul Street and Ramsay Street are both north-south local streets which connect to the south side of Townline Road East. St. Paul Street has an urban cross section with a sidewalk along the east side of the road. Ramsay Street has a rural cross section with no sidewalks. Both streets have no posted speed limits or parking restrictions.

### Intersections

Lanark/Townline - The intersection of Lanark Street and Townline Road East is a "T" intersection with Lanark Street forming the southbound stop controlled approach and Townline Road East the eastbound and westbound approaches. The Lanark/Townline intersection has the following lane configuration along with a photo obtained from Google mapping:

Southbound Lanark St.	One shared left/right turn lane
Eastbound Townline Rd.	One through lane
	Shared back-to-back left turn lane
Westbound Townline Rd.	One shared through/right lane
	Shared back-to-back left turn lane

### Lanark/Townline Intersection - Looking Westbound along Townline Road East



Carleton/Townline - The Carleton/Townline intersection is located approximately 75 m east of Lanark Street. The intersection is a “T” intersection with Carleton Street forming the southbound stop controlled approach and Townline Road East the eastbound and westbound approaches. The Carleton/Townline intersection has the following lane configuration along with a photo obtained from Google mapping:

Southbound Carleton St.	One shared left/right turn lane
Eastbound Townline Rd.	One through lane
	Shared back-to-back left turn lane
Westbound Townline Rd.	One shared through/right lane
	Shared back-to-back left turn lane

### Carleton/Townline Intersection - Looking Westbound along Townline Road East



St. Paul/Townline - The St. Paul Street and Townline Road East intersection is located approximately 35 m (centreline to centreline) west of Lanark Street. St. Paul Street forms the northbound stop controlled approach with the intersection having the following lane configuration along with a photo obtained from Google mapping:

Northbound St. Paul St.	One shared left/right turn lane
Eastbound Townline Rd.	One shared through/right lane Shared back-to-back left turn lane
Westbound Townline Rd.	One through lane Shared back-to-back left turn lane

**St. Paul/Townline Intersection - Looking Westbound along Townline Road East**



Ramsay/Townline - The Ramsay Street and Townline Road East intersection is located approximately 10 m (centreline to centreline) west of Carleton Street. Ramsay Street forms the northbound stop controlled approach with the intersection having the following lane configuration along with a photo obtained from Google mapping:

Northbound Ramsay St.	One shared left/right turn lane
Eastbound Townline Rd.	One shared through/right lane Shared back-to-back left turn lane
Westbound Townline Rd.	One through lane Shared back-to-back left turn lane



## Ramsay/Townline Intersection - Looking Westbound along Townline Road East



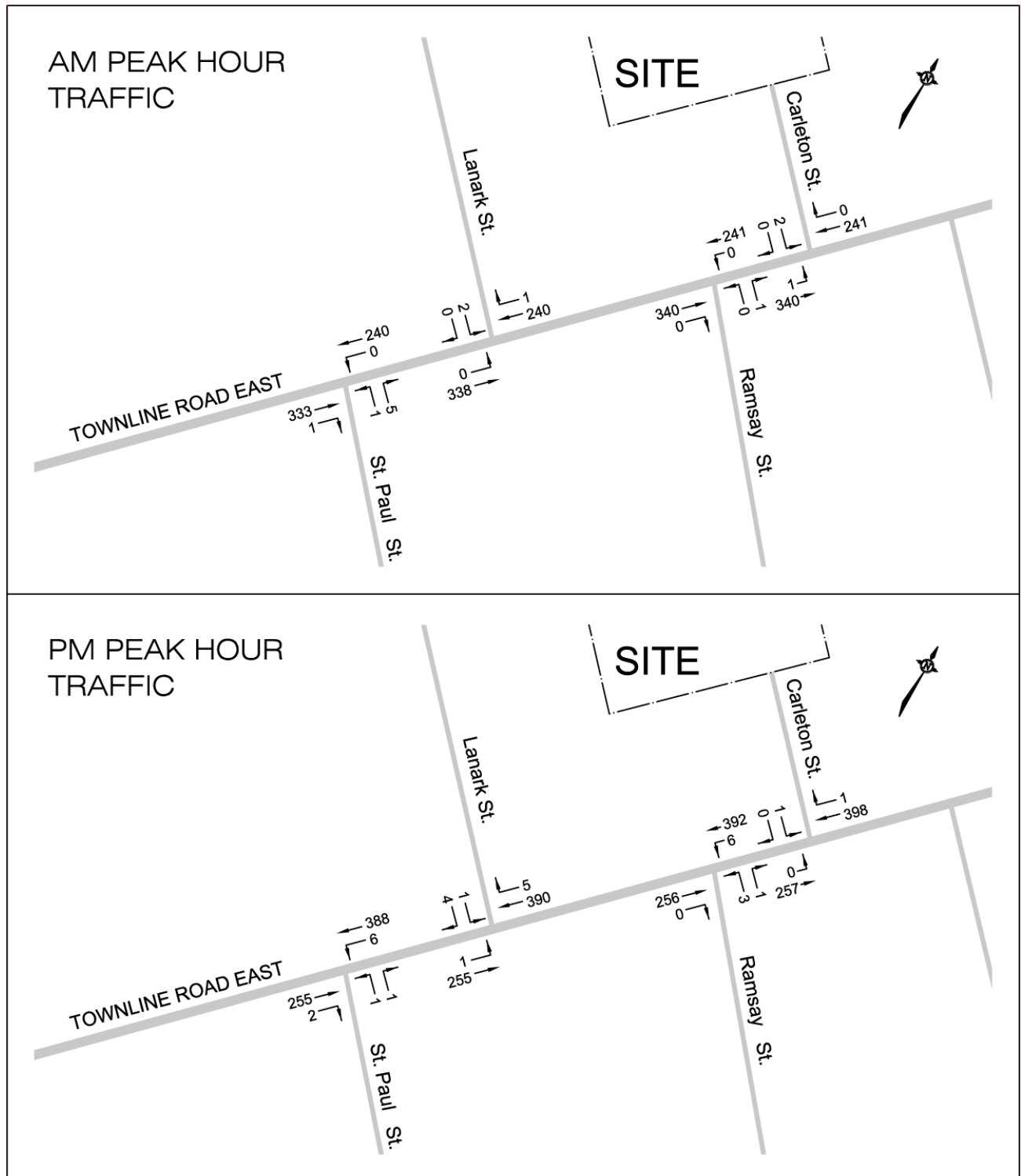
Figure 2.1 shows the existing traffic counts at all four intersections. With trip reductions from employees working remotely due to COVID-19 and the closure of the Bridge Street bridge for construction, traffic counts taken at the time of the preparation of this report would not be representative of the actual traffic. The existing peak hour traffic counts for the study were obtained from the Town of Carleton Place TMP (Figure B1-1) which were taken at the east approach of the Bridge/Townline intersection and projected east to the St. Paul/Townline intersection. The volume of traffic to/from Lanark Street, Carleton Street, St. Paul Street and Ramsay Street was determined from counts taken by this firm in 2014 for the Sunny Hill Subdivision which was previously proposed for this site. With no new development along the local streets, the study has assumed the 2014 counts would still be representative of a typical day in 2022.

### 3. PROPOSED CARLETON AND LANARK SUBDIVISION

The Carleton and Lanark Subdivision will be located on the north side of Townline Road East approximately 670 m west of the intersection of Townline Road East and McNeely Avenue (CR 29). The subdivision will be situated on a 6.741 hectare parcel of vacant land connecting to the existing local streets of Lanark Street and Carleton Street, and extending them further north linking both streets together within the subdivision. The subdivision would have two access points from the Lanark/Townline and Carleton/Townline intersections.

The subdivision will comprise of 248 dwelling units which would consist of a mix of semi-detached and townhouse units. The number and type of dwelling units are detailed in Table 3.1. The semi-detached and townhouse units will have private driveways and garages for each unit. The stacked townhouse units will have a community parking lot which would provide 264 parking spaces.

**FIGURE 2.1**  
**EXISTING PEAK AM AND PM HOUR TRAFFIC COUNTS**



NOT TO SCALE

**TABLE 3.1  
 INVENTORY OF DWELLING UNITS**

RESIDENTIAL UNIT TYPE	NUMBER OF UNITS
Semi-Detached Units	26 Units
Townhouse Units	62 Units
Stacked Townhouse Units	<u>160 Units</u>
TOTAL Subdivision Units	248 Units

Existing development along Lanark Street and Carleton Street consists of residential homes, with some commercial/industrial development to the east of the lands and the Sobczak Tree Farm adjacent to the west limit of the property. Development south of Townline Road East is predominately residential housing. The subdivision site is currently zoned residential which will support the proposed development.

The Carleton and Lanark Subdivision will be constructed in accordance with market demands with completion expected by the year 2026. A conceptual site plan for the development is shown in Figure 3.1.

#### 4. TRAFFIC ANALYSIS

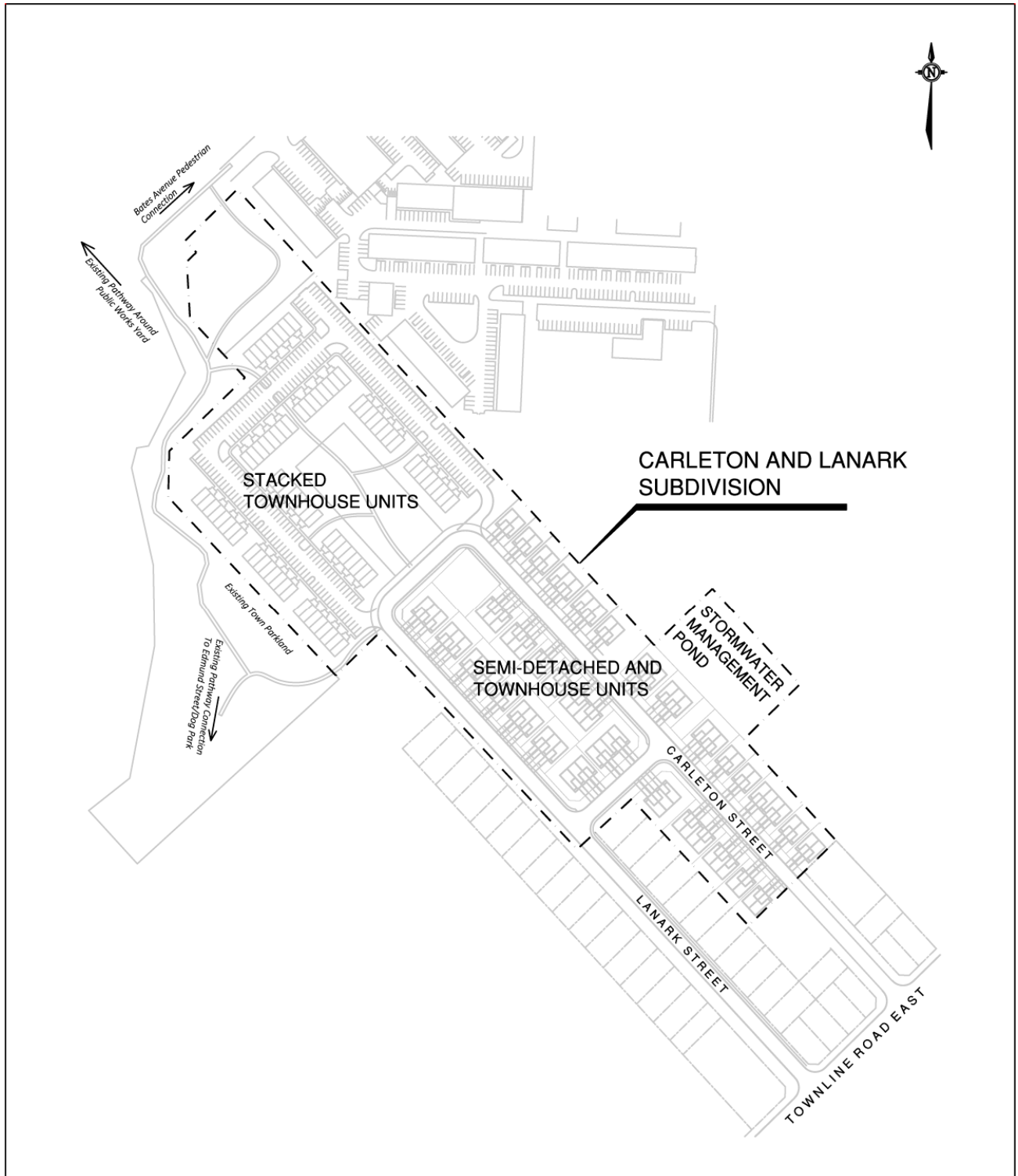
##### 4.1 Trip Generation

The study has determined the number of weekday peak AM and PM hour site generated trips for a 248 unit subdivision comprising of 26 semi-detached units, 62 townhouse units, and 160 stacked townhouses units. The trip analysis has utilized the statistical data published in the Institute of Transportation Engineers (ITE) document, *Trip Generation*. The analysis used the fitted curve equations for the peak AM and PM hour of the adjacent street traffic using the “Multifamily Housing (Low-Rise) ITE 220” land use. Table 4.1 presents the trip generation rates which were derived from the ITE Trip Graphs.

**TABLE 4.1  
 TRIP GENERATION RATES - Multifamily Housing (Low-Rise)**

248 UNITS	Peak AM Hour		Peak PM Hour	
Fitted Curve Equation	$\ln(T) = 0.95 \ln(X) - 0.51$		$\ln(T) = 0.89 \ln(X) - 0.02$	
Trip Rate	0.46 T/DU		0.53 T/DU	
Directional Distribution	23% Entering	77% Exiting	63% Entering	37% Exiting

**FIGURE 3.1**  
**CONCEPTUAL SITE PLAN**



NOT TO SCALE

The directional split of trips entering and exiting the site utilized the split presented in the ITE statistical data for the peak hours for the land use. Table 4.2 shows the expected number of site generated trips for the weekday peak AM and PM hour for 248 dwelling units. With no public transit service in Carleton Place, there were no trip adjustments applied for transit use.

**TABLE 4.2  
 PEAK HOUR SITE TRIPS GENERATED**

TRIPS USE	WEEKDAY PEAK AM HR.			WEEKDAY PEAK PM HR.		
	TOTAL	ENTER	EXIT	TOTAL	ENTER	EXIT
Multifamily Units	113	26 (23%)	87 (77%)	132	83 (63%)	49 (37%)

## 4.2 Trip Distribution

The distribution of expected site generated trips entering and exiting the Carleton and Lanark Subdivision was determined from the examination of the projected 2026 and 2031 traffic volumes as documented in the Town of Carleton Place, *Transportation Master Plan* (TMP). The traffic volumes in the TMP reflect any proposed development and infrastructure in the Town of Carleton Place. The AM and PM peak hour traffic at the east approach to the Bridge/Townline intersection determined the following trip distribution along Townline Road East which was applied to the AM and PM peak hour site generated trips:

To/From the east along Townline Road → 60%  
 To/From the west along Townline Road → 40%

Site generated trips entering and exiting the subdivision would choose either Lanark Street or Ramsay Street, whichever is the shortest and most convenient route to Townline Road East. The unit count and access routes within the subdivision were examined which determined that approximately 55 percent of the trips would use Carleton Street to access the subdivision and 45 percent would use Lanark Street.

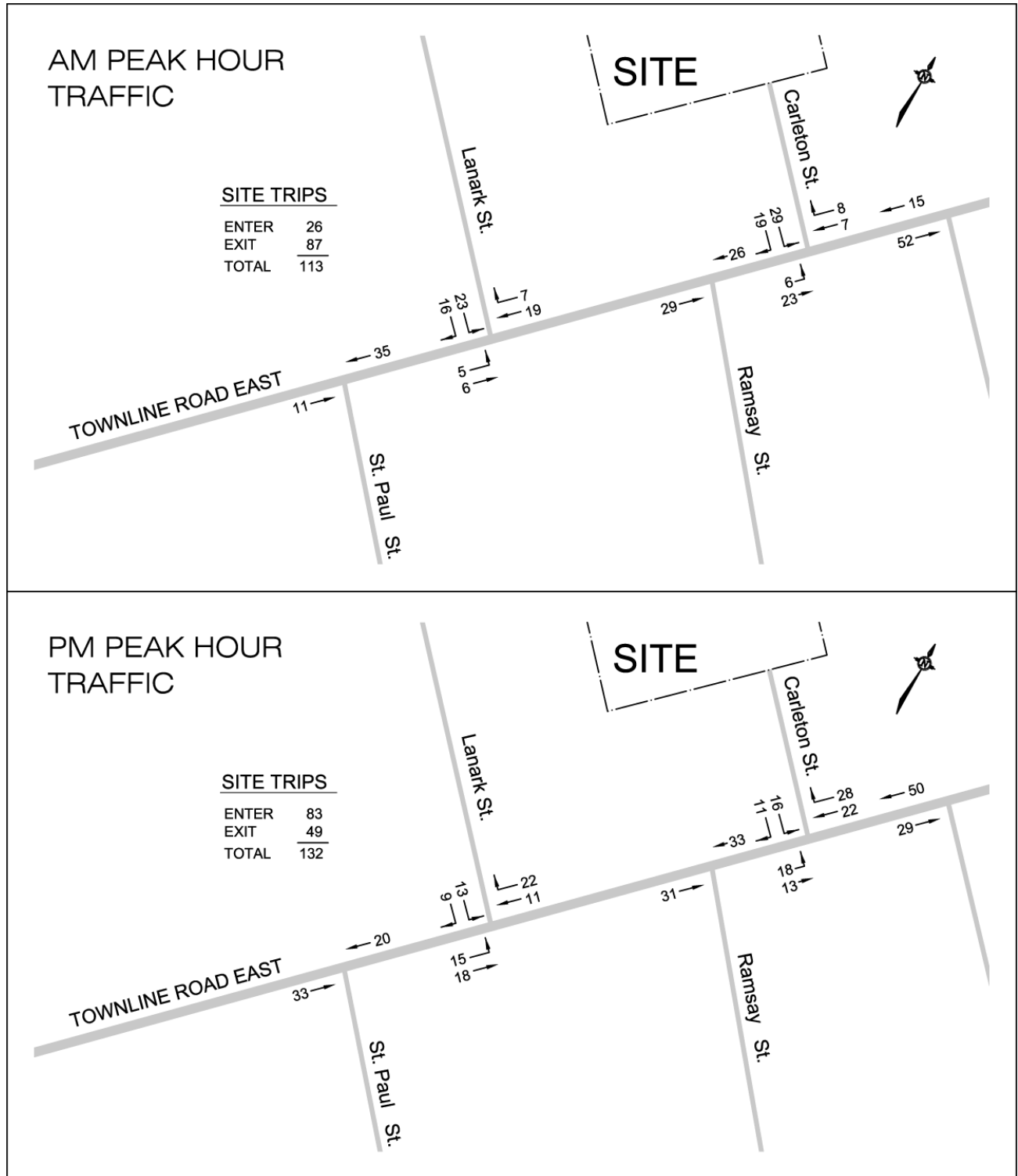
Figure 4.1 shows the expected weekday peak AM and PM hour site generated trips for the Carleton and Lanark Subdivision using the expected trips from Table 4.2.

## 5. TRAFFIC IMPACT

### 5.1 Background Traffic

The background traffic would consist of the expected future traffic volumes which would include future development, but would not include the trips generated by the proposed

**FIGURE 4.1  
 PEAK AM AND PM HOUR SITE GENERATED TRIPS**



NOT TO SCALE

Carleton and Lanark Subdivision. With reduced traffic along the roadway network due to COVID-19 and the remote working of employees plus the closure of the Bridge Street bridge for construction, the future volume of traffic was determined from the Town of Carleton Place's TMP. The TMP has provided future traffic for the year 2026 which accounts for linear growth within the network and trips from anticipated development. The TIS has utilized the 2026 future traffic (Figure B3-1 in the TMP) which coincides with the completion date of the subdivision. The traffic at the east approach of the Bridge/Townline intersection was projected east to the St. Paul/Townline intersection. The traffic turning to/from the St. Paul/Townline, Lanark/Townline, Ramsay/Townline and Carleton/Townline was determined from the traffic from counts taken in 2014 by this firm for the Sunny Hill Subdivision. The 2014 counts to/from the side streets would be representative of existing and future traffic since no new development has occurred along these local streets. The 2026 background traffic is presented in Figure 5.1.

The TIS study has also examined the impact of the trips from the subdivision at the year 2031 which represents five years beyond completion of the subdivision. The study has utilized the projected 2031 peak hour traffic from the TMP (Figure B3-2), and has also accounted for the development of lands adjacent to the west limit of the subdivision as requested by staff of the Town of Carleton Place. The lands are currently occupied by the Sobczak Tree Farm with the Concept Plan proposing 219 residential units consisting of single detached, townhouse and apartment units. The plan shows access to the development from Edmund Street and Lanark Street with a symmetrical layout of the development providing a 50/50 split of trips entering and exiting from either Edmund Street or Lanark Street. The trips were further distributed to 60 percent to the east and 40 percent to the west as determined for the Carleton and Lanark Subdivision. The number of trips was calculated for the peak AM and PM hours using the ITE fitted curve equations for a Multifamily Housing (low-Rise) land use, which determined the site to generate a total of 100 trips during the peak AM hour and 119 trips during the peak PM hour. The product of the trips from the Sobczak Tree Farm development and the 2031 TMP traffic is presented in Figure 5.2 as the 2031 background traffic for the TIS.

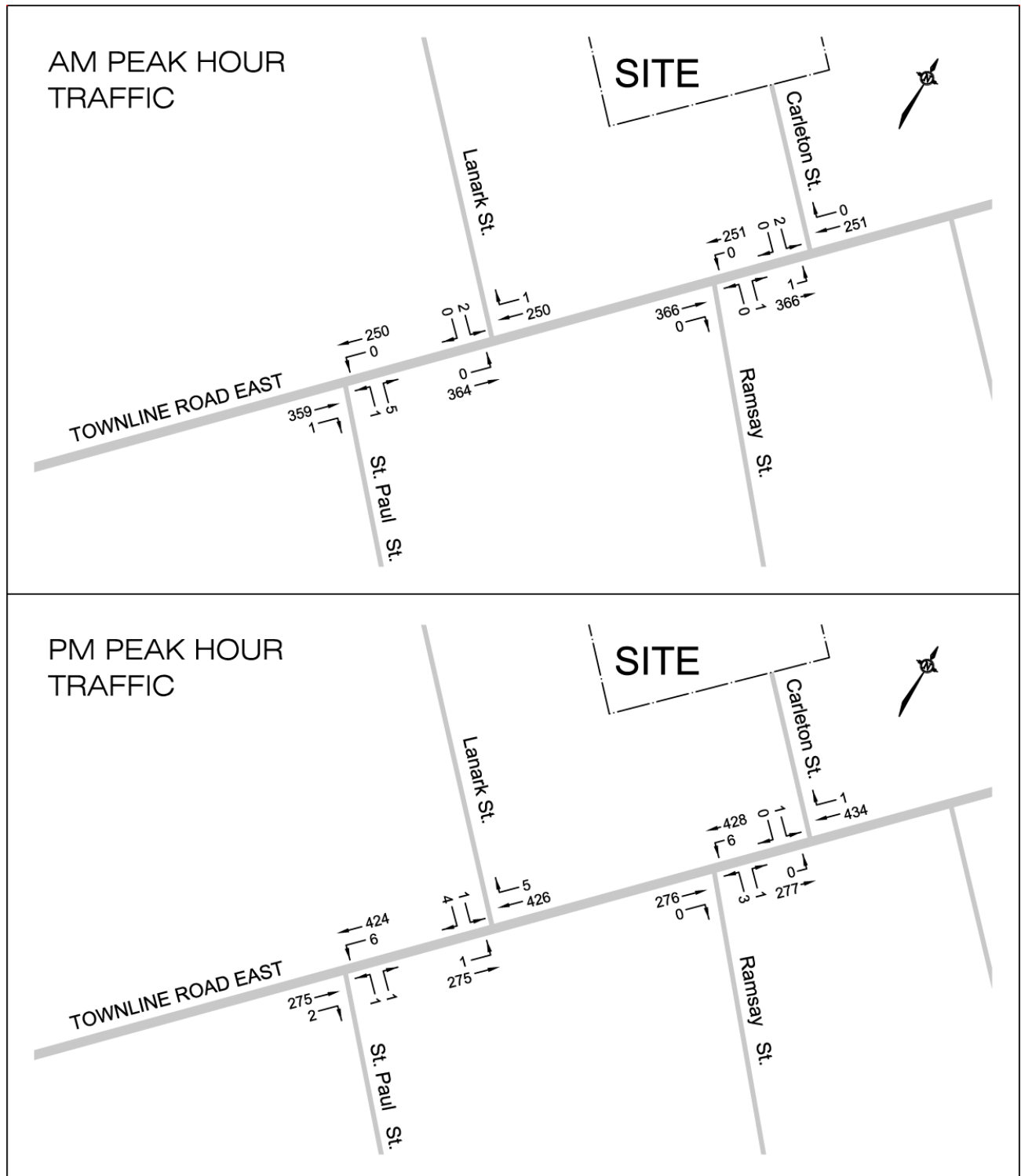
## 5.2 Total Traffic

The total traffic volumes are the addition of the future background traffic from Figure 5.1 and Figure 5.2, and the expected site generated trips (Figure 4.1). Figure 5.3 shows the 2026 total volume of traffic and Figure 5.4 the 2031 total traffic.

## 5.3 Traffic Analysis

The Traffic Impact Study will examine the site accesses and adjacent intersections to the subdivision site. The intersections would comprise of the Lanark/Townline, Carleton/Townline, St. Paul/Townline and Ramsay/Townline intersections. The analysis will examine the operation of the intersections during the weekday peak hour for the existing traffic volumes from Figure 2.1, and the total traffic at the years 2026 and 2031. The analysis will utilize the *Highway Capacity Software, HCS2022 Release 8.1*, which uses the capacity analysis procedure as documented in the *Highway Capacity Manual (HCM) 7<sup>th</sup> Edition*.

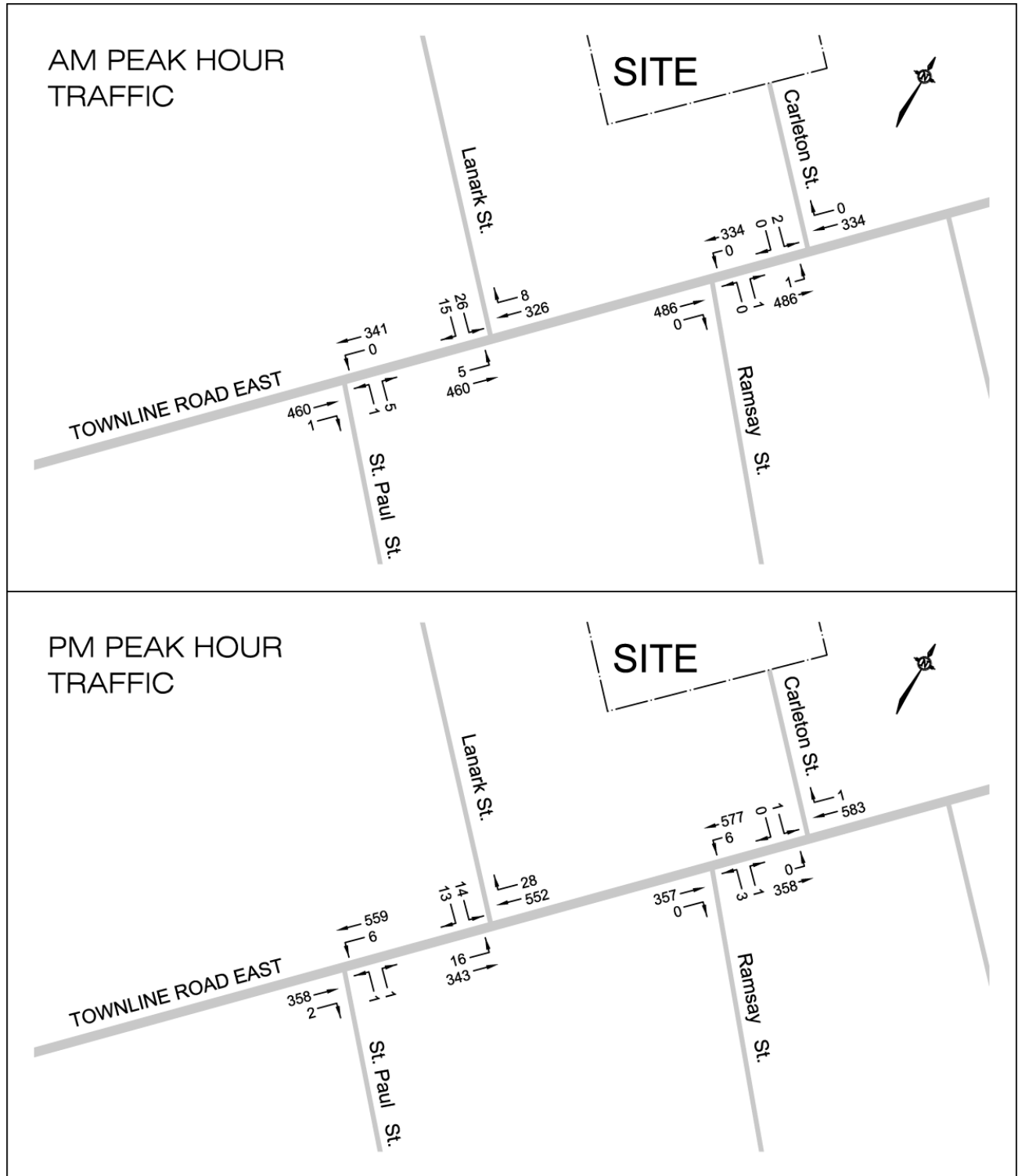
**FIGURE 5.1**  
**2026 PEAK AM AND PM HOUR BACKGROUND TRAFFIC**



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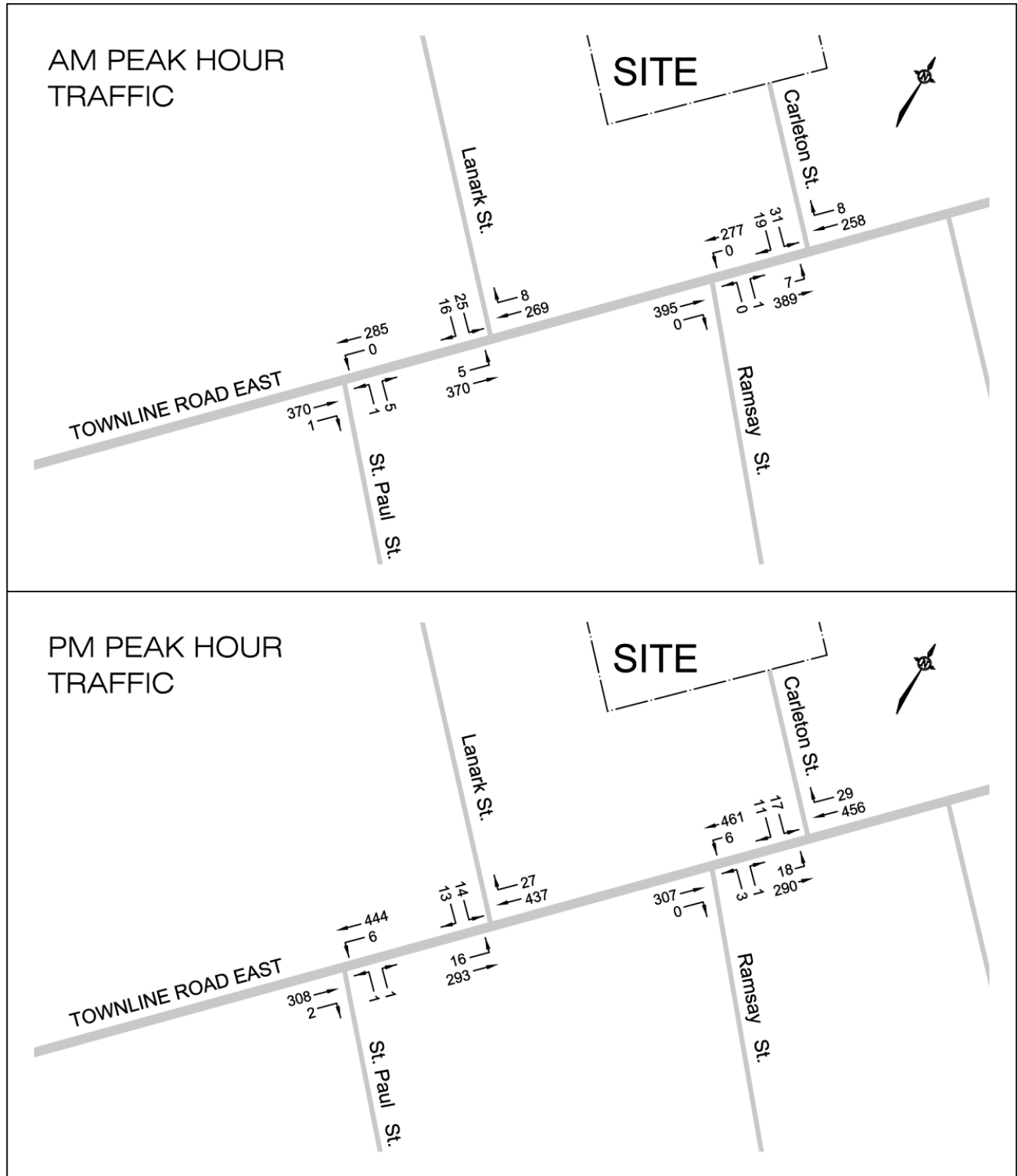


**FIGURE 5.2**  
**2031 PEAK AM AND PM HOUR BACKGROUND TRAFFIC**



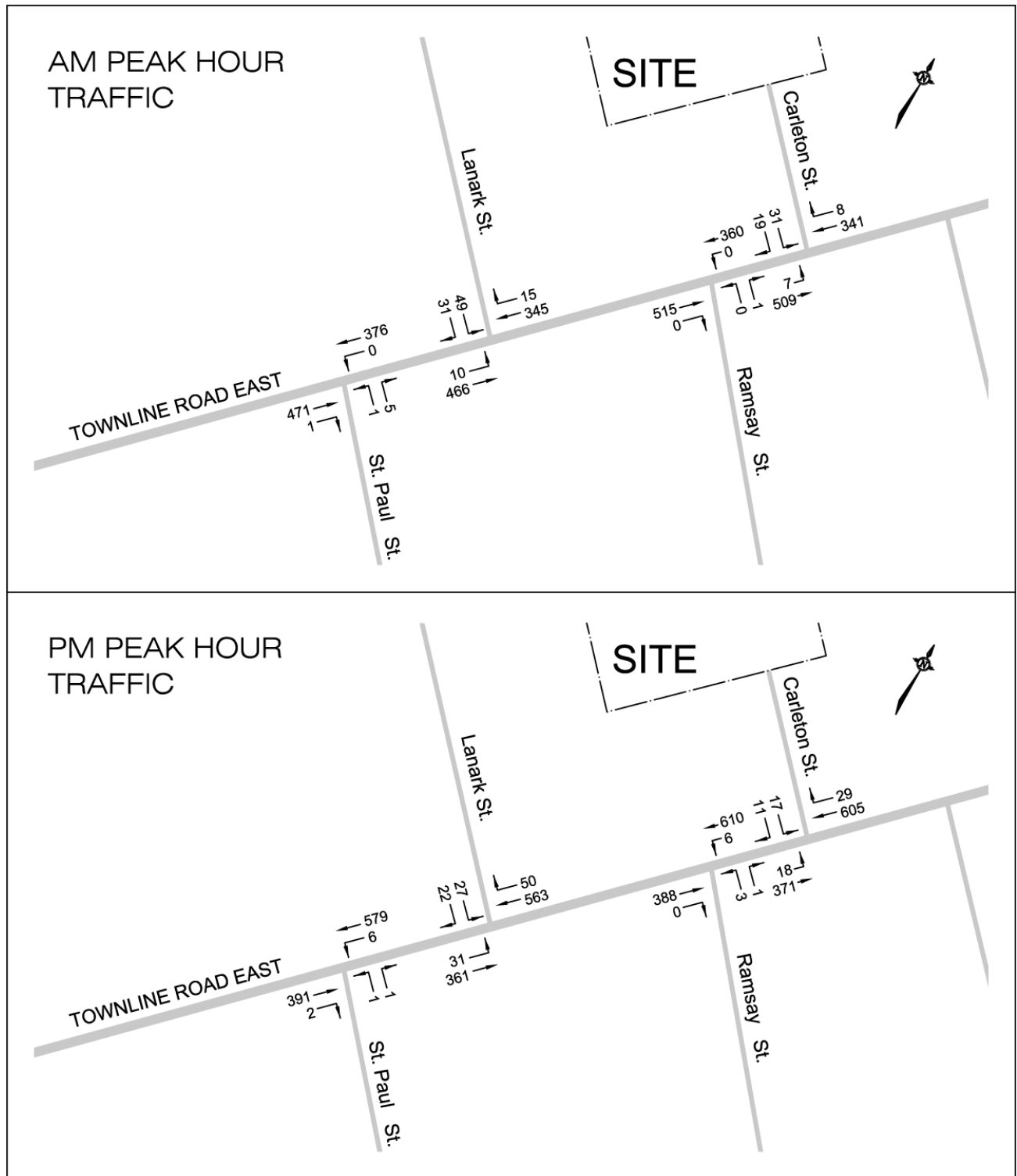
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**FIGURE 5.3**  
**2026 PEAK AM AND PM HOUR TOTAL TRAFFIC**



NOT TO SCALE

**FIGURE 5.4**  
**2031 PEAK AM AND PM HOUR TOTAL TRAFFIC**



NOT TO SCALE

For unsignalized intersections, the level of service of each lane movement and approach is determined as a function of the delay of vehicles at the approach. The following relates the level of service of each lane movement with the expected control delay at the approach.

LEVEL OF SERVICE	DELAY	
Level of Service A	0-10 sec./vehicle	Little or No Delay
Level of Service B	>10-15 sec./vehicle	Short Traffic Delays
Level of Service C	>15-25 sec./vehicle	Average Traffic Delays
Level of Service D	>25-35 sec./vehicle	Long Traffic Delays
Level of Service E	>35-50 sec./vehicle	Very Long Traffic Delays
Level of Service F	>50 sec./vehicle	Extreme Delays – Demand Exceeds Capacity

The expected length of queue at the critical lane movements for an unsignalized two-way stop controlled intersection was determined by the calculation of the 95<sup>th</sup> percentile queue at the lane approach. The 95<sup>th</sup> percentile queue length is the calculated 95<sup>th</sup> greatest queue length out of 100 occurrences at a movement during a 15-minute peak period. The 95<sup>th</sup> percentile queue length is a function of the capacity of a movement and the total expected traffic, with the calculated value determining the magnitude of the queue by representing the queue length as fractions of vehicles.

The results of the analysis are discussed in detail in the following sections with the lane configuration and photographs provided in Section 2. Adjacent Roads and Intersections.

### Lanark Street and Townline Road East Intersection

The Lanark/Townline intersection is a two-way stop controlled “T” intersection with a stop sign at the southbound Lanark Street approach. Townline Road East is a two lane road with a centre lane providing shared back-to-back left turn movements.

The operational analysis was completed for the existing traffic counts (Figure 2.1) obtained from the Town of Carleton Place TMP. The analysis determined that during the peak AM and PM hour, the eastbound left turn movement functioned at a Level of Service (LOS) “A” and the southbound left/right turn movement at a LOS “B”. Table 5.1 summarizes the analysis with the report provided in the Appendix as Exhibit 1 and 2.

**TABLE 5.1  
 LANARK/TOWNLINE INTERSECTION – LOS & Delay**

INTERSECTION APPROACH	WEEKDAY PEAK AM HOUR YEAR Existing 2026 (2031)		WEEKDAY PEAK PM HOUR YEAR Existing 2026 (2031)	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
EB Left – Townline	A A (A)	7.8 7.9 (8.1)	A A (A)	8.2 8.4 (9.0)
SB Left/Right – Lanark	B B (C)	13.1 13.1 (17.1)	B B (C)	11.4 14.3 (19.7)

The intersection was examined to determine if traffic control signals may be required in the future. The expected traffic at the year 2031 (Figure 5.4) was used to conduct a traffic signal warrant analysis. The analysis followed the procedure presented in the *Ontario Traffic Manual Book 12 - Traffic Signals*. The analysis was conducted using the 2031 peak AM and PM hour traffic which determined that the intersection only met 25 percent of the warrants as shown in the warrant sheet of Exhibit 3. The 2026 and 2031 operational analysis was therefore completed assuming the intersection will continue to be a two-way controlled intersection with a stop sign at the southbound Lanark Street approach.

Following the full development of the site, the 2026 traffic (Figure 5.3) determined the eastbound Townline Road East left turn movement to functioned at a LOS "A" and the southbound Lanark Street approach at a LOS "B" during the peak AM and PM hour as shown in Table 5.1 and Exhibit 4 and Exhibit 5.

At five years beyond full development, the 2031 traffic (Figure 5.4) determined the intersection to continue to operate at an acceptable level of service with the eastbound left turn movement functioning at a LOS "A" and southbound approach at a LOS "C" during the peak AM and PM hour. The 95<sup>th</sup> percentile queue at the year 2031 determined that the queuing at the southbound approach would be 0.9 vehicles during the peak AM hour and 0.1 vehicles at the eastbound left turn movement during the peak PM hour. There is approximately 28 m (4 vehicles) of queuing space at the eastbound left turn movement without interfering with turning movements at the St. Paul/Townline intersection. The analysis is summarized in Table 1 with the analysis sheets provided as Exhibit 6 for the peak AM hour and Exhibit 7 for the peak PM hour.

There would be no intersection modifications required for the Lanark/Townline intersection due to the development of the Carleton and Lanark Subdivision.

### Carleton Street and Townline Road East Intersection

The Carleton/Townline intersection is located approximately 75 m east of Lanark Street. The Carleton/Townline intersection is a two-way stop controlled "T" intersection with a stop sign at the southbound Carleton Street approach. Townline Road East is a two lane arterial road with a centre lane providing shared back-to-back left turn movements.

The operational analysis was completed using the existing peak hour traffic counts which were obtained from the TMP. The analysis determined that the eastbound Townline Road East left turn movement functioned at a LOS "A" and southbound Carleton Street shared left/right turn movement at a LOS "B" during both the peak AM and PM hour. The analysis for the existing traffic is summarized in Table 5.2 with the analysis sheets provided as Exhibit 8 for the peak AM hour and Exhibit 9 for the peak PM hour.

A traffic signal warrant analysis was completed for the intersection using the expected 2031 traffic. The warrant analysis determined that the intersection would meet 16 percent of the warrants for the installation of traffic control signals. The intersection was

therefore analyzed using the existing lane geometry and two-way stop controls with a stop sign at the southbound Carleton Street approach. The traffic signal warrant analysis sheet is provided as Exhibit 10.

**TABLE 5.2  
 CARLETON/TOWNLINE INTERSECTION – LOS & Delay**

INTERSECTION APPROACH	WEEKDAY PEAK AM HOUR YEAR <i>Existing</i> 2026 (2031)		WEEKDAY PEAK PM HOUR YEAR <i>Existing</i> 2026 (2031)	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
EB Left – Townline	A A (A)	7.8 7.8 (8.1)	A A (A)	8.2 8.5 (9.0)
SB Left/Right – Carleton	B B (C)	13.1 13.5 (16.4)	B C (C)	14.0 15.2 (19.3)

For the 2026 traffic following the development of the site, the eastbound Townline Road East left turn movement functioned at a LOS “A” and southbound Carleton Street approach at a LOS “B” during the peak AM hour, and eastbound left turn movement at a LOS “A” and southbound approach at a LOS “C” during the peak PM hour as shown in Table 5.2. The analysis sheets are provided as Exhibits 11 and 12.

At the year 2031 following the development of the site, the eastbound left turn movement would function at a LOS “A” and southbound approach at a LOS “C” during both the peak AM and PM hour. The 95<sup>th</sup> percentile queue determined the southbound Carleton Street approach to have a queue of 0.5 vehicles during the peak AM hour, and the eastbound Townline Road East left turn movement a queue of 0.1 vehicles during the peak PM hour. There is approximately 5 m (slightly less than 1 vehicle) of queuing space at the eastbound left turn movement without interfering with turning movements at the Ramsay/Townline intersection. The northbound left turn movements from Ramsay Street may periodically be delayed due to the queuing at the eastbound left turn movement onto Carleton Street which may extend past Ramsay Street. Table 5.2 summarizes the operation of the intersection with the 2031 analysis sheets provided as Exhibits 13 and 14.

There would be no intersection modifications required for the Carleton/Townline intersection due to the development of the Carleton and Lanark Subdivision.

St. Paul Street and Townline Road East Intersection

The St. Paul/Townline intersection is located 35 m west of Lanark Street. The intersection is a two-way stop controlled “T” intersection with a stop sign at the northbound St. Paul Street shared left/right turn movement and a westbound shared back-to-back left turn lane at the Townline Road East approach.

The operational analysis for the existing traffic counts determined that the westbound left turn movement for Townline Road East functioned at a LOS “A” and northbound shared left/right St. Paul Street approach functioned at a LOS “B” during both the peak AM and PM hours. The operation of the intersection is summarized in Table 5.3 with the analysis sheets provided as Exhibit 15 and Exhibit 16.

**TABLE 5.3**  
**ST. PAUL/TOWNLINER INTERSECTION – LOS & Delay**

INTERSECTION APPROACH	WEEKDAY PEAK AM HOUR YEAR Existing 2026 (2031)		WEEKDAY PEAK PM HOUR YEAR Existing 2026 (2031)	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
WB Left – Townline	A A (A)	8.0 8.1 (8.4)	A A (A)	7.8 7.9 (8.2)
NB Left/Right – St. Paul	B B (B)	10.8 11.2 (12.4)	B B (C)	11.9 12.9 (15.3)

At the year 2026, which includes the site generated trips at build out of the subdivision, the westbound Townline Road East left turn movement functioned at a LOS “A” and northbound St. Paul Street approach at a LOS “B” during both the peak AM and PM hour. The analysis is summarized in Table 5.3 with the analysis provided as Exhibit 17 and Exhibit 18.

The operational analysis for the expected 2031 traffic determined that during the peak AM hour the westbound left turn movement would function at a LOS “A” and northbound shared left/right movement at a LOS “B”. During the peak PM hour the westbound left turn movement would function at a LOS “A” and northbound approach at a LOS “C”. The analysis determined that the 95<sup>th</sup> percentile queue during the peak AM and PM hour would be 0.0 vehicles at both approaches, resulting in the queuing of westbound left turning vehicles to not interfere with turning movements from the southbound Lanark Street approach located 35 m east of the intersection. The 2031 level of service is summarized in Table 5.3 with the analysis sheets provided as Exhibit 19 for the peak AM hour and Exhibit 20 for the peak PM hour.

There would be no intersection modifications required for the St. Paul/Townline intersection due to the development of the Carleton and Lanark Subdivision.

Ramsay Street and Townline Road East Intersection

The Ramsay/Townline intersection is located 10 m west of Carleton Street. The Ramsay/Townline intersection is a two-way stop controlled “T” intersection with a stop sign located at the northbound Ramsay Street approach, with westbound Townline Road East providing left turn movements from a shared lane allowing back-to-back left turn movements.

The operational analysis of the Ramsay/Townline intersection using the existing traffic counts determined the westbound Townline Road East left turn movement to function at a LOS “A” and northbound Ramsay Street shared left/right turn movement at a LOS “B” during both the peak AM and PM hours. Table 5.4 shows the level of service and delay at each approach. The analysis sheets are provided as Exhibit 21 for the peak AM hour and Exhibit 22 for the peak PM hour.

**TABLE 5.4  
 RAMSAY/TOWNLINE INTERSECTION – LOS & Delay**

INTERSECTION APPROACH	WEEKDAY PEAK AM HOUR YEAR <i>Existing</i> 2026 (2031)		WEEKDAY PEAK PM HOUR YEAR <i>Existing</i> 2026 (2031)	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
WB Left – Townline	A A (A)	8.0 8.2 (8.5)	A A (A)	7.8 7.9 (8.2)
NB Left/Right – Ramsay	B B (B)	10.3 10.7 (11.8)	B B (C)	13.1 14.5 (18.1)

At the year 2026, the westbound Townline Road East left turn movement would function at a LOS “A” and northbound Ramsay Street approach at a LOS “B” during both the peak AM and PM hour as shown in Table 5.4. The analysis sheets are provided as Exhibit 23 and Exhibit 24.

At five years beyond build out of the subdivision, the Townline Road East left turn movement would function at a LOS “A” and northbound Ramsay Street approach at a LOS “B” during the peak AM hour, and during the peak PM hour the westbound left turn movement would function at a LOS “A” and northbound approach at a LOS “C”. The 95<sup>th</sup> percentile queue was determined to be 0.0 vehicles at both approaches during the peak AM and PM hours. Although the queuing is expected to be minimal at the Ramsay/Townline intersection, the northbound left turn movements from Ramsay Street may periodically be delayed due to the queuing at the eastbound Townline Road East left turn movement onto Carleton Street which may extend past Ramsay Street. The analysis is summarized in Table 5.4 with the analysis sheets provided as Exhibit 25 and Exhibit 26.

There would be no intersection modifications required for the Ramsay/Townline intersection due to the development of the Carleton and Lanark Subdivision.

**5.4 Subdivision Accesses**

The subdivision will have two access points from two existing intersections. The first intersection will be the Lanark/Townline intersection and the second the Carleton/Townline intersection. Both intersections are “T” intersections which are controlled by a stop sign at the southbound approach of Lanark Street and Carleton Street. Townline Road East is a two lane arterial road which forms the eastbound and



westbound approaches along with a centre back-to-back left turn lane. The Town of Carleton Place does not project any roadway modifications in the *Transportation Master Plan* for roads or intersections within the study area.

The Sobczak Tree Farm adjacent to the west limit of the site has prepared a Concept Plan proposing 219 residential units consisting of single detached, townhouse and apartment units. The subdivision will be connected to Lanark Street within the Carleton and Lanark Subdivision. The Sobczak Tree Farm subdivision would add trips to Lanark Street, but would not be used by residents of the Carleton and Lanark Subdivision as access to their site.

## 6. FINDINGS AND RECOMMENDATIONS

A Site Plan has been prepared for the construction of the Carleton and Lanark Subdivision located on the north side of Townline Road East approximately 670 m west of McNeely Avenue in the Town of Carleton Place. The development will be constructed on 6.741 ha of currently vacant land. The subdivision will consist of semi-detached homes, townhomes and stacked townhomes totalling 248 housing units. The subdivision will be constructed to market demands, with an expected 2026 completion date of the total subdivision.

The Traffic Impact Study report has examined the impact of the subdivision trips on intersections in close proximity to the site. The intersections examined consist of the Lanark/Townline, Carleton/Townline, St. Paul/Townline and Ramsay/Townline intersections. The analysis was conducted at the intersections for the existing traffic, at the year 2026 which is when completion of the subdivision is expected, and at the year 2031 which represents five years beyond completion. The operation of the intersections was determined for the peak AM and PM hour. Due to reduced traffic from COVID-19 related to remote working, and the temporary closure of the Bridge Street bridge due to construction, the traffic volumes were determined from the Town of Carleton Place *Transportation Master Plan*. The findings and recommendations of the study are summarized in the following:

1. The trips from the subdivision were determined using the trip generation rates from the Institute of Transportation Engineers (ITE) document, *Trip Generation*. The trip generation analysis determined that the subdivision would generate 26 vehicles entering and 87 vehicles exiting the site during the weekday peak AM hour for a total of 113 vehicle trips, and 83 vehicles entering and 49 vehicles exiting during the peak PM hour for a total of 132 vehicle trips.
2. The site will have two accesses at the existing intersections of Lanark/Townline and Carleton/Townline. The accesses will have a separation of 75 m with each access allowing vehicles to enter and exit the site.
3. The Site Plan provides an efficient movement of traffic within the site for residents along with emergency and service vehicles.

4. Following full development of the subdivision, the expected 2026 and 2031 traffic would have a minor impact on the operation of the Lanark/Townline, Carleton/Townline, St. Paul/Townline and Ramsay/Townline intersections. All four intersections would operate at an acceptable level of service with no modifications recommended to the lane geometry or traffic controls of the intersections resulting from the expected traffic from the Carleton and Lanark Subdivision.

Prepared by:

*David J. Halpenny*

David J. Halpenny, M. Eng., P. Eng.



## **APPENDIX**

### **OPERATIONAL ANALYSIS WORK SHEETS**

### **LEFT TURN LANE WARRANT ANALYSIS**

## EXHIBIT 1 EXISTING WEEKDAY PEAK AM HOUR ANALYSIS – Lanark/Townline

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst								Intersection	Lanark/Townline									
Agency/Co.								Jurisdiction	Town of Carleton Place									
Date Performed	10/31/2022							East/West Street	Townline Road East									
Analysis Year	2021							North/South Street	Lanark Street									
Time Analyzed	Peak AM Hour							Peak Hour Factor	0.92									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Carleton and Lanark Subdivision																	
Lanes																		
<p style="text-align: center;">Major Street: East-West</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6			7	8	9			10	11	12
Number of Lanes	0	1	1	0	0	0	1	0			0	0	0			0	1	0
Configuration		L	T					TR								LR		
Volume (veh/h)		0	338				240	1								2		0
Percent Heavy Vehicles (%)		1														1		1
Proportion Time Blocked																		
Percent Grade (%)	0																	
Right Turn Channelized																		
Median Type   Storage	Undivided																	
Critical and Follow-up Headways																		
Base Critical Headway (sec)		4.1												7.1			6.2	
Critical Headway (sec)		4.11												6.41			6.21	
Base Follow-Up Headway (sec)		2.2												3.5			3.3	
Follow-Up Headway (sec)		2.21												3.51			3.31	
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)		0														2		
Capacity, c (veh/h)		1308														448		
v/c Ratio		0.00														0.00		
95% Queue Length, Q <sub>95</sub> (veh)		0.0														0.0		
Control Delay (s/veh)		7.8														13.1		
Level of Service (LOS)		A														B		
Approach Delay (s/veh)	0.0								13.1									
Approach LOS	A								B									

## EXHIBIT 2 EXISTING WEEKDAY PEAK PM HOUR ANALYSIS – Lanark/Townline

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Lanark/Townline							
Agency/Co.								Jurisdiction	Town of Carleton Place							
Date Performed	10/31/2022							East/West Street	Townline Road East							
Analysis Year	2021							North/South Street	Lanark Street							
Time Analyzed	Peak PM Hour							Peak Hour Factor	0.92							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Carleton and Lanark Subdivision															
Lanes																
<p style="text-align: center;">Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		1	255				390	5						1		4
Percent Heavy Vehicles (%)		1												1		1
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type   Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.11												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.21												3.51		3.31
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		1													5	
Capacity, c (veh/h)		1135													566	
v/c Ratio		0.00													0.01	
95% Queue Length, Q <sub>95</sub> (veh)		0.0													0.0	
Control Delay (s/veh)		8.2													11.4	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	0.0								11.4							
Approach LOS	A								B							

**EXHIBIT 3  
 2031 TRAFFIC SIGNAL WARRANT ANALYSIS - Lanark/Townline**

**MINIMUM WARRANTS FOR INSTALLATION OF TRAFFIC SIGNAL  
 USING PROJECTED VOLUME**

**Location** Lanark Street and Townline Road East **of** \_\_\_\_\_  
**(Roadway)** **(Intersecting Road)**

**Municipality** Town of Carleton Place **Projected Volume** Year 2031

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR 2 LANE HIGHWAYS		COMPLIANCE		
		2. FREE FLOW	3. RESTRICT. FLOW	SECTIONAL		4. ENTIRE %
				NUMBER	%	
1. VEHICULAR VOLUME	1. A. Vehicle volume all approaches (Average hour)	480	(720)	493	68	13%
	B. Vehicle volume, along minor roads, (Average hour)	120	(255) 170	32	13	
2. DELAY TO CROSS TRAFFIC	1. A. Vehicle volume, along artery (Average hour)	480	(720)	460	64	(25%)
	B. Combined vehicle and pedestrian volume crossing artery from minor roads, (Average hour)	50	(75)	19	25	

**Projected Average Hour - Use the sum of the AM and PM Peak volumes divided by 4**

**NOTES:**

1. Vehicle volume warrants (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction, should be 25% higher than the values given above.
2. Warrant values for free flow apply when the 85 percentile speed of artery traffic equals or exceeds 70 Km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000.
3. Warrant values for restricted flow apply to large urban communities when the 85 percentile speed of artery traffic does not exceed 70 Km/h.
4. The lowest sectional percentage governs the entire Warrant.
5. For "T" intersections the warrant values for minor road should be increased by 50 % (Warrant 1B only).
6. The crossing volumes are defined as:
  - (a) Left turns from both minor road approaches
  - (b) The heaviest through volume from the minor road
  - (c) 50% of the heavier left turn movement from major road when both of the following are met:
    - (i) the left turn volume > 120 vph.
    - (ii) the left turn volume plus the opposing volume > 720 vph.
  - (d) Pedestrians crossing the major road.

## EXHIBIT 4 2026 WEEKDAY PEAK AM HOUR ANALYSIS – Lanark/Townline

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst								Intersection	Lanark/Townline									
Agency/Co.								Jurisdiction	Town of Carleton Place									
Date Performed	10/31/2022							East/West Street	Townline Road East									
Analysis Year	2026							North/South Street	Lanark Street									
Time Analyzed	Peak AM Hour							Peak Hour Factor	0.92									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Carleton and Lanark Subdivision																	
Lanes																		
<p style="text-align: center;">Major Street: East-West</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6			7	8	9			10	11	12
Number of Lanes	0	1	1	0	0	0	1	0			0	0	0			0	1	0
Configuration		L	T					TR								LR		
Volume (veh/h)		5	370				269	8								25		16
Percent Heavy Vehicles (%)		1														1		1
Proportion Time Blocked																		
Percent Grade (%)	0																	
Right Turn Channelized																		
Median Type   Storage	Undivided																	
Critical and Follow-up Headways																		
Base Critical Headway (sec)		4.1												7.1			6.2	
Critical Headway (sec)		4.11												6.41			6.21	
Base Follow-Up Headway (sec)		2.2												3.5			3.3	
Follow-Up Headway (sec)		2.21												3.51			3.31	
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)		5														45		
Capacity, c (veh/h)		1266														488		
v/c Ratio		0.00														0.09		
95% Queue Length, Q <sub>95</sub> (veh)		0.0														0.3		
Control Delay (s/veh)		7.9														13.1		
Level of Service (LOS)		A														B		
Approach Delay (s/veh)	0.1								13.1									
Approach LOS	A								B									

## EXHIBIT 5 2026 WEEKDAY PEAK PM HOUR ANALYSIS – Lanark/Townline

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Lanark/Townline							
Agency/Co.								Jurisdiction	Town of Carleton Place							
Date Performed	10/31/2022							East/West Street	Townline Road East							
Analysis Year	2026							North/South Street	Lanark Street							
Time Analyzed	Peak PM Hour							Peak Hour Factor	0.92							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Carleton and Lanark Subdivision															
Lanes																
<p style="text-align: center;">Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		16	293				437	27						14		13
Percent Heavy Vehicles (%)		1												1		1
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type   Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.11												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.21												3.51		3.31
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		17													29	
Capacity, c (veh/h)		1065													416	
v/c Ratio		0.02													0.07	
95% Queue Length, Q <sub>95</sub> (veh)		0.0													0.2	
Control Delay (s/veh)		8.4													14.3	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	0.4								14.3							
Approach LOS	A								B							



## EXHIBIT 6 2031 WEEKDAY PEAK AM HOUR ANALYSIS – Lanark/Townline

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst								Intersection	Lanark/Townline									
Agency/Co.								Jurisdiction	Town of Carleton Place									
Date Performed	10/31/2022							East/West Street	Townline Road East									
Analysis Year	2031							North/South Street	Lanark Street									
Time Analyzed	Peak AM Hour							Peak Hour Factor	0.92									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Carleton and Lanark Subdivision																	
Lanes																		
<p style="text-align: center;">Major Street: East-West</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6			7	8	9			10	11	12
Number of Lanes	0	1	1	0	0	0	1	0			0	0	0			0	1	0
Configuration		L	T					TR								LR		
Volume (veh/h)		10	466				345	15								49		31
Percent Heavy Vehicles (%)		1														1		1
Proportion Time Blocked																		
Percent Grade (%)	0																	
Right Turn Channelized																		
Median Type   Storage	Undivided																	
Critical and Follow-up Headways																		
Base Critical Headway (sec)		4.1												7.1			6.2	
Critical Headway (sec)		4.11												6.41			6.21	
Base Follow-Up Headway (sec)		2.2												3.5			3.3	
Follow-Up Headway (sec)		2.21												3.51			3.31	
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)		11															87	
Capacity, c (veh/h)		1173															384	
v/c Ratio		0.01															0.23	
95% Queue Length, Q <sub>95</sub> (veh)		0.0															0.9	
Control Delay (s/veh)		8.1															17.1	
Level of Service (LOS)		A															C	
Approach Delay (s/veh)	0.2								17.1									
Approach LOS	C								C									

## EXHIBIT 7 2031 WEEKDAY PEAK PM HOUR ANALYSIS – Lanark/Townline

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Lanark/Townline							
Agency/Co.								Jurisdiction	Town of Carleton Place							
Date Performed	10/31/2022							East/West Street	Townline Road East							
Analysis Year	2031							North/South Street	Lanark Street							
Time Analyzed	Peak PM Hour							Peak Hour Factor	0.92							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Carleton and Lanark Subdivision															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		31	361				563	50						27		22
Percent Heavy Vehicles (%)		1												1		1
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type   Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.11												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.21												3.51		3.31
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		34													53	
Capacity, c (veh/h)		928													298	
v/c Ratio		0.04													0.18	
95% Queue Length, Q <sub>95</sub> (veh)		0.1													0.6	
Control Delay (s/veh)		9.0													19.7	
Level of Service (LOS)		A													C	
Approach Delay (s/veh)	0.7								19.7							
Approach LOS	C								C							

## EXHIBIT 8 EXISTING WEEKDAY PEAK AM HOUR ANALYSIS – Carleton/Townline

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Carleton/Townline							
Agency/Co.								Jurisdiction	Town of Carleton Place							
Date Performed	10/31/2022							East/West Street	Townline Road East							
Analysis Year	2021							North/South Street	Carleton Street							
Time Analyzed	Peak AM Hour							Peak Hour Factor	0.92							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Carleton and Lanark Subdivision															
Lanes																
<p style="text-align: center;">Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		1	340				241	0						2		0
Percent Heavy Vehicles (%)		1												1		1
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type   Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.11												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.21												3.51		3.31
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		1													2	
Capacity, c (veh/h)		1308													445	
v/c Ratio		0.00													0.00	
95% Queue Length, Q <sub>95</sub> (veh)		0.0													0.0	
Control Delay (s/veh)		7.8													13.1	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	0.0								13.1							
Approach LOS	A								B							

## EXHIBIT 9 EXISTING WEEKDAY PEAK PM HOUR ANALYSIS – Carleton/Townline

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Carleton/Townline							
Agency/Co.								Jurisdiction	Town of Carleton Place							
Date Performed	10/31/2022							East/West Street	Townline Road East							
Analysis Year	2021							North/South Street	Carleton Street							
Time Analyzed	Peak PM Hour							Peak Hour Factor	0.92							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Carleton and Lanark Subdivision															
Lanes																
<p style="text-align: center;">Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		0	257				398	1						1		0
Percent Heavy Vehicles (%)		1												1		1
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type   Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.11												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.21												3.51		3.31
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		0													1	
Capacity, c (veh/h)		1131													400	
v/c Ratio		0.00													0.00	
95% Queue Length, Q <sub>95</sub> (veh)		0.0													0.0	
Control Delay (s/veh)		8.2													14.0	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	0.0								14.0							
Approach LOS	A								B							

**EXHIBIT 10**  
**2031 TRAFFIC SIGNAL WARRANT ANALYSIS - Carleton/Townline**

**MINIMUM WARRANTS FOR INSTALLATION OF TRAFFIC SIGNAL  
 USING PROJECTED VOLUME**

**Location** Carleton Street and Townline Road East **of** .....  
**(Roadway)** ..... **(Intersecting Road)** .....

**Municipality** Town of Carleton Place **Projected Volume** Year 2031 .....

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR 2 LANE HIGHWAYS		COMPLIANCE		
		2. FREE FLOW	3. RESTRICT. FLOW	SECTIONAL		4. ENTIRE %
				NUMBER	%	
1. VEHICULAR VOLUME	1. A. Vehicle volume all approaches (Average hour)	480	720	492	68	8%
	B. Vehicle volume, along minor roads, (Average hour)	120	255 170	20	8	
2. DELAY TO CROSS TRAFFIC	1. A. Vehicle volume, along artery (Average hour)	480	720	472	66	16%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads, (Average hour)	50	75	12	16	

**Projected Average Hour - Use the sum of the AM and PM Peak volumes divided by 4**

**NOTES:**

1. Vehicle volume warrants (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction, should be 25% higher than the values given above.
2. Warrant values for free flow apply when the 85 percentile speed of artery traffic equals or exceeds 70 Km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000.
3. Warrant values for restricted flow apply to large urban communities when the 85 percentile speed of artery traffic does not exceed 70 Km/h.
4. The lowest sectional percentage governs the entire Warrant.
5. For "T" intersections the warrant values for minor road should be increased by 50 % (Warrant 1B only).
6. The crossing volumes are defined as:
  - (a) Left turns from both minor road approaches
  - (b) The heaviest through volume from the minor road
  - (c) 50% of the heavier left turn movement from major road when both of the following are met:
    - (i) the left turn volume > 120 vph.
    - (ii) the left turn volume plus the opposing volume > 720 vph.
  - (d) Pedestrians crossing the major road.

## EXHIBIT 11 2026 WEEKDAY PEAK AM HOUR ANALYSIS – Carleton/Townline

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst								Intersection	Carleton/Townline									
Agency/Co.								Jurisdiction	Town of Carleton Place									
Date Performed	10/31/2022							East/West Street	Townline Road East									
Analysis Year	2026							North/South Street	Carleton Street									
Time Analyzed	Peak AM Hour							Peak Hour Factor	0.92									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Carleton and Lanark Subdivision																	
Lanes																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6			7	8	9			10	11	12
Number of Lanes	0	1	1	0	0	0	1	0			0	0	0			0	1	0
Configuration		L	T					TR								LR		
Volume (veh/h)		7	389				258	8								31		19
Percent Heavy Vehicles (%)		1														1		1
Proportion Time Blocked																		
Percent Grade (%)	0																	
Right Turn Channelized																		
Median Type   Storage	Undivided																	
Critical and Follow-up Headways																		
Base Critical Headway (sec)		4.1												7.1			6.2	
Critical Headway (sec)		4.11												6.41			6.21	
Base Follow-Up Headway (sec)		2.2												3.5			3.3	
Follow-Up Headway (sec)		2.21												3.51			3.31	
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)		8														54		
Capacity, c (veh/h)		1279														480		
v/c Ratio		0.01														0.11		
95% Queue Length, Q <sub>95</sub> (veh)		0.0														0.4		
Control Delay (s/veh)		7.8														13.5		
Level of Service (LOS)		A														B		
Approach Delay (s/veh)	0.1							13.5										
Approach LOS	A							B										

## EXHIBIT 12 2026 WEEKDAY PEAK PM HOUR ANALYSIS – Carleton/Townline

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Carleton/Townline							
Agency/Co.								Jurisdiction	Town of Carleton Place							
Date Performed	10/31/2022							East/West Street	Townline Road East							
Analysis Year	2026							North/South Street	Carleton Street							
Time Analyzed	Peak PM Hour							Peak Hour Factor	0.92							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Carleton and Lanark Subdivision															
Lanes																
<p style="text-align: center;">Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		18	290				456	29						17		11
Percent Heavy Vehicles (%)		1												1		1
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type   Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.11												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.21												3.51		3.31
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		20													30	
Capacity, c (veh/h)		1045													385	
v/c Ratio		0.02													0.08	
95% Queue Length, Q <sub>95</sub> (veh)		0.1													0.3	
Control Delay (s/veh)		8.5													15.2	
Level of Service (LOS)		A													C	
Approach Delay (s/veh)	0.5								15.2							
Approach LOS	C								C							

## EXHIBIT 13 2031 WEEKDAY PEAK AM HOUR ANALYSIS – Carleton/Townline

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	Carleton/Townline							
Agency/Co.								Jurisdiction	Town of Carleton Place							
Date Performed	10/31/2022							East/West Street	Townline Road East							
Analysis Year	2031							North/South Street	Carleton Street							
Time Analyzed	Peak AM Hour							Peak Hour Factor	0.92							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Carleton and Lanark Subdivision															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		7	509				341	8						31		19
Percent Heavy Vehicles (%)		1												1		1
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type   Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.11												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.21												3.51		3.31
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		8													54	
Capacity, c (veh/h)		1185													371	
v/c Ratio		0.01													0.15	
95% Queue Length, Q <sub>95</sub> (veh)		0.0													0.5	
Control Delay (s/veh)		8.1													16.4	
Level of Service (LOS)		A													C	
Approach Delay (s/veh)	0.1								16.4							
Approach LOS	C								C							



## EXHIBIT 14 2031 WEEKDAY PEAK PM HOUR ANALYSIS – Carleton/Townline

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst								Intersection	Carleton/Townline									
Agency/Co.								Jurisdiction	Town of Carleton Place									
Date Performed	10/31/2022							East/West Street	Townline Road East									
Analysis Year	2031							North/South Street	Carleton Street									
Time Analyzed	Peak PM Hour							Peak Hour Factor	0.92									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Carleton and Lanark Subdivision																	
Lanes																		
<p style="text-align: center;">Major Street: East-West</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6			7	8	9			10	11	12
Number of Lanes	0	1	1	0	0	0	1	0			0	0	0			0	1	0
Configuration		L	T					TR								LR		
Volume (veh/h)		18	371				605	29								17		11
Percent Heavy Vehicles (%)		1														1		1
Proportion Time Blocked																		
Percent Grade (%)																0		
Right Turn Channelized																		
Median Type   Storage					Undivided													
Critical and Follow-up Headways																		
Base Critical Headway (sec)		4.1													7.1		6.2	
Critical Headway (sec)		4.11													6.41		6.21	
Base Follow-Up Headway (sec)		2.2													3.5		3.3	
Follow-Up Headway (sec)		2.21													3.51		3.31	
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)		20													30			
Capacity, c (veh/h)		910													282			
v/c Ratio		0.02													0.11			
95% Queue Length, Q <sub>95</sub> (veh)		0.1													0.4			
Control Delay (s/veh)		9.0													19.3			
Level of Service (LOS)		A													C			
Approach Delay (s/veh)		0.4													19.3			
Approach LOS															C			

## EXHIBIT 15 EXISTING WEEKDAY PEAK AM HOUR ANALYSIS – St. Paul/Townline

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst								Intersection	St. Paul/Townline									
Agency/Co.								Jurisdiction	Town of Carleton Place									
Date Performed	10/31/2022							East/West Street	Townline Road East									
Analysis Year	2021							North/South Street	St. Paul Street									
Time Analyzed	Peak AM Hour							Peak Hour Factor	0.92									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Carleton and Lanark Subdivision																	
Lanes																		
<p style="text-align: center;">Major Street: East-West</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12			
Number of Lanes	0	0	1	0	0	1	1	0	0	1	0		0	0	0			
Configuration					TR	L	T						LR					
Volume (veh/h)					333	1	0	240					1	5				
Percent Heavy Vehicles (%)									1					1	1			
Proportion Time Blocked																		
Percent Grade (%)	0																	
Right Turn Channelized																		
Median Type   Storage	Undivided																	
Critical and Follow-up Headways																		
Base Critical Headway (sec)					4.1				7.1				6.2					
Critical Headway (sec)					4.11				6.41				6.21					
Base Follow-Up Headway (sec)					2.2				3.5				3.3					
Follow-Up Headway (sec)					2.21				3.51				3.31					
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)					0				7									
Capacity, c (veh/h)					1201				630									
v/c Ratio					0.00				0.01									
95% Queue Length, Q <sub>95</sub> (veh)					0.0				0.0									
Control Delay (s/veh)					8.0				10.8									
Level of Service (LOS)					A				B									
Approach Delay (s/veh)					0.0				10.8									
Approach LOS									B									

## EXHIBIT 16 EXISTING WEEKDAY PEAK PM HOUR ANALYSIS – St. Paul/Townline

HCS7 Two-Way Stop-Control Report																			
General Information								Site Information											
Analyst								Intersection	St. Paul/Townline										
Agency/Co.								Jurisdiction	Town of Carleton Place										
Date Performed	10/31/2022							East/West Street	Townline Road East										
Analysis Year	2021							North/South Street	St. Paul Street										
Time Analyzed	Peak PM Hour							Peak Hour Factor	0.92										
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25										
Project Description	Carleton and Lanark Subdivision																		
Lanes																			
<p style="text-align: center;">Major Street: East-West</p>																			
Vehicle Volumes and Adjustments																			
Approach	Eastbound				Westbound				Northbound				Southbound						
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R			
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12				
Number of Lanes	0	0	1	0	0	1	1	0	0	1	0		0	0	0				
Configuration					TR	L	T						LR						
Volume (veh/h)					255	2	6	388					1		1				
Percent Heavy Vehicles (%)									1					1		1			
Proportion Time Blocked																			
Percent Grade (%)	0																		
Right Turn Channelized																			
Median Type   Storage	Undivided																		
Critical and Follow-up Headways																			
Base Critical Headway (sec)					4.1				7.1				6.2						
Critical Headway (sec)					4.11				6.41				6.21						
Base Follow-Up Headway (sec)					2.2				3.5				3.3						
Follow-Up Headway (sec)					2.21				3.51				3.31						
Delay, Queue Length, and Level of Service																			
Flow Rate, v (veh/h)					7				2										
Capacity, c (veh/h)					1289				523										
v/c Ratio					0.01				0.00										
95% Queue Length, Q <sub>95</sub> (veh)					0.0				0.0										
Control Delay (s/veh)					7.8				11.9										
Level of Service (LOS)					A				B										
Approach Delay (s/veh)					0.1				11.9										
Approach LOS									B										

## EXHIBIT 17 2026 WEEKDAY PEAK AM HOUR ANALYSIS – St. Paul/Townline

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst								Intersection	St. Paul/Townline									
Agency/Co.								Jurisdiction	Town of Carleton Place									
Date Performed	10/31/2022							East/West Street	Townline Road East									
Analysis Year	2026							North/South Street	St. Paul Street									
Time Analyzed	Peak AM Hour							Peak Hour Factor	0.92									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Carleton and Lanark Subdivision																	
Lanes																		
<p style="text-align: center;">Major Street: East-West</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12			
Number of Lanes	0	0	1	0	0	1	1	0	0	1	0		0	0	0			
Configuration					TR	L	T						LR					
Volume (veh/h)					370	1	0	285					1	5				
Percent Heavy Vehicles (%)									1					1	1			
Proportion Time Blocked																		
Percent Grade (%)	0																	
Right Turn Channelized																		
Median Type   Storage	Undivided																	
Critical and Follow-up Headways																		
Base Critical Headway (sec)					4.1				7.1				6.2					
Critical Headway (sec)					4.11				6.41				6.21					
Base Follow-Up Headway (sec)					2.2				3.5				3.3					
Follow-Up Headway (sec)					2.21				3.51				3.31					
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)					0				7									
Capacity, c (veh/h)					1161				589									
v/c Ratio					0.00				0.01									
95% Queue Length, Q <sub>95</sub> (veh)					0.0				0.0									
Control Delay (s/veh)					8.1				11.2									
Level of Service (LOS)					A				B									
Approach Delay (s/veh)					0.0				11.2									
Approach LOS									B									

## EXHIBIT 18 2026 WEEKDAY PEAK PM HOUR ANALYSIS – St. Paul/Townline

HCS7 Two-Way Stop-Control Report																			
General Information								Site Information											
Analyst								Intersection	St. Paul/Townline										
Agency/Co.								Jurisdiction	Town of Carleton Place										
Date Performed	10/31/2022							East/West Street	Townline Road East										
Analysis Year	2026							North/South Street	St. Paul Street										
Time Analyzed	Peak PM Hour							Peak Hour Factor	0.92										
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25										
Project Description	Carleton and Lanark Subdivision																		
Lanes																			
<p style="text-align: center;">Major Street: East-West</p>																			
Vehicle Volumes and Adjustments																			
Approach	Eastbound				Westbound				Northbound				Southbound						
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R			
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12				
Number of Lanes	0	0	1	0	0	1	1	0	0	1	0		0	0	0				
Configuration					TR	L	T						LR						
Volume (veh/h)					308	2	6	444					1		1				
Percent Heavy Vehicles (%)									1					1		1			
Proportion Time Blocked																			
Percent Grade (%)	0																		
Right Turn Channelized																			
Median Type   Storage	Undivided																		
Critical and Follow-up Headways																			
Base Critical Headway (sec)					4.1				7.1				6.2						
Critical Headway (sec)					4.11				6.41				6.21						
Base Follow-Up Headway (sec)					2.2				3.5				3.3						
Follow-Up Headway (sec)					2.21				3.51				3.31						
Delay, Queue Length, and Level of Service																			
Flow Rate, v (veh/h)					7				2										
Capacity, c (veh/h)					1228				458										
v/c Ratio					0.01				0.00										
95% Queue Length, Q <sub>95</sub> (veh)					0.0				0.0										
Control Delay (s/veh)					7.9				12.9										
Level of Service (LOS)					A				B										
Approach Delay (s/veh)					0.1				12.9										
Approach LOS									B										

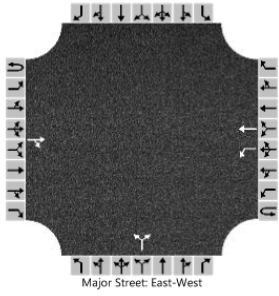
## EXHIBIT 19 2031 WEEKDAY PEAK AM HOUR ANALYSIS – St. Paul/Townline

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	St. Paul/Townline							
Agency/Co.								Jurisdiction	Town of Carleton Place							
Date Performed	10/31/2022							East/West Street	Townline Road East							
Analysis Year	2031							North/South Street	St. Paul Street							
Time Analyzed	Peak AM Hour							Peak Hour Factor	0.92							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Carleton and Lanark Subdivision															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12	
Number of Lanes	0	0	1	0	0	1	1	0	0	1	0		0	0	0	
Configuration					TR	L	T						LR			
Volume (veh/h)					471	1			0	376			1		5	
Percent Heavy Vehicles (%)									1				1		1	
Proportion Time Blocked																
Percent Grade (%)	0															
Right Turn Channelized																
Median Type   Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)					4.1				7.1				6.2			
Critical Headway (sec)					4.11				6.41				6.21			
Base Follow-Up Headway (sec)					2.2				3.5				3.3			
Follow-Up Headway (sec)					2.21				3.51				3.31			
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)					0				7							
Capacity, c (veh/h)					1058				492							
v/c Ratio					0.00				0.01							
95% Queue Length, Q <sub>95</sub> (veh)					0.0				0.0							
Control Delay (s/veh)					8.4				12.4							
Level of Service (LOS)					A				B							
Approach Delay (s/veh)					0.0				12.4							
Approach LOS									B							

## EXHIBIT 20 2031 WEEKDAY PEAK PM HOUR ANALYSIS – St. Paul/Townline

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst								Intersection	St. Paul/Townline							
Agency/Co.								Jurisdiction	Town of Carleton Place							
Date Performed	10/31/2022							East/West Street	Townline Road East							
Analysis Year	2031							North/South Street	St. Paul Street							
Time Analyzed	Peak PM Hour							Peak Hour Factor	0.92							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Carleton and Lanark Subdivision															
Lanes																
<p style="text-align: center;">Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12	
Number of Lanes	0	0	1	0	0	1	1	0	0	1	0		0	0	0	
Configuration				TR		L	T				LR					
Volume (veh/h)			391	2		6	579			1		1				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type   Storage					Undivided											
Critical and Follow-up Headways																
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.11				6.41		6.21				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.21				3.51		3.31				
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)						7				2						
Capacity, c (veh/h)						1138				353						
v/c Ratio						0.01				0.01						
95% Queue Length, Q <sub>95</sub> (veh)						0.0				0.0						
Control Delay (s/veh)						8.2				15.3						
Level of Service (LOS)						A				C						
Approach Delay (s/veh)						0.1				15.3						
Approach LOS										C						

## EXHIBIT 21 EXISTING WEEKDAY PEAK AM HOUR ANALYSIS – Ramsay/Townline

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst								Intersection	Ramsay/Townline									
Agency/Co.								Jurisdiction	Town of Carleton Place									
Date Performed	10/31/2022							East/West Street	Townline Road East									
Analysis Year	2021							North/South Street	Ramsay Street									
Time Analyzed	Peak AM Hour							Peak Hour Factor	0.92									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Carleton and Lanark Subdivision																	
Lanes																		
 <p>Major Street: East-West</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12			
Number of Lanes	0	0	1	0	0	1	1	0	0	1	0		0	0	0			
Configuration					TR	L	T						LR					
Volume (veh/h)					340	0	0	241					0	1				
Percent Heavy Vehicles (%)									1					1	1			
Proportion Time Blocked																		
Percent Grade (%)	0																	
Right Turn Channelized																		
Median Type   Storage	Undivided																	
Critical and Follow-up Headways																		
Base Critical Headway (sec)					4.1				7.1				6.2					
Critical Headway (sec)					4.11				6.41				6.21					
Base Follow-Up Headway (sec)					2.2				3.5				3.3					
Follow-Up Headway (sec)					2.21				3.51				3.31					
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)					0				1									
Capacity, c (veh/h)					1194				678									
v/c Ratio					0.00				0.00									
95% Queue Length, Q <sub>95</sub> (veh)					0.0				0.0									
Control Delay (s/veh)					8.0				10.3									
Level of Service (LOS)					A				B									
Approach Delay (s/veh)					0.0				10.3									
Approach LOS									B									



## EXHIBIT 22 EXISTING WEEKDAY PEAK PM HOUR ANALYSIS – Ramsay/Townline

HCS7 Two-Way Stop-Control Report																			
General Information								Site Information											
Analyst								Intersection	Ramsay/Townline										
Agency/Co.								Jurisdiction	Town of Carleton Place										
Date Performed	10/31/2022							East/West Street	Townline Road East										
Analysis Year	2021							North/South Street	Ramsay Street										
Time Analyzed	Peak PM Hour							Peak Hour Factor	0.92										
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25										
Project Description	Carleton and Lanark Subdivision																		
Lanes																			
<p style="text-align: center;">Major Street: East-West</p>																			
Vehicle Volumes and Adjustments																			
Approach	Eastbound				Westbound				Northbound				Southbound						
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R			
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12				
Number of Lanes	0	0	1	0	0	1	1	0	0	1	0		0	0	0				
Configuration					TR	L	T						LR						
Volume (veh/h)					256	0	6	392					3		1				
Percent Heavy Vehicles (%)									1					1		1			
Proportion Time Blocked																			
Percent Grade (%)	0																		
Right Turn Channelized																			
Median Type   Storage	Undivided																		
Critical and Follow-up Headways																			
Base Critical Headway (sec)					4.1				7.1				6.2						
Critical Headway (sec)					4.11				6.41				6.21						
Base Follow-Up Headway (sec)					2.2				3.5				3.3						
Follow-Up Headway (sec)					2.21				3.51				3.31						
Delay, Queue Length, and Level of Service																			
Flow Rate, v (veh/h)					7				4										
Capacity, c (veh/h)					1290				450										
v/c Ratio					0.01				0.01										
95% Queue Length, Q <sub>95</sub> (veh)					0.0				0.0										
Control Delay (s/veh)					7.8				13.1										
Level of Service (LOS)					A				B										
Approach Delay (s/veh)					0.1				13.1										
Approach LOS									B										

## EXHIBIT 23 2026 WEEKDAY PEAK AM HOUR ANALYSIS – Ramsay/Townline

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst								Intersection	Ramsay/Townline									
Agency/Co.								Jurisdiction	Town of Carleton Place									
Date Performed	10/31/2022							East/West Street	Townline Road East									
Analysis Year	2026							North/South Street	Ramsay Street									
Time Analyzed	Peak AM Hour							Peak Hour Factor	0.92									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Carleton and Lanark Subdivision																	
Lanes																		
<p style="text-align: center;">Major Street: East-West</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12			
Number of Lanes	0	0	1	0	0	1	1	0	0	1	0		0	0	0			
Configuration					TR	L	T						LR					
Volume (veh/h)					395	0	0	277					0	1				
Percent Heavy Vehicles (%)									1					1	1			
Proportion Time Blocked																		
Percent Grade (%)	0																	
Right Turn Channelized																		
Median Type   Storage	Undivided																	
Critical and Follow-up Headways																		
Base Critical Headway (sec)					4.1				7.1				6.2					
Critical Headway (sec)					4.11				6.41				6.21					
Base Follow-Up Headway (sec)					2.2				3.5				3.3					
Follow-Up Headway (sec)					2.21				3.51				3.31					
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)					0				1									
Capacity, c (veh/h)					1135				628									
v/c Ratio					0.00				0.00									
95% Queue Length, Q <sub>95</sub> (veh)					0.0				0.0									
Control Delay (s/veh)					8.2				10.7									
Level of Service (LOS)					A				B									
Approach Delay (s/veh)					0.0				10.7									
Approach LOS									B									

## EXHIBIT 24 2026 WEEKDAY PEAK PM HOUR ANALYSIS – Ramsay/Townline

HCS7 Two-Way Stop-Control Report																			
General Information								Site Information											
Analyst								Intersection	Ramsay/Townline										
Agency/Co.								Jurisdiction	Town of Carleton Place										
Date Performed	10/31/2022							East/West Street	Townline Road East										
Analysis Year	2026							North/South Street	Ramsay Street										
Time Analyzed	Peak PM Hour							Peak Hour Factor	0.92										
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25										
Project Description	Carleton and Lanark Subdivision																		
Lanes																			
<p style="text-align: center;">Major Street: East-West</p>																			
Vehicle Volumes and Adjustments																			
Approach	Eastbound				Westbound				Northbound				Southbound						
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R			
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12				
Number of Lanes	0	0	1	0	0	1	1	0	0	1	0		0	0	0				
Configuration					TR	L	T						LR						
Volume (veh/h)					307	0	6	461					3		1				
Percent Heavy Vehicles (%)									1					1		1			
Proportion Time Blocked																			
Percent Grade (%)	0																		
Right Turn Channelized																			
Median Type   Storage	Undivided																		
Critical and Follow-up Headways																			
Base Critical Headway (sec)					4.1				7.1				6.2						
Critical Headway (sec)					4.11				6.41				6.21						
Base Follow-Up Headway (sec)					2.2				3.5				3.3						
Follow-Up Headway (sec)					2.21				3.51				3.31						
Delay, Queue Length, and Level of Service																			
Flow Rate, v (veh/h)					7				4										
Capacity, c (veh/h)					1231				382										
v/c Ratio					0.01				0.01										
95% Queue Length, Q <sub>95</sub> (veh)					0.0				0.0										
Control Delay (s/veh)					7.9				14.5										
Level of Service (LOS)					A				B										
Approach Delay (s/veh)					0.1				14.5										
Approach LOS									B										

## EXHIBIT 25 2031 WEEKDAY PEAK AM HOUR ANALYSIS – Ramsay/Townline

HCS7 Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst								Intersection	Ramsay/Townline									
Agency/Co.								Jurisdiction	Town of Carleton Place									
Date Performed	10/31/2022							East/West Street	Townline Road East									
Analysis Year	2031							North/South Street	Ramsay Street									
Time Analyzed	Peak AM Hour							Peak Hour Factor	0.92									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Carleton and Lanark Subdivision																	
Lanes																		
<p>Major Street: East-West</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12			
Number of Lanes	0	0	1	0	0	1	1	0	0	1	0		0	0	0			
Configuration					TR	L	T						LR					
Volume (veh/h)					515	0	0	360					0	1				
Percent Heavy Vehicles (%)									1					1	1			
Proportion Time Blocked																		
Percent Grade (%)	0																	
Right Turn Channelized																		
Median Type   Storage	Undivided																	
Critical and Follow-up Headways																		
Base Critical Headway (sec)					4.1				7.1				6.2					
Critical Headway (sec)					4.11				6.41				6.21					
Base Follow-Up Headway (sec)					2.2				3.5				3.3					
Follow-Up Headway (sec)					2.21				3.51				3.31					
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)					0				1									
Capacity, c (veh/h)					1016				530									
v/c Ratio					0.00				0.00									
95% Queue Length, Q <sub>95</sub> (veh)					0.0				0.0									
Control Delay (s/veh)					8.5				11.8									
Level of Service (LOS)					A				B									
Approach Delay (s/veh)					0.0				11.8									
Approach LOS									B									

## EXHIBIT 26 2031 WEEKDAY PEAK PM HOUR ANALYSIS – Ramsay/Townline

HCS Two-Way Stop-Control Report																		
General Information								Site Information										
Analyst								Intersection	Ramsay/Townline									
Agency/Co.								Jurisdiction	Town of Carleton Place									
Date Performed	10/31/2022							East/West Street	Townline Road East									
Analysis Year	2031							North/South Street	Ramsay Street									
Time Analyzed	Peak PM Hour							Peak Hour Factor	0.92									
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25									
Project Description	Carleton and Lanark Subdivision																	
Lanes																		
<p style="text-align: center;">Major Street: East-West</p>																		
Vehicle Volumes and Adjustments																		
Approach	Eastbound				Westbound				Northbound				Southbound					
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Priority	1U	1	2	3	4U	4	5	6			7	8	9			10	11	12
Number of Lanes	0	0	1	0	0	1	1	0			0	1	0			0	0	0
Configuration				TR	L	T					LR							
Volume (veh/h)			388	0	6	610					3		1					
Percent Heavy Vehicles (%)					1						1		1					
Proportion Time Blocked																		
Percent Grade (%)											0							
Right Turn Channelized																		
Median Type   Storage					Undivided													
Critical and Follow-up Headways																		
Base Critical Headway (sec)						4.1					7.1		6.2					
Critical Headway (sec)						4.11					6.41		6.21					
Base Follow-Up Headway (sec)						2.2					3.5		3.3					
Follow-Up Headway (sec)						2.21					3.51		3.31					
Delay, Queue Length, and Level of Service																		
Flow Rate, v (veh/h)						7					4							
Capacity, c (veh/h)						1143					279							
v/c Ratio						0.01					0.02							
95% Queue Length, Q <sub>95</sub> (veh)						0.0					0.0							
Control Delay (s/veh)						8.2					18.1							
Level of Service (LOS)						A					C							
Approach Delay (s/veh)						0.1					18.1							
Approach LOS						A					C							