HANLEY PARK NORTH SUBDIVISION
EAST OF HAIG ROAD
BELLEVILLE, ONTARIO

TRAFFIC IMPACT STUDY

November 25, 2020

D. J. Halpenny & Associates Ltd.
Consulting Transportation Engineers
P. O. Box 774, Manotick, Ontario K4M 1A7

HANLEY PARK NORTH SUBDIVISION
EAST OF HAIG ROAD
BELLEVILLE, ONTARIO

TRAFFIC IMPACT STUDY

November 25, 2020

Prepared for:

Hanley Park Developments Inc.
1058A Albion Road, Suite 207
Etobicoke, ON M9V 1A7

729 TIS Report_1.doc

D. J. Halpenny & Associates Ltd.
Consulting Transportation Engineers
P.O. Box 774, Manotick, ON K4M 1A7 - Tel (613) 692-8662 - Fax (613) 692-1945

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

HANLEY PARK NORTH SUBDIVISION
EAST OF HAIG ROAD
BELLEVILLE, ONTARIO

TRAFFIC IMPACT STUDY

1. INTRODUCTION

A Site Plan has been prepared for a development of a 35.16 ha parcel of vacant land at the east end of the City of Belleville in the County of Hastings. The subdivision will be located east of Haig Road and north of Victoria Avenue. The subdivision will consist of 99 single-family homes and 57 townhouses for a total of 156 dwelling units. The subdivision will be constructed in phases which will be dependent on market demands. Completion is expected by 2029. Figure 1.1 shows the location of the subdivision.

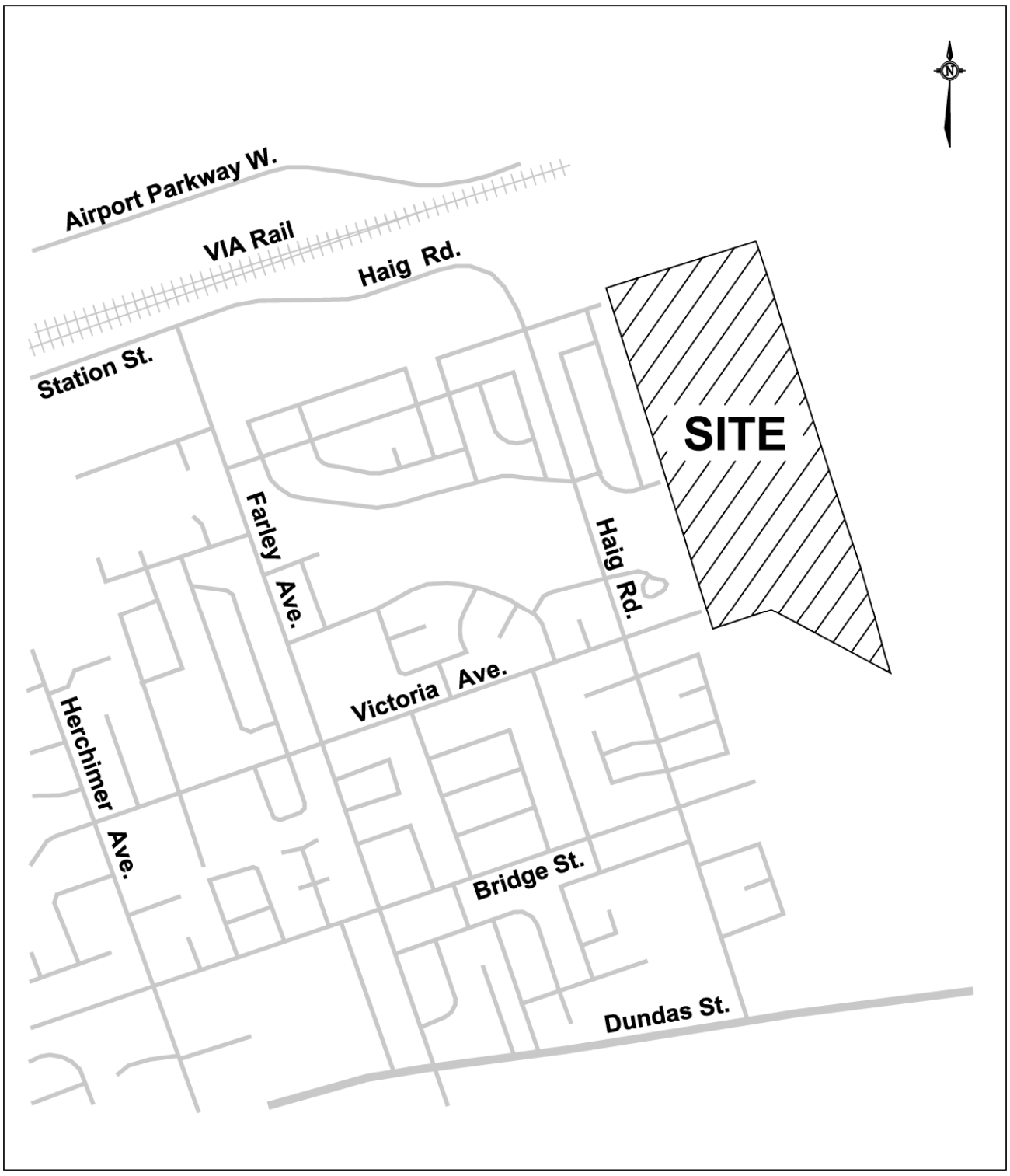
The subdivision will be known as Hanley Park North and will have two access points onto the municipal road network. The first access will be from Street A onto Haig Road by way of the local streets of Tessa Boulevard and Oak Ridge Boulevard. The intersection of Oak Ridge Boulevard and Haig Road is controlled by all-way stop signs. The second will be from Spruce Gardens onto Haig Road which is an all-way stop controlled intersection serving 6 single-family homes.

The firm of D. J. Halpenny & Associates Ltd. has been retained by Hanley Park Developments Inc. to prepare a Traffic Impact Study report for the subdivision in support of the Draft Plan of Subdivision Application. The report will examine the impact that the site will have on the operation of the adjacent roads and intersections, and identify modifications to the road network which would be triggered by the subdivision.

1.1 Purpose and Scope of Work

The purpose of the Traffic Impact Study (TIS) will be to examine the major intersections within the study area which would be impacted by the expected trips from the proposed Hanley Park North Subdivision. Following correspondence with staff of the City of Belleville, the study area will consist of the Oak Ridge/Haig intersection which will be the main access point to the subdivision, and the Victoria/Haig intersection which will be the first major intersection south of the site. The Spruce Gardens/Haig intersection would access only 6 homes and will not be examined in the study. The analysis will be conducted for the existing 2020 traffic, and traffic at both the completion of the subdivision in the year 2029 and at the year 2034 which represents five years beyond completion. The time period would be for the weekday peak AM and PM hours, which are expected to be the peak traffic periods for the residents of the subdivision and of the background traffic.

FIGURE 1.1
SITE LOCATION PLAN



NOT TO SCALE

2. ADJACENT ROADS AND INTERSECTIONS

Roadways

Street A of the subdivision will connect to Haig Road by way of Tessa Boulevard and Oak Ridge Boulevard, both which are two lane urban local streets. Oak Ridge Boulevard is located approximately 390 m north of Victoria Avenue. Both streets will have a pavement width of 8.0 m with a sidewalk along one side of the road. The speed limit is unposted with no parking restrictions along either road.

Haig Road is a north-south two lane collector road with a pavement width of 11.0 m. Haig Road has been extended in 2019 from Spruce Gardens to connect to Station Street at Farley Avenue. Sidewalks exist along both sides of the road and the speed limit is unposted at 50 km,/h. On-street parking is restricted along the west side of the road from Oak Ridge Boulevard south to Dundas Street. Along the east side parking is restricted between Oak Ridge Boulevard and Briarwood Crescent. Cycling lanes are provided along both sides of the road north from Oak Ridge Boulevard to Farley Avenue. Truck travel is prohibited north of Victoria Avenue to east of Farley Avenue.

Victoria Avenue is an east-west arterial road connecting to Front Street to the west and extends approximately 180 m east of Haig Road. Victoria Avenue is a two lane urban road with sidewalks along both sides of the road. On-street parking is permitted on both sides of the road. The speed limit is unposted at 50 km./h.

Intersections

The intersection of Oak Ridge Boulevard and Haig Road is an all-way stop controlled intersection with Haig Road forming the northbound and southbound approaches.

OAK RIDGE/HAIG INTERSECTION - Northbound Haig Rd. Approach

OAK RIDGE/HAIG INTERSECTION - Westbound Oak Ridge Blvd. Approach

The following shows the lane configuration of the intersection:

Northbound Haig Road	One shared left/through/right lane (Stop Sign)
Southbound Haig Road	One shared left/through/right lane (Stop Sign)
Eastbound Oak Ridge Blvd.	One shared left/through/right lane (Stop Sign)
Westbound Oak Ridge Blvd.	One shared left/through/right lane (Stop Sign)

The Victoria/Haig Intersection is a two-way stop controlled intersection with Haig Road forming the north-south approaches and Victoria Avenue the east-west approaches.

VICTORIA/HAIG INTERSECTION - Northbound Haig Rd. Approach

VICTORIA/HAIG INTERSECTION - Eastbound Victoria Ave. Approach

The following shows the lane configuration of the intersection:

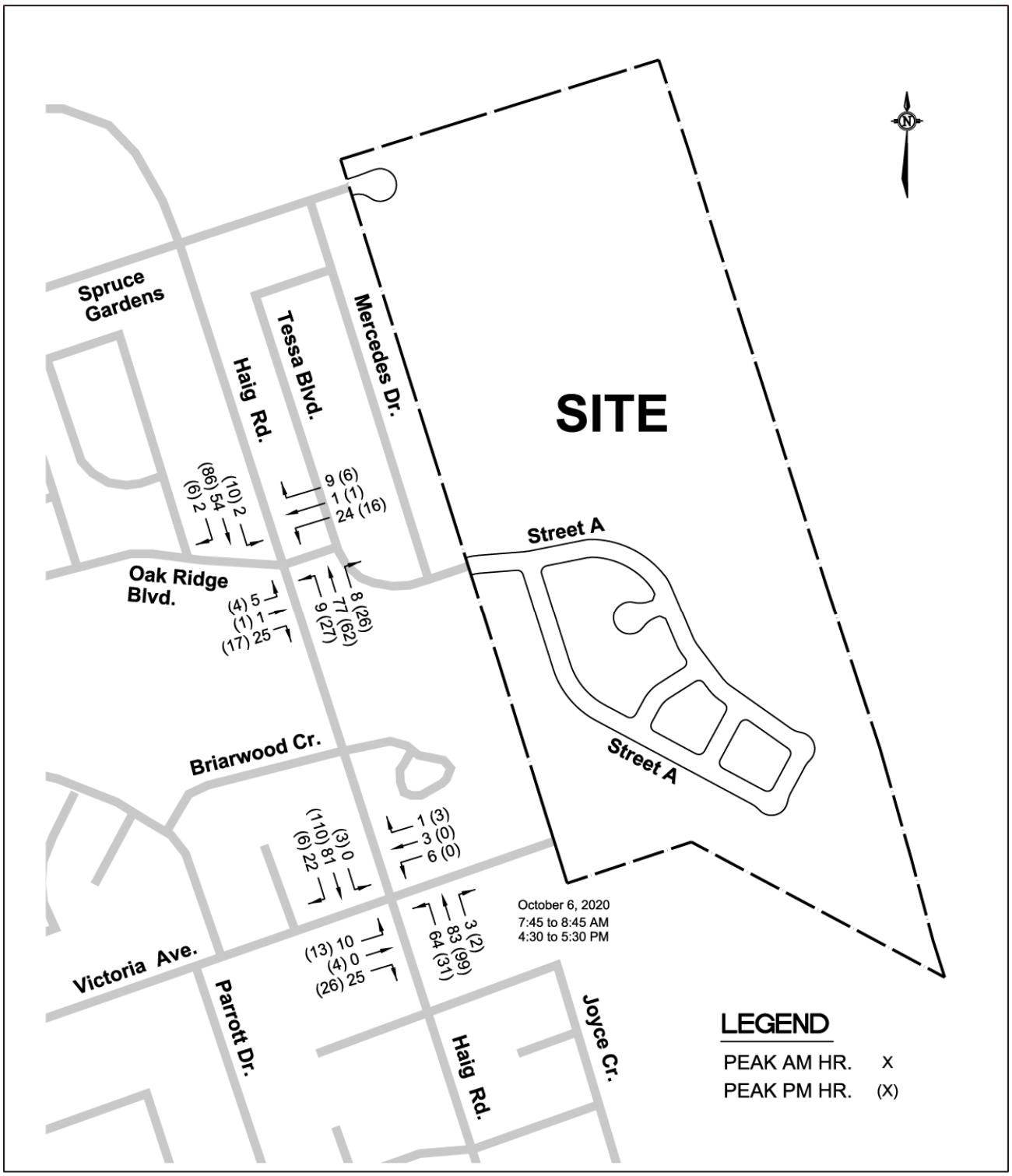
Northbound Haig Road	One shared left/through/right lane
Southbound Haig Road	One shared left/through/right lane
Eastbound Victoria Avenue	One shared left/through/right lane (Stop Sign)
Westbound Victoria Avenue	One shared left/through/right lane (Stop Sign

Figure 2.1 shows the peak AM hour traffic counts which occurred between 7:45 and 8:45 and peak PM hour traffic between 4:30 and 5:30 which were taken by the consultant on October 6, 2020. The 2020 counts are presented in the Appendix as Exhibit 1 for the Victoria/Haig intersection. The traffic for the Oak Ridge/Haig intersection was determined using a trip generation analysis of the development in the area assuming the completion of the homes along Tessa Boulevard and Mercedes Drive. The traffic volumes were then balanced with the counts taken at the Victoria/Haig intersection on October 6, 2020.

Transit

City of Belleville has a public transit system which provides two transit routes in close proximity to the site. Route 1 - Plaza, is a route which provides service downtown to City Hall/Terminal. The route travels southbound along Haig Road between Oak Ridge Boulevard and Victoria Avenue. Access from the subdivision to the bus stops along Haig Road would be from Oak Ridge Boulevard, the pedestrian walkway to Haig Road 65 m south of Oak Ridge Boulevard, and to the Victoria/Haig intersection from the pedestrian walkway at the south portion of the site. Route 2 - Parkwood Heights, is a route which travels northbound along Haig Road between Dundas Street and Victoria Avenue, providing service to the downtown and City Hall/Terminal. Access to the bus

FIGURE 2.1
2020 PEAK AM AND PM HOUR TRAFFIC COUNTS



NOT TO SCALE

stops would be from the pedestrian walkway from the subdivision to the Victoria Avenue extension east of Haig Road.

3. PROPOSED HANLEY PARK NORTH SUBDIVISION

Hanley Park Developments Inc. has proposed the development of the Hanley Park North subdivision at the east limits of the City of Belleville. The subdivision will be located on 35.16 ha of vacant land just east of Haig Road and north of Victoria Avenue. Of the total parcel of land for the subdivision, 11.26 ha will be developable lands located in the south portion of the property, and 23.90 ha on the north portion which will be protected from development and retained in a natural state. The lands are current zoned Residential Holding zone (RH-1) and Environmental Control zone (E). The property will require a zoning by-law amendment application to rezone the property to support the proposed residential housing. The existing development surrounding the proposed subdivision consists of residential housing.

The subdivision will provide 156 homes which would consist of 99 single-family homes and 57 townhouse units. The subdivision will have one access point onto Haig Road from Oak Ridge Boulevard, and a second access along Spruce Gardens to Haig Road which will service 6 single-family homes. The subdivision will also provide an emergency access onto Haig Road through a recreational walkway along Block D which connects Street A to Haig Road approximately 65 m south of the Oak Ridge/Haig intersection. A second pedestrian walkway is provided along Block E which connects to Victoria Avenue east of Haig Road.

All of the streets within the subdivision will be local streets with a sidewalk along one side of the road. On-street parking will be permitted within the subdivision.

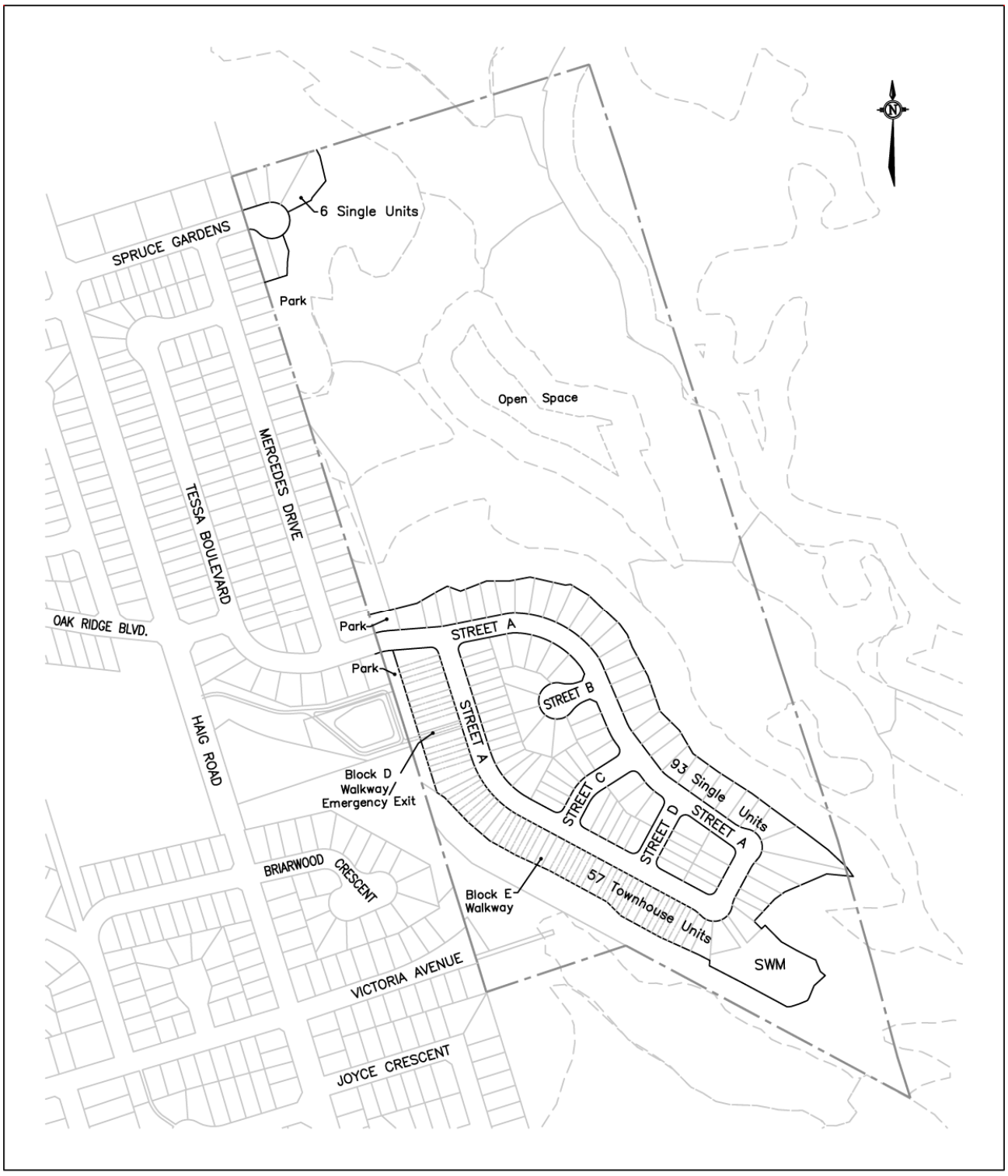
The Hanley Park North subdivision will be constructed according with market demands with completion expected by the year 2029. A conceptual site plan for the subdivision is shown in Figure 3.1.

4. TRAFFIC ANALYSIS

4.1 Trip Generation

The trip analysis for the subdivision was determined using the statistical data published in the Institute of Transportation Engineers (ITE) document, *Trip Generation, 10th Edition*. The analysis used the fitted curve equations for the housing, with the ITE Trip Graph for the “Single-Family Detached Housing (210)” provided as Exhibit 2 for the 99 single-family housing units, and the “Multifamily Housing (Low-Rise) (220)” land use provided as Exhibit 3 for the 57 townhouse units. Table 4.1 presents the trip generation rates which were derived from the ITE Trip Graph equations.

FIGURE 3.1
CONCEPTUAL SITE PLAN



NOT TO SCALE

TABLE 4.1
TRIP GENERATION RATES

RESIDENTIAL UNIT TYPE	ITE LAND USE	TRIP GENERATION RATE	
		Peak AM Hr.	Peak PM Hr.
99 Single Homes	Single-Family Detached Housing ITE Land Use Code 210	0.758 T/DU T = 0.71 (X) + 4.80	1.020 T/DU Ln(T) = 0.96 Ln(X) + 0.20
57 Townhouse Units	Multifamily Housing (Low-Rise) ITE Land Use Code 220	0.491 T/DU Ln(T) = 0.95 Ln(X) - 0.51	0.632 T/DU Ln(T) = 0.89 Ln(X) - 0.02

Table 4.2 shows the expected number of peak hour site generated trips for the site during the weekday peak AM and PM hour. The trip table has assumed a transit mode share of 5 percent of the trips. The reduction would account for public transit trips between the subdivision and the downtown core and bus terminal.

TABLE 4.2
PEAK HOUR SITE TRIPS GENERATED

UNIT TYPE	WEEKDAY PEAK AM HR.			WEEKDAY PEAK PM HR.		
	TOTAL	ENTER	EXIT	TOTAL	ENTER	EXIT
99 Single-Family Homes	75	19 (25%)	56 (75%)	101	64 (63%)	37 (37%)
57 Townhouse Units	28	6 (23%)	22 (77%)	36	23 (63%)	13 (37%)
Site Trips	**103**	25	78	**137**	87	50
5% Transit Reduction	5	1	4	7	4	3
TOTAL Site Trips	**98**	24	74	**130**	83	47

4.2 Trip Distribution

The distribution of expected site generated trips entering and exiting the Hanley Park North subdivision was determined from the examination of the 2020 peak hour traffic counts at the Victoria/Haig intersection which would show the traffic patterns in the area and the extension of Haig Road to Station Street. These volumes would represent the weekday peak AM and PM hour commuter trips to/from the subdivision. The determination of trips also considered the shortest and most convenient routes to

employment and retail areas. The site generated trips were distributed onto the adjacent roads to the following proportion:

To/From the North along Haig	55%		
To/From the South along Haig	45% →	To/From the East along Victoria	10%
		To/From the South along Haig	35%

Figure 4.1 shows the expected weekday peak AM and PM hour site generated trips for the Hanley Park North subdivision using the expected trips from Table 4.2.

5. TRAFFIC IMPACT

5.1 Background and Total Traffic Volumes

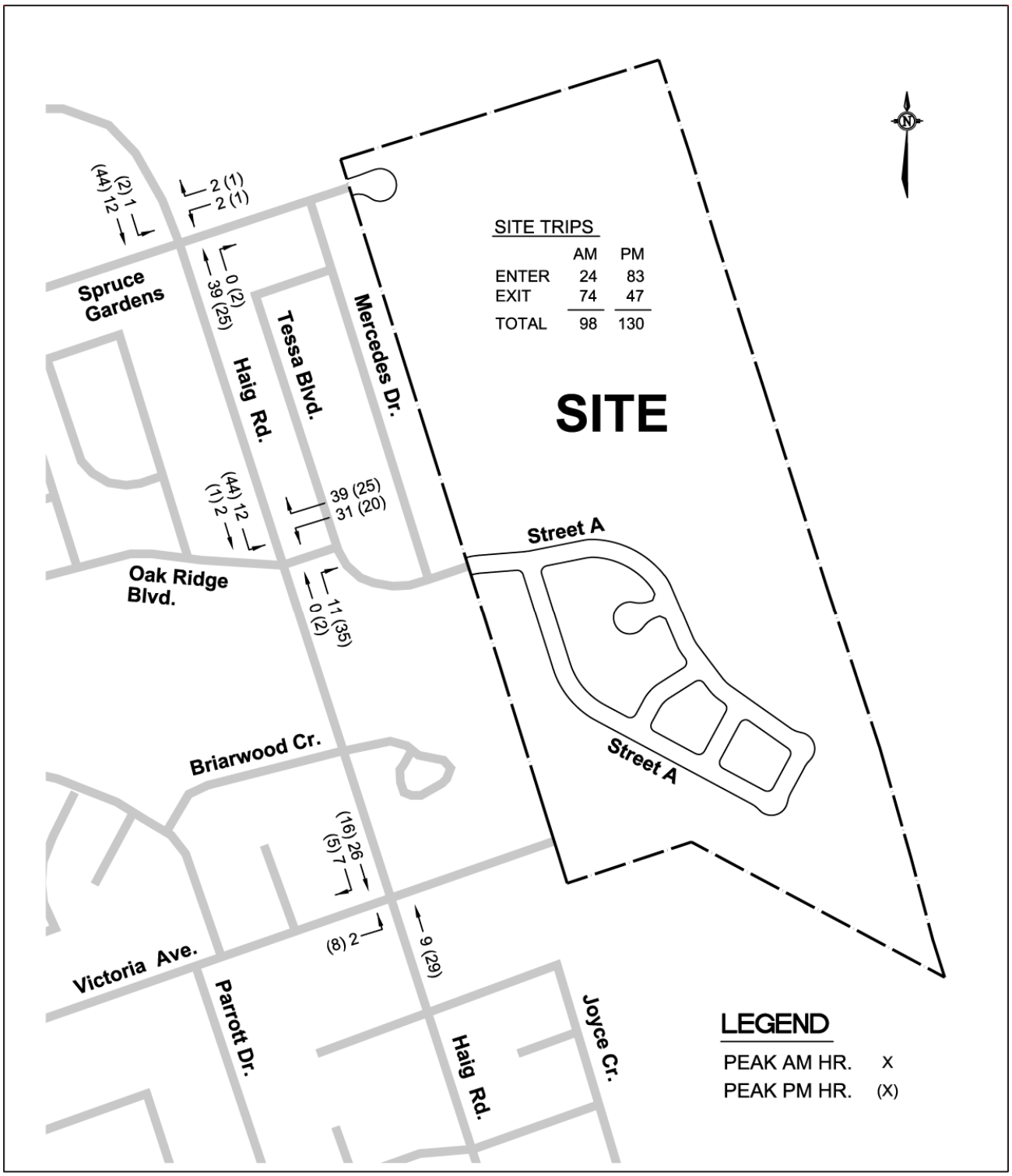
The background traffic would consist of the expected future traffic volumes which would include future development, but would not include the proposed Hanley Park North subdivision. The 2020 traffic counts taken at the intersection of Victoria Avenue and Haig Road were projected to the year 2029 when the total development is expected to be completed and the housing units substantially occupied.

The future background traffic was determined by applying the following two factors which would increase the October 6, 2020 traffic counts to the peak AM and PM hour pre-COVID-19 traffic (normalize to typical peak hour traffic), and the future traffic resulting from development outside the study area (future background traffic). The following are the two factors:

1) Typical Peak Hour Traffic (pre-COVID-19)

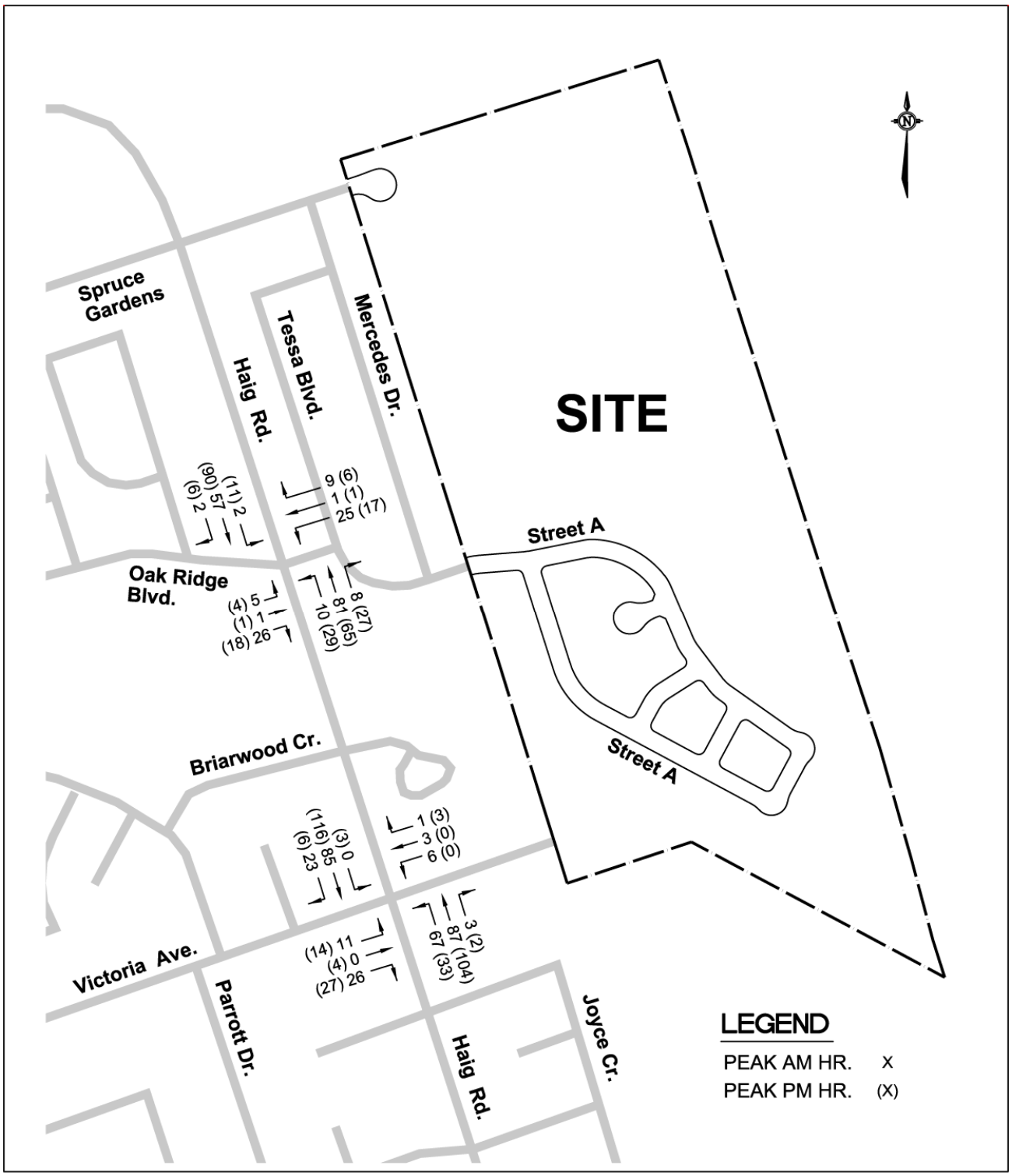
The October 6, 2020 traffic counts would need to be increased to account for the decreased traffic due to the COVID-19 outbreak which resulted from both the temporary job loss of some of the work force, and allowing some workers to work remotely from home. To determine the impact on traffic from COVID-19 outbreak, traffic counts were obtained from the County of Lanark along County Road (CR) 17 just south of March Road (CR 49) in Almonte (Town of Mississippi Mills). The counts were taken at the same location on July 10, 2019 and June 17, 2020. The counts were taken on a typical Tuesday during the peak AM and PM hours in a small municipality with few federal government employee positions. This would provide a similar traffic pattern to that of Haig Road which is located on the east limit of the City of Belleville. The Almonte counts showed a decrease in peak AM and PM hour traffic of 3.97 percent between the 2019 and 2020 traffic counts. For the first factor, the October 6, 2020 counts shown in Figure 2.1 were increased by 5.0 percent at all approaches to the Victoria/Haig and Oak Ridge/Haig intersections to represent typical traffic (pre-COVID-19). The typical 2020 peak AM and PM hour traffic following the application of the pre-COVID-19 factor is shown in Figure 5.1.

FIGURE 4.1
PEAK AM AND PM HOUR SITE GENERATED TRIPS



NOT TO SCALE

FIGURE 5.1
2020 PEAK AM AND PM HOUR TRAFFIC COUNTS (Pre-COVID-19)



NOT TO SCALE

2) Future 2029 and 2034 Background Traffic

The second factor represents the increase in traffic due to future development outside the study area. The study has examined the growth in population over the five year period between 2011 and 2016 from statistical data obtained from Canada Census. The census has shown the population to increase from 49,454 in 2011 to 50,716 in 2016. This would translate to an annual average compounded increase 0.505 percent. Utilizing the growth statistics discussed above, the study has assumed an annual average compounded growth of 1.0 percent which was applied to the traffic counts at all approaches to the Victoria/Haig and Oak Ridge/Haig intersections. The growth rate translates to the factors below which were applied to the typical traffic (pre-COVID-19) shown in Figure 5.1.

1.0% Annual Increase

2020 → 2029 1.094

2020 → 2034 1.149

The subdivision is located at the east edge of the urban boundary of the City of Belleville. With the exception of the proposed Hanley Park (South) subdivision which is located between Janlyn Crescent and Bridge Street, the surrounding area is essentially built out with little growth in the next few years. The expected traffic following the development of the Hanley Park (South) subdivision was determined from the December 6, 2012 Traffic Impact Study Update report which was prepared by this firm, and was added to the background traffic.

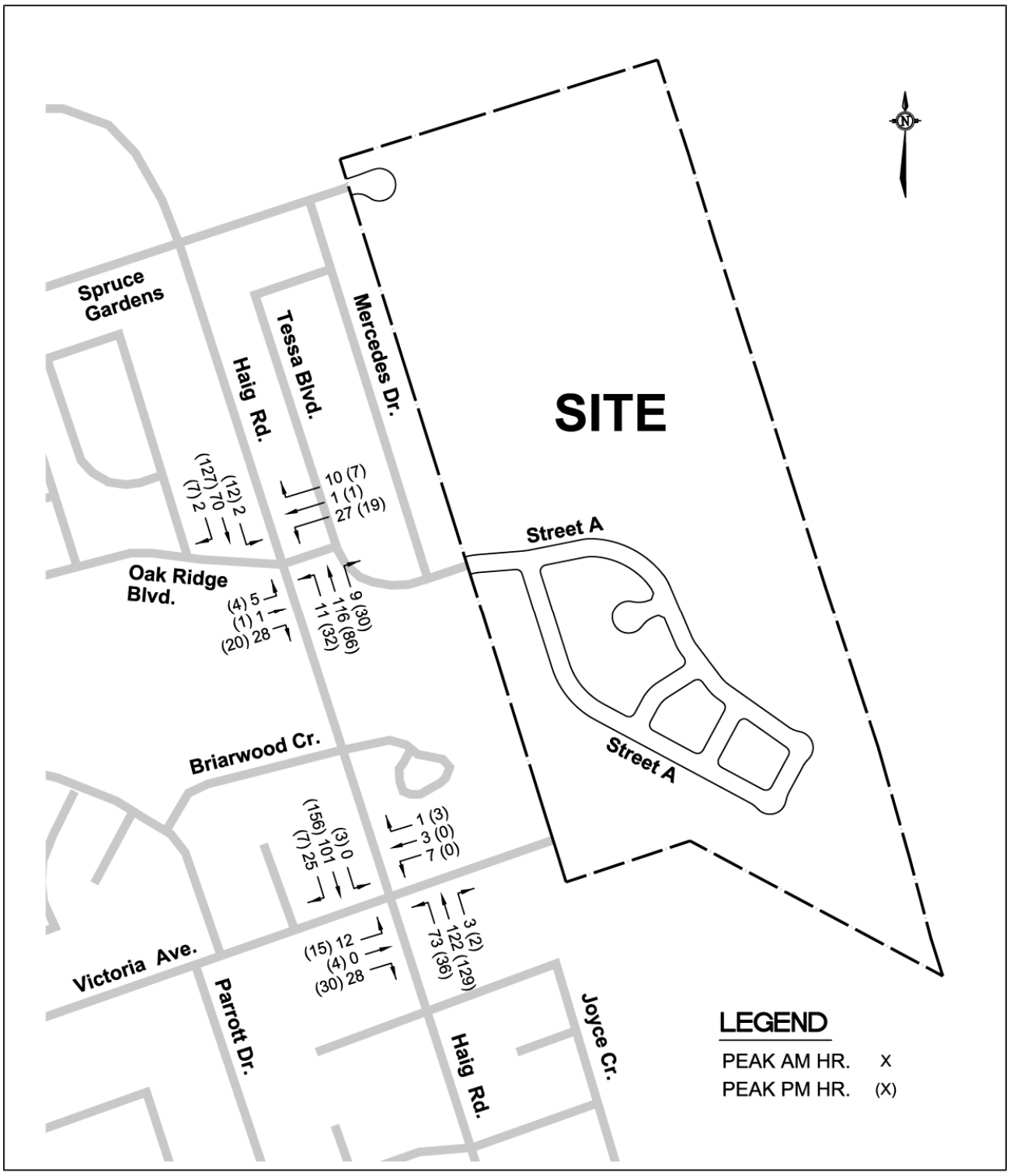
Figure 5.2 shows the expected 2029 peak AM and PM hour background traffic utilizing the above growth factors (excluding site generated trips) plus the expected trips from the Hanley Park (South) subdivision. Figure 5.3 shows the 2034 peak hour background traffic.

The total traffic volumes are the addition of the future background traffic and the expected site generated trips (Figure 4.1). Figure 5.4 shows the 2029 total volume of traffic and Figure 5.5 the 2034 total traffic.

5.2 Traffic Analysis

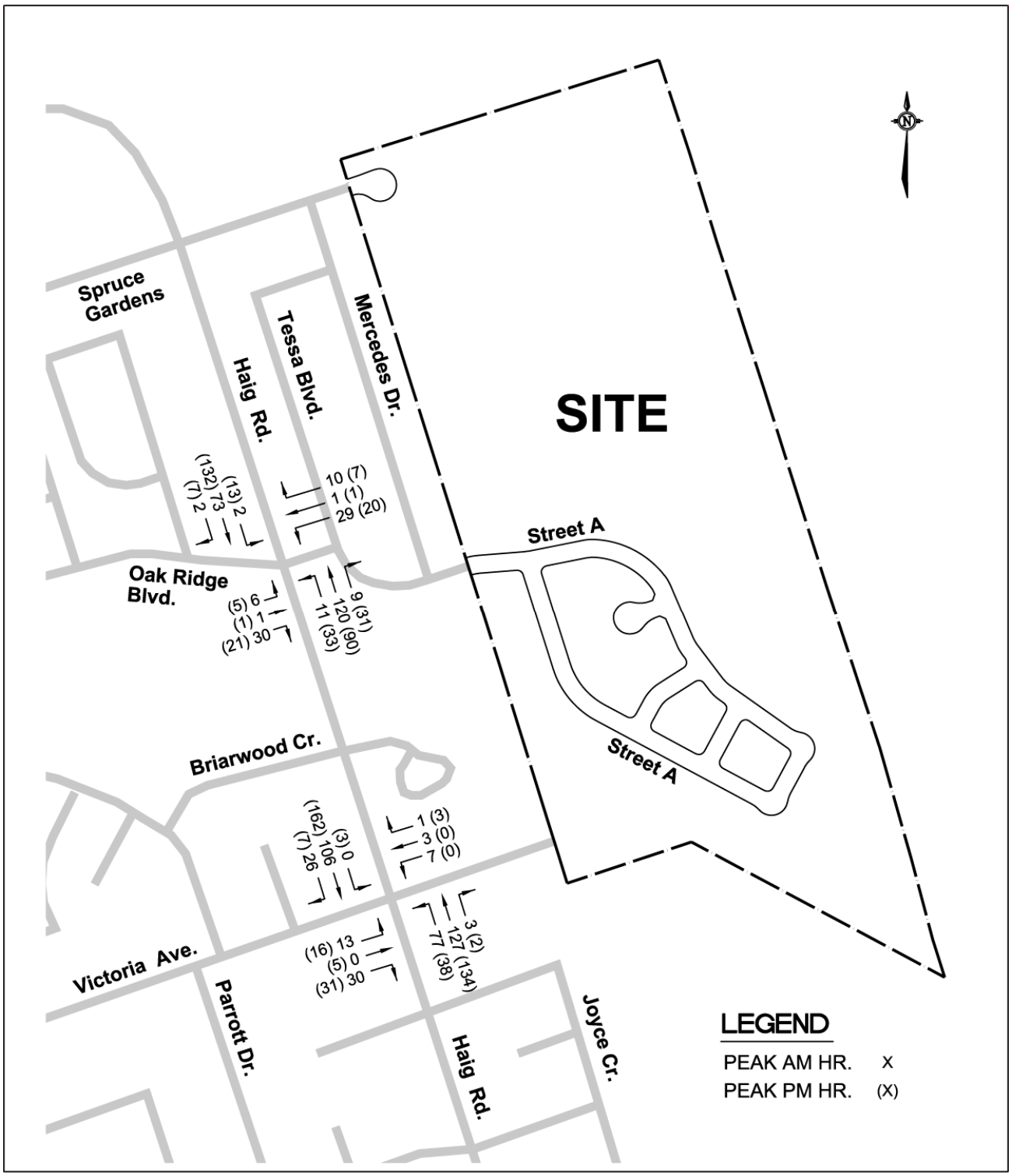
The Traffic Impact Study will examine the operation of the subdivision access onto Haig Road at the Oak Ridge/Haig intersection, and at the Victoria/Haig intersection located 390 m south of Oak Ridge Boulevard. The Spruce Gardens/Haig intersection was not examined as part of the study due to the low trips generated by the 6 single-family homes. The time period of the analysis would be the weekday peak AM and PM hour of the adjacent streets which was determined by the traffic counts. The study will examine the operation of the intersections for the traffic counts taken on October 6, 2020 which were adjusted to pre-COVID-19 volumes, at the year 2029 when the total subdivision is expected to be completed, and at the year 2034 which represents five years beyond

FIGURE 5.2
2029 PEAK AM AND PM HOUR BACKGROUND TRAFFIC



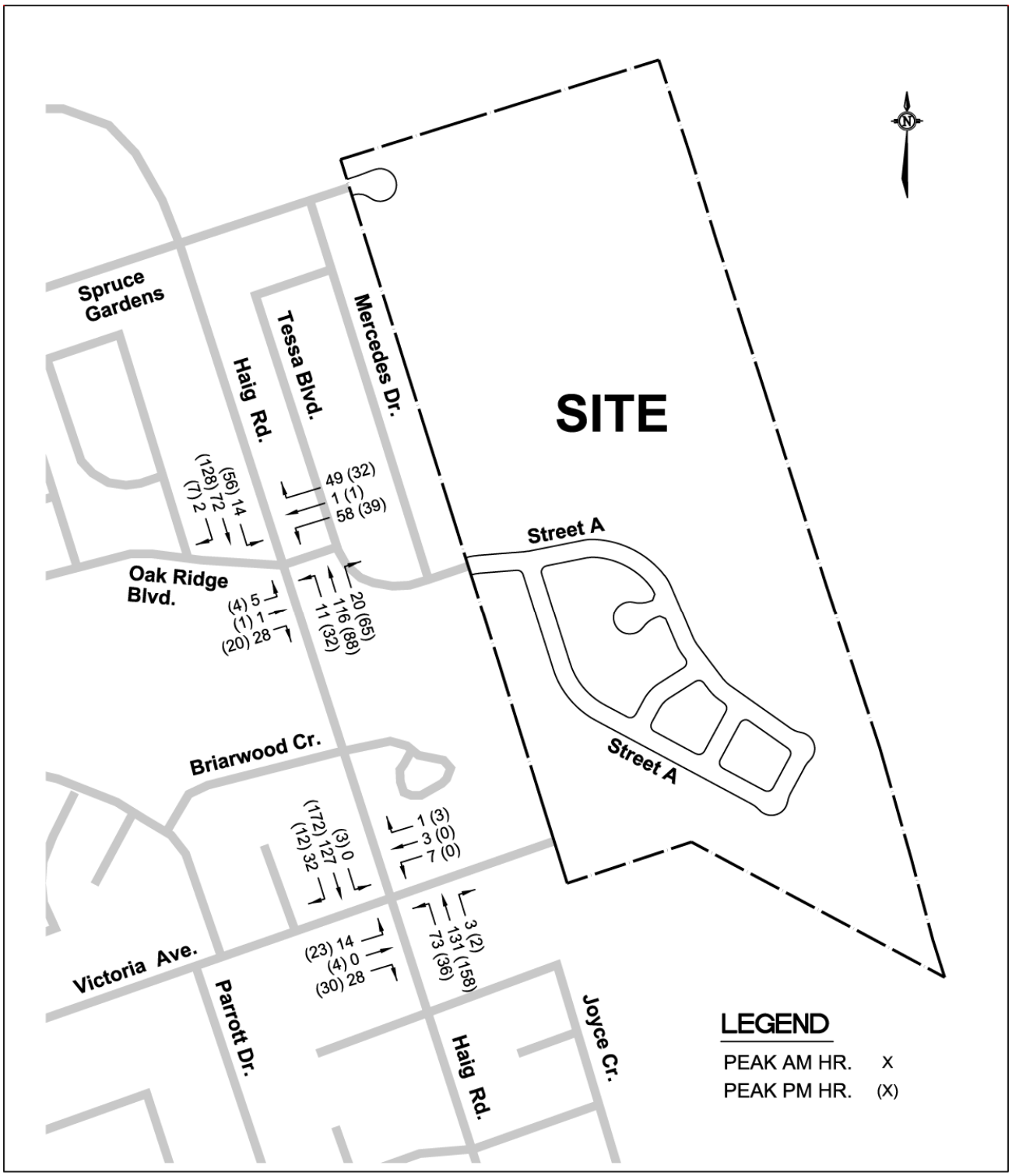
NOT TO SCALE

FIGURE 5.3
2034 PEAK AM AND PM HOUR BACKGROUND TRAFFIC



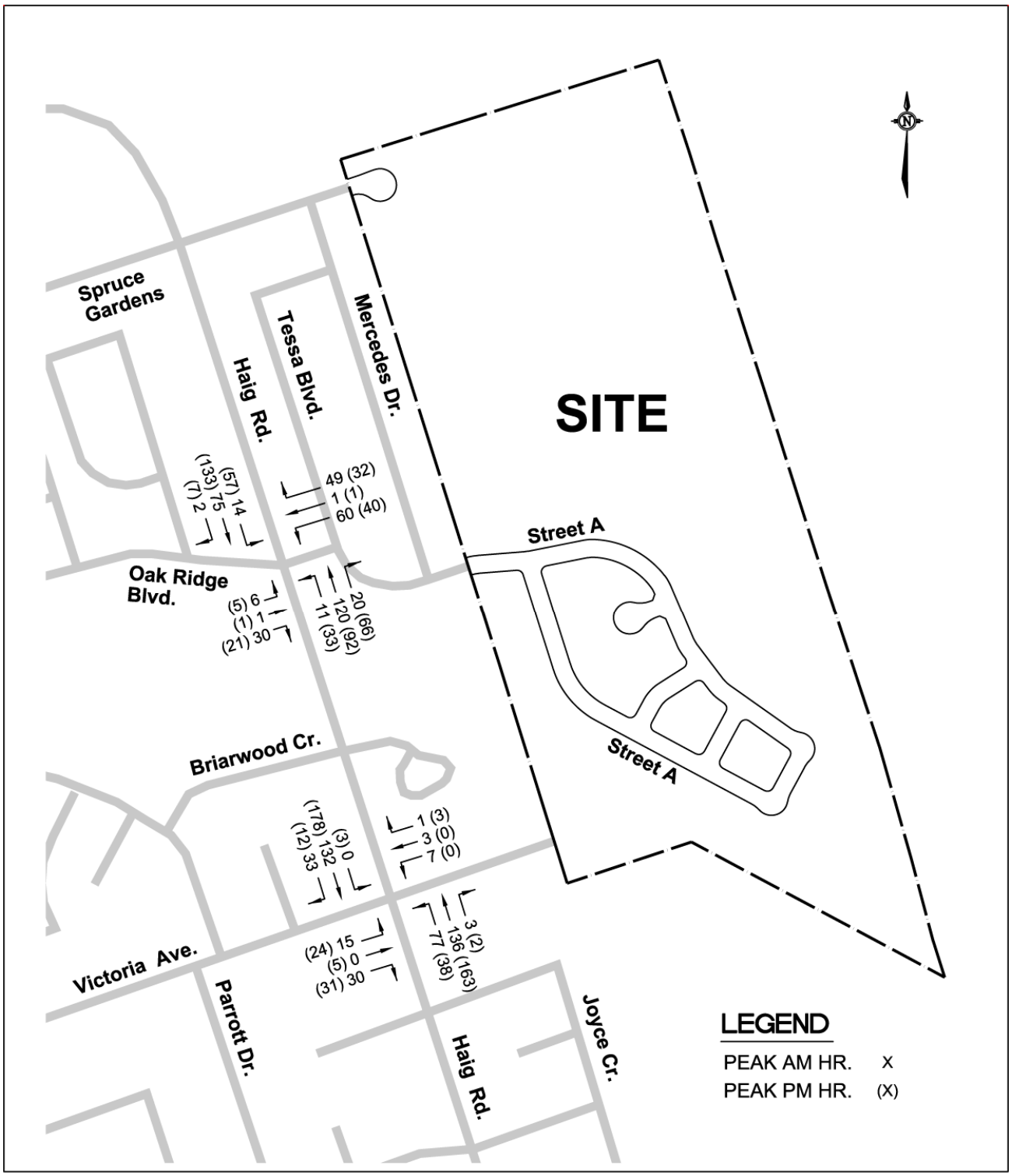
NOT TO SCALE

FIGURE 5.4
2029 PEAK AM AND PM HOUR TOTAL TRAFFIC



NOT TO SCALE

FIGURE 5.5
2034 PEAK AM AND PM HOUR TOTAL TRAFFIC



NOT TO SCALE

completion. The analysis will utilize the *Highway Capacity Software, Version 7.8.5,* which uses the capacity analysis procedure as documented in the *Highway Capacity Manual (HCM) 2010 and HCM 6th Edition*.

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 intersection was determined by the calculation of the 95th percentile queue at the lane approach as shown on the analysis work sheets provided in the Appendix. The 95th percentile queue length is the calculated 95th greatest queue length out of 100 occurrences at a movement during a 15-minute peak period. The 95th 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:

Oak Ridge Boulevard/Haig Road Intersection

The Hanley Park North subdivision will have one access onto the surrounding roadway network. The access will be from Street A which will connect to Tessa Boulevard, then to Haig Road by way of a 50 m section of Oak Ridge Boulevard linking Tessa Boulevard to Haig Road. All site generated traffic would access the site from the existing intersection of Oak Ridge Boulevard and Haig Road.

The Oak Ridge/Haig intersection is an all-way stop controlled intersection with Haig Road forming the northbound and southbound approaches, and Oak Ridge Boulevard the eastbound and westbound approaches. All approaches will comprise of one lane having shared left/through/right vehicle movements.

An operational analysis was conducted for the 2020 typical traffic (pre-COVID-19) using the adjusted traffic of Figure 5.1. The analysis determined that the all approaches to the intersection currently function at a Level of Service (LoS) “A” during both the peak AM and PM hour time periods. The operation of the all-way stop controlled intersection is summarized in Table 5.1 with the analysis sheets provided in the Appendix as Exhibit 4 for the peak AM hour and Exhibit 5 for the peak PM hour.

TABLE 5.1
OAK RIDGE/HAIG INTERSECTION – LoS & Delay

Intersection Approach	PEAK AM HOUR YEAR 2020 (2029) **2034**		PEAK PM HOUR YEAR 2020 (2029) **2034**	
	LoS	**Delay (sec.)**	**LoS**	**Delay (sec.)**
EB Left/Through/Right – Oak Ridge	A (A) **A**	7.0 (7.4) **7.4**	A (A) **A**	7.2 (7.6) **7.7**
WB Left/Through/Right – Oak Ridge	A (A) **A**	7.5 (8.1) **8.2**	A (A) **A**	7.6 (8.2) **8.3**
NB Left/Through/Right – Haig	A (A) **A**	7.7 (8.3) **8.4**	A (A) **A**	7.8 (8.5) **8.6**
SB Left/Through/Right – Haig	A (A) **A**	7.5 (8.1) **8.1**	A (A) **A**	7.8 (8.9) **9.0**

Following the completion of the subdivision in 2029, all approaches to the intersection would continue to function at a LoS "A" during both the peak AM and PM hours. A summary of the intersection is presented in Table 5.1 with the analysis sheets provided as Exhibit 6 and Exhibit 7.

The operation of the intersection using the expected 2034 traffic, which represents five years beyond completion of the subdivision, determined that all approaches functioned at a LoS "A" during the peak AM and PM hours. Table 5.1 summarizes the 2034 operation of the intersection with the analysis sheets provided as Exhibits 8 and 9.

The 95th percentile queue at the intersection utilizing the expected 2034 traffic determined that the queue at the westbound Oak Ridge Boulevard approach would be 0.5 vehicles during the peak AM hour. The northbound and southbound Haig Road approaches determined a 95th percentile queue of 1.0 vehicle during the peak PM hour.

Following the completion of the Hanley Park North subdivision, the intersection of Oak Ridge Boulevard and Haig Road would operate at an acceptable level of service with no roadway or intersection modifications triggered by the construction of the proposed subdivision.

Victoria Avenue and Haig Road Intersection

The intersection of Victoria Avenue and Haig Road is located 390 m south the intersection of Oak Ridge Boulevard and Haig Road. The Victoria/Haig intersection is a two-way stop controlled intersection with stop signs placed at the eastbound and westbound Victoria Avenue approaches. All approaches to the intersection would be a single lane, each allowing shared left/through/right vehicular movements.

The operational analysis for the typical 2020 traffic (Figure 5.1) determined that during the peak AM hour the northbound and southbound Haig Road approaches and eastbound Victoria Avenue approaches functioned at a LoS "A", and the westbound

Victoria Avenue approach at a LoS “B”. During the peak PM hour the northbound and southbound Haig Road approaches and westbound Victoria Avenue approach functioned at a LoS “A” and eastbound Victoria Avenue approach at a LoS “B”. The 2020 operation of the intersection is summarized in Table 5.2 with the analysis sheets provided as Exhibit 10 for the peak AM hour and Exhibit 11 for the peak PM hour.

TABLE 5.2
VICTORIA/HAIG INTERSECTION – LoS & Delay

Intersection Approach	PEAK AM HOUR YEAR 2020 (2029) **2034**		PEAK PM HOUR YEAR 2020 (2029) **2034**	
	LoS	**Delay (sec.)**	**LoS**	**Delay (sec.)**
EB Left/Through/Right – Victoria	A (B) **B**	9.7 (10.5) **10.7**	B (B) **B**	10.0 (11.2) **11.4**
WB Left/Through/Right – Victoria	B (B) **B**	11.4 (12.6) **12.9**	A (A) **A**	8.8 (9.1) **9.2**
NB Left/Through/Right – Haig	A (A) **A**	3.5 (3.0) **3.1**	A (A) **A**	1.9 (1.6) **1.7**
SB Left/Through/Right – Haig	A (A) **A**	0.0 (0.0) **0.0**	A (A) **A**	0.2 (0.1) **0.1**

For the expected 2029 traffic following the completion of the subdivision, the northbound Haig Road approaches functioned at a LoS “A” and Victoria Avenue approaches at a LoS “B” during the peak AM hour. During the peak PM hour the northbound and southbound Haig Road approaches and westbound Victoria Avenue approach would function at a LoS “A” and the eastbound Victoria Avenue approach at a LoS “B”. The operation of the intersection is summarized in Table 5.2 with the analysis sheets provided as Exhibit 12 and Exhibit 13.

At the year 2034 the intersection would continue to operate at the same level of service as the 2029 traffic. Table 5.2 summarizes the 2034 operation of the intersection with the analysis sheets provided as Exhibit 14 for the peak AM hour and Exhibit 15 for the peak PM hour.

Utilizing the 2034 traffic volumes, the 95th percentile queue at the eastbound Victoria Avenue approach was determined to be 0.3 vehicles during the peak PM hour.

Following the completion of the Hanley Park North subdivision, the intersection of Victoria Avenue and Haig Road would operate at an acceptable level of service with no roadway or intersection modifications triggered by the construction of the proposed subdivision.

5.3 Subdivision Roads and Accesses

The main access to the Hanley Park North subdivision will be from Street A connecting to Tessa Boulevard which currently ends at a cul-de-sac. The photo below shows the point of connection between Street A and Tessa Boulevard.

STREET A/TESSA CONNECTION - Eastbound Street A Approach

The photo was taken at the intersection of Tessa Boulevard and Mercedes Drive, looking east to the Street A connection. Roadway modifications due to the development of the subdivision would be the installation of a stop sign at the southbound Mercedes Drive approach to the Mercedes/Tessa intersection.

The main street through the subdivision will be Street A, with minor streets labeled Street B, C and D which all connect to Street A. All streets within the subdivision will have a pavement width of 8.0 m.

There is an emergency access onto Haig Road through a recreational walkway along Block D which connects Street A to Haig Road approximately 65 m south of the Oak Ridge/Haig intersection. The emergency access will be 8.0 m in width.

6. FINDINGS AND RECOMMENDATIONS

A site plan has been prepared for a 35.16 ha parcel of land at the east limit of the City of Belleville. The subdivision is called Hanley Park North and will contain 99 single-family homes and 57 townhouse units constructed on 11.26 ha of developable land. The subdivision will have one access point at a connection to Tessa Boulevard. The connection will be along Street A onto Tessa Boulevard, then along a 50 m length of Oak Ridge Boulevard to Haig Road. A second access will be along Spruce Gardens to

Haig Road, which will provide access to 6 single-family homes at the easterly extension of Spruce Gardens. The 6 homes will be isolated from the rest of the subdivision.

The Traffic Impact Study report has examined the impact of the subdivision trips at the intersection of Oak Ridge Boulevard and Haig Road, and at the intersection of Victoria Avenue and Haig Road which is located 390 m south of Oak Ridge Boulevard. The analysis was conducted for the 2020 traffic counts, at the year 2029 which is when completion of the subdivision is expected, and at the year 2034 which represents five years beyond completion. The 2020 traffic counts were adjusted to account for the reduction of traffic due to the COVID-19 outbreak. The operation of the intersections was determined for the peak AM and PM hours. The findings and recommendations of the study are summarized in the following:

1. The trip generation analysis determined that the Hanley Park North subdivision would generate 24 vehicles entering and 74 vehicles exiting the site during the weekday peak AM hour for a total of 98 vehicle trips, and 83 vehicles entering and 47 vehicles exiting during the peak PM hour for a total of 130 vehicle trips.

2. The connection of Street A to Tessa Boulevard would be at the southeast leg of Tessa Boulevard. The existing cul-de-sac would be removed and replaced by the Street A connection. A stop sign is recommended at the southbound Mercedes Drive approach to the Mercedes/Tessa intersection.

3. An operational analysis for the Oak Ridge/Haig intersection determined that the intersection would operate at an acceptable level of service for the expected peak AM and PM hour traffic at the year 2034. There would be no modifications required to the intersection.

4. Following the development of the site, the intersection of Victoria/Haig which is located 390 south of Oak Ridge Boulevard, would operate at an acceptable level of service for the expected peak AM and PM hour traffic at the year 2034. There would be no modifications required to the intersection.

5. The Site Plan provides an emergency access to/from the subdivision. The emergency access will connect Street A to Haig Road through a recreational walkway along Block D. The walkway is located approximately 65 m south of the Oak Ridge/Haig intersection.

Prepared by:

David J. Halpenny

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

APPENDIX

TRAFFIC COUNTS

ITE TRIP GENERATION DATA SHEETS

OPERATIONAL ANALYSIS WORK SHEETS

EXHIBIT 1
PEAK AM AND PM HOUR TRAFFIC COUNTS (October 6, 2020) – Victoria/Haig

All Vehicles

Time Period	Northbound			Southbound			Eastbound			Westbound			
AM	**LT**	**ST**	**RT**	**LT**	**ST**	**RT**	**LT**	**ST**	**RT**	**LT**	**ST**	**RT**	**Total**
07:00 – 07:15	3	12	1	0	12	0	0	0	0	0	0	0	**28**
07:15 – 07:30	6	12	0	1	13	1	0	0	1	0	0	0	**34**
07:30 – 07:45	9	20	0	0	12	1	0	0	5	2	0	0	**49**
07:45 – 08:00	24	20	0	0	17	3	1	0	5	1	1	0	**72**
08:00 – 08:15	21	18	1	0	27	12	5	0	5	1	1	0	**91**
08:15 – 08:30	15	22	1	0	25	3	4	0	11	2	1	0	**84**
08:30 – 08:45	4	23	1	0	12	4	0	0	4	2	0	1	**51**
08:45 – 09:00	2	21	1	0	24	3	1	0	5	1	0	1	**59**
PM													
03:30 – 03:45	6	19	1	0	17	3	4	0	5	0	0	1	**56**
03:45 – 04:00	8	34	1	0	30	5	2	1	11	1	1	0	**94**
04:00 – 04:15	4	19	0	1	29	9	4	0	8	1	0	0	**75**
04:15 – 04:30	4	24	1	0	19	2	6	1	6	1	0	0	**64**
04:30 – 04:45	7	23	0	0	21	2	2	0	4	0	0	1	**60**
04:45 – 05:00	9	21	1	1	35	1	2	1	8	0	0	0	**79**
05:00 – 05:15	7	29	1	1	36	3	6	1	6	0	0	0	**90**
05:15 – 05:30	8	26	0	1	18	0	3	2	8	0	0	2	**68**

Truck & Bus Traffic

Time Period	Northbound			Southbound			Eastbound			Westbound			
AM	**LT**	**ST**	**RT**	**LT**	**ST**	**RT**	**LT**	**ST**	**RT**	**LT**	**ST**	**RT**	**Total**
07:00 – 07:15	1	0	0	0	0	0	0	0	0	0	0	0	**1**
07:15 – 07:30	0	0	0	0	1	0	0	0	0	0	0	0	**1**
07:30 – 07:45	1	0	0	0	0	1	0	0	0	0	0	0	**2**
07:45 – 08:00	4	1	0	0	1	0	0	0	1	0	0	0	**7**
08:00 – 08:15	2	0	0	0	1	1	0	0	0	0	0	0	**4**
08:15 – 08:30	1	1	0	0	1	0	0	0	0	0	0	0	**3**
08:30 – 08:45	1	1	0	0	1	0	0	0	0	0	0	0	**3**
08:45 – 09:00	0	1	0	0	1	0	0	0	0	0	0	0	**2**
PM													
03:30 – 03:45	2	0	0	0	0	0	2	0	0	0	0	0	**4**
03:45 – 04:00	0	0	0	0	1	0	1	0	1	0	0	0	**3**
04:00 – 04:15	0	0	0	0	0	0	0	0	0	0	0	0	**0**
04:15 – 04:30	1	0	0	0	1	0	0	0	0	0	0	0	**2**
04:30 – 04:45	1	0	0	0	0	0	0	0	0	0	0	0	**1**
04:45 – 05:00	0	0	0	0	1	0	0	0	0	0	0	0	**1**
05:00 – 05:15	0	0	0	0	0	0	0	0	0	0	0	0	**0**
05:15 – 05:30	0	1	0	0	1	0	0	0	0	0	0	0	**2**

EXHIBIT 2
ITE TRIP GENERATION MANUAL 10th Ed. – Single-Family Detached Housing (210)

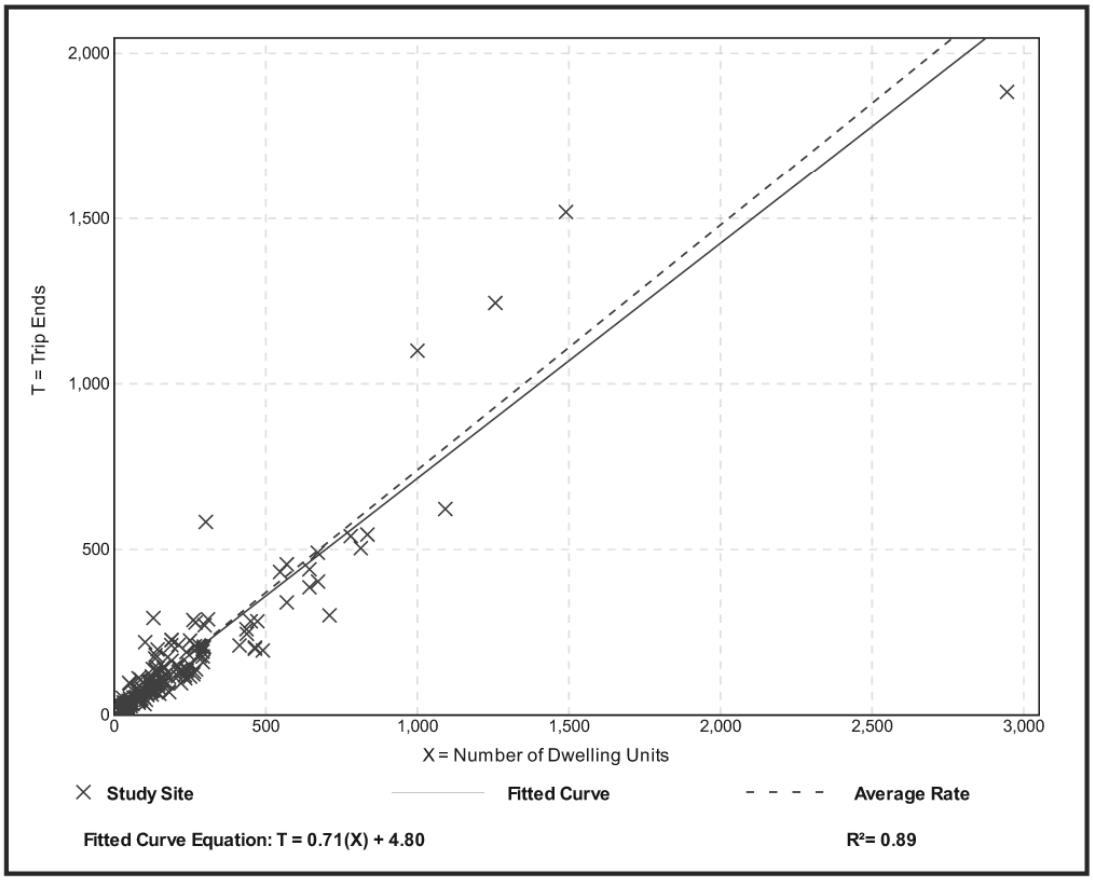
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	173
Avg. Num. of Dwelling Units:	219
Directional Distribution:	25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	190
Avg. Num. of Dwelling Units:	242
Directional Distribution:	63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation

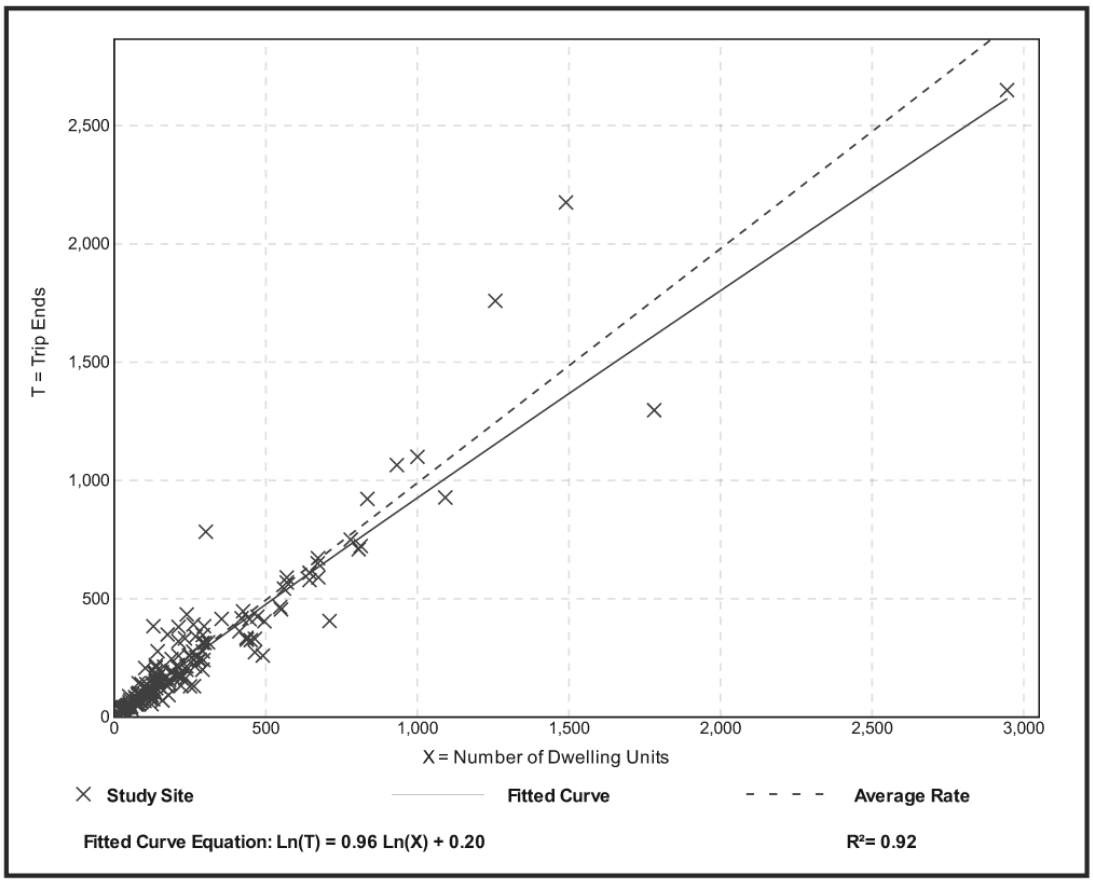


EXHIBIT 3
ITE TRIP GENERATION MANUAL 10th Edition – Multifamily Housing (Low-Rise) (220)

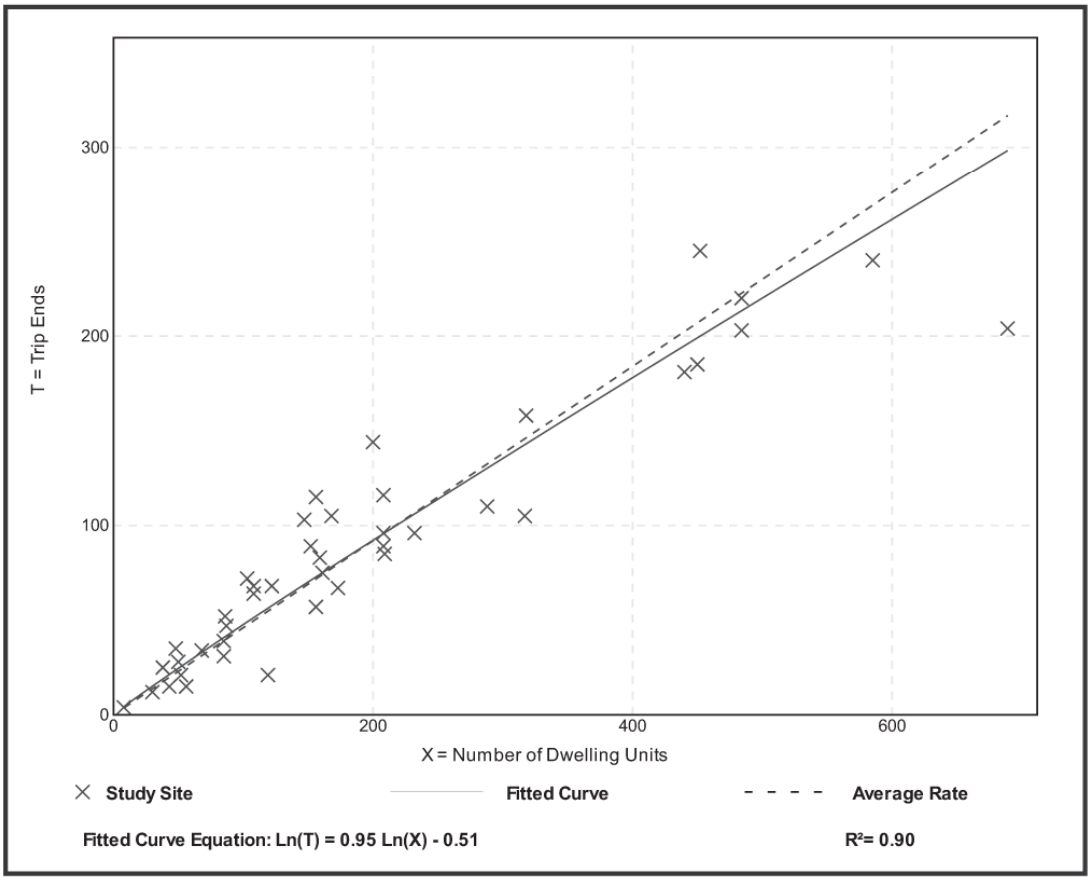
Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	42
Avg. Num. of Dwelling Units:	199
Directional Distribution:	23% entering, 77% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.46	0.18 - 0.74	0.12

Data Plot and Equation



Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	50
Avg. Num. of Dwelling Units:	187
Directional Distribution:	63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.56	0.18 - 1.25	0.16

Data Plot and Equation

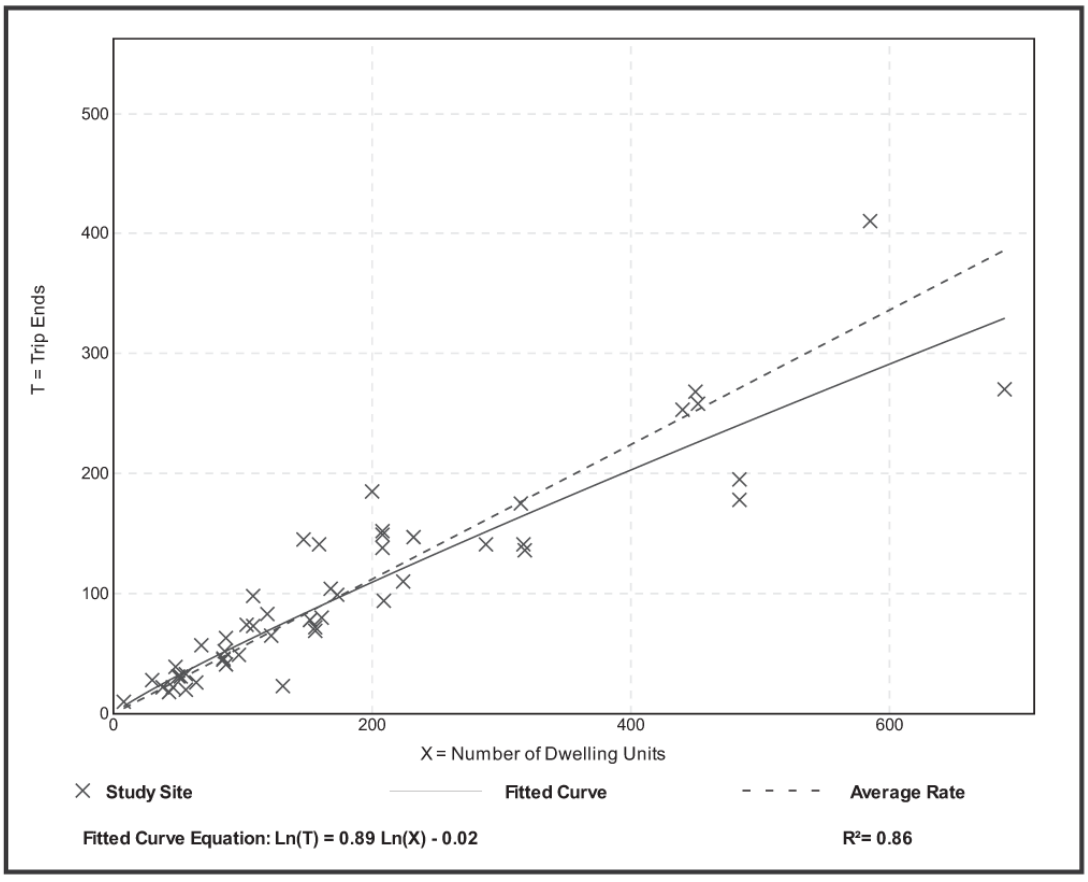
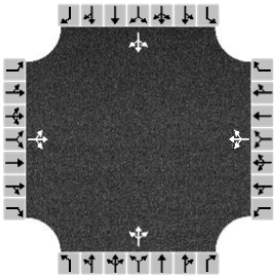


EXHIBIT 4
2020 WEEKDAY PEAK AM HOUR ANALYSIS (Pre-COVID-19) – Oak Ridge/Haig

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst		Intersection	Oak Ridge/Haig
Agency/Co.		Jurisdiction	City of Belleville
Date Performed	11/19/2020	East/West Street	Oak Ridge Boulevard
Analysis Year	2020	North/South Street	Haig Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.92
Time Analyzed	Peak AM Hour Pre-COVID-19		
Project Description	Hanley Park North Subdivision		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	5	1	26	25	1	9	10	81	8	2	57	2
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	35			38			108			66		
Percent Heavy Vehicles	1			1			1			1		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.031			0.034			0.096			0.059		
Final Departure Headway, hd (s)	3.88			4.32			4.11			4.16		
Final Degree of Utilization, x	0.037			0.046			0.123			0.077		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	1.88			2.32			2.11			2.16		

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	35			38			108			66		
Capacity	929			834			876			864		
95% Queue Length, Q_{95} (veh)	0.1			0.1			0.4			0.2		
Control Delay (s/veh)	7.0			7.5			7.7			7.5		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	7.0			7.5			7.7			7.5		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	7.5						A					

HCS™ AWSC Version 7.8.5
729_2020_typ_AM.xaw

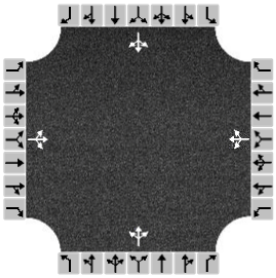
Generated: 11/19/2020 8:32:07 AM

EXHIBIT 5
2020 WEEKDAY PEAK PM HOUR ANALYSIS (Pre-COVID-19) – Oak Ridge/Haig

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst		Intersection	Oak Ridge/Haig
Agency/Co.		Jurisdiction	City of Belleville
Date Performed	11/19/2020	East/West Street	Oak Ridge Boulevard
Analysis Year	2020	North/South Street	Haig Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.92
Time Analyzed	Peak PM Hour Pre-COVID-19		
Project Description	Hanley Park North Subdivision		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	4	1	18	17	1	6	29	65	27	11	90	6
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	25			26			132			116		
Percent Heavy Vehicles	1			1			1			1		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.022			0.023			0.117			0.103		
Final Departure Headway, hd (s)	4.04			4.46			4.06			4.14		
Final Degree of Utilization, x	0.028			0.032			0.148			0.134		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	2.04			2.46			2.06			2.14		

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	25			26			132			116		
Capacity	891			807			887			869		
95% Queue Length, Q_{95} (veh)	0.1			0.1			0.5			0.5		
Control Delay (s/veh)	7.2			7.6			7.8			7.8		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	7.2			7.6			7.8			7.8		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	7.7						A					

HCS™ AWSC Version 7.8.5
729_2020_typ_PM.xaw

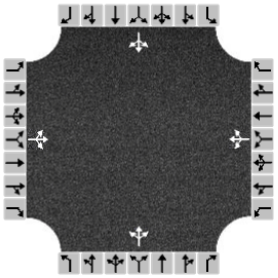
Generated: 11/19/2020 8:34:43 AM

EXHIBIT 6
2029 WEEKDAY PEAK AM HOUR ANALYSIS – Oak Ridge/Haig

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst		Intersection	Oak Ridge/Haig
Agency/Co.		Jurisdiction	City of Belleville
Date Performed	11/19/2020	East/West Street	Oak Ridge Boulevard
Analysis Year	2029	North/South Street	Haig Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.92
Time Analyzed	Peak AM Hour		
Project Description	Hanley Park North Subdivision		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	5	1	28	58	1	49	11	116	20	14	72	2
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	37			117			160			96		
Percent Heavy Vehicles	1			1			1			1		
Departure Headway and Service Time												
Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.033			0.104			0.142			0.085		
Final Departure Headway, hd (s)	4.17			4.38			4.31			4.46		
Final Degree of Utilization, x	0.043			0.143			0.191			0.119		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	2.17			2.38			2.31			2.46		
Capacity, Delay and Level of Service												
Flow Rate, v (veh/h)	37			117			160			96		
Capacity	862			822			835			806		
95% Queue Length, Q_{95} (veh)	0.1			0.5			0.7			0.4		
Control Delay (s/veh)	7.4			8.1			8.3			8.1		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	7.4			8.1			8.3			8.1		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	8.1						A					

HCS™ AWSC Version 7.8.5
729_2029_tot_AM.xaw

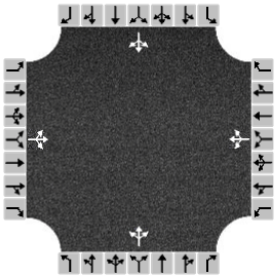
Generated: 11/24/2020 4:13:48 PM

EXHIBIT 7
2029 WEEKDAY PEAK PM HOUR ANALYSIS – Oak Ridge/Haig

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst		Intersection	Oak Ridge/Haig
Agency/Co.		Jurisdiction	City of Belleville
Date Performed	11/19/2020	East/West Street	Oak Ridge Boulevard
Analysis Year	2029	North/South Street	Haig Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.92
Time Analyzed	Peak PM Hour		
Project Description	Hanley Park North Subdivision		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	4	1	20	39	1	32	32	88	65	56	128	7
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	27			78			201			208		
Percent Heavy Vehicles	1			1			1			1		
Departure Headway and Service Time												
Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.024			0.070			0.179			0.185		
Final Departure Headway, hd (s)	4.49			4.70			4.23			4.42		
Final Degree of Utilization, x	0.034			0.102			0.236			0.255		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	2.49			2.70			2.23			2.42		
Capacity, Delay and Level of Service												
Flow Rate, v (veh/h)	27			78			201			208		
Capacity	803			766			852			814		
95% Queue Length, Q_{95} (veh)	0.1			0.3			0.9			1.0		
Control Delay (s/veh)	7.6			8.2			8.5			8.9		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	7.6			8.2			8.5			8.9		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	8.6						A					

HCS™ AWSC Version 7.8.5
729_2029_tot_PM.xaw

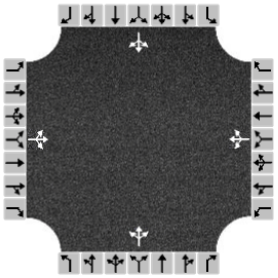
Generated: 11/24/2020 4:15:27 PM

EXHIBIT 8
2034 WEEKDAY PEAK AM HOUR ANALYSIS – Oak Ridge/Haig

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst		Intersection	Oak Ridge/Haig
Agency/Co.		Jurisdiction	City of Belleville
Date Performed	11/19/2020	East/West Street	Oak Ridge Boulevard
Analysis Year	2034	North/South Street	Haig Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.92
Time Analyzed	Peak AM Hour		
Project Description	Hanley Park North Subdivision		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	6	1	30	60	1	49	11	120	20	14	75	2
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	40			120			164			99		
Percent Heavy Vehicles	1			1			1			1		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.036			0.106			0.146			0.088		
Final Departure Headway, hd (s)	4.21			4.41			4.33			4.48		
Final Degree of Utilization, x	0.047			0.146			0.198			0.123		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	2.21			2.41			2.33			2.48		

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	40			120			164			99		
Capacity	856			817			831			803		
95% Queue Length, Q_{95} (veh)	0.1			0.5			0.7			0.4		
Control Delay (s/veh)	7.4			8.2			8.4			8.1		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	7.4			8.2			8.4			8.1		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	8.2						A					

HCS™ AWSC Version 7.8.5
729_2034_tot_AM.xaw

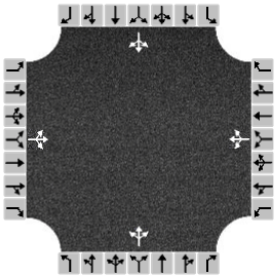
Generated: 11/24/2020 4:17:10 PM

EXHIBIT 9
2034 WEEKDAY PEAK PM HOUR ANALYSIS – Oak Ridge/Haig

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst		Intersection	Oak Ridge/Haig
Agency/Co.		Jurisdiction	City of Belleville
Date Performed	11/19/2020	East/West Street	Oak Ridge Boulevard
Analysis Year	2034	North/South Street	Haig Road
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.92
Time Analyzed	Peak PM Hour		
Project Description	Hanley Park North Subdivision		

Lanes



Vehicle Volume and Adjustments

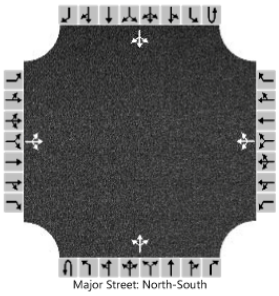
Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	5	1	21	40	1	32	33	92	66	57	133	7
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LTR			LTR			LTR			LTR		
Flow Rate, v (veh/h)	29			79			208			214		
Percent Heavy Vehicles	1			1			1			1		
Departure Headway and Service Time												
Initial Departure Headway, hd (s)	3.20			3.20			3.20			3.20		
Initial Degree of Utilization, x	0.026			0.071			0.185			0.190		
Final Departure Headway, hd (s)	4.54			4.74			4.25			4.44		
Final Degree of Utilization, x	0.037			0.105			0.245			0.264		
Move-Up Time, m (s)	2.0			2.0			2.0			2.0		
Service Time, ts (s)	2.54			2.74			2.25			2.44		
Capacity, Delay and Level of Service												
Flow Rate, v (veh/h)	29			79			208			214		
Capacity	793			759			847			811		
95% Queue Length, Q_{95} (veh)	0.1			0.3			1.0			1.1		
Control Delay (s/veh)	7.7			8.3			8.6			9.0		
Level of Service, LOS	A			A			A			A		
Approach Delay (s/veh)	7.7			8.3			8.6			9.0		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	8.7						A					

EXHIBIT 10
2020 WEEKDAY PEAK AM HOUR ANALYSIS (Pre-COVID-19) – Victoria/Haig

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Victoria/Haig
Agency/Co.		Jurisdiction	City of Belleville
Date Performed	11/19/2020	East/West Street	Victoria Avenue
Analysis Year	2020	North/South Street	Haig Road
Time Analyzed	Peak AM Hour Pre-COVID-19	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Hanley Park North 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		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		11	0	26		6	3	1		67	87	3		0	85	23
Percent Heavy Vehicles (%)		0	0	0		0	0	0		5				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.50	6.20		4.15				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.25				2.20		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			40				11			73				0		
Capacity, c (veh/h)			802				576			1452				1508		
v/c Ratio			0.05				0.02			0.05				0.00		
95% Queue Length, Q_{95} (veh)			0.2				0.1			0.2				0.0		
Control Delay (s/veh)			9.7				11.4			7.6				7.4		
Level of Service (LOS)			A				B			A				A		
Approach Delay (s/veh)	9.7				11.4				3.5				0.0			
Approach LOS	A				B											

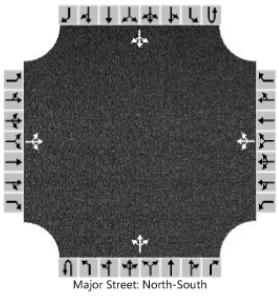
HCS™ TWSC Version 7.8.5
729_2020_typ_AM.xtw
Generated: 11/19/2020 9:22:56 AM

EXHIBIT 11
2020 WEEKDAY PEAK PM HOUR ANALYSIS (Pre-COVID-19) – Victoria/Haig

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Victoria/Haig
Agency/Co.		Jurisdiction	City of Belleville
Date Performed	11/19/2020	East/West Street	Victoria Avenue
Analysis Year	2020	North/South Street	Haig Road
Time Analyzed	Peak PM Hour Pre-COVID-19	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Hanley Park North 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		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		14	4	27		0	0	3		33	104	2		3	116	6
Percent Heavy Vehicles (%)		0	0	0		0	0	0		3				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.50	6.20		4.13				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.23				2.20		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			49				3			36				3		
Capacity, c (veh/h)			766				944			1446				1486		
v/c Ratio			0.06				0.00			0.02				0.00		
95% Queue Length, Q_{95} (veh)			0.2				0.0			0.1				0.0		
Control Delay (s/veh)			10.0				8.8			7.6				7.4		
Level of Service (LOS)			B				A			A				A		
Approach Delay (s/veh)	10.0				8.8				1.9				0.2			
Approach LOS	B				A											

HCS™ TWSC Version 7.8.5
729_2020_typ_PM.xtw

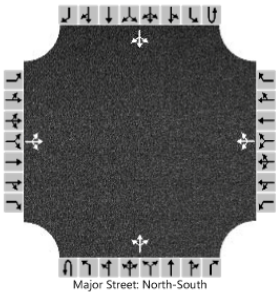
Generated: 11/19/2020 9:49:59 AM

EXHIBIT 12
2029 WEEKDAY PEAK AM HOUR ANALYSIS – Victoria/Haig

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Victoria/Haig
Agency/Co.		Jurisdiction	City of Belleville
Date Performed	11/19/2020	East/West Street	Victoria Avenue
Analysis Year	2029	North/South Street	Haig Road
Time Analyzed	Peak AM Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Hanley Park North 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		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		14	0	28		7	3	1		73	131	3		0	127	32
Percent Heavy Vehicles (%)		0	0	0		0	0	0		5				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.50	6.20		4.15				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.25				2.20		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			46				12			79				0		
Capacity, c (veh/h)			700				485			1386				1449		
v/c Ratio			0.07				0.02			0.06				0.00		
95% Queue Length, Q_{95} (veh)			0.2				0.1			0.2				0.0		
Control Delay (s/veh)			10.5				12.6			7.8				7.5		
Level of Service (LOS)			B				B			A				A		
Approach Delay (s/veh)	10.5				12.6				3.0				0.0			
Approach LOS	B				B											

HCS™ TWSC Version 7.8.5
729_2029_tot_AM.xtw

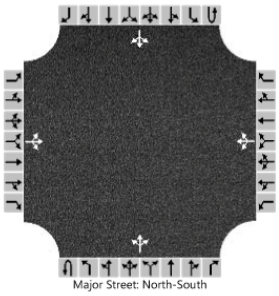
Generated: 11/24/2020 4:22:39 PM

EXHIBIT 13
2029 WEEKDAY PEAK PM HOUR ANALYSIS – Victoria/Haig

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Victoria/Haig
Agency/Co.		Jurisdiction	City of Belleville
Date Performed	11/19/2020	East/West Street	Victoria Avenue
Analysis Year	2029	North/South Street	Haig Road
Time Analyzed	Peak PM Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Hanley Park North 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		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		23	4	30		0	0	3		36	158	2		3	172	12
Percent Heavy Vehicles (%)		0	0	0		0	0	0		3				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.50	6.20		4.13				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.23				2.20		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			62				3			39				3		
Capacity, c (veh/h)			641				876			1366				1415		
v/c Ratio			0.10				0.00			0.03				0.00		
95% Queue Length, Q_{95} (veh)			0.3				0.0			0.1				0.0		
Control Delay (s/veh)			11.2				9.1			7.7				7.6		
Level of Service (LOS)			B				A			A				A		
Approach Delay (s/veh)	11.2				9.1				1.6				0.1			
Approach LOS	B				A											

HCS™ TWSC Version 7.8.5
729_2029_tot_PM.xtw

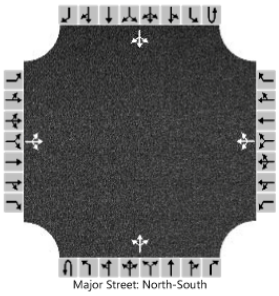
Generated: 11/24/2020 4:27:00 PM

EXHIBIT 14
2034 WEEKDAY PEAK AM HOUR ANALYSIS – Victoria/Haig

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Victoria/Haig
Agency/Co.		Jurisdiction	City of Belleville
Date Performed	11/19/2020	East/West Street	Victoria Avenue
Analysis Year	2034	North/South Street	Haig Road
Time Analyzed	Peak AM Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Hanley Park North 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		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		15	0	30		7	3	1		77	136	3		0	132	33
Percent Heavy Vehicles (%)		0	0	0		0	0	0		5				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.50	6.20		4.15				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.25				2.20		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			49				12			84				0		
Capacity, c (veh/h)			686				468			1378				1442		
v/c Ratio			0.07				0.03			0.06				0.00		
95% Queue Length, Q_{95} (veh)			0.2				0.1			0.2				0.0		
Control Delay (s/veh)			10.7				12.9			7.8				7.5		
Level of Service (LOS)			B				B			A				A		
Approach Delay (s/veh)	10.7				12.9				3.1				0.0			
Approach LOS	B				B											

HCS™ TWSC Version 7.8.5
729_2034_tot_AM.xtw

Generated: 11/24/2020 4:28:20 PM

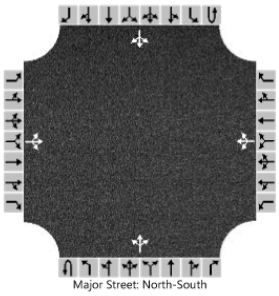
EXHIBIT 15
2034 WEEKDAY PEAK PM HOUR ANALYSIS – Victoria/Haig

HCS7 Two-Way Stop-Control Report

General Information

Analyst		Intersection	Victoria/Haig
Agency/Co.		Jurisdiction	City of Belleville
Date Performed	11/19/2020	East/West Street	Victoria Avenue
Analysis Year	2034	North/South Street	Haig Road
Time Analyzed	Peak PM Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Hanley Park North 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		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		24	5	31		0	0	3		38	163	2		3	178	12
Percent Heavy Vehicles (%)		0	0	0		0	0	0		3				0		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.10	6.50	6.20		7.10	6.50	6.20		4.13				4.10		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.50	4.00	3.30		3.50	4.00	3.30		2.23				2.20		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			65				3			41				3		
Capacity, c (veh/h)			626				870			1359				1408		
v/c Ratio			0.10				0.00			0.03				0.00		
95% Queue Length, Q_{95} (veh)			0.3				0.0			0.1				0.0		
Control Delay (s/veh)			11.4				9.2			7.7				7.6		
Level of Service (LOS)			B				A			A				A		
Approach Delay (s/veh)	11.4				9.2				1.7				0.1			
Approach LOS	B				A											

HCS™ TWSC Version 7.8.5
729_2034_tot_PM.xtw

Generated: 11/24/2020 4:29:41 PM