

TRAFFIC IMPACT, PARKING STUDY AND SITE PLAN REVIEW

May 2022

Proposed Mixed-Use Development
10 Aspen Springs Drive,
Clarington (Bowmanville), Ontario

Prepared for
Sunray Group

c/o
Gagnon Walker Domes Ltd.



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May 2, 2022

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Re: Proposed Multi-Building, Mixed-Use Development, 10 Aspen Springs Drive, Municipality of Clarington (Bowmanville), ON – Transportation Study

Dear Mr. Michaud,

TRANS-PLAN is pleased to submit this Transportation Study, consisting of Traffic Impact Study, Parking Study, Traffic Demand Management Plan, and Site Plan Review, for the proposed multi-building mixed-use development at 10 Aspen Springs Drive in the Town of Bowmanville. The development consists of one 25-storey twin-tower mixed-use building including 485 dwelling units, with commercial/retail-at-grade, and a 9-storey mid-rise residential building with 122 dwelling units.

Our traffic impact study findings indicate that the proposed development would be accommodated by the existing road network and no future road improvements (other than construction of the site access) are necessary. Both site entrances are expected to operate well.

The proposed auto parking supply is expected to be sufficient based on the site context, access to transit facilities and the proximity to future Bowmanville GO station. A review of parking layout requirements and site circulation is also provided herein. Traffic and parking activity at the proposed development will function in an acceptable manner.

Sincerely,



Anil Seegobin, P.Eng.
Partner, Engineer



Jing Min, E.I.T.
Traffic Analyst

Trans-Plan Transportation Inc.
Transportation Consultants

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Transmittal Letter

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1. INTRODUCTION

Trans-Plan has been retained by Sunray Group to provide Traffic Impact, Parking Study, TDM Plan and Site Plan Review for a proposed multi-building, mixed-use development at 10 Aspen Springs Drive, Town of Bowmanville, Municipality of Clarington. This study includes the following components and tasks:

Traffic Impact Study

- A review and assessment of the existing road network
- A review of the site context and development proposal
- An assessment of future background conditions based on anticipated traffic growth, area developments and planned transportation improvements in the study area
- An assessment of the impact of site-generated traffic on the adjacent roadway network under future background and total traffic conditions at full build-out and a 5-year planning horizon after build-out
- Determination of roadway improvements and transit and pedestrian / cycling infrastructure improvements, as required, to accommodate the proposed development

Parking Review

- A review of on-site parking requirements, as per the Municipality of Clarington Zoning By-law, in comparison to the proposed parking supply
- A review of public parking opportunities and alternative modes of travel, including transit, cycling and walking

Traffic Demand Management (TDM) Plan

- a review of the study area roadways for transit and active transportation facilities
- a review of TDM guidelines to determine the TDM measures that would be appropriate for the planned development in terms of context, scale and land use

Site Plan Review

- A review of the proposed access location, design, configuration and operation
- A review of fire routes, walkways, loading area and parking stall dimensions and other proposed traffic features
- A review of on-site circulation for passenger vehicles, loading/waste collection trucks, and fire trucks, including turning templates for all design vehicles

Prior to conducting this study, transportation staff at Municipality of Clarington and Durham Region were provided a term of reference (TOR) to confirm the study scope and methodology, and this report adheres to the Region of Durham's Traffic Impact Study Guidelines, dated October 2011, and the Municipality of Clarington's Traffic Impact Study Guidelines, dated January 2015.

2. SITE LOCATION

The subject site, shown in Figure 1, is located on the northwest quadrant of the intersection of Bowmanville Avenue and Aspen Springs Drive, located in the Town of Bowmanville, Municipality of

Clarington, Durham Region. The lot is currently vacant, with surrounding land uses consisting of mainly residential, including single family detached dwellings, and three mid-rise condominiums west of the site. South of the site includes a small commercial plaza providing various amenities such as food and beverage, dentistry, physical therapy clinic, and a convenience store. Highway 401 is also located approximately 1.5km south of the site. The CN railway track runs approximately 200m north parallel to Aspen Springs Drive. Further north includes a retirement community, commercial retail plazas, and a recreational center.

3. PROPOSED DEVELOPMENT

The site plan, prepared by Mataj Architects Inc., is shown in Figure 2. The proposed development consists of the following changes to the lot:

- One twin-tower mixed-use building (two residential towers and a podium) rising 25-storeys, with 433.4 sq.m. of commercial floor area at grade, and a total of 485 dwelling units
- One mid-rise residential building, rising 9-storeys, with 191.4 sq.m. of commercial floor area at grade, and a total of 122 dwelling units

Parking is to be provided via surface parking area and three underground levels, with vehicular access to the site provided from two accesses: one full-moves driveway on Aspen Springs Drive approximately 75-meters west of its intersection with Bowmanville Avenue, and a right-in/right-out (RIRO) access (RO only until Metrolinx lands are developed) along Bowmanville Avenue which is ultimately to be shared with the adjacent Metrolinx lands (once the lands are fully developed), approximately 120m north of Aspen Springs Drive.

4. EXISTING CONDITIONS

4.1 Road Network

The boundary roadways located in the study area are described as follows:

King Street West / Highway 2 is an arterial roadway running in an east-west orientation, under the jurisdiction of the Region of Durham. It consists of four travel lanes, two in each direction. The posted speed limit east of within the study area is 60km/h and reduces to 50km/h east of Bowmanville Avenue.

Bowmanville Avenue / Martin Road (Reginal Road 57) is a collector roadway running in a north-south direction, under the jurisdiction of the Region of Durham. It consists of two travel lanes, one in each direction. The posted speed limit within the study area is 60km/h.

Aspen Springs Drive is a local road under the jurisdiction of the Town of Bowmanville, running in an east-west direction. The roadway includes existing unbuffered cycling lanes on the north and south sides. The speed limit is unposted, and thus is assumed to be 50 km/h.

Bonnycastle Drive is a local road under the jurisdiction of the Town of Bowmanville, running in a north-south direction. The posted speed limit within the study area is 50 km/h.

Fry Crescent is a local road under the jurisdiction of the Town of Bowmanville, generally running in a north-south direction as it intersects with Aspen Springs Drive twice. The east node is configured as a 3-legged T-intersection, and the west node includes a north leg which is the driveway access to another condominium development. The speed limit is unposted, and thus is assumed to be 50 km/h.

The study area intersections and driveways reviewed in our analysis are as follows:

- Bowmanville Avenue and Regional Highway 2 / King Street West (signalized intersection)
- Bowmanville Avenue and Aspen Springs Drive (signalized intersection)
- Bowmanville Avenue and Hartwell Avenue (signalized intersection)
- Aspen Springs Drive and Bonnycastle Drive (unsignalized / stop-controlled)
- Aspen Springs Drive and Fry Crescent (unsignalized / stop-controlled)
- Bowmanville Avenue and Proposed RIRO Site Driveway
- Aspen Springs Drive and Proposed Site Driveway

The existing study area roadway characteristics are shown in Figure 3.

4.2 Traffic Counts

Detailed TMC data for the three (3) signalized Bowmanville Avenue intersections were obtained from Durham Region’s Open Data website, and current signal timing plans for the signalized intersections from Durham Region Transportation Staff. It should be noted TMC data available for the Bowmanville Avenue and Hartwell Avenue intersection did not reflect westbound volumes from the condominium which has been constructed since counts were last conducted.

With no available TMC data for the study area intersections along Aspen Springs Drive, as well as the east leg from the Hartwell Avenue intersection, Trans-Plan conducted our own counts on Wednesday November 10, 2021 (a typical weekday) during Step Three of Ontario’s Roadmap to Reopen.

The detailed TMC data is provided in Appendix A, and the count dates, times and peak hours are summarized below in Table 1.

Table 1 – Turning Movement Counts, Study Area Intersections and Driveways

Location	Source	Count Date	Count Hours	Peak Hours
Bowmanville Avenue and Regional Highway 2	Durham Region	Wednesday November 20, 2019	6:00am – 9:30am 3:30pm – 6:30pm	8:00am – 9:00am 4:00pm – 5:00pm
Bowmanville Avenue and Aspen Springs Drive				8:00am – 9:00am 4:45pm – 5:45pm
Bowmanville Avenue and Hartwell Avenue / Condo Access (North, South, and West legs)		Tuesday May 28, 2019		7:45am – 8:45am 4:00pm – 5:00pm
Bowmanville Avenue and Hartwell Avenue / Condo Access (East leg, Condo Access)	Trans-Plan	Wednesday November 10, 2021	7:00am – 9:30am 3:00pm – 6:00pm	8:30am – 9:30am 3:00pm – 4:00pm
Aspen Springs Drive and Bonnycastle Drive				8:15am – 9:15am 3:30pm – 4:30pm
Aspen Springs Drive and Fry Crescent (East and West nodes)				8:15am – 9:15am 3:30pm – 4:30pm

Traffic volumes along the study area roadways were balanced (increased) for corridor volume consistency, where appropriate. Existing traffic volumes for the weekday AM and PM peak hours are illustrated in Figure 4.

4.3 Signal Timing Plans

The signal timing plans (STP's) for the intersections along Bowmanville Avenue at; Regional Highway 2, Aspen Springs Drive, and Hartwell Avenue, were obtained from Durham Region which manages the signals for the Town of Bowmanville. The signal timings which were provided are attached in Appendix A.

4.4 Transit Service

The site is served by GO Transit and Durham Region Transit; the route details are as follows:

Route 88 Peterborough/Oshawa is a bus route that generally operates in a north-south orientation, connecting riders from the Oshawa GO Station to Trent University in Peterborough. The nearest stop is at the intersection of Aspen Springs Drive and Bowmanville Avenue.

Route 902A King is a bus route that generally operates in an east-west orientation, connecting riders from the Oshawa Station to Simpson Avenue in Bowmanville. The nearest stop is at the intersection of Highway 2 and Bowmanville Avenue.

The approximate service times and peak service frequencies for the transit routes are shown below in Table 2. A study area route map is provided in Figure 5, and a route map for the GO Peterborough/Oshawa line is provided in Figure 6.

Table 2 – Transit Service

Transit Route	Nearest Transit Stop to Site	Approximate Service Times		Approximate Peak Service Frequency (min)		
		Weekday	Weekend	Weekday AM Peak	Weekday PM Peak	SAT peak
GO Route 88	Bowmanville Avenue & Aspen Springs Drive	05:29 – 23:04	07:06 – 23:06	25-35	30	60
902A	Bowmanville Avenue & Highway 2	05:26 – 22:25	05:26 – 22:25	30	30	30

Source: GO Transit & Durham Region Transit Website

5. FUTURE BACKGROUND CONDITIONS

The future background traffic volumes for the weekday AM and PM peak hours were determined based on a review of background traffic growth, planned developments and roadway improvements.

5.1 Horizon Years

A 5-year horizon period beyond the expected build-out year of 2024 was analyzed. As such, years 2024 and 2029 were considered in our analysis of future background traffic conditions.

5.2 Background Growth Rate

Horizon year 2024

Typically, traffic growth in the study area is analyzed through a linear regression analysis of aggregate Annual Average Daily Traffic (AADT) mid-block volumes, which were obtained from Durham Region’s Open Data Website. However, as the results were inconclusive (negative results), a 2% growth rate was carried forward through the analysis of 2024 future background traffic conditions. Detailed growth rate calculations are provided in Appendix B.

Horizon year 2029

Transportation Planning staff from Durham Region has suggested the following annual growth rates for year 2024-2029 with proposed roadway improvements and the Bowmanville GO station:

- RR57, south of Hwy 2 – 2.0%
- RR57, south of Aspen Springs Dr – 1.5%
- Hwy 2, between Green Rd and RR57 – 2.5%
- Hwy 2, west of Green Rd – 2.0%

As suggested, a 2.5% growth rate was applied along Hwy 2 (between Green Rd and RR57), and a 2% growth rate was applied at all other roadway segments to be conservative. Detailed growth rate calculations are provided in Appendix B.

5.3 Background Developments

Based on correspondence with Region of Durham, and Municipality of Clarington Staff, there are four notable background developments near the site that may have traffic impacts on the study area intersections and driveways. These developments and their details are listed below in Table 3.

Table 3 - Planned Background Developments

No.	Location	Description of Application	Trip Generation Source
DEV 1	Green Road & Highway 2 (Southwest Corner)	Proposed multi-residential development consisting of two 11-storey buildings (228 units) with 1 st floor commercial (371m ²)	Figure 8 of Traffic Impact Study, Parking and Site Circulation Review, dated January 2017, prepared by Trans-Plan
DEV 2	215, 219 & 223 King Street West	Proposed residential development consisting of 3 condominium buildings (425 units)	Figure 4–1 and Figure 4–2 of Transportation Impact Study, Proposed Multi-Residential Development, dated September 2021 by Nextrans
DEV 3	51 – 55 Clarington Boulevard	Apartment building (134 units) and 215 townhouse units	Exhibit 3.2, Memorandum: Update Traffic Impact Study, dated February 2017
DEV 4	Metrolinx Lands adjacent North and West of Site	Metrolinx Transit Hub	Durham Region

DEV 1’s traffic study was referenced to obtain trip generation and distribution; however, it should be noted it is not directly located in the vicinity of the study area analyzed in this report. To adjust, the westbound (inbound) and eastbound (outbound) trips were carried through to the Highway 2 and

Bowmanville Avenue intersection, which were then distributed to the road network based on the traffic patterns derived from the TMC counts conducted for this report.

DEV 2's traffic study was referenced to obtain trip generation and distribution, which was then distributed to the study area intersections based on existing traffic patterns.

Similarly, DEV 3's traffic study was referenced to obtain trip generation and distribution, however the road network analyzed in their report did not include Highway 2. In this case, inbound and outbound site generated trips were carried to/from Highway 2 and distributed to the intersections at Clarington Boulevard and Green Road, based on traffic patterns at the Green Road and Highway 2 intersection, as derived from the DEV 1 traffic study.

Metrolinx and Durham Region staff were contacted to confirm access locations and estimated trip generation for the future GO Station. However, as the development is still in its early planning stages this information is not yet available. Metrolinx staff were also contacted to obtain any potential ridership information or future train schedules, however this information was also unavailable. As a result, Durham Region provided growth rates for the study area roadways to reflect the anticipated increase in traffic, which were applied to the appropriate road sections and are included in our analysis of future background traffic conditions.

As per correspondence with Metrolinx staff there are no confirmed design plans or access locations. Durham Region Transportation Staff were also contacted, in which it was advised to assume the RIRO access on Bowmanville Avenue, as well as the full-moves access on Aspen Springs Drive. For this study, the north leg of the Fry Crescent (east) intersection was analyzed as a full-moves access point. It was also assumed the RIRO driveway along Bowmanville Avenue north of Aspen Springs Drive would be shared with the subject development (with only outbound traffic generated by the subject site intended to utilize this access until the GO station is fully in operation).

For this study, the assumed design features mentioned above were incorporated into our analysis of future background traffic conditions for horizon year 2029, given the transit hub is expected to be operational sometime between 2024 and 2029.

The trip generation and assignment figures for these above background developments, and excerpts of the referenced traffic studies, are provided in Appendix B.

5.4 Planned Roadway Improvements

Based on review of Durham Region's Public Works Projects, there are currently plans to widen Bowmanville Avenue between Baseline Road, and beyond Regional Highway 2. Additional road improvements affecting Bowmanville Avenue were noted, and are as follows:

- Road widening from 2 to 4 lanes
- Exclusive southbound right-turn lanes at Aspen Springs Drive, and Hartwell Avenue
- Relocation of existing bus stop at Aspen Springs Drive (mentioned previously in Section 4.4) to the SW corner

Regional Transportation Staff were contacted to confirm design features, as well as any anticipated year of completion for the road improvements. As per correspondence with the Region, construction of the road-widening along Bowmanville Avenue is scheduled to start in 2023 and is projected to take at least two years. As such, the above road improvements will be included in the analysis of future 2029

background traffic conditions in capacity/queuing analysis. The referenced design drawings obtained from the Regions website are attached in Appendix B.

The future study area roadway characteristics are shown in Figure 8. The future background traffic volumes for the horizon years 2024 and 2029, during the AM and PM peak hours are provided in Figure 7 and Figure 9, respectively.

6. SITE TRAFFIC

6.1 Trip Generation

The auto trip rates from the Institute of Transportation Engineers (ITE) Trip Generation manuals, 10th Edition, Land Use Codes (LUC) 222 – Multi-Family Housing (High-rise), LUC 221 for Multifamily Housing (Mid-Rise), and LUC 820 for Shopping Center were referenced to estimate the trip volumes generated by the site. A summary of the estimated trip generation is provided below in Table 4.

Table 4 – Site Trip Generation

Land Use	Unit Count		Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
LUC 222	485 Units	Distribution	23%	77%	100%	63%	37%	100%
		Equation	$(T) = 0.28(X) + 12.86$			$(T) = 0.34(X) + 8.56$		
		Rate	0.07	0.23	0.31	0.26	0.15	0.42
		Trips	36	113	149	127	75	202
LUC 221	122 Units	Distribution	26%	74%	100%	61%	39%	100%
		Equation	$\ln(T) = 0.98\ln(X) - 0.98$			$\ln(T) = 0.96\ln(X) - 0.63$		
		Rate	0.09	0.25	0.34	0.27	0.17	0.44
		Trips	11	31	42	33	21	54
LUC 820	6,526 Sq.ft.	Distribution	62%	38%	100%	48%	52%	100%
		Rate	0.58	0.36	0.94	1.83	1.98	3.81
		Trips	4	2	6	12	13	25
Total Trips			51	146	197	172	109	281

Based on ITE’s base rates, the site is expected to generate approximately 197 and 281 two-way trips during the weekday AM and PM peak hours, respectively.

6.2 Trip Distribution and Assignment

The site trips for the proposed development were distributed to / from the subject site and the boundary roadways by considering the existing travel patterns at the study area intersections, and 2016 TTS data for overall travel patterns in the GTA. Based on the TTS data, the directional distribution of home-based trips from Clarington Ward 2 to the surrounding wards and other municipalities in the morning (and returning in the evening) is shown as follows:

		North		
		1%		
West	48%		23%	East
		28%		
		South		

A summary of the source TTS data is provided in Appendix C. The site traffic assignment for the weekday AM and PM peak hours is shown in Figure 10.

6.3 Modal Trip Generation

2016 Transportation Tomorrow Survey (TTS) data for the Regional Municipality of Durham, was used to obtain the mode of travel percentages within the subject site, which falls under the Municipality of Clarington, Ward 2. Applying the results of the auto trip generation and the TTS mode of travel percentages, the trip generation for all other modes was estimated for the site for the weekday AM and PM peak hours, as summarized in Table 5. Source information for TTS data, mode of travel percentages, is provided in Appendix C.

Table 5 – Modal Trip Generation

Mode of Travel		Weekday AM Peak Hour			Weekday PM Peak Hour		
Mode	Percentage	In	Out	Total	In	Out	Total
Driver	75%	44	126	170	148	94	242
Passenger	12%	7	20	27	24	15	39
Transit	2%	1	3	4	3	2	5
GO Train	3%	2	4	6	5	3	8
Walk & Cycle	6%	3	10	13	12	7	19
Other	3%	2	5	7	6	4	10
Total	100%						
Total Trips for All Modes		59	168	227	198	124	323

Source: 2016 Transportation Tomorrow Survey – Trips Made by Residents of Municipality of Clarington – Ward 2 (6am-9am)

Passenger Trips

Approximately 12% of trips from Ward 2 are passenger trips. The site is expected to generate 27 and 39 two-way passenger trips during the weekday AM and PM peak hours, respectively.

Transit Trips

Approximately 3% of trips from Ward 2 are made by GO Transit. The site is expected to generate 6 and 8 two-way passenger trips during the weekday AM and PM peak hours, respectively. Significantly more GO Transit trips are expected after the future GO station is in operation.

The site is expected to generate 4 and 5 two-way passenger trips during the weekday AM and PM peak hours, respectively.

Walk & Cycle Trips

Approximately 6% of trips within Ward 2 are walk / cycle trips. The site is expected to generate approximately 13 two-way walk trips in the weekday AM peak hour and 19 two-way walk trips in the weekday PM peak hours (excluding walk trips to and from the nearby transit stops).

7. FUTURE TOTAL CONDITIONS

The future total traffic volumes for horizon years 2024 and 2029 during the weekday AM and PM peak hours were obtained by adding the site trip assignment to the future background traffic volumes and are provided in Figure 11 and Figure 12.

8. CAPACITY AND VEHICLE QUEUING ANALYSIS

A capacity analysis was performed for the study area intersections and driveways using Synchro 10 analysis software. The following traffic conditions, during the weekday AM and PM peak hours, were analyzed:

- Existing Traffic Conditions
- Future 2024 and 2029 Background and Total Traffic Conditions

According to the Traffic Impact Study Guidelines of Durham Region and the Municipality of Clarington, a Level of Service (LOS) of D or better is considered acceptable in an urban setting.

The capacity analysis results are provided in Table 9 and the critical movements are discussed below. A vehicle queuing analysis was performed for the study area intersections and driveways using SimTraffic analysis software, under the critical future 2024 and 2028 total traffic conditions. The 95th percentile queue results are shown in Table 11. The detailed Synchro output sheets and LOS definitions are provided in Appendix D and Appendix E, respectively.

The results for the study area intersections and driveway(s) are summarized as follows:

Bowmanville Avenue at Highway 2

Under existing conditions, this intersection operates at an overall LOS of D with a v/c ratio at 0.88 in the weekday AM peak hour and 1.02 in the weekday PM peak hour. During the PM peak hour, the southbound left, through and the eastbound left movements operate at an LOS E or F with a critical capacity of 1.0.

Horizon Year 2024

Adjustments to the traffic signal timings were made to improve operational efficiency and accommodate motorists in the interim while the Bowmanville Avenue Road improvements (contemplated through the municipal EA Study) are not completed. The existing cycle lengths were maintained as 90 seconds. The signal timing adjustments applied to this intersection are summarized in Table 6.

Table 6 – Future Signal Timing Adjustments at Highway 2 and Bowmanville Avenue, 2024

Phase	Movement	Adjustments (seconds)	
		Weekday AM Peak Hour	Weekday PM Peak Hour
1	WB Left	+1.1	-0.9
2	EB Through	+0.3	-4.7
3	NB Left	-4.3	-1.5
4	SB/ SB Through	+2.9	+1.1
5	EB Left	+1.1	+2.2
6	WB Through	+0.3	-7.8
8	NB Through	-1.4	-0.4

Under 2024 future background and total conditions, with the STP adjustments, the intersection is expected to operate similarly to the existing conditions. The intersection is expected to operate at an acceptable LOS of D with an overall v/c ratio of 0.94 during weekday AM peak hour. All the movements are expected to operate under a v/c ratio of 1.0. During PM peak hour, the intersection is expected to operate at an LOS of E with a v/c ratio of 1.18 during PM peak hour. The eastbound, northbound left and southbound through movements are expected to operate at a critical capacity.

Horizon Year 2029

The signal timing adjustments were applied to 2029 future background and total conditions to improve operational efficiency and accommodate the EA improvements of Bowmanville Avenue Road. A protected left turn phase was introduced during PM peak hour. The existing cycle lengths were maintained as 90 seconds. The signal timing adjustments applied to this intersection are summarized in Table 7.

Table 7 – Future Signal Timing Adjustments at Highway 2 and Bowmanville Avenue, 2029

Phase	Movement	Adjustments (seconds)	
		Weekday AM Peak Hour	Weekday PM Peak Hour
1	WB Left	+8.1	+0.1
2	EB Through	-0.7	+2.3
3	NB Left	-2.8	+0.5
4	SB /SB Through	-4.6	-2.9
5	EB Left	+3.1	+7.2
6	WB Through	+4.3	-4.8
7	SB Left	n/a	+10
8	NB Through	-7.4	-12.4

Under 2029 future background and total conditions, with the STP adjustments, the intersection is expected to operate similarly to the existing conditions. The intersection is expected to operate at an acceptable LOS of D with an overall v/c ratio of 1.01 during weekday AM peak hour. All the movements are expected to operate at a LOS of D or better. During weekday PM peak hour, the intersection is expected to operate at an LOS of E with a v/c ratio of 1.21 and a delay of 70 seconds. The eastbound left, northbound left and westbound movements are expected to operate over capacity.

Summary

In summary, the intersection is currently operating at acceptable capacity. In the horizon years 2024 and 2029, background traffic growth is causing the intersection to operate at critical capacity in the weekday

peak hours. Given the signal timing plan at this intersection is coordinated along a corridor, no adjustment on cycle length has been made in this analysis. Longer cycle length may further improve the operation.

The results of the background conditions compared to the total conditions is similar. Therefore, the proposed site is expected to have minimal effect to this intersection and is not expected to cause any excess delay to this intersection.

Bowmanville Avenue at Aspen Springs Drive

Under existing conditions, this intersection operates at an overall good LOS of B with a v/c ratio at 0.78 in the weekday AM peak hour and 0.75 in the weekday PM peak hour. All the movements operate at an acceptable LOS of D or better

Horizon Year 2024

Adjustments to the traffic signal timings were made to improve operational efficiency and accommodate motorists in the interim while the Bowmanville Avenue Road improvements are not completed. A protected left turn phase was introduced during PM peak hour. The existing cycle lengths were maintained as 90 seconds. The signal timing adjustments applied to this intersection are summarized in Table 8.

Table 8 – Future Signal Timing Adjustments at Aspen Springs Drive and Bowmanville Avenue, 2029

Phase	Movement	Adjustments (seconds)	
		Weekday AM Peak Hour	Weekday PM Peak Hour
2	NB Through	+2.7	+5.7
4	EB Left/Right	-2.7	-5.7
5	NB Left	n/a	+9 (new)
6	SB Through	+2.7	-3.3

Under 2024 future background and total conditions, with the STP adjustments, the intersection is expected to operate at an acceptable LOS of C with an overall v/c ratio of 0.94 during weekday AM peak hour. All the movements are expected to operate under a v/c ratio of 1.0. During PM peak hour, the intersection is expected to operate at an LOS of E with a v/c ratio of 1.07 during PM peak hour. The eastbound, northbound left and southbound movements are expected to operate at a critical capacity. However, this is an interim condition before the EA Bowmanville Avenue improvements are completed, the operation will be improved after the widening.

Horizon Year 2029

No signal timing adjustments were applied to 2029 future background and total conditions. Under 2029 future background and total conditions, the intersection is expected to operate similarly to the existing conditions. The intersection is expected to operate at a good LOS of B with an overall v/c ratio of 0.57 and 0.68 during weekday AM and PM peak hour, respectively. All the movements are expected to operate at a LOS of D or better.

The 95th percentile vehicle queue for eastbound movements were observed to reach up to 47m and 54m under 2024 and 2029 future conditions, respectively. It is not expected to exceed the available storage length provided or block the site access. The southbound through and right movement may slightly exceed the available storage length provided under 2024 future conditions, but the situation will be greatly

improved after the widening along Bowmanville Avenue is completed. The traffic queues are not expected to have any adverse impact on intersection operation under 2029 future conditions.

Summary

The intersection is currently operating at acceptable capacity. Longer cycle length may further improve the operation. Although the intersection is expected to operate over capacity during weekday PM peak hour under 2024 future conditions, it is an interim condition. The proposed widening along Bowmanville Avenue would greatly improve the operation once completed (The road improvements are scheduled to start in 2023). Given the signal timing plan at this intersection is coordinated along a corridor, no adjustment on cycle length has been made in this analysis.

Bowmanville Avenue at Hartwell Avenue / Existing Condo Access

Under existing conditions, this intersection operates at an overall LOS of A with a v/c ratio of 0.65 and 0.70 during the AM and PM peak hours, respectively. All the movements operate at a LOS of D or better.

Horizon Year 2024

Under 2024 future background and total conditions, the intersection is expected to operate similarly to the existing conditions. The intersection is expected to operate at a good LOS of B or better with an overall v/c ratio of 0.72 and 0.81 during weekday AM and PM peak hour, respectively. All the movements are expected to operate at a LOS of D or better.

Horizon Year 2029

Under 2029 future background and total conditions, with the roadway improvements, the intersection is expected to operate better than the existing conditions. The intersection is expected to operate at a good LOS of A with an overall v/c ratio of 0.44 and 0.52 during weekday AM and PM peak hour, respectively. All the movements are expected to operate at a LOS of D or better.

The 95th percentile vehicle queue for southbound movements were observed to reach up to 113m and 32m under 2024 and 2029 future conditions, respectively. It is not expected to exceed the available storage length provided. The lane configuration changes at this intersection improve traffic queues at this intersection. The traffic queues are not expected to have any adverse impact on intersection operation under 2029 future conditions.

Summary

In summary, the intersection is expected to operate well and is not expected to experience any major delays.

Bonnycastle Drive at Aspen Springs Drive

Under existing conditions, all the movements operate at a good LOS of B or better with a delay up to 12 seconds during weekday peak hours.

Under 2024 and 2029 future conditions, all the movements at this intersection are expected to operate and at a good LOS of B or better with a delay up to 15 seconds.

The 95th percentile vehicle queue was observed to reach up to 23m (approximately 4-5 vehicles) and it is not expected to exceed the available storage length provided. The vehicle queues are not expected to have any adverse impact on intersection operation.

Summary

In summary, the intersection is expected to operate well and is not expected to experience any major delays.

Fry Crescent (East) at Aspen Springs Drive

Under existing conditions, all the movements operate at a good LOS of B or better with a delay up to 11 seconds during weekday peak hours.

Under 2024 and 2029 future conditions, all the movements at this intersection are expected to operate and at a good LOS of B or better with a delay up to 13 seconds.

Summary

In summary, the intersection is expected to operate well and is not expected to experience any major delays.

Fry Crescent (West) / Existing Condo Access at Aspen Springs Drive

Under existing conditions, all the movements operate at a good LOS of B or better with a delay up to 13 seconds during weekday peak hours.

Under 2024 and 2029 future conditions, all the movements at this intersection are expected to operate and at a LOS of C or better with a delay up to 16 seconds.

Summary

In summary, the intersection is expected to operate well and is not expected to experience any major delays.

Aspen Springs Drive at Proposed Site Driveway

Under 2024 and 2029 future conditions, all the movements at the proposed site access are expected to operate and at a LOS of C or better with a delay up to 16 seconds.

The 95th percentile vehicle queue was observed to reach up to 16m (approximately 3 vehicles) and it is expected to be contained within the site. The vehicle queue for eastbound and westbound are not expected to have any adverse impact on intersection operation.

Summary

In summary, the access is expected to operate well and is not expected to experience any major delays.

Bowmanville Avenue at Proposed Right-In/Right-Out Access (RO only for the subject site)

Under 2024 future conditions, all the movements at the proposed site access are expected to operate and at a LOS of C or better with a delay up to 20 seconds.

Under 2029 future conditions, with the EA roadway improvements completed, all the movements at the proposed site access are expected to operate and at a LOS of B or better with a delay up to 11 seconds.

The 95th percentile vehicle queue was observed to reach up to 17m (approximately 3 vehicles) under 2024 future conditions and 13m (approximately 2-3 vehicles) under 2029 total conditions, which are expected to be contained within the site. The EA widening improvements along Bowmanville Avenue would improve traffic queues at this intersection.

Summary

In summary, the access is expected to operate well and is not expected to experience any major delays.

Overall Summary

Overall, the traffic analysis indicates that the site accesses would operate well in future conditions with no roadway improvements necessary to accommodate the subject site. The intersection of Bowmanville Avenue and Highway 2 is expected to operate at critical or over capacity in future conditions due to background traffic growth with signal timing adjustments. The subject site is not expected to cause any major delays to the intersection.

Further, the vehicle queuing analysis indicates that 95th percentile queues are also expected to be acceptable in horizon years. It can be concluded that no road improvements, other than the site driveway, are necessary for the site to function.

Table 9 – Capacity Analysis Results, Existing and Future 2024 Traffic Conditions



Intersection Movement	Existing Traffic Conditions						Background Traffic Conditions						Total Traffic Conditions					
	Weekday AM Peak			Weekday PM Peak			2024 Weekday AM			2024 Weekday PM			2024 Weekday AM			2024 Weekday PM		
	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS
Bowmanville Avenue & Highway 2	0.88	36	D	1.02	43	D	0.94	40	D	1.10	61	E	0.98	43	D	1.18	67	E
Eastbound Left	0.84	48	D	1.00	69	E	0.88	53	D	0.97	63	E	0.91	60	E	0.98	68	E
Eastbound Through	0.74	36	D	0.96	46	D	0.83	41	D	1.14	103	F	0.83	41	D	1.14	103	F
Eastbound Right	0.20	27	C	0.31	22	C	0.23	27	C	0.38	24	C	0.27	28	C	0.42	25	C
Westbound Left	0.79	39	D	0.77	36	D	0.85	46	D	0.82	44	D	0.90	58	E	0.94	71	E
Westbound Through	0.91	47	D	0.74	28	C	0.97	57	E	1.04	70	E	0.97	57	E	1.04	70	E
Westbound Right	0.05	25	C	0.06	19	B	0.05	25	C	0.06	22	C	0.05	25	C	0.06	22	C
Northbound Left	0.65	21	C	0.94	53	D	0.83	37	D	0.94	58	E	0.94	58	E	1.10	106	F
Northbound Through	0.47	14	B	0.80	31	C	0.51	14	B	0.81	30	C	0.57	15	B	0.86	33	C
Northbound Right	0.08	10	B	0.13	18	B	0.08	9	A	0.14	16	B	0.09	10	B	0.15	16	B
Southbound Left	0.14	21	C	1.00	121	F	0.14	21	C	0.62	33	C	0.15	20	C	0.70	40	D
Southbound Through	0.95	56	E	1.00	79	E	0.95	56	E	0.95	60	E	0.97	60	E	1.04	84	F
Southbound Right	0.25	22	C	0.24	28	C	0.27	22	C	0.29	25	C	0.28	21	C	0.31	25	C
Bowmanville Avenue & Aspen Springs Drive	0.78	13	B	0.75	14	B	0.84	17	B	0.93	32	C	0.94	29	C	1.07	62	E
Eastbound Left	0.62	40	D	0.68	40	D	0.64	40	D	0.71	44	D	0.77	44	D	0.84	54	D
Eastbound Right	0.09	33	C	0.09	31	C	0.10	32	C	0.09	32	C	0.13	30	C	0.11	31	C
Northbound Left	0.37	7	A	0.40	9	A	0.49	11	B	0.58	32	C	0.87	52	D	0.93	76	E
Northbound Through	0.41	5	A	0.73	10	B	0.45	5	A	0.76	9	A	0.47	6	A	0.79	9	A
Southbound Through / Right	0.82	11	B	0.77	9	A	0.89	17	B	1.01	49	D	0.99	34	C	1.17	108	F
Bowmanville Avenue & Hartwell Avenue/Existing Condo Access	0.65	7	A	0.70	10	A	0.70	8	A	0.76	11	B	0.72	8	A	0.81	14	B
Eastbound Through / Left	0.27	41	D	0.4	41	D	0.28	41	D	0.42	42	D	0.28	41	D	0.42	42	D
Eastbound Right	0.03	39	D	0.05	38	D	0.03	39	D	0.05	38	D	0.03	39	D	0.05	38	D
Westbound Through / Left / Right	0.02	39	D	0.05	38	D	0.02	39	D	0.05	38	D	0.02	39	D	0.05	38	D
Northbound Left	0.11	3	A	0.24	4	A	0.13	3	A	0.28	5	A	0.14	3	A	0.29	5	A
Northbound Through / Right	0.45	5	A	0.73	9	A	0.48	5	A	0.79	11	B	0.50	5	A	0.86	15	B
Southbound Left	0.01	3	A	0.01	3	A	0.01	3	A	0.01	4	A	0.01	3	A	0.01	4	A
Southbound Through / Right	0.69	6	A	0.62	6	A	0.75	7	A	0.66	7	A	0.76	8	A	0.69	9	A
Bonnycastle Drive & Aspen Springs Drive																		
Eastbound Through / Right		0	A		0	A		0	A		0	A		0	A		0	A
Westbound Through / Left		1	A		1	A		1	A		1	A		1	A		1	A
Northbound Left / Right		11	B		12	B		11	B		13	B		12	B		13	B
Fry Crescent (East) & Aspen Springs Drive																		
Eastbound Through / Right		0	A		0	A		0	A		0	A		0	A		0	A
Westbound Through / Left		0	A		0	A		0	A		1	A		0	A		0	A
Northbound Left / Right		11	B		11	B		11	B		11	B		11	B		12	B
Fry Crescent (West)/Existing Condo Access & Aspen Springs Drive																		
Eastbound Through / Left / Right		1	A		1	A		1	A		1	A		1	A		1	A
Westbound Through / Left / Right		0	A		0	A		0	A		0	A		0	A		0	A
Northbound Through / Left / Right		10	B		13	B		11	B		14	B		11	B		15	B
Southbound Through / Left / Right		11	B		13	B		12	B		13	B		12	B		14	B
Aspen Springs Drive & 10 Aspen Springs Drive Access																		
Eastbound Through / Left								0	A		0	A		0	A		1	A
Westbound Through / Right								0	A		0	A		0	A		0	A
Southbound Left / Right								0	A		0	A		13	B		15	B
Bowmanville Avenue & Shared Site/Metrolinx Laneway																		
Eastbound Right								0	A		0	A		20	C		17	C
Northbound Through								0	A		0	A		0	A		0	A
Southbound Through / Right								0	A		0	A		0	A		0	A

Table 10 – Capacity Analysis Results, Existing and Future 2029 Traffic Conditions



Intersection Movement	Existing Traffic Conditions						Background Traffic Conditions						Total Traffic Conditions					
	Weekday AM Peak			Weekday PM Peak			2029 Weekday AM			2029 Weekday PM			2029 Weekday AM			2029 Weekday PM		
	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS
Bowmanville Avenue & Highway 2	0.88	36	D	1.02	43	D	0.96	39	D	1.15	67	E	1.01	40	D	1.21	70	E
Eastbound Left	0.84	48	D	1.00	69	E	0.87	48	D	0.90	48	D	0.87	48	D	0.91	49	D
Eastbound Through	0.74	36	D	0.96	46	D	0.94	51	D	1.15	105	F	0.95	53	D	1.15	105	F
Eastbound Right	0.20	27	C	0.31	22	C	0.37	29	C	0.46	24	C	0.40	30	C	0.49	24	C
Westbound Left	0.79	39	D	0.77	36	D	0.92	52	D	1.03	93	F	0.93	55	D	1.12	122	F
Westbound Through	0.91	47	D	0.74	28	C	0.95	47	D	1.11	95	F	0.95	48	D	1.10	91	F
Westbound Right	0.05	25	C	0.06	19	B	0.07	21	C	0.07	22	C	0.07	21	C	0.07	22	C
Northbound Left	0.65	21	C	0.94	53	D	0.85	39	D	1.06	80	F	0.93	54	D	1.17	119	F
Northbound Through	0.47	14	B	0.80	31	C	0.36	16	B	0.79	25	C	0.40	16	B	0.83	28	C
Northbound Right	0.08	10	B	0.13	18	B	0.10	10	B	0.41	17	B	0.11	11	B	0.38	17	B
Southbound Left	0.14	21	C	1.00	121	F	0.26	28	C	0.71	36	C	0.26	28	C	0.67	34	C
Southbound Through	0.95	56	E	1.00	79	E	0.77	36	D	0.73	38	D	0.79	37	D	0.80	42	D
Southbound Right	0.25	22	C	0.24	28	C	0.36	29	C	0.25	31	C	0.37	29	C	0.28	31	C
Bowmanville Avenue & Aspen Springs Drive	0.78	13	B	0.75	14	B	0.51	10	A	0.57	11	B	0.57	13	B	0.68	13	B
Eastbound Left	0.62	40	D	0.68	40	D	0.67	40	D	0.73	41	D	0.77	43	D	0.80	42	D
Eastbound Right	0.09	33	C	0.09	31	C	0.24	33	C	0.10	29	C	0.33	31	C	0.17	27	C
Northbound Left	0.37	7	A	0.40	9	A	0.38	8	A	0.38	8	A	0.48	12	B	0.63	13	B
Northbound Through	0.41	5	A	0.73	10	B	0.28	5	A	0.52	8	A	0.29	5	A	0.54	10	A
Southbound Through							0.47	4	A	0.40	5	A	0.50	7	A	0.43	5	A
Southbound Through / Right	0.82	11	B	0.77	9	A												
Southbound Right							0.13	2	A	0.15	2	A	0.16	5	A	0.24	2	A
Bowmanville Avenue & Hartwell Avenue/Existing Condo Access	0.65	7	A	0.70	10	A	0.43	4	A	0.49	6	A	0.44	4	A	0.52	7	A
Eastbound Through / Left	0.27	41	D	0.4	41	D	0.30	41	D	0.45	41	D	0.30	41	D	0.45	41	D
Eastbound Right	0.03	39	D	0.05	38	D	0.03	39	D	0.06	38	D	0.03	39	D	0.06	38	D
Westbound Through / Left / Right	0.02	39	D	0.05	38	D	0.02	38	D	0.06	38	D	0.02	38	D	0.06	38	D
Northbound Left	0.11	3	A	0.24	4	A	0.14	3	A	0.29	5	A	0.14	3	A	0.3	5	A
Northbound Through / Right	0.45	5	A	0.73	9	A	0.29	3	A	0.49	5	A	0.30	3	A	0.53	5	A
Southbound Left	0.01	3	A	0.01	3	A	0.01	2	A	0.01	2	A	0.01	2	A	0.02	2	A
Southbound Through							0.44	2	A	0.36	3	A	0.45	2	A	0.37	3	A
Southbound Through / Right	0.69	6	A	0.62	6	A												
Southbound Right							0.04	1	A	0.06	2	A	0.04	1	A	0.06	2	A
Bonnycastle Drive & Aspen Springs Drive																		
Eastbound Through / Right	0	A		0	A		0	A		0	A		0	A		0	A	
Westbound Through / Left	1	A		1	A		1	A		1	A		1	A		1	A	
Northbound Left / Right	11	B		12	B		12	B		14	B		12	B		15	B	
Fry Crescent (East) & Aspen Springs Drive																		
Eastbound Through / Right	0	A		0	A		0	A		0	A		0	A		0	A	
Westbound Through / Left	0	A		0	A		0	A		1	A		0	A		0	A	
Northbound Left / Right	11	B		11	B		11	B		12	B		12	B		13	B	
Fry Crescent (West)/Existing Condo Access & Aspen Springs Drive																		
Eastbound Through / Left / Right	1	A		1	A		1	A		1	A		1	A		1	A	
Westbound Through / Left / Right	0	A		0	A		0	A		0	A		0	A		0	A	
Northbound Through / Left / Right	10	B		13	B		11	B		15	B		11	B		16	C	
Southbound Through / Left / Right	11	B		13	B		12	B		14	B		13	B		15	B	
Aspen Springs Drive & 10 Aspen Springs Drive Access																		
Eastbound Through / Left							0	A		0	A		0	A		1	A	
Westbound Through / Right							0	A		0	A		0	A		0	A	
Southbound Left / Right							0	A		0	A		14	B		16	C	
Bowmanville Avenue & Shared Site/Metrolix Laneway																		
Eastbound Right							0	A		0	A		11	B		11	B	
Northbound Through							0	A		0	A		0	A		0	A	
Southbound Through							0	A		0	A		0	A		0	A	
Southbound Through / Right							0	A		0	A		0	A		0	A	

Table 11 – Vehicle Queuing Analysis Results, Future 2024 and 2029 Total Traffic Conditions

Intersection Movement	Available Storage Length (m)	95th Percentile Vehicle Queues (m)			
		2024 Total		2029 Total	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Bowmanville Avenue & Aspen Springs Drive					
Eastbound Left	60	47	47	45	54
Eastbound Right	60	39	27	26	54
Southbound Through / Right	120	129	125	15	18
Northbound Left	130	130	97	39	62
Bowmanville Avenue & Hartwell Avenue					
Southbound Left	130	0	9	7	32
Southbound Through/Right	130	113	100	23	18
Bonnycastle Drive & Aspen Springs Drive					
Eastbound Through / Right	85	0	5	0	0
Westbound Left / Through	95	0	15	7	18
Northbound Left / Right	55	14	18	16	23
Aspen Springs Drive & Site Access					
Eastbound Left / Through	95	10	16	7	37
Westbound Through / Right	60	0	5	0	0
Southbound Left / Right	30	14	16	16	15
Bowmanville Avenue & Site Access					
Eastbound Right	70	17	6	13	9
Southbound Through / Right	>300	63	56	0	0

9. PARKING STUDY

9.1 Parking Supply and Requirements

Auto parking is to be provided via three underground parking levels, along with an at-grade parking area, which are broken down as follows:

- At-Grade (visitor/customer parking): 18 spaces
- Underground Parking Levels 1, 2 & 3 (visitor/resident parking): 757 spaces

A total of 775 parking spaces are provided on site. The parking requirements for the proposed uses on site were calculated based on the Municipality of Clarington’s By-law 84-63, dated July 2015. Table 12 below shows a breakdown of the parking requirements, with relevant excerpts of the by-law provided in Appendix F.

Table 12 – Auto Parking Requirements and Supply, Zoning By-Law

Land Use		Size (units / sq.m)	Minimum Requirements		Proposed Supply
			Rate	Spaces	
Dwelling Units	Bachelor/ 1-bedroom	385	1 parking space / unit	385	665
	2-bedroom	212	1.25 parking spaces / unit	265	
	3-bedroom	10	1.5 parking spaces / unit	15	
	Visitors	607	0.25 parking spaces / unit	151.8	89
Retail GFA		624.8	1 parking space / 30m ² of GFA	20.8	21
Accessible Parking: 2% of total space required				16.7	17
Total (including accessible parking)				837	775

Source: Municipality of Clarington By-law 84-63

Based on the site plan, 775 parking spaces are provided on site, including 665 spaces for residents, 89 spaces for visitors and 21 spaces for visitors and customers. Based on the zoning by-law the required parking supply is 837 spaces, compared to the proposed supply of 775 spaces, resulting in a shortfall of 62 spaces. Overall, the parking requirement is met by 93%, and the shortage is fairly minor. A total of 17 accessible parking spaces are provided on site, which meets the Zoning By-law requirements.

The subject site is located within Urban Centra land use area based on Municipality of Clarington’s Official Plan, and Urban Centre Mixed-Use (MU3) zoning requirements are considered to be comparable for the subject site. MU3 zone has a minimum required parking rate of 1 space per unit for apartment and 1 space for every 40 sqm for retail uses. The parking requirements based on MU3 zone have been summarized in Table 13 for comparison purposes. The relevant excerpts of the by-law provided in Appendix F.

Table 13 – Auto Parking Requirements and Supply, MU3 Zone

Land Use		Size (units / sq.m)	Minimum Requirements		Proposed Supply
			Rate	Spaces	
Apartment Dwelling		607	1 parking space / unit	607	754
Retail GFA		624.8	1 parking space / 40m ² of GFA	15.6	21
Accessible Parking: 2% of total space required				12.5	17
Total (including accessible parking)				623	775

Source: Municipality of Clarington By-law 84-63

Based on the parking requirements for MU3 zone, the required parking supply is 623 spaces, compared to the proposed supply of 775 spaces, resulting in a surplus of 152 spaces. A total of 775 parking spaces are provided on site, which exceeds the requirements for MU3 zone.

9.2 Alternative Modes of Transportation

Existing Transit Infrastructure

As mentioned earlier in Section 4.4, the subject site is located within the service area of Durham Region Transit and GO Transit. Residents and visitors from the site can easily access the transit.

Durham Region Transit’s Route 902 operates along Highway 2 from an area near the Lakeridge Health Bowmanville Hospital, and the Oshawa Centre Terminal, providing a connection to the local routes servicing the Oshawa area. The nearest bus stops are located at the Highway 2 and Bowmanville Avenue intersection located approximately 500m north of the subject site. Although the bus stops are just beyond a preferred walkable distance (400m), the eventual widening of Bowmanville Avenue is to include new multi-use paths, improving connections to these bus stops for residents and visitors.

GO Transit’s Route 88 currently services the site, with a bus stop located on the northwest corner of Bowmanville Avenue and Aspen Springs Drive, just next to the subject site. The route provides locals a connection further east to Trent University in Peterborough, or west to the Oshawa GO Station, which can then be utilized to access other major transit hubs such as Union Station, in the City of Toronto.

Future Bowmanville GO Expansion

As previously mentioned in this report, Metrolinx is in the preliminary planning stages of developing a new GO Station in the Town of Bowmanville, which is to be located within the lot adjacent west of the subject development. The new extension to the Lakeshore East line will link Bowmanville and the downtown Oshawa core to downtown Toronto in the form of four (4) new GO Stations, to be constructed along the existing railway infrastructure. The Bowmanville station is to be the eastern most node of the extension that will connect to the Lakeshore East line, and project completion is anticipated sometime between 2024 and 2029. A map providing an overview of the new extension is provided in Figure 13.

As anticipated ridership for the Bowmanville expansion was unavailable, a review of the Fiscal Year-To-Date Ridership Report, obtained from Metrolinx’s Open Datasets was conducted to further understand ridership statistics and growth along the Lakeshore East line. It should be noted the 2020 results from Metrolinx’s Fiscal-Year-To-Date Ridership report were significantly affected because of the COVID-19 pandemic. Subsequently the results are not considered to accurately reflect the current demand of the GO Train service and were left out of this review. Table 14 provides a breakdown of total ridership for 2018 and 2019, with source information provided in Appendix B.

Table 14 – Summary of Ridership Performance, GO Train Lakeshore East (2018 & 2019)

Year	Total Ridership	Average Daily Ridership	Average Daily Ridership (%)
2018	5.3 M	21.6 K	4.5 %
2019	6.3 M	22.7 K	7.1 %

As noted above, there was an approximate 2.5% increase in average daily ridership along the Lakeshore East line between 2018 and 2019.

The future transit hub is expected to generate some ridership from the surrounding residential uses, including the subject development given its proximity to the site. Durham Region also indicated that train schedules are anticipated to have a headway frequency of 30 minutes during the peak hours, allowing

passengers greater flexibility when considering the time, they have to leave their home or work to catch their desired departure time. This will provide a convenient mode of transportation to accommodate residents on their daily commute, as well as visitors to the development, and should help reduce overall auto parking demand on-site.

9.3 Public Parking Opportunities

There is currently on-street parking (approximately 25 spaces) available along the north and south sides of Aspen Springs Drive, beginning from the west leg of the Bonnycastle Drive intersection to a point approximately 30m east of Green Road (coinciding with the existing bicycle lanes). Both the north and south sides of the roadway allow for on-street parking, which will provide visitors/customers to the building potential parking opportunities. Figure 14 provides a map illustrating the areas within a 200-m radius (2-3 minutes) in which on-street parking is available along the study area roadways.

In conclusion, given the site context, access to transit facilities and the proximity to future Bowmanville GO station, the proposed development could be accommodated by the proposed parking supply (775 spaces) on site, alternative travel modes and on-street parking availability.

10. TRANSPORTATION DEMAND MANAGEMENT PLAN

A Transportation Demand Management (TDM) Plan is provided as part of this report in an effort to minimize parking demands, traffic congestion, improve air quality, reduce greenhouse gas emissions, and improve public health in the long-term. The plan will help provide the public greater choice, incentives, and opportunities to choose travel modes other than single-occupant vehicles. Our proposed TDM plan for the site is outlined as follows:

Pedestrian & Cycling

There is existing sidewalk infrastructure along all study area roadways, with pathways to extend from the main access allowing for connectivity to the sidewalk network on both Aspen Springs Drive and Bowmanville Avenue. There are also currently bicycle lanes provided along Aspen Springs Drive, which start at Bonnycastle Drive and continue to Green Road. There are bicycle parking spaces on-site, providing visitors to the residence a means of securing their bike should they choose cycling over driving.

The widening of Bowmanville Avenue, proposed through the municipal EA Study, is also to include the construction of new multi-use paths on both the east and west sides, extending along the corridor within the study area. This multi-use path is to connect with the existing sidewalk network along Hartwell Avenue, Aspen Springs Drive, and Regional Highway 2.

Multi-use pathway facilities are encouraged as both a means of travel and recreation. Sidewalks and off-road pathways are intended to be integrated into a continuous pedestrian system that includes local roads, arterial roads, collector roads and off-road pathways. Connecting pedestrian systems to major roadways such as Highway 2 encourages a healthier and more environmentally friendly lifestyle. A total of 252 bicycle spaces (including 18 outdoor spaces and 234 indoor spaces) is provided on site to encourage cycling.

Transit Services

As discussed in Section 4.4, the subject site is served by GO Transit's Route 88, allowing for connectivity between the Oshawa GO Station and Trent University in Peterborough, at which other major transit routes can be accessed. The nearest bus stop is located at the Bowmanville Avenue and Aspen Springs Drive intersection, adjacent to the site.

Furthermore, the previously mentioned improvements to Bowmanville Avenue, such as the multi-use trail will provide a viable connection from the subject site to the Bowmanville Avenue / Highway 2 intersection, where Durham Region Transit's Route 902 bus stops are located, which will help establish a viable connection to other local routes operated by Durham Region Transit in the Bowmanville and Oshawa areas.

The future Bowmanville GO station is expected to generate ridership from the surrounding residential uses, including the subject development given its proximity to the site. This will provide a convenient mode of transportation to accommodate residents on their daily commute, as well as visitors to the development, and should help reduce overall auto parking demand on-site.

Increasing public transit use has many benefits such as protecting the environment, reducing traffic congestion on regional roads, providing convenience, saving energy, strengthening communities, and improving liveability. To encourage travel by transit, transit information packages containing route maps, schedules and other useful information should be readily available for residents and visitors within an accessible location, such as the entrance lobby of each building.

Carpooling / Ridesharing

To help reduce travel by single-occupant automobiles, staff and visitors should be encouraged to carpool where possible. Smart Commute is one of a network of local transportation management associations across the GTA delivering TDM programs and services.

Ridesharing is a growing trend within the GTA, allowing people without a vehicle to share a vehicle with others to their specified location. Uber was one of the first to start the ridesharing movement within the GTA. The ease of use with the smartphone application (app) is popular with young professionals who may look for other options than owning a personal vehicle for travel.

Communication Strategy

We recommend distribution of Information packages and pre-loaded Presto cards to new residents. The Applicant is encouraged to reach out to Durham Region for assistance in the provision of these items:

- Durham Region / GO Transit route maps and schedules
- Cycling and Trails Map
- Instructions for validating / pre-loading and using Transit Passes

As the residences get occupied, Information packages can be provided to residents so as to encourage alternative modes of travel. It is recommended that resident profile survey questionnaires be distributed to new residents at 50% occupancy of the buildings, in order to determine mode of travel characteristics. These surveys would identify whether the resident owns a personal vehicle, travels by transit, or would

use transit if service was improved - thus identifying resident's interest in transit and other modes of travel.

11. SITE PLAN REVIEW

11.1 Site Access Review

A review of the proposed site access design was completed using Carington’s Zoning By-Law and Transportation Association of Canada’s (TAC) Geometric Design Guidelines for Canadian Roads. Source information is provided in Appendix F and Appendix G. TAC defines the minimum spacing for residential driveways to be a minimum of 2m apart. Table 15 summarized the spacing requirement and proposed spacing.

Table 15 – Required and Proposed Dimensions of Site Driveway

		Distance to Street Corner	Curb Radius	Driveway Width
Requirements		2.0m	3.0 - 4.5m	Minimum 4.5m for One-way, 6.0m for two-way
Proposed	Aspen Springs Drive Access	67.7m	6.0m	6.5m (two-way)
	Bowmanville Avenue Access	130.5m	6.0m	4.5m (one-way)

Sources: Clarington’s Zoning By-law 84-63, TAC Guidelines

The proposed site access off Aspen Springs Drive is approximately 67.7m to the intersection of Bowmanville Avenue and Aspen Springs and has a width of 6.5m; the proposed site access off Bowmanville Avenue is approximately 130.5m to the intersection of Bowmanville Avenue and Aspen Springs and has a width of 4.5m, which meet the requirements of spacing and width. Although TAC identifies typical curb radius for residential developments as 3.0m to 4.5m, a radius of 6.0m is proposed at both site access to allow smooth vehicle turning movements. Details are discussed in Section 11.3, the site circulation review.

11.2 Parking Design Review

Table 16 summarized the dimension requirements and proposed dimensions for parking stalls and layout. Source information is provided in Appendix F.

Table 16 – Required and Proposed Dimensions of Parking Layout

	Space Width (m)	Space Length (m)	Aisle Width (m)
Minimum Requirements	2.75 4.5 (accessible space)	5.7	Minimum 4.5 (one-way) 6.0 (two-way)
Proposed	2.75 4.5 (accessible space)	5.7	4.5 (one-way) 6.0-6.5 (two-way)

Sources: Clarington’s Zoning By-law 84-63

The proposed parking stalls have a width of 2.75m (4.5m for accessible parking spaces) and a length of 5.7m. The driving aisle at grade is proposed to be 6.25m to 6.5m and the aisles underground are 6.0m. All

the dimensions of parking spaces meet the Town's zoning By-law's minimum requirements. Source information is provided in Appendix F.

11.3 Site Circulation Review

A site circulation review was completed using AutoTurn vehicle turning template software to simulate design vehicles expected to use the site, including a loading vehicle (for moving, delivery, etc.), a waste collection vehicle and a passenger vehicle. Details of the site circulation review for each vehicle type is provided in this section:

Passenger Vehicles

Figure 15 and Figure 16 show passenger vehicles accessing the site via the driveway off Aspen Springs Drive, parking into critical spaces, and then exiting via the proposed two accesses.

Figure 17 and Figure 18 show a passenger vehicle accessing the parking garage via ramp and parking into critical spaces, and then exiting via the same ramp. The parking layout for all the parking levels (P1 to P3) are identical.

Loading Vehicles

Figure 19, Figure 20 and Figure 21 show a Medium Sing-Unit (MSU) vehicle accessing the driveway off Aspen Springs Drive and parking into the loading areas on ground floor, and exiting the site from the same access.

Waste Collection Vehicles

Figure 22 and Figure 23 demonstrate that a typical 12m waste collection vehicle is able to access and exit from the loading spaces and site adequately.

Overall, the figures indicated that the proposed site plan layout is adequate for the circulation of passenger vehicles, loading vehicles, and waste collection vehicles. Vehicles larger than a 12m waste collection truck are not expected to enter the site.

12. SUMMARY AND CONCLUSIONS

12.1 Summary

This Transportation Study, prepared for the proposed residential condominium development at 10 Aspen Springs Drive, Clarington (Bowmanville), ON, is summarized as follows:

Traffic Impact Study

- Based on ITE's Trip Generation manual, the site is expected to generate approximately 197 and 281 two-way trips during the weekday AM and PM peak hours, respectively.
- For the intersection of Highway 2 and Bowmanville Avenue, background traffic growth is causing the intersection to operate at critical capacity, with signal timing plan adjustments, during weekday peak hours in horizon years.
- The intersection of Bowmanville Avenue and Aspen Springs Drive is expected to operate over capacity during weekday PM peak hour under 2024 future conditions (with STP adjustments), but it is an interim

condition. The proposed widening road improvements along Bowmanville Avenue, as proposed through the municipal EA Study, would greatly improve the operation once completed.

- The capacity and queuing analysis indicates that the proposed site driveway and all other the intersections in the study area are expected to operate acceptably with reserve capacity in horizon year 2024 and 2029. No road improvements (other than constructing the site driveway) or additional signal timing adjustments are required to accommodate the traffic generated by the development.

Parking Study

- A total of 775 parking spaces are provided on site, including 665 spaces for residents, 89 spaces for visitors and 21 spaces for retail uses. Based on the Zoning by-law, the required parking supply is 837 spaces, compared to the proposed supply of 775 spaces, resulting in a shortfall of 62 spaces. Overall, the parking requirement is met by 93%. A total of 17 accessible parking spaces are provided on site, which exceeds the Zoning By-law requirements.
- Based on the parking requirements for MU3 zone, the required parking supply is 623 spaces, compared to the proposed supply of 775 spaces, resulting in a surplus of 152 spaces. A total of 775 parking spaces are provided on site, which exceeds the requirements for MU3 zone.
- The future Bowmanville GO Station, just north of the subject site is expected to generate some ridership from the surrounding residential uses, including the subject development given its proximity to the site. It will provide a convenient mode of transportation to accommodate residents on their daily commute, as well as visitors to the development, and should help reduce overall auto parking demand on-site.
- Given the site context, access to transit facilities and the proximity to future Bowmanville GO station, the proposed development could be accommodated by the proposed parking supply on site, alternative travel modes and on-street parking availability.

TDM Plan

- Pedestrian connections are provided on-site to connect residents, visitors and patrons to the municipal sidewalk along Aspen Springs Drive and Bowmanville Avenue. Transit stops are provided within a walking distance from the site, and the site is therefore adequately serviced by transit.
- The applicant would distribute transit service schedules / maps, cycling routes / pedestrian trails maps and a list / description of available community services in the area to new tenants as part of a welcome package.

Site Plan Review

- The Municipality of Clarington Zoning By-law and TAC guidelines were reviewed to ensure proper access and parking layout design. The proposed site accesses, parking stalls and parking aisles meet the design requirements.
- The vehicle turning templates show that the proposed driveway and internal drive aisles can accommodate waste collection, loading / delivery, and passenger vehicles. Vehicles larger than a waste collection vehicle are not expected at the site.

12.2 Conclusions

To conclude, our traffic findings for horizon year 2024 and 2029 indicate that the proposed development can be accommodated by surrounding road network and no improvements are required. The proposed auto parking supply is expected to be sufficient based on the site context, access to transit facilities and the proximity to future Bowmanville GO station. A review of parking layout requirements and site circulation is also provided herein. Traffic and parking activity at the proposed development will function in an acceptable manner.

Respectfully submitted,



Anil Seegobin, P.Eng.
Partner, Engineer

Trans-Plan Transportation Inc.
Transportation Consultants



Jing Min, E.I.T.
Traffic Analyst

Figure 1 – Site Location



Source: Google Earth

North Arrow

Project Name: ASP-3

Site Plan

No.	Description	By	Date
1	TYMWOOD	TYMWOOD	10/11/2019
2	TYMWOOD	TYMWOOD	10/11/2019
3	TYMWOOD	TYMWOOD	10/11/2019
4	TYMWOOD	TYMWOOD	10/11/2019
5	TYMWOOD	TYMWOOD	10/11/2019
6	TYMWOOD	TYMWOOD	10/11/2019
7	TYMWOOD	TYMWOOD	10/11/2019
8	TYMWOOD	TYMWOOD	10/11/2019
9	TYMWOOD	TYMWOOD	10/11/2019
10	TYMWOOD	TYMWOOD	10/11/2019

ALL DIMENSIONS AND LOCATIONS SHOWN ON THIS DRAWING ARE THE RESULT OF FIELD SURVEY AND SHOWN TO THE NEAREST MILLIMETER UNLESS OTHERWISE NOTED TO THE CONTRARY. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND LOCATIONS SHOWN ON THIS DRAWING BEFORE CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.

WORK IN PROGRESS

MATAJAJ ARCHITECTS

MATAJAJ ARCHITECTS INCORPORATED

Project: **BOWMANVILLE**
10 ASPEN SPRINGS DR., BOWMANVILLE, ON L1C 4W7

SITE PLAN

Design By:	M.A.	Drawn By:	X.Z.	Approved By:	EM
Scale:	1:250	Date:	22.03.10	Project No.:	21-019
Drawing No.:	ASP-3	Client:		Contract No.:	

Drawing Scale: 1:250

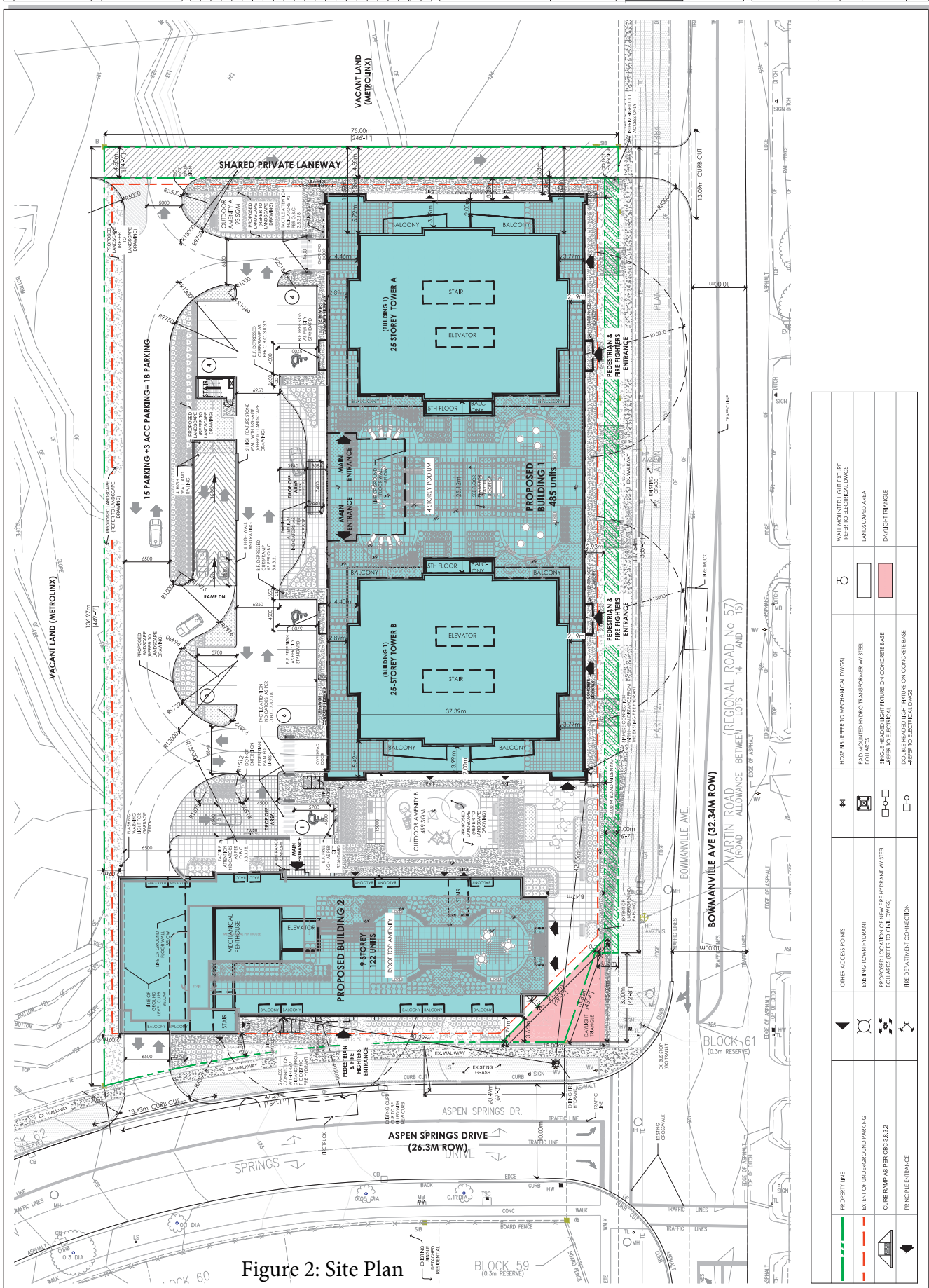
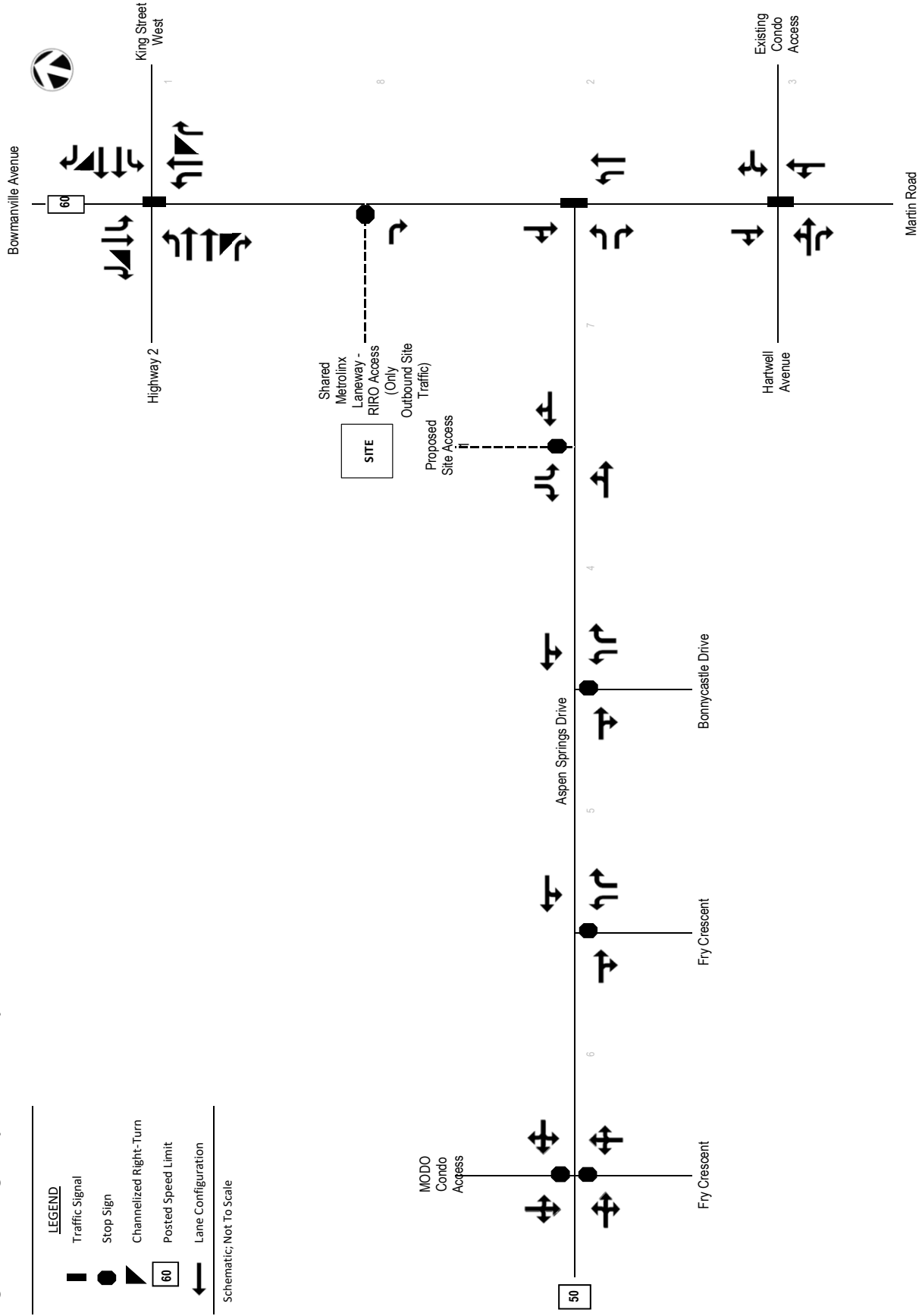







Figure 2: Site Plan

PROPERTY LINE	OTHER ACCESS POINTS	HOSE BIB (REFER TO MECHANICAL DWGS)	WALL MOUNTED LIGHT FIXTURE (REFER TO ELECTRICAL DWGS)

Figure 3: Existing Study Area Roadway Characteristics



LEGEND

-  Traffic Signal
-  Stop Sign
-  Channelized Right-Turn
-  Posted Speed Limit 60
-  Lane Configuration

Schematic; Not To Scale

Figure 4: Existing Traffic Volumes, Weekday AM and PM Peak Hours

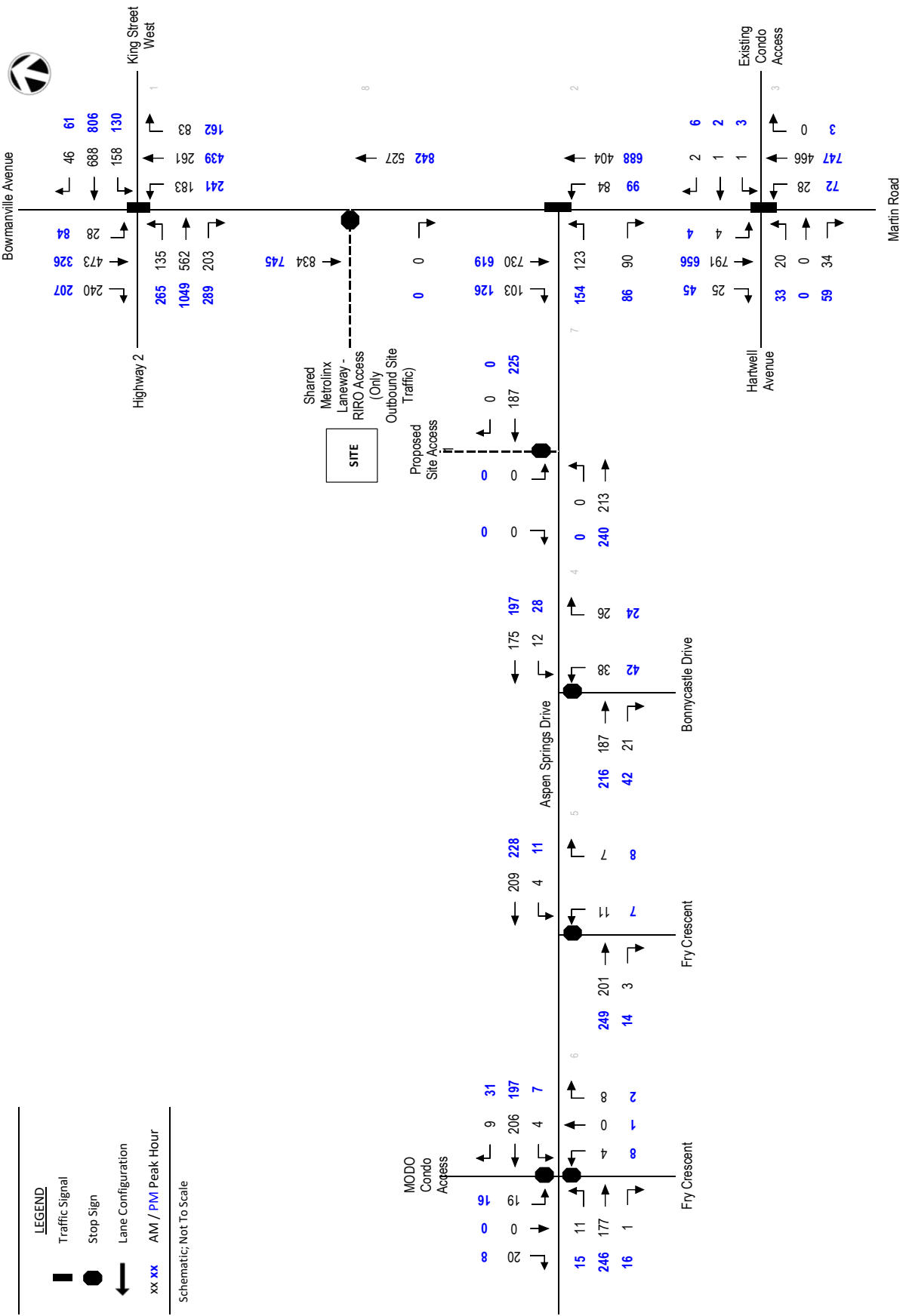


Figure 5 – Study Area Transit Service

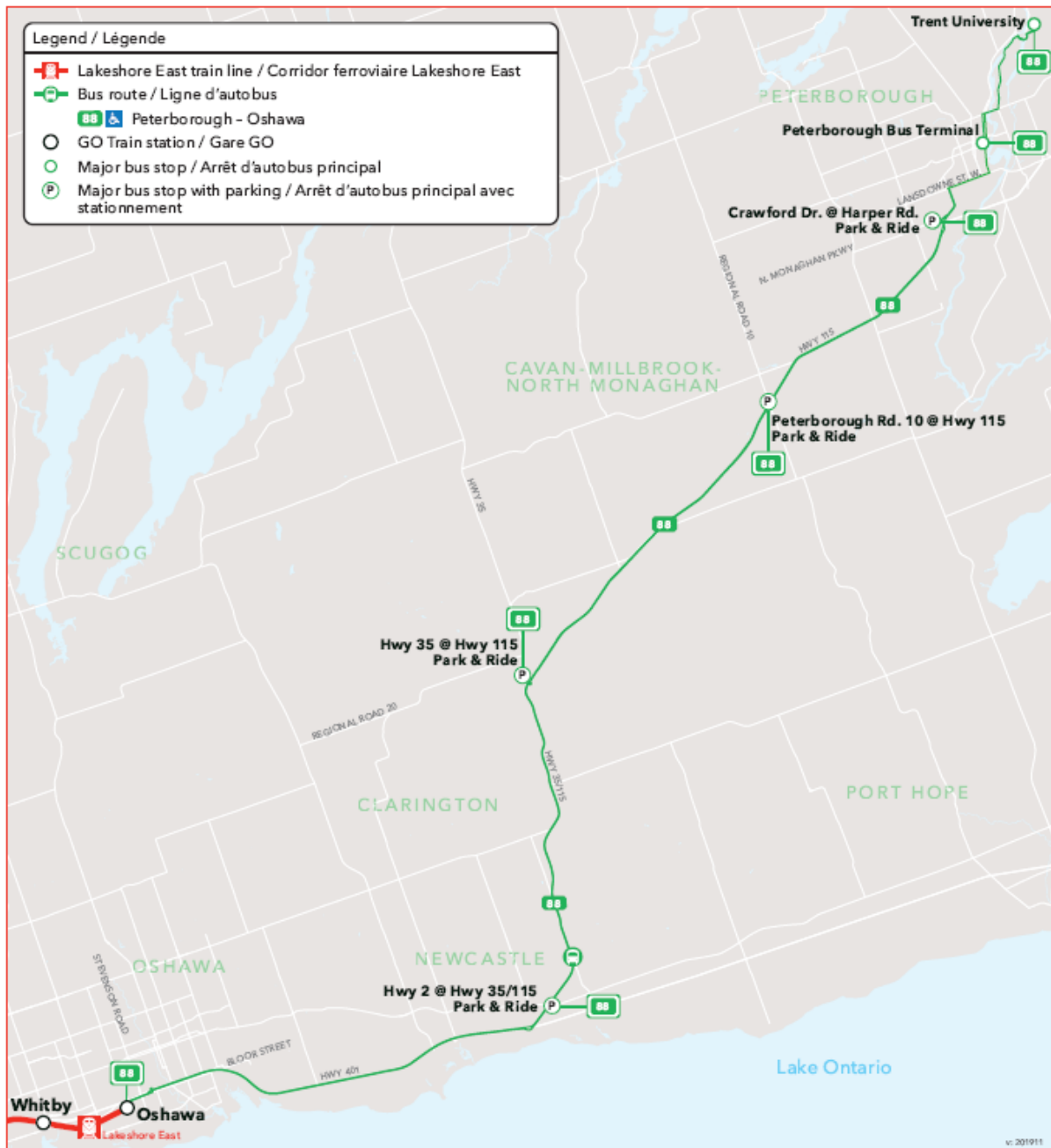


Source: Durham Region Transit

Figure 6 – Route Map of Line Peterborough/Oshawa

88 Route number / Numéro du trajet

Peterborough/Oshawa



Source: GO Transit

Figure 8: Future Study Area Roadway Characteristics (2029)

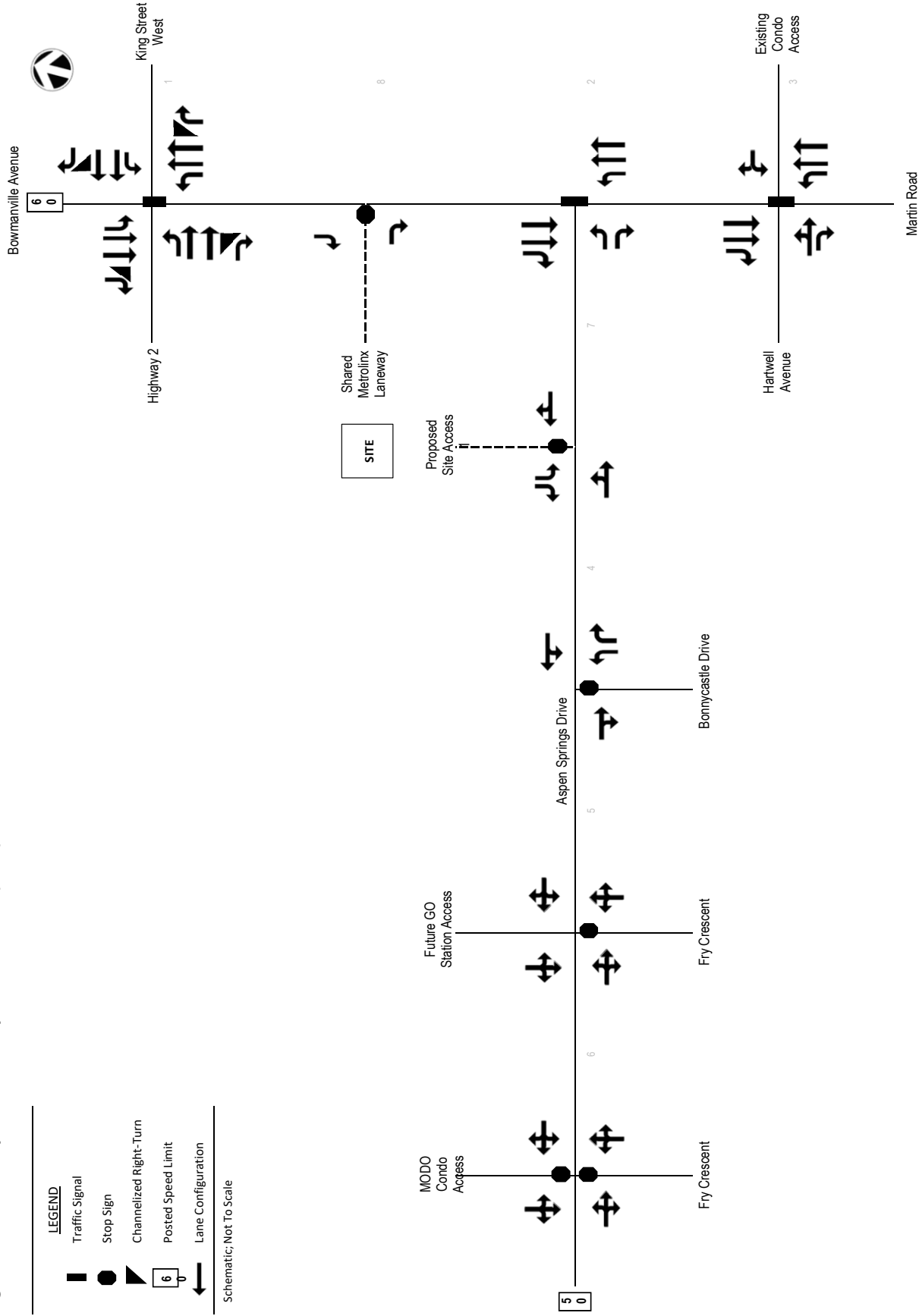


Figure 10: Site Traffic Assignment, Weekday AM and PM Peak Hours

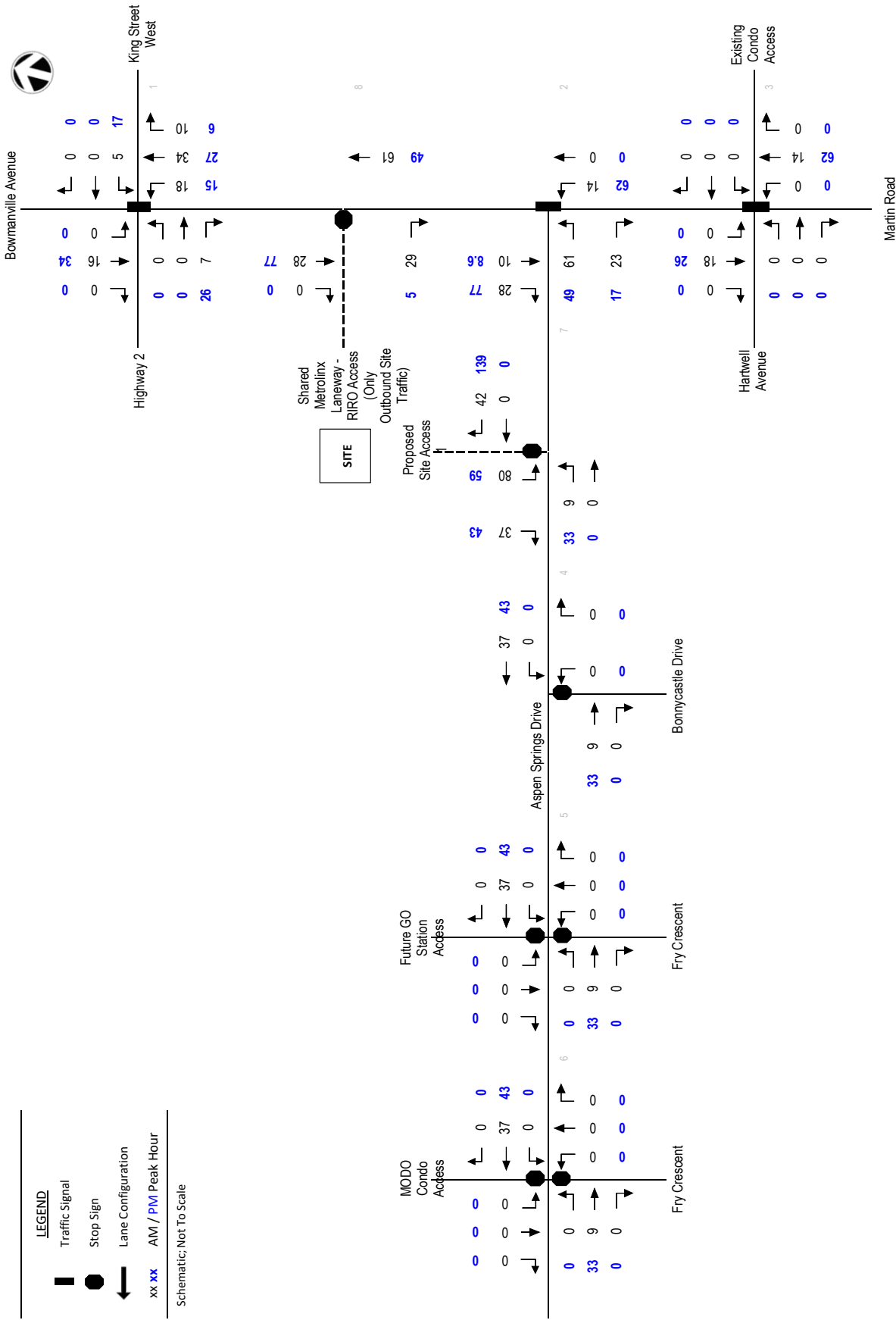


Figure 11: 2024 Future Total Traffic Volumes, Weekday AM and PM Peak Hours

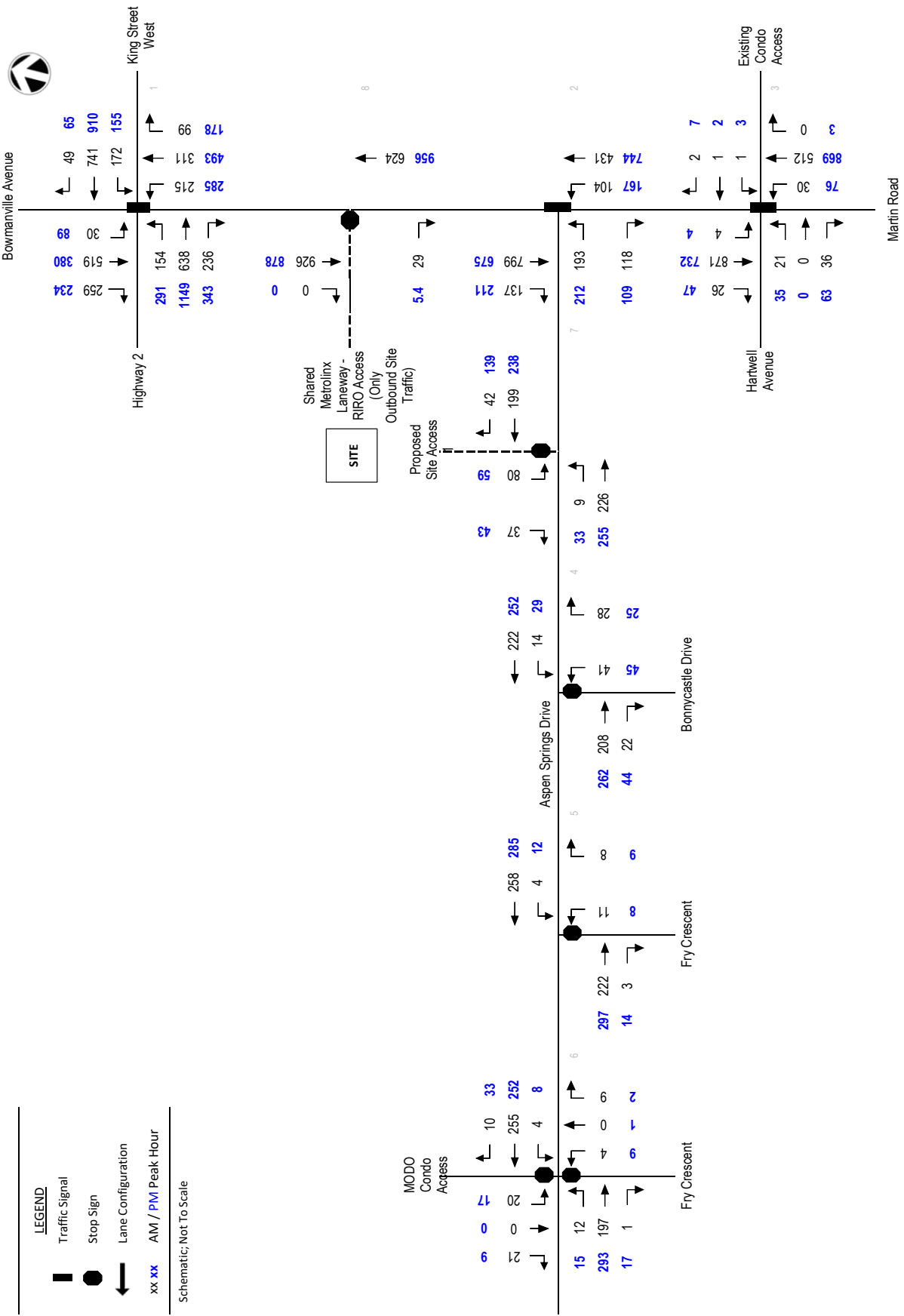


Figure 12: 2029 Future Total Traffic Volumes, Weekday AM and PM Peak Hours

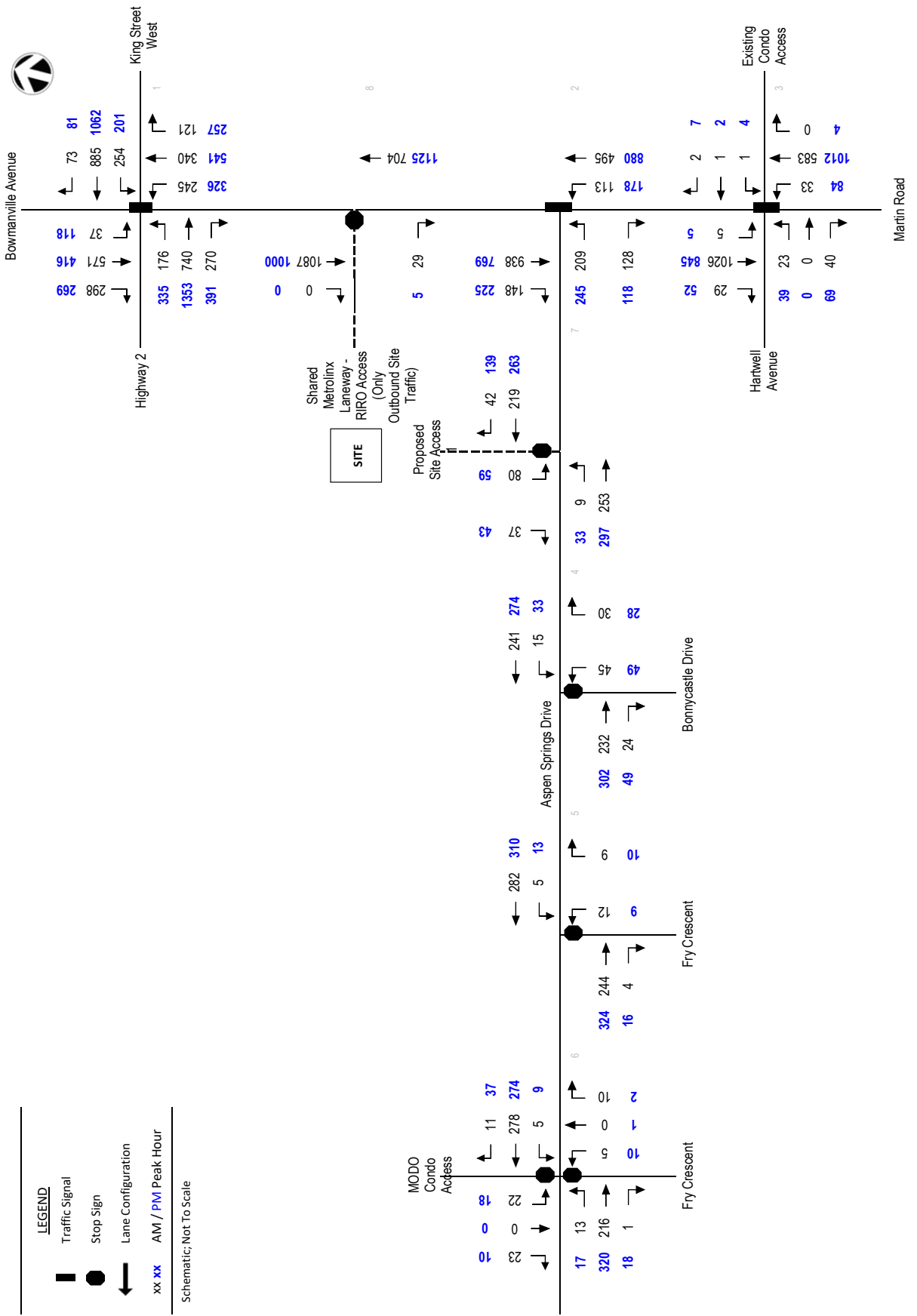
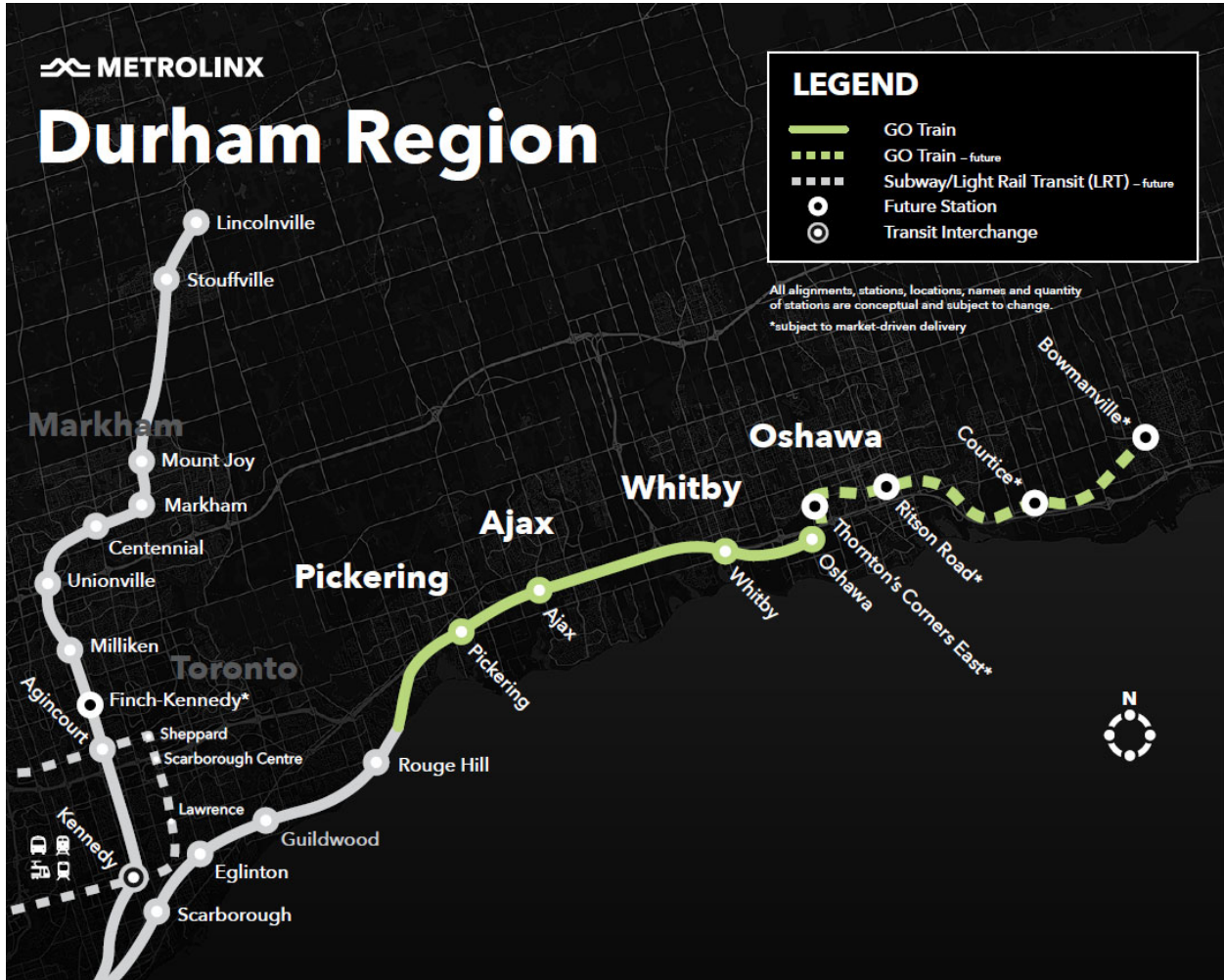


Figure 13 – Future Bowmanville GO Expansion Map



Source: Metrolinx

Figure 14 – Map of Available On-Street Parking



Source: Google Earth

GFA COLOR LEGEND

- AMENITY
- COMMERCIAL
- COMMON SPACES
- SERVICE

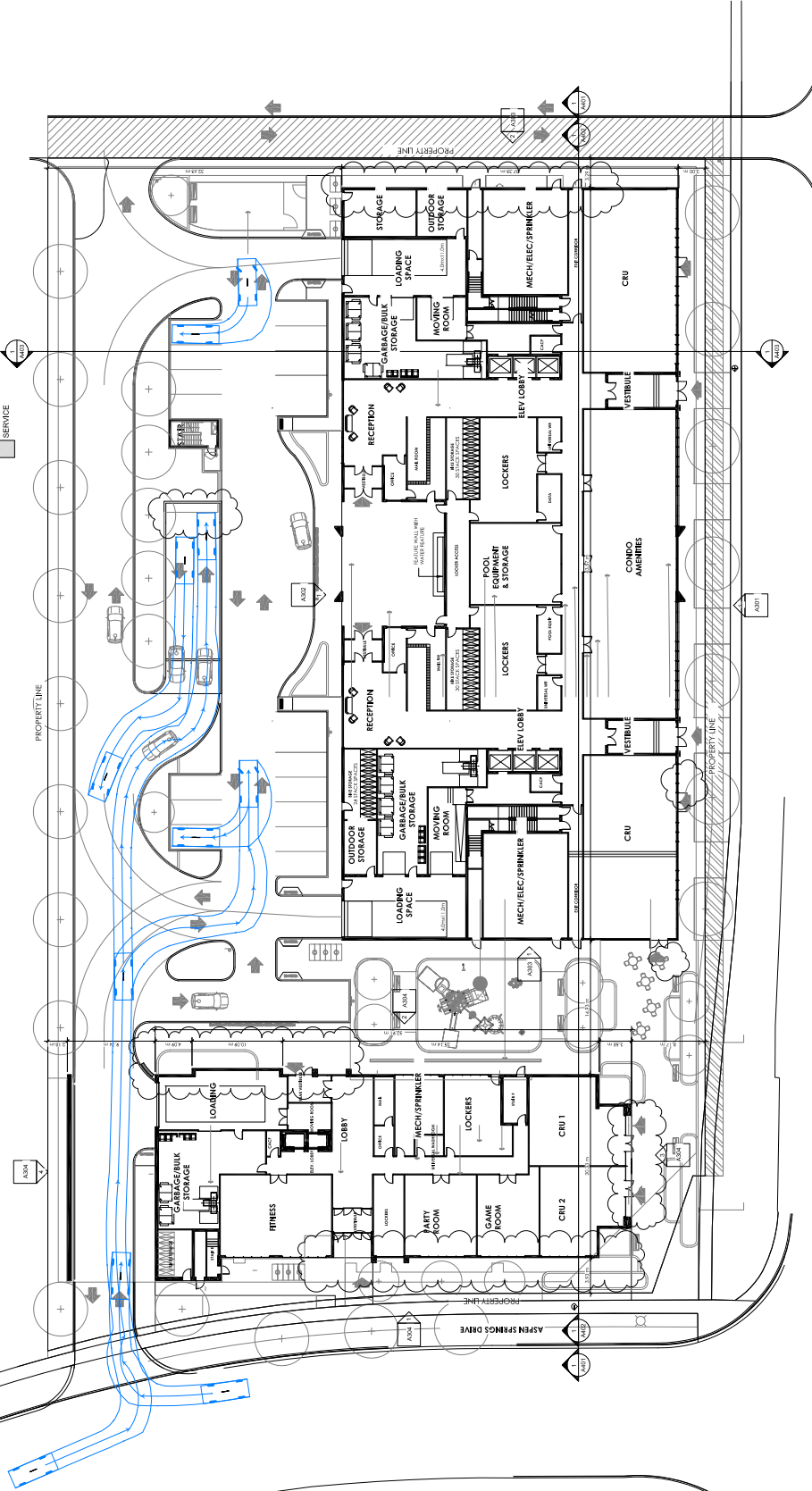
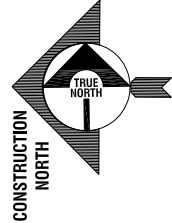
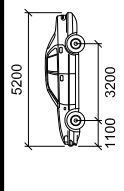


Figure 15 - Passenger Vehicle, Entering the Site and the Ground Floor

PROPOSED MIXED-USE DEVELOPMENT
 10 Aspen Springs Drive,
 Bowmansville, ON

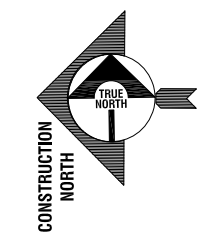
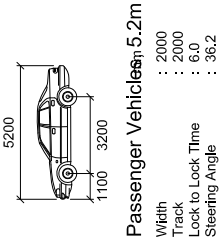
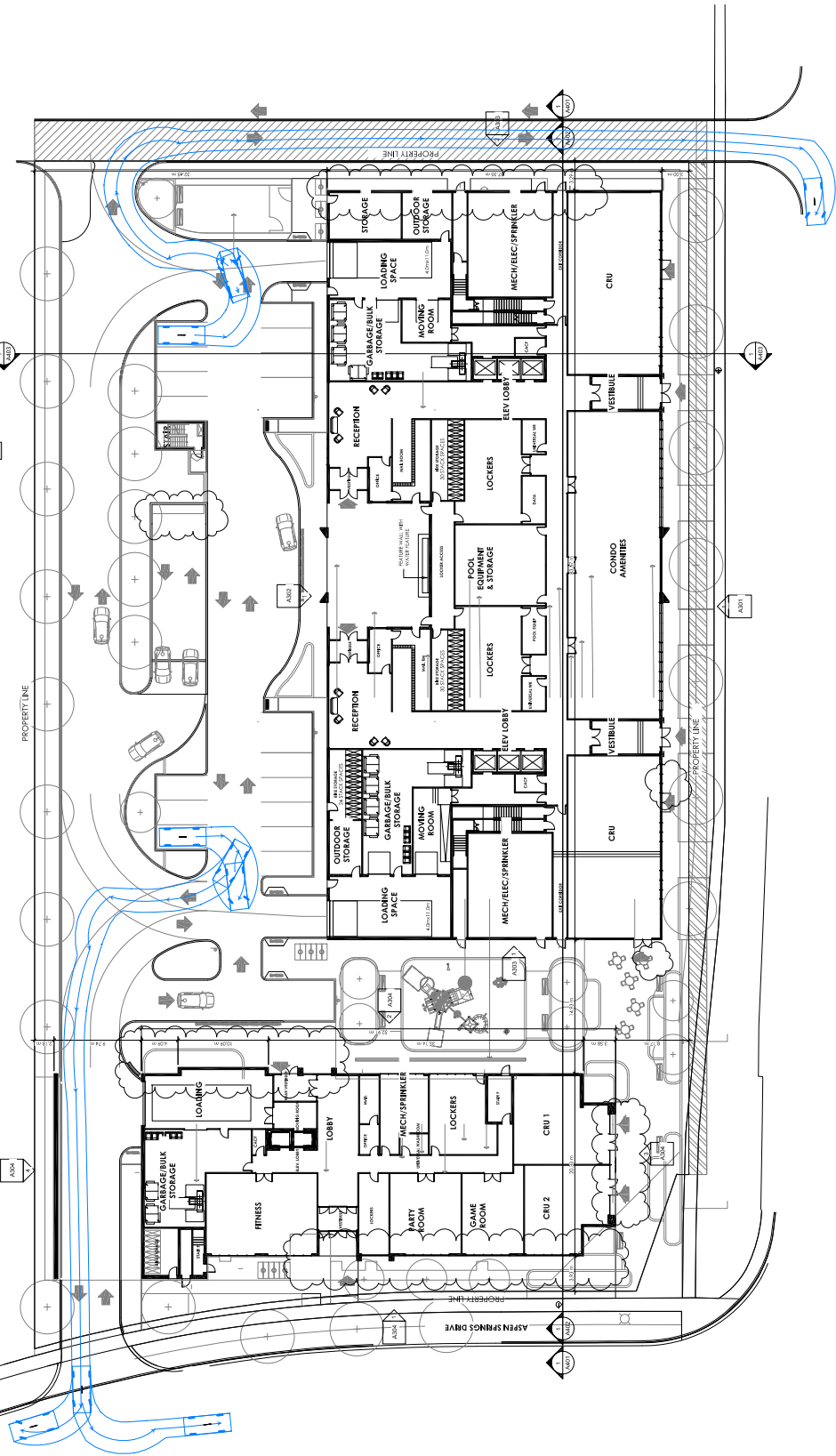


Source: Site Plan by Mataj Architects Inc., dated March 16, 2022

SCALE: 1:750 UNITS: m

GFA COLOR LEGEND

- AMENITY
- COMMERCIAL
- COMMON SPACES
- SERVICE



TRANS-PLANTM
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 785 Dundas Street West
 Toronto, Ontario, M6J 1V2
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Figure 16 - Passenger Vehicle, Exiting Ground Floor and the Site
 PROPOSED MIXED-USE DEVELOPMENT
 10 Aspen Springs Drive,
 Bowmanville, ON
 Source: Site Plan by Mataj Architects Inc., dated March 16, 2022

SCALE: 1:750 UNITS: m

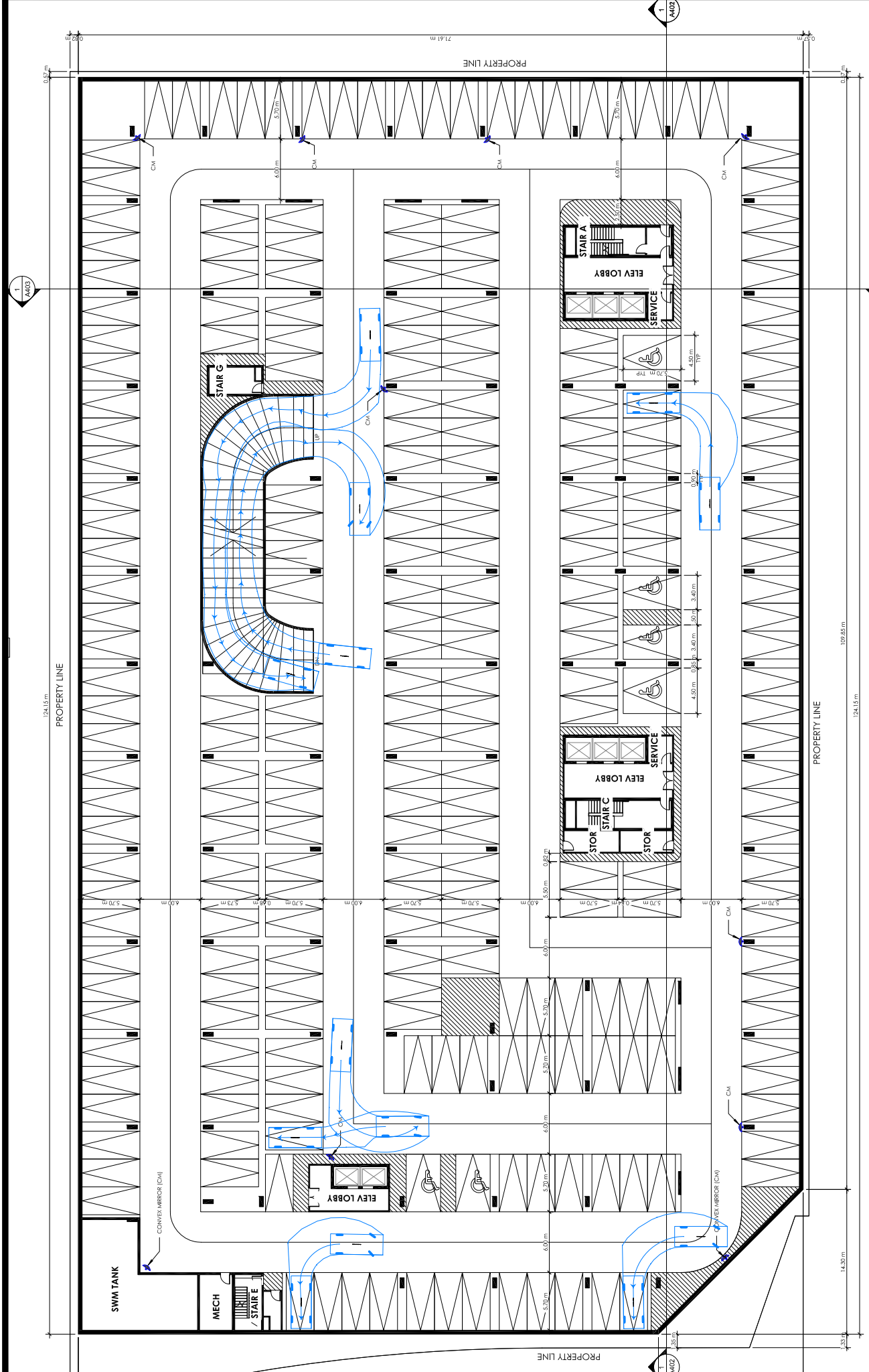
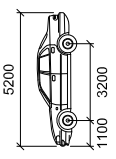


Figure 17 - Passenger Vehicle, Entering the Underground Parking Garage

PROPOSED MIXED-USE DEVELOPMENT
 10 Aspen Springs Drive,
 Bowmanville, ON

Passenger Vehicle: 5.2m

Width	: 2000
Track	: 2000
Lock to Lock Time	: 6.0
Steering Angle	: 38.2



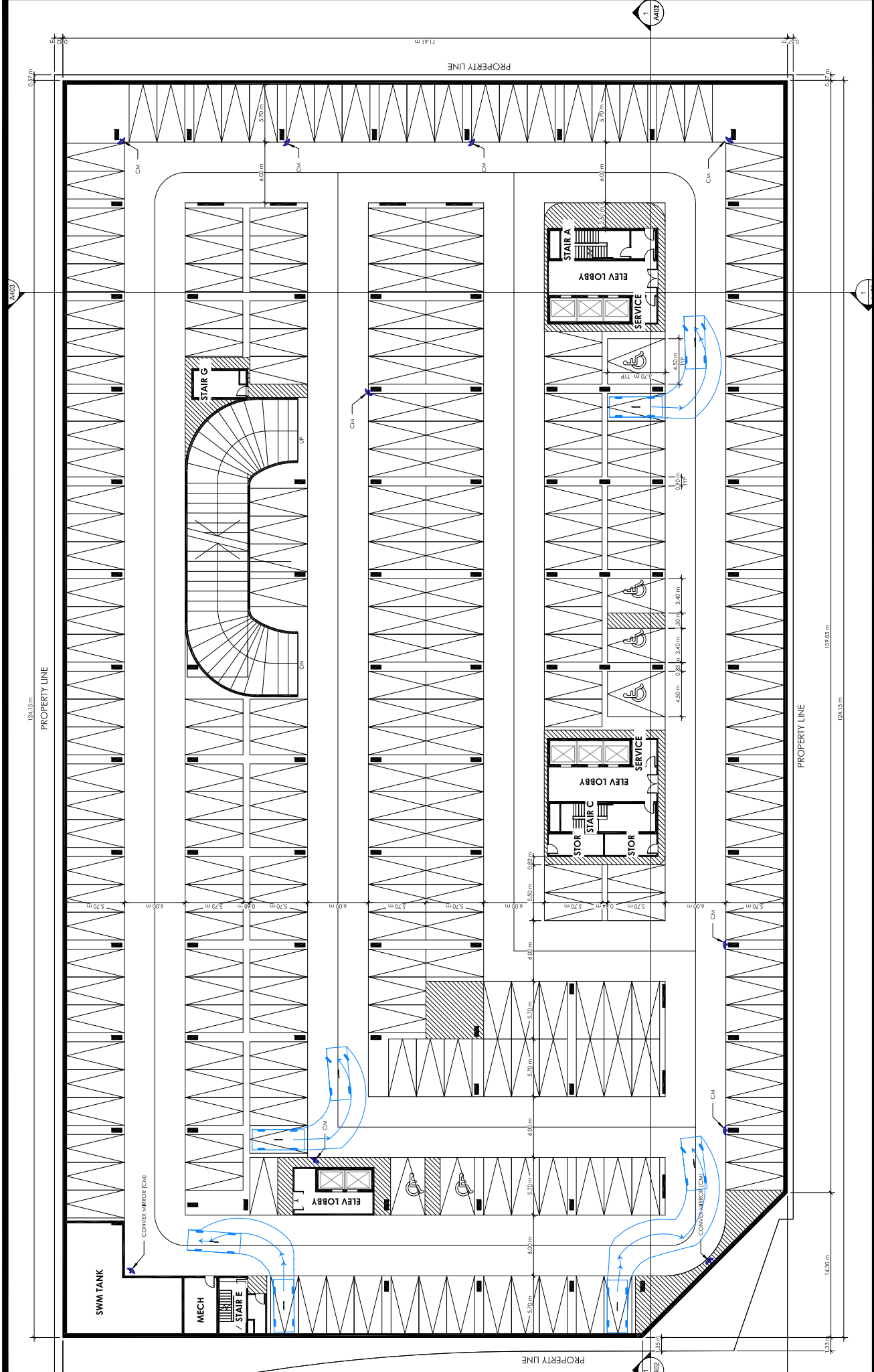
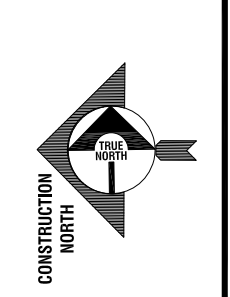


Figure 18 - Passenger Vehicle, Exiting the Underground Parking Garage

PROPOSED MIXED-USE DEVELOPMENT
 10 Aspen Springs Drive,
 Bowmanville, ON

Passenger Vehicle Length	: 5.2m
Width	: 2000
Track	: 2000
Lock to Lock Time	: 6.0
Steering Angle	: 36.2



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GFA COLOR LEGEND

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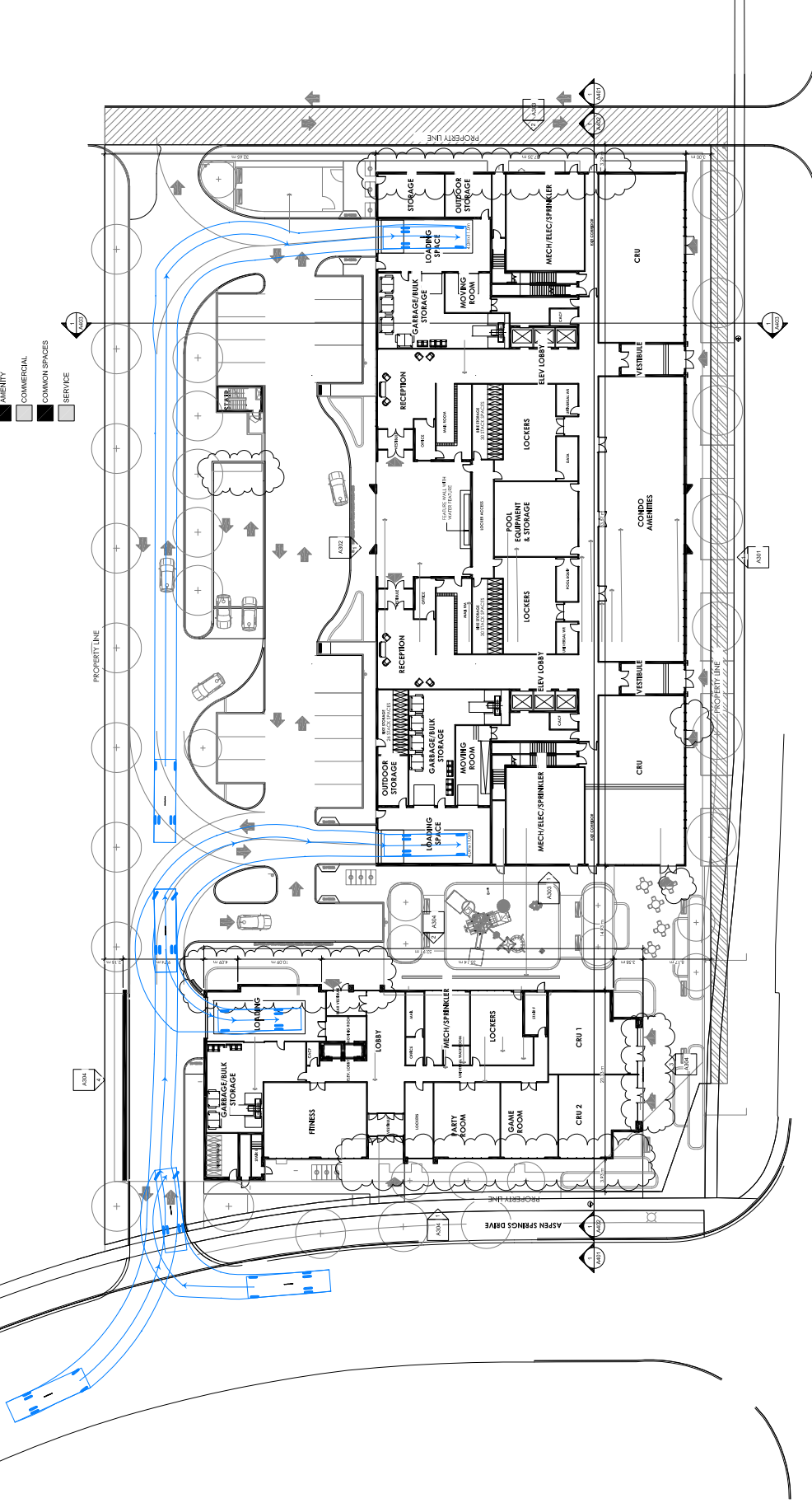
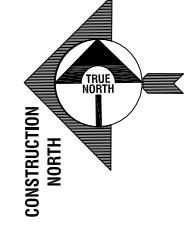
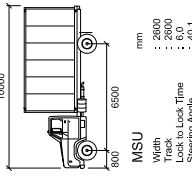


Figure 19 - Loading Vehicle, Entering Site and Loading Area

PROPOSED MIXED-USE DEVELOPMENT
 10 Aspen Springs Drive,
 Bowmanville, ON



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- COMMON SPACES
- SERVICE

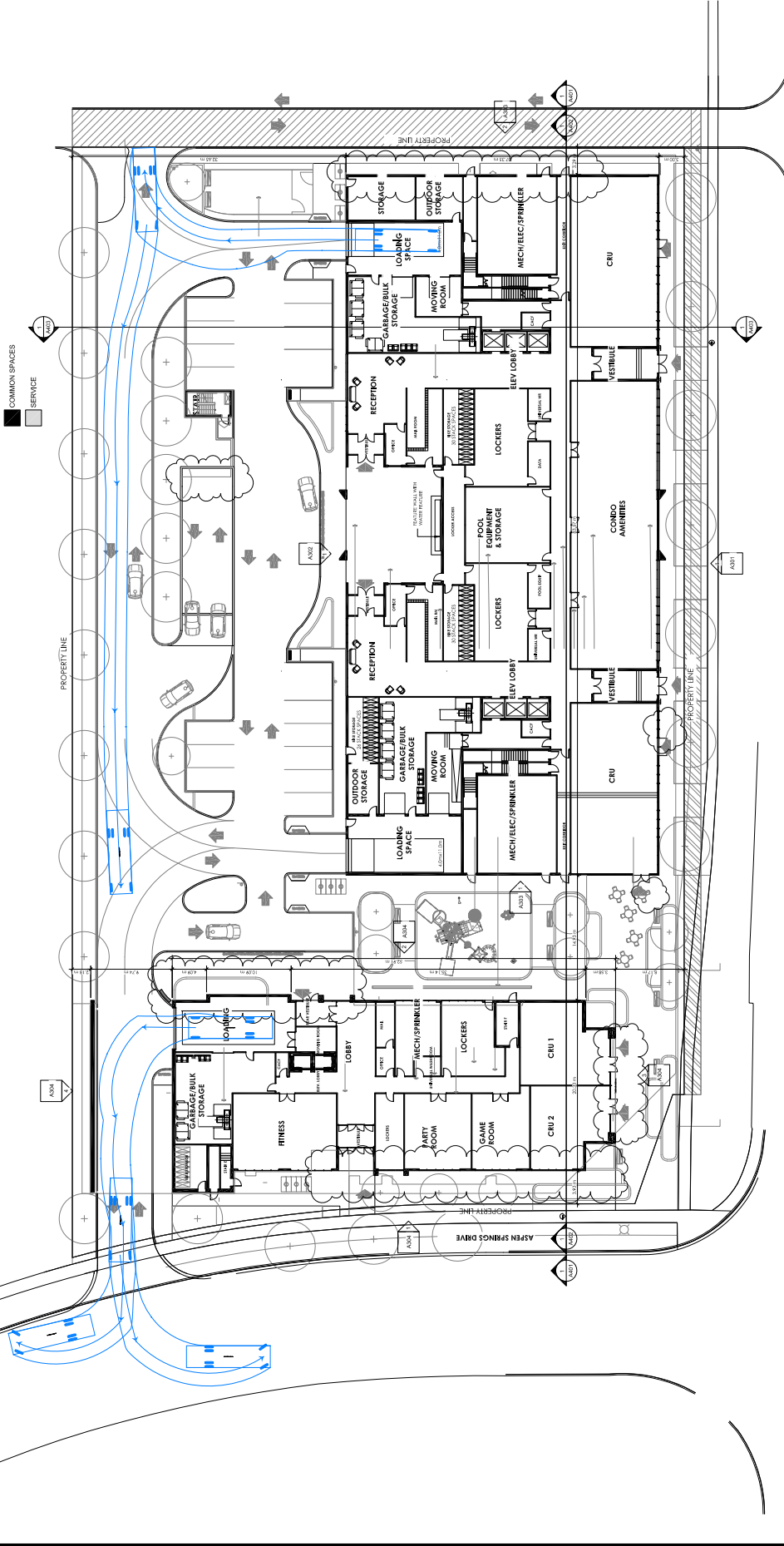
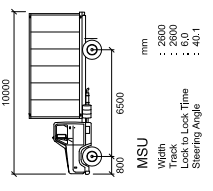


Figure 20 - Loading Vehicle, Exiting Loading Area (Mid-Rise and Tower A) and the Site

PROPOSED MIXED-USE DEVELOPMENT
 10 Aspen Springs Drive,
 Bowmanville, ON



Source: Site Plan by Mataj Architects Inc., dated March 16, 2022

SCALE: 1:750 UNITS: m

GFA COLOR LEGEND

- AMENITY
- COMMERCIAL
- COMMON SPACES
- SERVICE

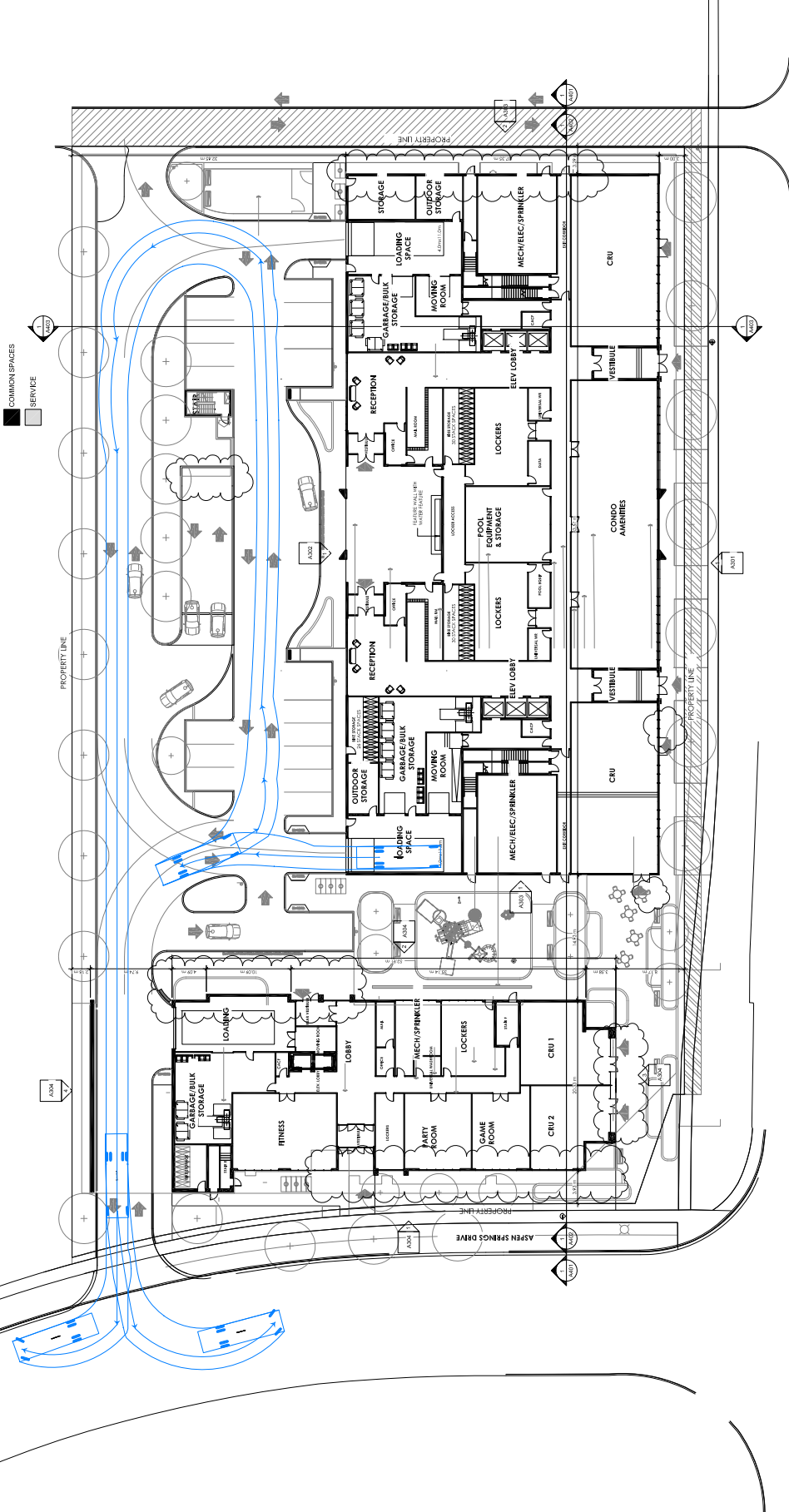
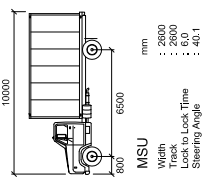


Figure 21 - Loading Vehicle, Exiting Loading Area (Tower B) and the Site

PROPOSED MIXED-USE DEVELOPMENT
 10 Aspen Springs Drive,
 Bowmanville, ON



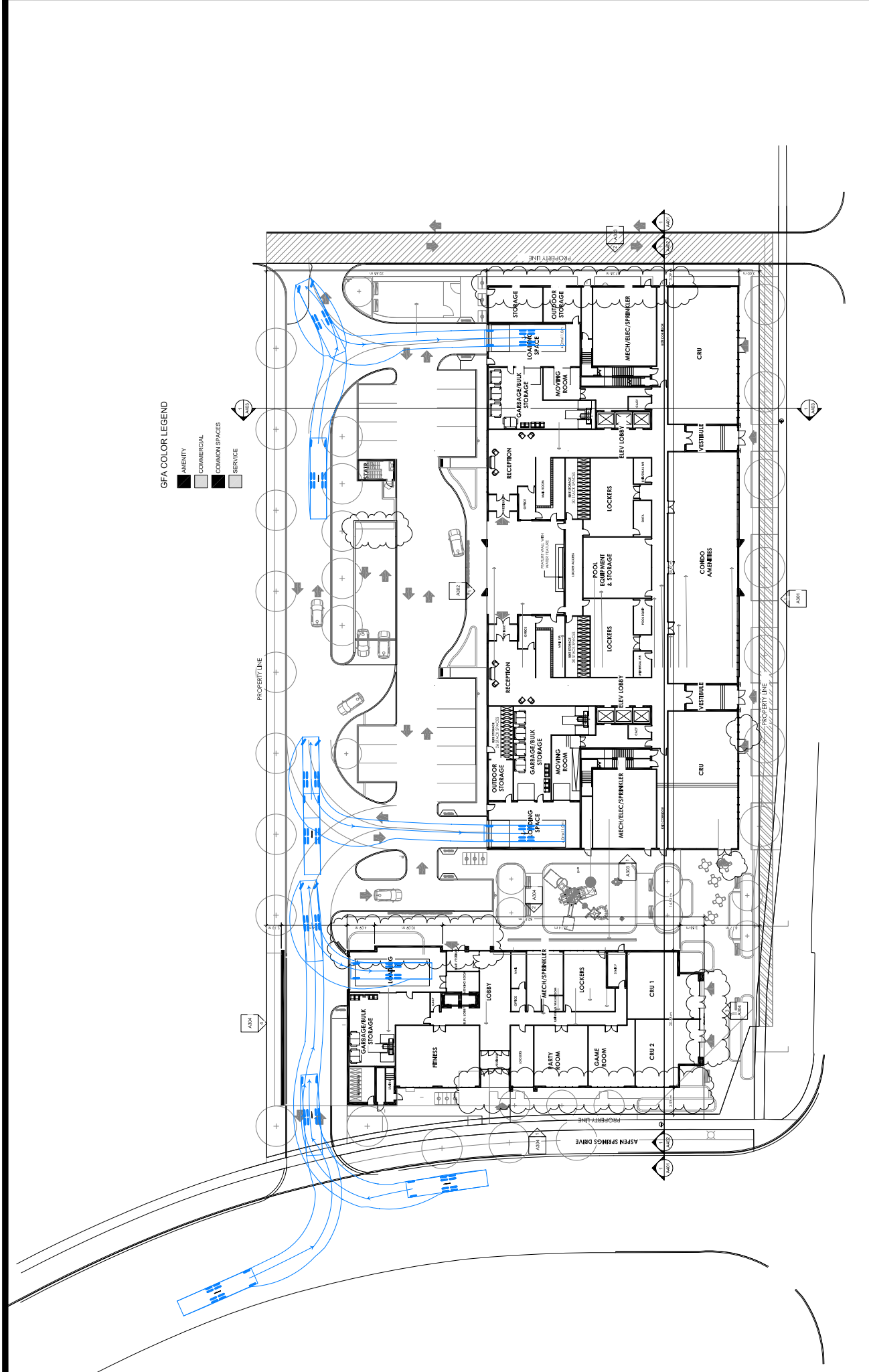
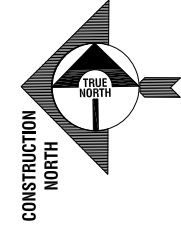


Figure 22 - Waste Collection Vehicle, Entering Site and Loading Area

PROPOSED MIXED-USE DEVELOPMENT
 10 Aspen Springs Drive,
 Bowmanville, ON

Source: Site Plan by Mataj Architects Inc., dated March 16, 2022



SCALE: 1:750 UNITS: m

GFA COLOR LEGEND

- APARTMENT
- COMMERCIAL
- COMMON SPACES
- SERVICE

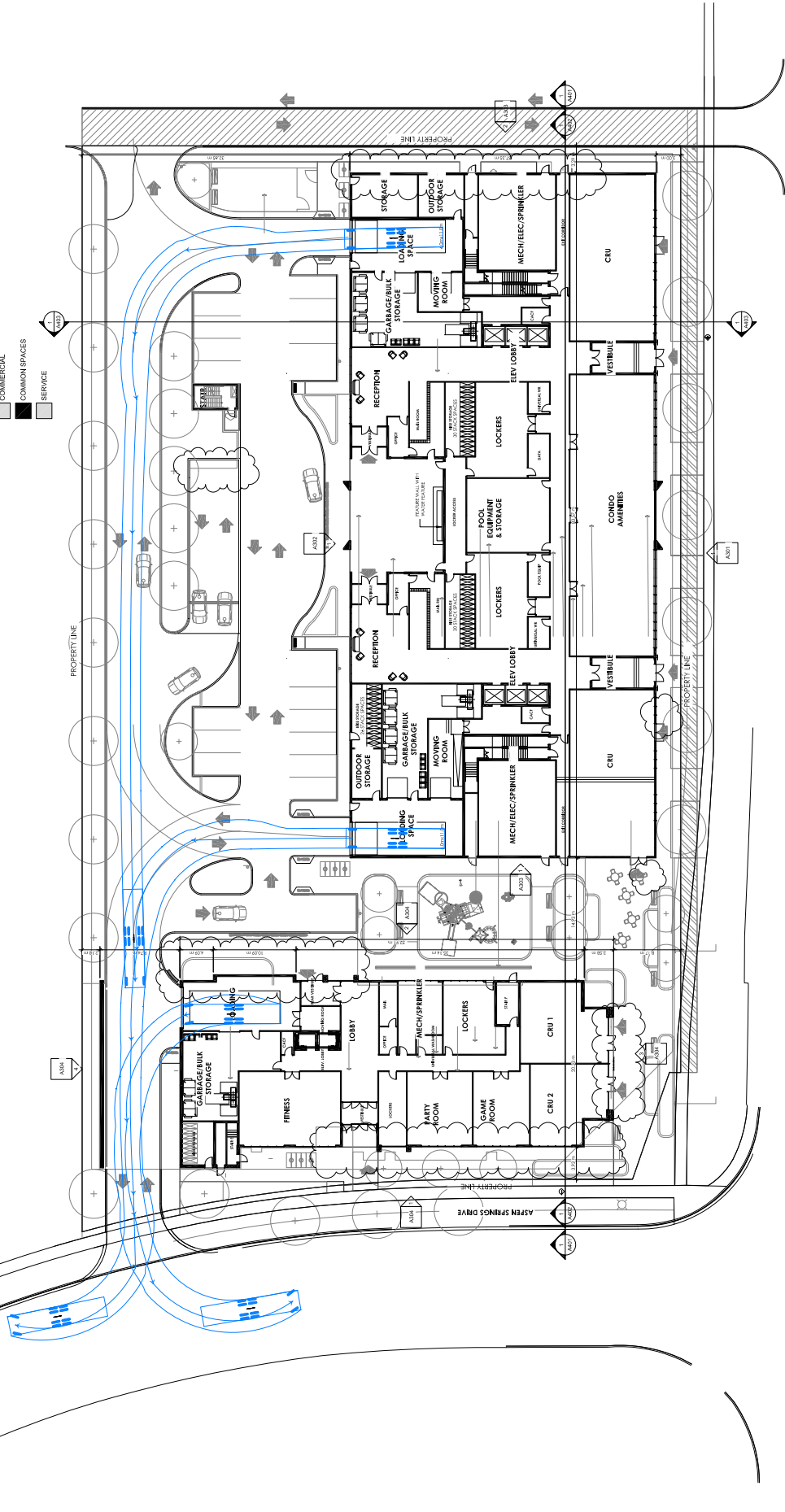
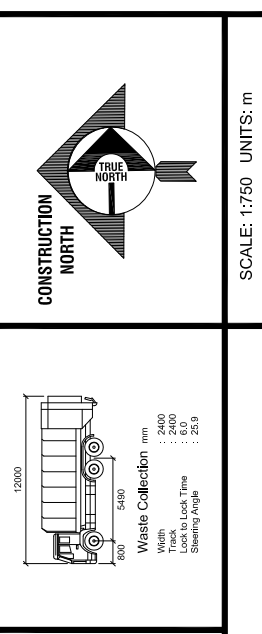


Figure 23 - Waste Collection Vehicle, Exiting Loading Area, and the Site
 PROPOSED MIXED-USE DEVELOPMENT
 10 Aspen Springs Drive,
 Bowmanville, ON



Source: Site Plan by Matraj Architects Inc., dated March 16, 2022

SCALE: 1:750 UNITS: m

APPENDICES

Appendix A – Turning Movement Counts and Signal Timing Plans

Appendix B – Background Traffic Information

Appendix C – Transportation Tomorrow Survey Data

Appendix D – Capacity and Vehicle Queuing Analysis Sheets

Appendix E – Level of Service Definitions

Appendix F – Municipality of Clarington By-law 84-63, Excerpts

Appendix G – TAC Guidelines, Excerpts



APPENDIX A

Traffic Count Data and Signal Timing Plans



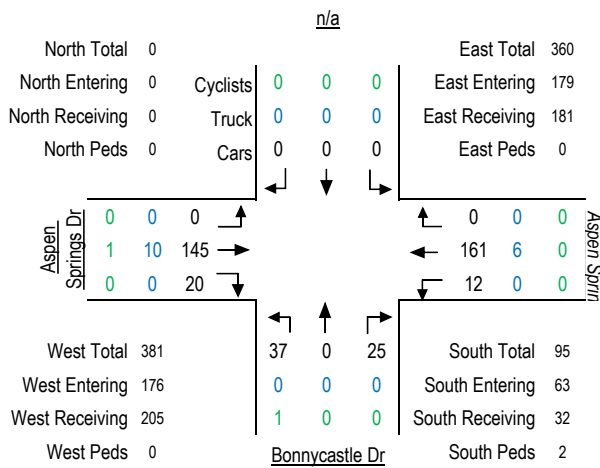
Turning Movement Count Diagram

Intersection: Aspen Springs Drive and Bonnycastle Drive
 Municipality: Bowmanville, Ontario

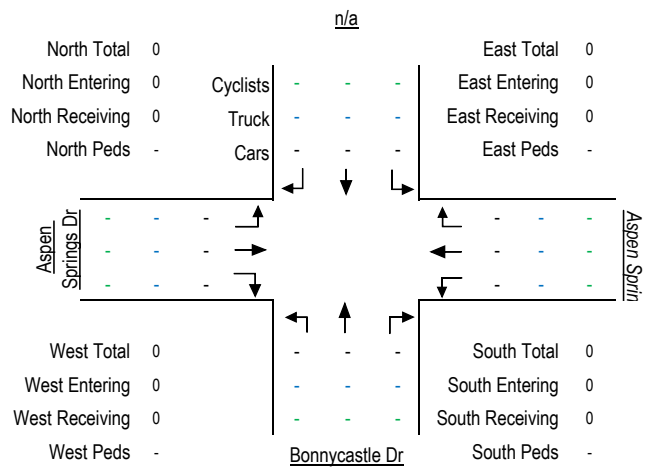
Intersection ID:

Date: Tuesday, November 16, 2021

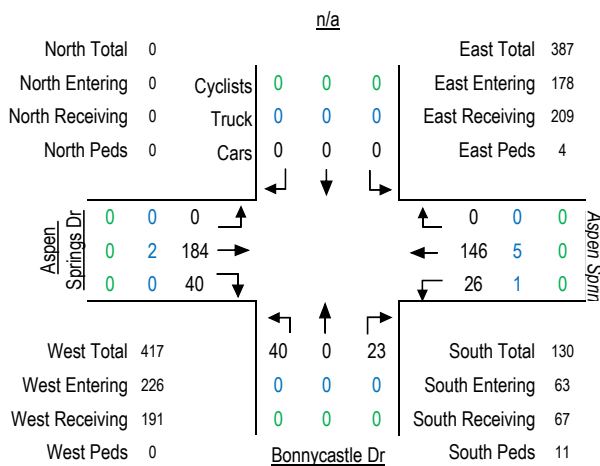
AM Peak Hour: 8:15 to 9:15



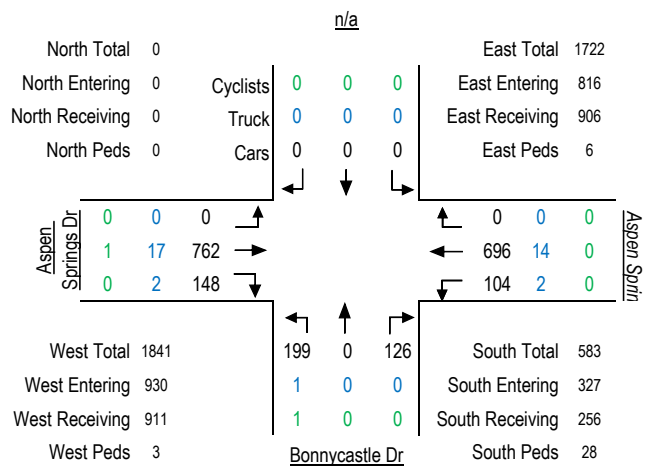
MD Peak Hour: - to -



PM Peak Hour: 15:30 to 16:30



Total 8-Hour Count



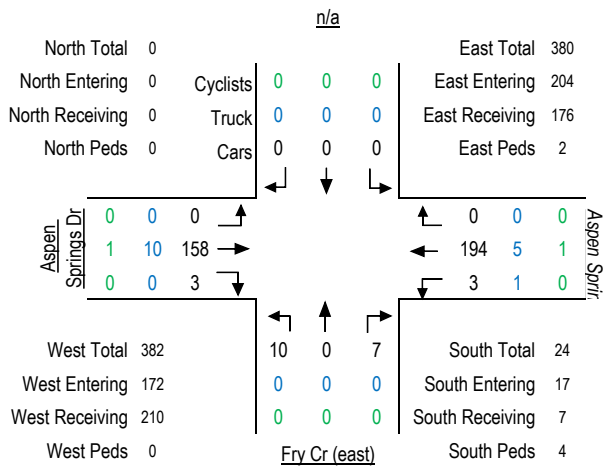


Turning Movement Count Diagram

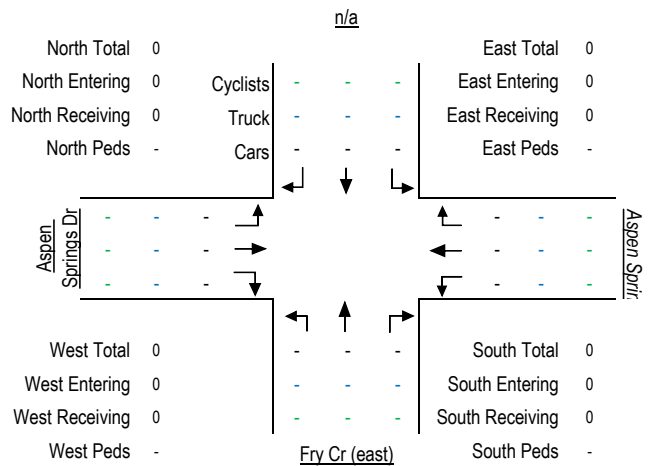
Intersection: Aspen Springs Drive and Fry Crescent (East)
 Municipality: Bowmanville, Ontario

Intersection ID:
 Date: Tuesday, November 16, 2021

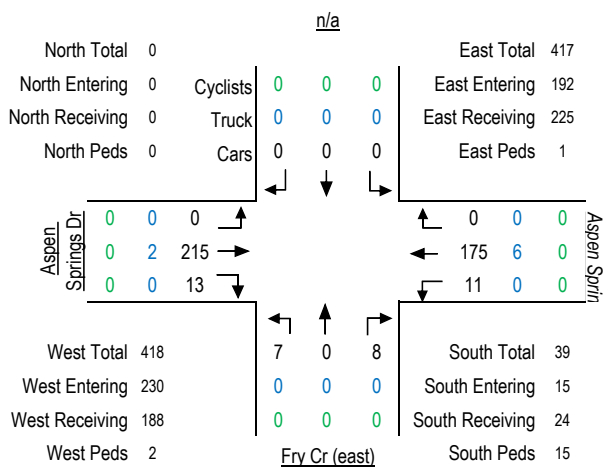
AM Peak Hour: 8:15 to 9:15



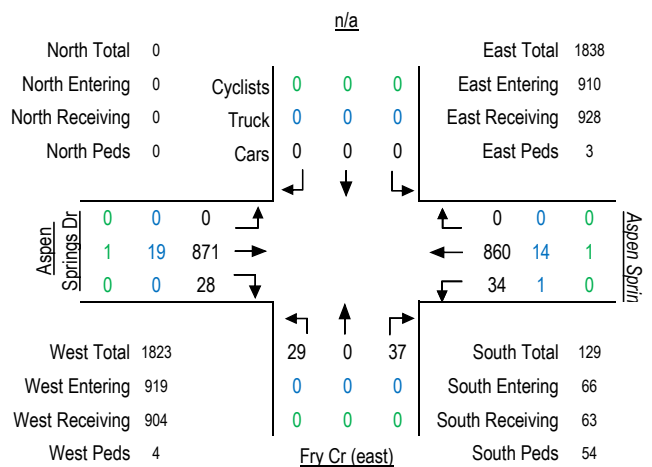
MD Peak Hour: - to -



PM Peak Hour: 15:30 to 16:30



Total 8-Hour Count





Turning Movement Count Diagram

Intersection: Aspen Springs Drive and Condo Access Fry Crescent (West)
 Municipality: Bowmanville, Ontario

Intersection ID:
 Date: Tuesday, November 16, 2021

AM Peak Hour: 8:15 to 9:15

MD Peak Hour: - to -

		Condo Access						
North Total	55				East Total	381		
North Entering	35	Cyclists	0	0	0	East Entering	209	
North Receiving	20	Truck	0	0	1	East Receiving	172	
North Peds	8	Cars	19	0	15	East Peds	0	
		←	↓	→				
Aspen Springs Dr	0	0	11	↑	←	8	1	0
	1	10	138	→	←	191	4	1
	0	0	1	↓	←	4	0	0
		←	↑	→				
West Total	380				South Total	16		
West Entering	161				South Entering	11		
West Receiving	219				South Receiving	5		
West Peds	0				South Peds	3		
		←	↑	→				
					Fry Cr (west)			

		Condo Access						
North Total	0				East Total	0		
North Entering	0	Cyclists	-	-	-	East Entering	0	
North Receiving	0	Truck	-	-	-	East Receiving	0	
North Peds	-	Cars	-	-	-	East Peds	-	
		←	↓	→				
Aspen Springs Dr	-	-	-	↑	←	-	-	-
	-	-	-	→	←	-	-	-
	-	-	-	↓	←	-	-	-
		←	↑	→				
West Total	0				South Total	0		
West Entering	0				South Entering	0		
West Receiving	0				South Receiving	0		
West Peds	-				South Peds	-		
		←	↑	→				
					Fry Cr (west)			

PM Peak Hour: 15:30 to 16:30

Total 8-Hour Count

		Condo Access						
North Total	61				East Total	417		
North Entering	21	Cyclists	0	0	0	East Entering	187	
North Receiving	40	Truck	0	0	0	East Receiving	230	
North Peds	5	Cars	8	0	13	East Peds	1	
		←	↓	→				
Aspen Springs Dr	0	0	14	↑	←	25	0	0
	0	2	213	→	←	150	6	0
	0	0	15	↓	←	6	0	0
		←	↑	→				
West Total	416				South Total	32		
West Entering	244				South Entering	11		
West Receiving	172				South Receiving	21		
West Peds	1				South Peds	14		
		←	↑	→				
					Fry Cr (west)			

		Condo Access						
North Total	309				East Total	1822		
North Entering	154	Cyclists	0	0	0	East Entering	901	
North Receiving	155	Truck	0	0	2	East Receiving	921	
North Peds	23	Cars	66	0	86	East Peds	3	
		←	↓	→				
Aspen Springs Dr	0	1	70	↑	←	82	1	0
	1	18	787	→	←	784	13	1
	0	0	33	↓	←	20	0	0
		←	↑	→				
West Total	1798				South Total	105		
West Entering	910				South Entering	52		
West Receiving	888				South Receiving	53		
West Peds	2				South Peds	36		
		←	↑	→				
					Fry Cr (west)			



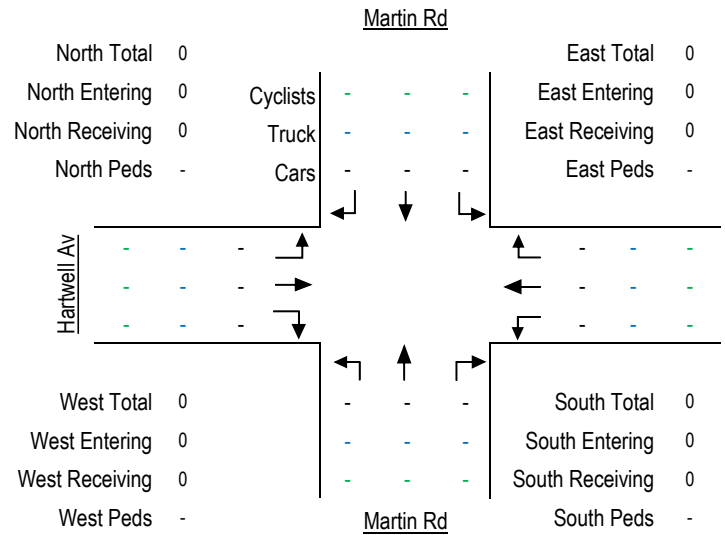
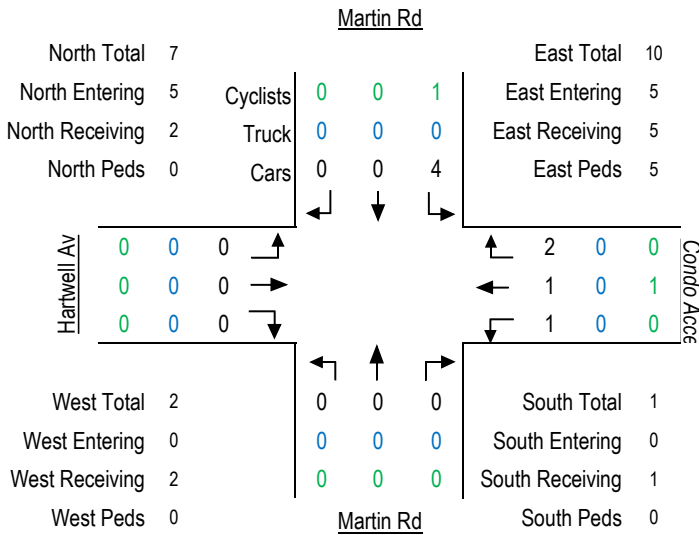
Turning Movement Count Diagram

Intersection: Martin Road and Hartwell Avenue
 Municipality: Bowmanville, Ontario

Intersection ID:
 Date: Tuesday, November 16, 2021

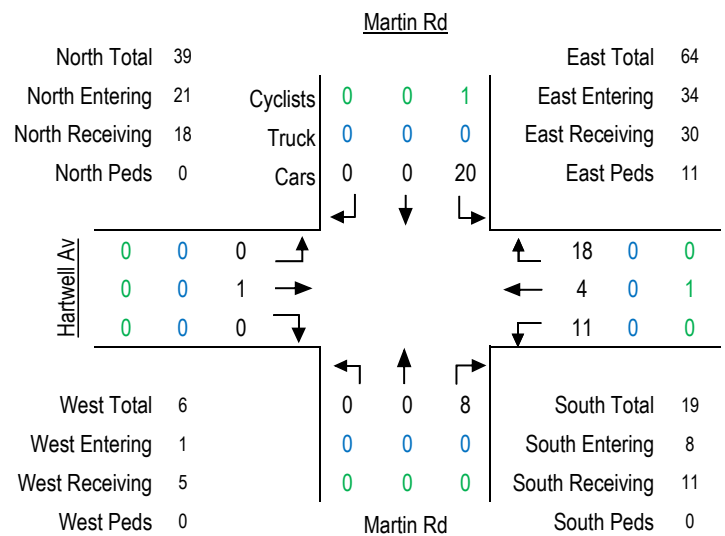
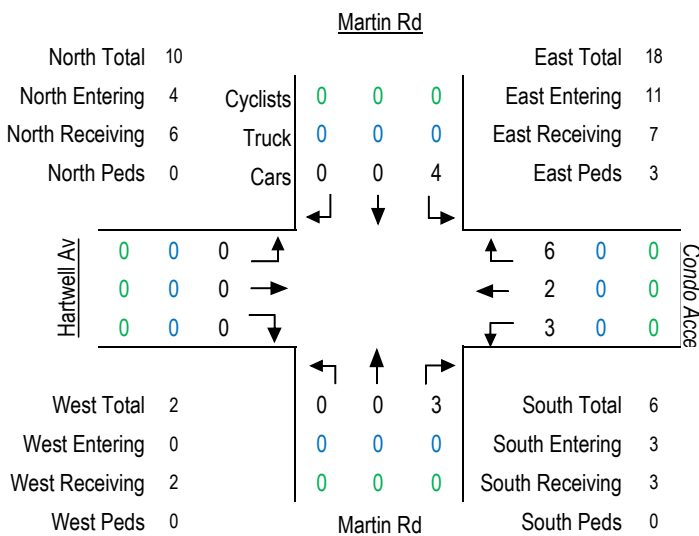
AM Peak Hour: 8:30 to 9:30

MD Peak Hour: - to -



PM Peak Hour: 15:00 to 16:00

Total 8-Hour Count



MD Peak 12:15		Ped. ↕		Cars		Trucks		Trucks % PHF	
0.00	0%	0	63	373	0	0	0	0%	0.00
0.94	19%	96	416	↔	↔	↔	↔	0%	0.00
0.64	13%	3	20	↔	↔	↔	↔	0%	0.00
PHF		Trucks % Trucks		Cars		Trucks		Ped. ↕	
0.84	19%	5	22	↔	↔	↔	↔	0	↕
0.68	8%	3	35	↔	↔	↔	↔	0	↕
0.00	0%	0	0	↔	↔	↔	↔	0	↕
0.338	60	15%	0.90						
0.37	11	23%	0.63						
0.438	101	↔							

AM Peak 07:45		Ped. ↕		Cars		Trucks		Trucks % PHF	
0.00	0%	0	97	370	0	0	0	0%	0.00
0.95	18%	133	627	↔	↔	↔	↔	0%	0.00
0.60	17%	4	20	↔	↔	↔	↔	0%	0.00
PHF		Trucks % Trucks		Cars		Trucks		Ped. ↕	
0.75	6%	2	31	↔	↔	↔	↔	0	↕
0.68	0%	0	19	↔	↔	↔	↔	0	↕
0.00	0%	0	0	↔	↔	↔	↔	0	↕
0.351	97	22%	0.84						
0.24	3	11%	0.68						
0.658	135	↔							

Total Count 3 hours*		Ped. ↕		Cars		Trucks		Trucks % PHF	
0%	0	0	748	3322	0	0	0	0%	0
19%	913	3899	↔	↔	↔	↔	↔	0%	0
12%	26	190	↔	↔	↔	↔	↔	0%	0
PHF		Trucks % Trucks		Cars		Trucks		Ped. ↕	
0.4186	960	↔							
0.268	50	16%	0.19						
0.3150	726	19%	0.16						
0.4186	960	↔							

PM Peak 16:00		Ped. ↕		Cars		Trucks		Trucks % PHF	
0.00	0%	0	141	609	0	0	0	0%	0.00
0.93	21%	131	500	↔	↔	↔	↔	0%	0.00
0.77	14%	6	37	↔	↔	↔	↔	0%	0.00
PHF		Trucks % Trucks		Cars		Trucks		Ped. ↕	
0.84	11%	6	51	↔	↔	↔	↔	0	↕
0.62	13%	4	28	↔	↔	↔	↔	0	↕
0.00	0%	0	0	↔	↔	↔	↔	0	↕
0.581	137	19%	0.92						
0.58	11	16%	0.91						
0.551	137	↔							



INTERSECTION SIGNAL TIMING REPORT

Location	Hwy. 2 and Bowmanville Ave. (RR 57)		
Date	2021-NOV-17	C&E No.	34664493
Prepared for	Trans-Plan	Prepared by	C. Cybulska

AM Peak 06:00 - 09:00

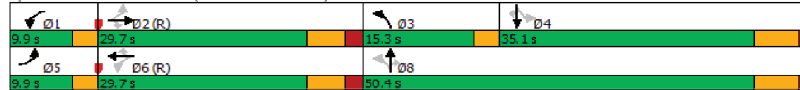


Phase Number	1	2	3	4	5	6	8
Movement	WBL	EBTL	NBL	SBTL	EBL	WBTL	NBTL
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	
Lead-Lag Optimize	Yes				Yes		
Recall Mode	None	C-Max	None	None	None	C-Max	None
Maximum Split (s)	9.9	29.7	15.3	35.1	9.9	29.7	50.4
Maximum Split (%)	11.0%	33.0%	17.0%	39.0%	11.0%	33.0%	56.0%
Minimum Split (s)	9	28	9	26	9	28	26
Yellow Time (s)	3	4.3	3	4.9	3	4.3	4.9
All-Red Time (s)	0	1.9	0	1.6	0	1.9	1.6
Minimum Initial (s)	5	20	5	12	5	20	12
Vehicle Extension (s)	3	3	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0
Walk Time (s)		11		13		11	13
Flash Dont Walk (s)		5		5		5	5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Coordinated
Natural Cycle	90
Offset: 8.1 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 332: RR 57 (BOWMANVILLE AVE) & HWY 2



PM Peak 15:15 - 20:00

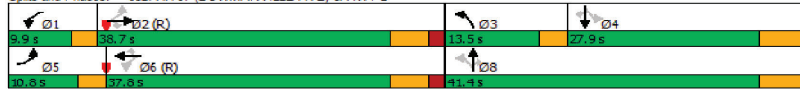


Phase Number	1	2	3	4	5	6	8
Movement	WBL	EBTL	NBL	SBTL	EBL	WBTL	NBTL
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	
Lead-Lag Optimize							
Recall Mode	None	C-Max	None	None	None	C-Max	None
Maximum Split (s)	9.9	38.7	13.5	27.9	10.8	37.8	41.4
Maximum Split (%)	11.0%	43.0%	15.0%	31.0%	12.0%	42.0%	46.0%
Minimum Split (s)	9	28	9	26	9	28	26
Yellow Time (s)	3	4.3	3	4.9	3	4.3	4.9
All-Red Time (s)	0	1.9	0	1.6	0	1.9	1.6
Minimum Initial (s)	5	20	5	12	5	20	12
Vehicle Extension (s)	3	3	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0
Walk Time (s)		11		13		11	13
Flash Dont Walk (s)		5		5		5	5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Coordinated
Natural Cycle	90
Offset: 34.2 (38%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 332: RR 57 (BOWMANVILLE AVE) & HWY 2



Weekend Peak 09:00 - 18:30

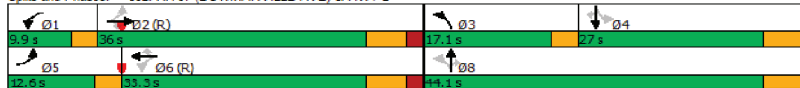


Phase Number	1	2	3	4	5	6	8
Movement	WBL	EBTL	NBL	SBTL	EBL	WBTL	NBTL
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	
Lead-Lag Optimize							
Recall Mode	None	C-Max	None	None	None	C-Max	None
Maximum Split (s)	9.9	36	17.1	27	12.6	33.3	44.1
Maximum Split (%)	11.0%	40.0%	19.0%	30.0%	14.0%	37.0%	49.0%
Minimum Split (s)	9	28	9	26	9	28	26
Yellow Time (s)	3	4.3	3	4.9	3	4.3	4.9
All-Red Time (s)	0	1.9	0	1.6	0	1.9	1.6
Minimum Initial (s)	5	20	5	12	5	20	12
Vehicle Extension (s)	3	3	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0
Walk Time (s)		11		13		11	13
Flash Dont Walk (s)		5		5		5	5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Coordinated
Natural Cycle	75
Offset: 39.5 (44%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 332: RR 57 (BOWMANVILLE AVE) & HWY 2



**Please note a concerted effort has been made to ensure the accuracy and completeness of the data provided, however, inadvertent errors or omissions can still occur. Please bring any errors or omissions to the Region's attention.*



INTERSECTION SIGNAL TIMING REPORT

Location	Bowmanville Avenue (Regional Road 57) at Aspen Springs Drive		
Date	11/16/2021	C&E No.	34664493
Prepared for	Trans-Plan	Prepared by	C. Cybulska

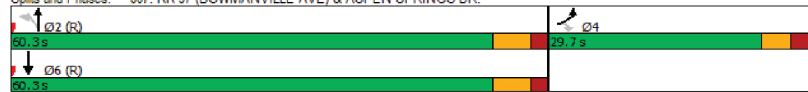
AM Peak 06:00 - 09:00



Phase Number	2	4	6
Movement	NBTL	EBL	SBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	C-Max	None	C-Max
Maximum Split (s)	60.3	29.7	60.3
Maximum Split (%)	67.0%	33.0%	67.0%
Minimum Split (s)	27	24	27
Yellow Time (s)	4.2	3.3	4.2
All-Red Time (s)	2.1	2.6	2.1
Minimum Initial (s)	20	8	20
Vehicle Extension (s)	3	3	3
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)	7	7	7
Flash Dont Walk (s)	10	10	10

Intersection Summary	
Cycle Length	90
Control Type	Actuated-Coordinated
Natural Cycle	70
Offset: 79.2 (88%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	

Splits and Phases: 807: RR 57 (BOWMANVILLE AVE) & ASPEN SPRINGS DR.



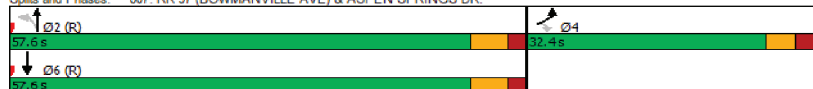
PM Peak 15:15 - 22:00



Phase Number	2	4	6
Movement	NBTL	EBL	SBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	C-Max	None	C-Max
Maximum Split (s)	57.6	32.4	57.6
Maximum Split (%)	64.0%	36.0%	64.0%
Minimum Split (s)	27	24	27
Yellow Time (s)	4.2	3.3	4.2
All-Red Time (s)	2.1	2.6	2.1
Minimum Initial (s)	20	8	20
Vehicle Extension (s)	3	3	3
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)	7	7	7
Flash Dont Walk (s)	10	10	10

Intersection Summary	
Cycle Length	90
Control Type	Actuated-Coordinated
Natural Cycle	65
Offset: 38.7 (43%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	

Splits and Phases: 807: RR 57 (BOWMANVILLE AVE) & ASPEN SPRINGS DR.



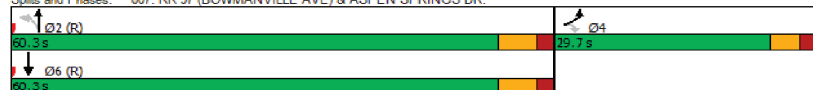
Weekend Peak 09:00 - 18:30



Phase Number	2	4	6
Movement	NBTL	EBL	SBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	C-Max	None	C-Max
Maximum Split (s)	60.3	29.7	60.3
Maximum Split (%)	67.0%	33.0%	67.0%
Minimum Split (s)	27	24	27
Yellow Time (s)	4.2	3.3	4.2
All-Red Time (s)	2.1	2.6	2.1
Minimum Initial (s)	20	8	20
Vehicle Extension (s)	3	3	3
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)	7	7	7
Flash Dont Walk (s)	10	10	10

Intersection Summary	
Cycle Length	90
Control Type	Actuated-Coordinated
Natural Cycle	60
Offset: 21.6 (24%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	

Splits and Phases: 807: RR 57 (BOWMANVILLE AVE) & ASPEN SPRINGS DR.



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INTERSECTION SIGNAL TIMING REPORT

Location	Bowmanville Ave. (RR 57) and Hartwell Ave.		
Date	2021-NOV-17	C&E No.	34664493
Prepared for	Trans-Plan		
		Prepared by	C. Cybulka

AM Peak 06:00 - 09:00



Phase Number	2	4
Movement	NBSB	EBWB
Lead/Lag		
Lead-Lag Optimize		
Recall Mode	C-Max	None
Maximum Split (s)	60.3	29.7
Maximum Split (%)	67.0%	33.0%
Minimum Split (s)	27	23
Yellow Time (s)	4.8	3.3
All-Red Time (s)	1.8	3
Minimum Initial (s)	20	8
Vehicle Extension (s)	3	3
Minimum Gap (s)	3	3
Time Before Reduce (s)	0	0
Time To Reduce (s)	0	0
Walk Time (s)	7	7
Flash Dont Walk (s)	5	9

Intersection Summary	
Cycle Length	90
Control Type	Actuated-Coordinated
Natural Cycle	60
Offset: 7.2 (8%), Referenced to phase 2:NBSB, Start of Green	

Splits and Phases: 831: RR 57 (BOWMANVILLE AVE) & HARTWELL AVENUE



PM Peak 15:15-22:00



Phase Number	2	4
Movement	NBSB	EBWB
Lead/Lag		
Lead-Lag Optimize		
Recall Mode	C-Max	None
Maximum Split (s)	57.6	32.4
Maximum Split (%)	64.0%	36.0%
Minimum Split (s)	27	23
Yellow Time (s)	4.8	3.3
All-Red Time (s)	1.8	3
Minimum Initial (s)	20	8
Vehicle Extension (s)	3	3
Minimum Gap (s)	3	3
Time Before Reduce (s)	0	0
Time To Reduce (s)	0	0
Walk Time (s)	7	7
Flash Dont Walk (s)	5	9

Intersection Summary	
Cycle Length	90
Control Type	Actuated-Coordinated
Natural Cycle	65
Offset: 27 (30%), Referenced to phase 2:NBSB, Start of Green	

Splits and Phases: 831: RR 57 (BOWMANVILLE AVE) & HARTWELL AVENUE



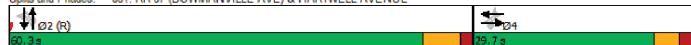
Weekend Peak 09:00-18:30



Phase Number	2	4
Movement	NBSB	EBWB
Lead/Lag		
Lead-Lag Optimize		
Recall Mode	C-Max	None
Maximum Split (s)	60.3	29.7
Maximum Split (%)	67.0%	33.0%
Minimum Split (s)	27	23
Yellow Time (s)	4.8	3.3
All-Red Time (s)	1.8	3
Minimum Initial (s)	20	8
Vehicle Extension (s)	3	3
Minimum Gap (s)	3	3
Time Before Reduce (s)	0	0
Time To Reduce (s)	0	0
Walk Time (s)	7	7
Flash Dont Walk (s)	5	9

Intersection Summary	
Cycle Length	90
Control Type	Actuated-Coordinated
Natural Cycle	60
Offset: 41.4 (46%), Referenced to phase 2:NBSB, Start of Green	

Splits and Phases: 831: RR 57 (BOWMANVILLE AVE) & HARTWELL AVENUE



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APPENDIX B

Background Traffic Information

Review of Traffic Growth



Reginal Rd 57

Year	AADT (vehicles)	xy	x^2	Growth by Linear Regression	Annual Growth Rate
2017	18875	38070875	4068289	19565	
2018	19295	38937310	4072324	17915	
2019	15575	31445925	4076361	16265	-8.43%
6054	53745	108454110	12216974		

events 3
 m -1650
 b 3347615

Source: AADT provided by the Region of Durham, 2017-2019

Hwy 2

Year	AADT (vehicles)	xy	x^2	Growth by Linear Regression	Annual Growth Rate
2017	29310	59118270	4068289	29732	
2018	28960	58441280	4072324	28117	
2019	26080	52655520	4076361	26502	-5.43%
6054	84350	170215070	12216974		

events 3
 m -1615
 b 3287186.667

Source: AADT provided by the Region of Durham, 2017-2019

Fw: 10 Aspen Springs Drive, Residential Development - Bowmanville GO Extension

Chris Toews <Chris.Toews@trans-plan.com>

Thu 11/11/2021 12:08 PM

To: Jing Min <Jing.Min@trans-plan.com>

Hey Jing,

See below Metrolinx's response to our inquiry.

Best regards,

Chris Toews
Traffic Analyst | TRANS-PLAN
Transportation Engineering

Toll Free: +1 (877) 668-8784 (TPTI)

Office/Fax: +1 (647) 931-7383

Cell: +1 (647) 993-2663

Email: chris.toews@trans-plan.com

W: www.trans-plan.com

Company portfolio: [Trans-Plan Portfolio](#)

Company stats: [Trans-Plan Statistics](#)

Head office: 785 Dundas Street West, Toronto, Ontario, M6J 1V2



From: Derek Davies <Derek.Davies@metrolinx.com>

Sent: Thursday, November 11, 2021 11:59 AM

To: Chris Toews <Chris.Toews@trans-plan.com>

Cc: Alexandra Goldstein <Alexandra.Goldstein@metrolinx.com>; Reiner Kravis <Reiner.Kravis@metrolinx.com>; Joseph Milos <Joseph.Milos@metrolinx.com>; Jennifer Wong <Jennifer.Wong@metrolinx.com>; Jocelyn Stenner <Jocelyn.Stenner@metrolinx.com>; Stephanie Cardenas <Stephanie.Cardenas@metrolinx.com>

Subject: RE: 10 Aspen Springs Drive, Residential Development - Bowmanville GO Extension

[EXTERNAL]

Hi Chris,

Thanks for reaching out! Please see below for Metrolinx's response and for some additional information regarding the Bowmanville GO Station that may be helpful.

- At this time, there are no station designs available and site access routes cannot be confirmed as the Bowmanville GO Station is to be delivered through Metrolinx's Transit Oriented Communities (TOC) Program. Please also note that the 2011 concept site plan provided was for the purposes of the 2011 Environmental Assessment which is now considered to be out of date.
- The TOC Program involves the partnership between Metrolinx and a third party to fund, design, and deliver new or improved transit infrastructure wherein third parties will fund the design and construction of infrastructure and Metrolinx will operate it. For more information on the Transit Oriented Communities Program, please [click here](#) to visit the Metrolinx TOC website.
- Additional environmental and limited traffic studies are currently underway to reflect updates since the 2011 EA and the 2020 Initial Business Case (IBC) with the future third party being responsible for completing necessary due diligence.
- Future transit schedules have not been determined at this time, for more information regarding level of service and ridership, please [click here](#) for the IBC and Metrolinx Board report.

- Metrolinx is currently in active discussions with landowners and developers to deliver the four GO stations proposed for Thornton's Corners East, Ritson Road, Courtice and Bowmanville through the TOC Program along the proposed Bowmanville Extension.

Should you have any additional questions, please feel free to reach out to Alex Goldstein who is a member of our Third Party Projects Review team or Reiner Kravis in Stations Planning, both CC'd

Thanks,

--

Derek Davies (*He, Him*)

Senior Advisor, Development, Heavy Rail (New Stations)

Metrolinx | 20 Bay Street, Suite 600 | Toronto, ON | M5J 2W3

C: 416-275-1473

From: Chris Toews <Chris.Toews@trans-plan.com>

Sent: Monday, November 08, 2021 1:45 PM

To: Derek Davies <Derek.Davies@metrolinx.com>

Subject: 10 Aspen Springs Drive, Residential Development - Bowmanville GO Extension

EXTERNAL SENDER: Do not click any links or open any attachments unless you trust the sender and know the content is safe.

EXPÉDITEUR EXTERNE: Ne cliquez sur aucun lien et n'ouvrez aucune pièce jointe à moins qu'ils ne proviennent d'un expéditeur fiable, ou que vous ayez l'assurance que le contenu provient d'une source sûre.

Good afternoon Derek,

My name is Chris Toews and I work for a traffic consultant named Trans-Plan. We have been retained to complete a Traffic Impact Study for the proposed residential development at 10 Aspen Springs Drive, Bowmanville (site plan attached for your reference). The development is to be located adjacent to the Metrolinx lands designated for the future Bowmanville GO Expansion. Upon submission of our Terms of Reference to Durham Region we were provided with your contact information to confirm current plans for the project, as it is required to include in our traffic analysis. We were hoping to obtain the following information:

- Access design and locations
- Confirmation of shared laneway configuration at northern border of site
- Previously completed Traffic Impact Studies (if any)
- Site trip generation estimates
- Future train schedules
- Anticipated completion year

If any of the above information can be provided it would be greatly appreciated.

Best regards,

Chris Toews

Traffic Analyst | TRANS-PLAN

Transportation Engineering

Toll Free: +1 (877) 668-8784 (TPTI)

Office/Fax: +1 (647) 931-7383

Cell: +1 (647) 993-2663

RE: Terms of Reference, Traffic Study_ 10 Aspen Springs Drive, Bowmanville

Greg Pereira <Greg.Pereira@durham.ca>

Mon 1/10/2022 12:27 PM

To: Jing Min <Jing.Min@trans-plan.com>

Cc: Doug Robertson <Doug.Robertson@Durham.ca>

[EXTERNAL]

Hi Jin –

Sorry for the delay in response, this information was in my inbox just before the xmas break.

Region of Durham Transportation Planning staff have completed some in-house analysis to identify the traffic growth rates for the major arterials in the study area. This analysis is based on the DRTPM2014, but uses the land use forecast work from our SGA analysis. The suggested annual growth rates are:

- Before 2024 – historic growth rates unless there is significant development during this time period. The consultant should use the traffic data to verify the rates.
- 2024-2029 – The RR57 will be widened to 4 lanes between Baseline Rd and Steven Rd and the GO station will be operational. The intensification will be mainly along Hwy 2 corridor. Assuming the linear development growth until 2051 to achieve the SGA forecast, the annual growth rates would be estimated at:
 - RR57, south of Hwy 2 – 2.0%
 - RR57, south of Aspen Springs Dr – 1.5%
 - Hwy 2, between Green Rd and RR57 – 2.5%
 - Hwy 2, west of Green Rd – 2.0%

Please let me know if you have any clarification questions.

Regards

Greg

From: Jing Min <Jing.Min@trans-plan.com>**Sent:** January 10, 2022 12:14 PM**To:** Greg Pereira <Greg.Pereira@durham.ca>**Subject:** Re: Terms of Reference, Traffic Study_ 10 Aspen Springs Drive, Bowmanville

Hi Greg,

Hope you had a great holiday.

Correct me if I'm wrong, you advised in our call that your team you would provide us with a growth rate for the new Bowmanville GO station to help us generate trips in TIS. I'm just following up and see if you have any update.

Thank you,

Background Developments Information

Proposed Residential Development
10 Aspen Springs Drive, Bowmanville, ON



Development 1 - Green Road and Highway 2

Proposed Multi-Residential Development

Land Use	Units / Size (GFA)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
PHASE 1 (2024)							
ITE 221 (Multi-Family High-Rise)	137						
ITE 820 (Shopping Centre)	187m ²						
Trips		14	39	53	36	27	63
PHASE 2 (2026)							
ITE 221 (Multi-Family High-Rise)	91						
ITE 820 (Shopping Centre)	174.4m ²						
Trips		11	29	40	26	21	47
Total New Trips		25	68	93	62	48	110

Source: Figures 4-1 and 4-2, Transportation Impact Study, September 2021 by Nextrans Consulting

Development 2 - 215, 219 & 223 King Street West

Proposed Residential Development

Land Use	Units	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Residential ITE Code 230	425						
Trips		27	129	156	125	62	187

Source: Figure 4-1, Transportation Study Update #2, August 2017 by Nextrans Consulting

Development 3 - 55 Clarington Boulevard

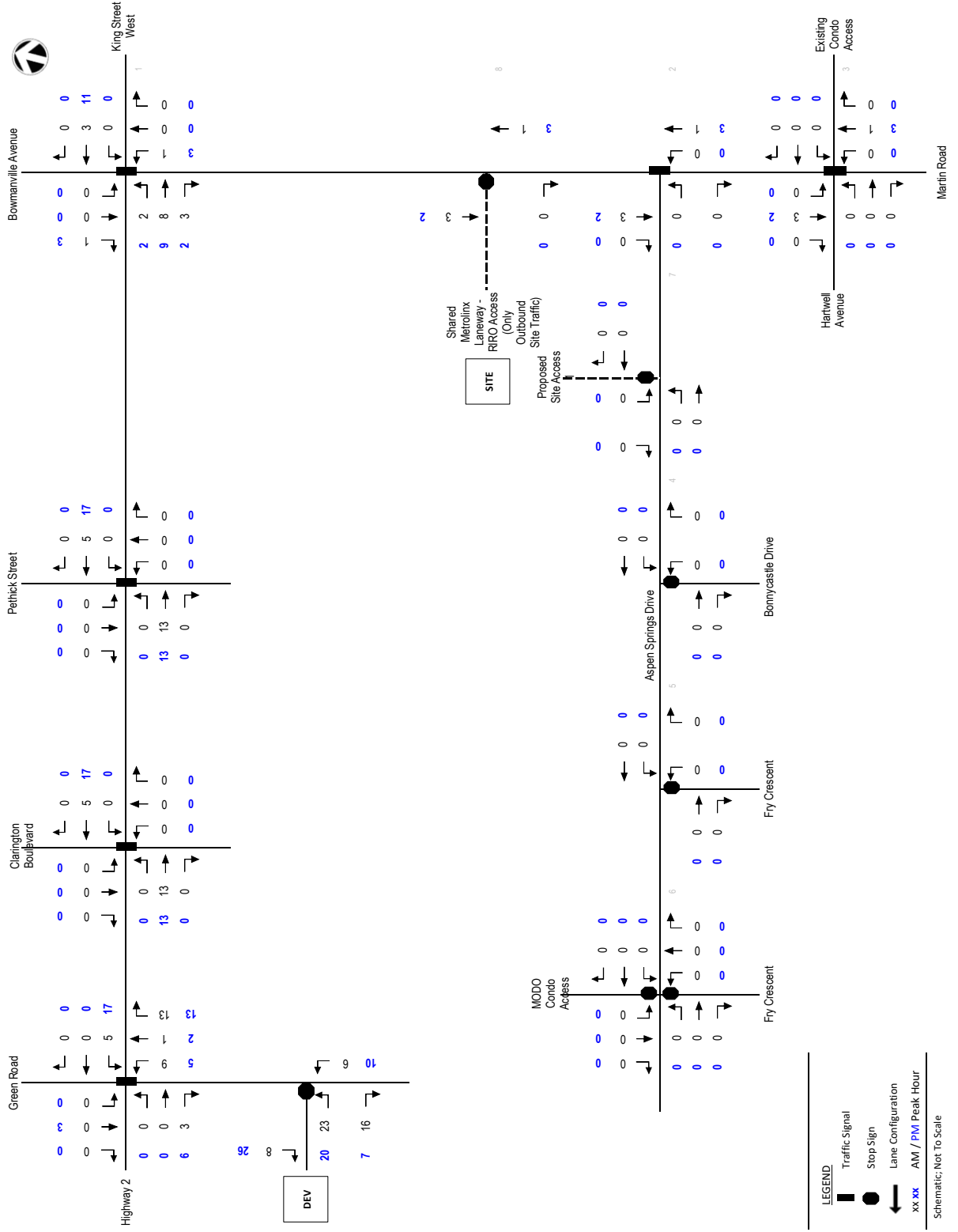
Proposed Residential Development

Land Use	Units	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Residential ITE Code 222	134						
Trips		20	86	106	83	43	127

Source: Exhibit 3.2, Memorandum: Update of 55 Clarington Boulevard TIS, February 2017 by Tranplan Associates

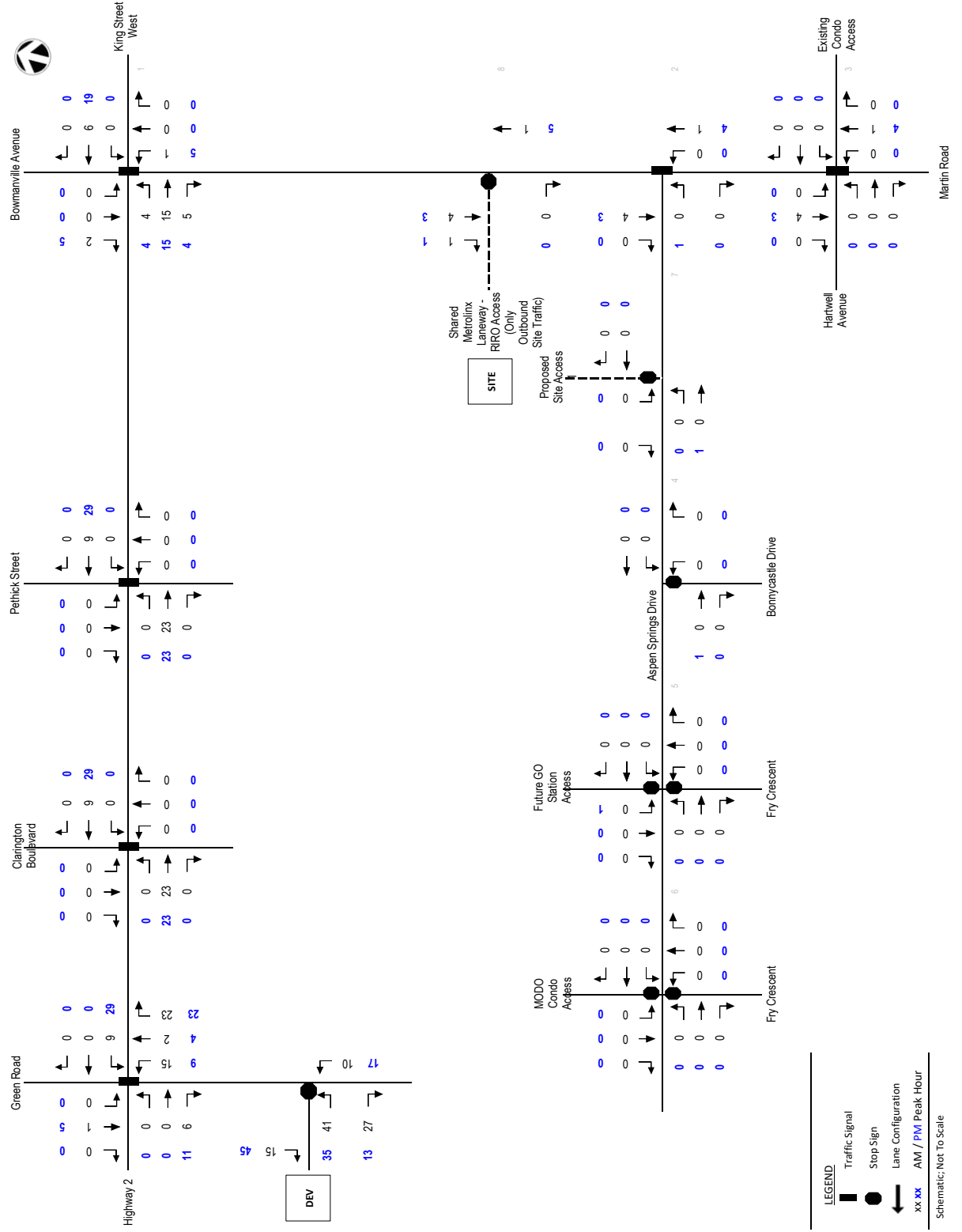
DEV 1: Phase 1 (2024) Trip Distribution for Proposed Residential Development at Green Road and Highway 2

Source: Transportation Impact Study (Figure 4-1 - Site Traffic, 2024), dated September 2021 by Nexttrans Consulting



DEV 1: Phase 2 (2026) Trip Distribution for Proposed Residential Development at Green Road and Highway 2




Source: Transportation Impact Study (Figure 4-2 - Site Traffic, 2026), dated September 2021 by Nexttrans Consulting



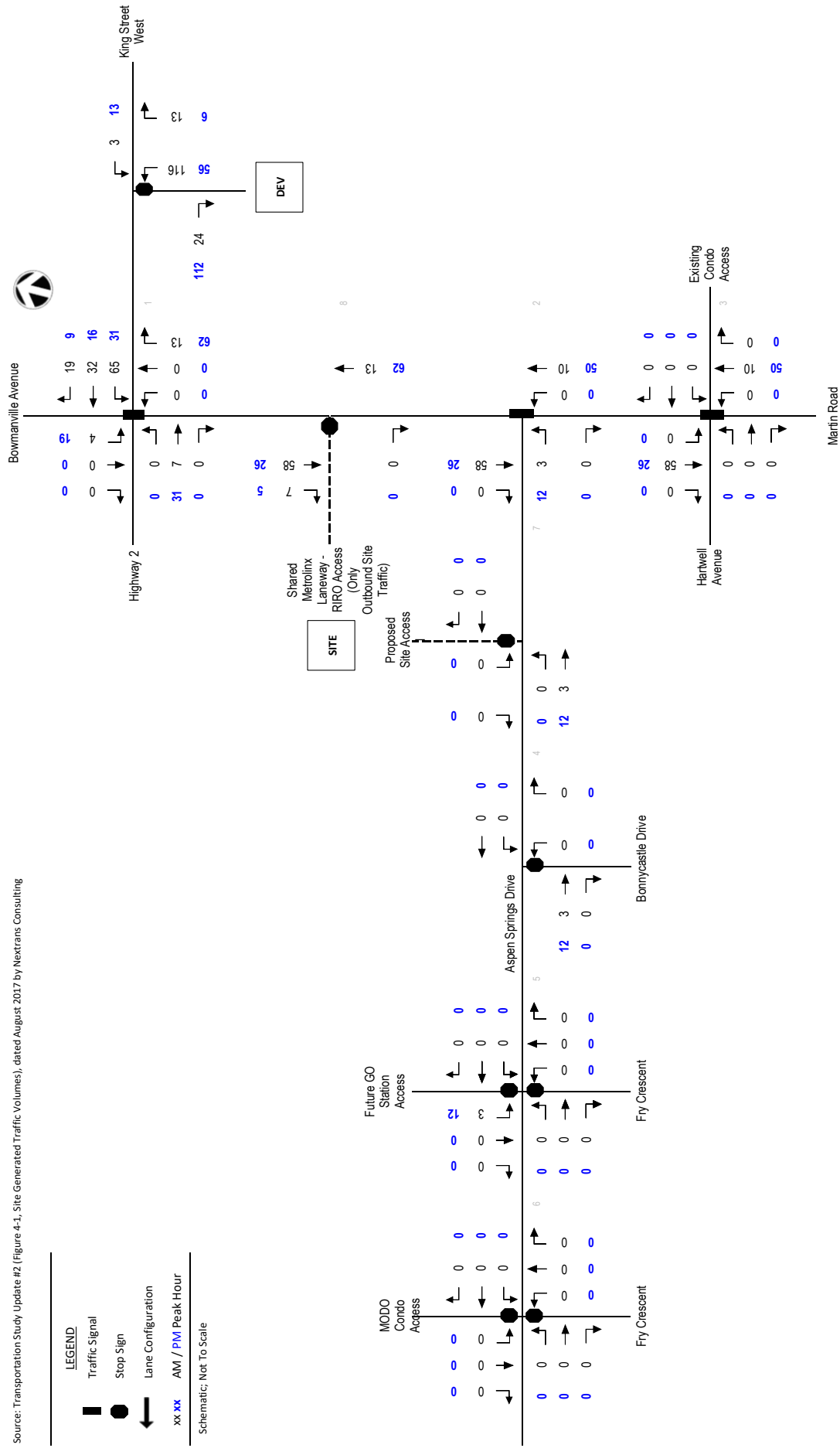
DEV 2: Trip Distribution for Proposed Residential Development at 215, 219 & 223 King Street West

Source: Transportation Study Update #2 (Figure 4-1, Site Generated Traffic Volumes), dated August, 2017 by Nexttrans Consulting

LEGEND

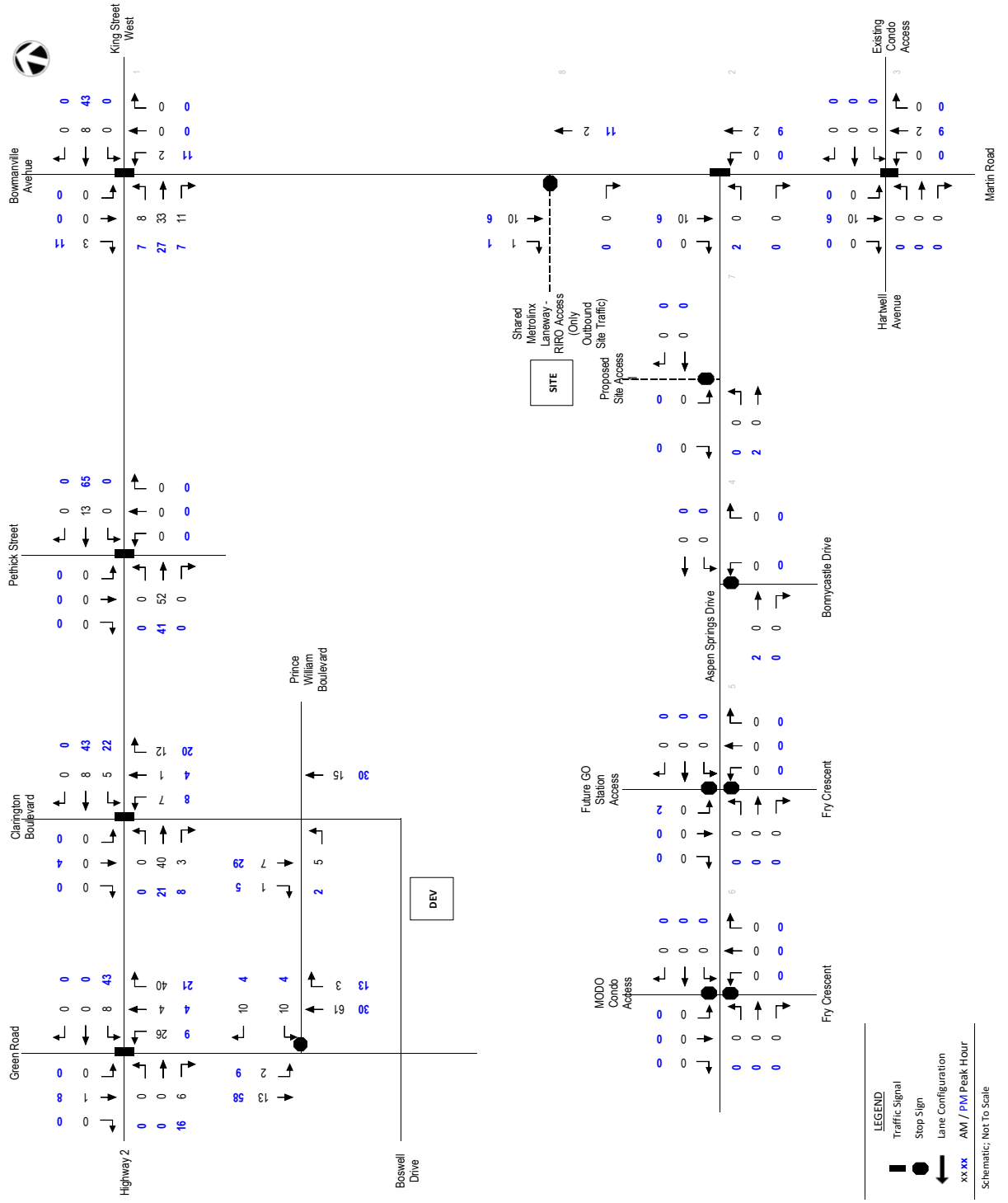
-  Traffic Signal
-  Stop Sign
-  Lane Configuration
- xx xx** AM / PM Peak Hour

Schematic: Not To Scale



DEV 3: Trip Distribution for Proposed Residential Development at 51-55 Clarington Boulevard

Source: Transportation Impact Study (Figure 4-1 - Site Traffic 2024), dated September 2021 by NeTrans Consulting





APPENDIX C

Transportation Tomorrow Survey Data

**MUNICIPALITY OF CLARINGTON
WARD 2**

WARD 2
HOUSEHOLD CHARACTERISTICS

Households	Dwelling Type			Household Size					Number of Available Vehicles					Household Averages				
	House	Townhouse	Apartment	1	2	3	4	5+	0	1	2	3	4+	Persons	Workers	Drivers	Vehicles	Trips/Day
10,700	73%	10%	17%	20%	32%	19%	19%	9%	4%	27%	50%	12%	7%	2.7	1.6	1.9	2.0	5.4

POPULATION CHARACTERISTICS

Population	Age							Daily Trips per Person (age 11+)	Daily Work Trips per Worker	Population	Employment Type			Student	Licensed	Transit Pass	
	0-10	11-15	16-25	26-45	46-64	65+	Median				Full Time	Part Time	At Home				
	28,500	15%	6%	11%	28%	27%	12%				37.8	2.4	0.74				14,300
											Male						
											Female						
											14,200	38%	10%	3%	21%	72%	7%

TRIPS MADE BY RESIDENTS OF MUNICIPALITY OF CLARINGTON - WARD 2

Time Period	Trips	% 24hr	Trip Purpose				Mode of Travel						Median Trip Length (km)			
			HB-W	HB-S	HB-D	N-HB	Driver	Pass.	Transit	GO Train	Walk & Cycle	Other	Driver	Pass.	Transit	GO Train
6-9 AM	12,600	21.9%	47%	14%	23%	15%	75%	12%	2%	3%	6%	3%	13.6	2.5	14.6	61.6
24 Hrs	57,600		33%	8%	42%	17%	78%	14%	1%	1%	5%	1%	11.1	7.7	14.6	62.0

TRIPS MADE TO MUNICIPALITY OF CLARINGTON - WARD 2 - BY RESIDENTS OF THE TTS AREA

Time Period	Trips	% 24 hr	Trip Purpose				Mode of Travel						Median Trip Length (km)			
			Work	School	Home	Other	Driver	Pass.	Transit	GO Train	Walk & Cycle	Other	Driver	Pass.	Transit	GO Train
6-9 AM	7,800	15.5%	43%	29%	6%	22%	65%	11%	1%	*	11%	12%	6.6	2.1	7.1	*
24 Hrs	50,100		12%	5%	47%	35%	76%	15%	1%	1%	6%	3%	8.0	6.5	17.8	62.0

USER : Trans-Plan Transportation Inc.
 DATE : Thursday November 04 2021
 DATA : 2016 TTS v1.1
 FILTER 1 : Ward number of origin - ward_orig In 73
 FILTER 2 : Trip purpose of origin => Home
 FILTER 3 : start_time => 600-1000
 ROW : pd_dest
 COLUMN : ward_orig

		North		
		1%		
West	48%		23%	East
		28%		
		South		

Destination Zone	No. of Trips from Ward 73	Percent of Trips from Ward 73	Location Respect to Site
PD 1 of Toronto	386	4.2%	W
PD 3 of Toronto	56	0.6%	W
PD 4 of Toronto	114	1.2%	W
PD 5 of Toronto	109	1.2%	W
PD 6 of Toronto	32	0.4%	W
PD 8 of Toronto	11	0.1%	W
PD 9 of Toronto	21	0.2%	W
PD 11 of Toronto	15	0.2%	W
PD 12 of Toronto	66	0.7%	W
PD 13 of Toronto	149	1.6%	W
PD 15 of Toronto	17	0.2%	W
PD 16 of Toronto	30	0.3%	W
Brock	10	0.1%	N
Scugog	81	0.9%	N
Pickering	531	5.8%	S
Ajax	448	4.9%	S
Whitby	1112	12.2%	S
Oshawa	2708	29.7%	W
Clarington			
72	658	7.2%	W
73	Internal		
74	1538	16.8%	E
75	287	3.1%	E
Richmond Hill	42	0.5%	S
Markham	93	1.0%	S
Vaughan	30	0.3%	S
Mississauga	73	0.8%	S
Waterloo	9	0.1%	S
Cambridge	17	0.2%	S
Kawartha Lakes	40	0.4%	E
Peterborough	180	2.0%	E
Cavan Monaghan	91	1.0%	E
Monaghan	7	0.1%	E
Northumberland	118	1.3%	S
Hastings	54	0.6%	S
External	129	1.4%	
Total	9133	100%	



APPENDIX D

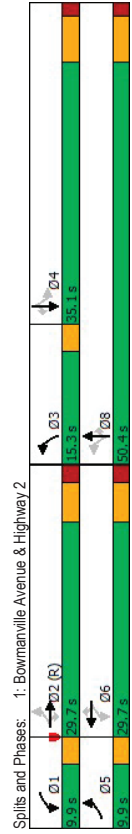
Capacity and Queuing Analysis

Timings
1: Bowmanville Avenue & Highway 2

<Existing> Weekday AM Peak Hour
1: Bowmanville Avenue & Highway 2

<Existing> Weekday AM Peak Hour
1: Bowmanville Avenue & Highway 2

EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
135	562	203	158	688	46	183	261	83	28	473	240
135	562	203	158	688	46	183	261	83	28	473	240
pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	NA	Perm	NA
5	2	2	6	6	6	8	8	8	4	4	4
5	2	2	1	6	6	3	8	8	4	4	4
5.0	20.0	20.0	5.0	20.0	20.0	5.0	12.0	12.0	12.0	12.0	12.0
9.0	28.2	28.2	9.0	28.2	28.2	9.0	26.0	26.0	30.5	30.5	30.5
9.9	29.7	29.7	9.9	29.7	29.7	15.3	50.4	50.4	35.1	35.1	35.1
11.0%	33.0%	33.0%	11.0%	33.0%	33.0%	17.0%	56.0%	56.0%	39.0%	39.0%	39.0%
3.0	4.3	4.3	3.0	4.3	4.3	3.0	4.9	4.9	4.9	4.9	4.9
0.0	1.9	1.9	0.0	1.9	1.9	0.0	1.6	1.6	1.6	1.6	1.6
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lag	Lag	Lag
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
None	C-Max	C-Max	None	None	None	None	None	None	None	None	None
34.1	23.6	23.6	34.1	23.5	23.5	46.9	43.4	43.4	29.6	29.6	29.6
0.38	0.26	0.26	0.38	0.26	0.26	0.52	0.48	0.48	0.33	0.33	0.33
0.80	0.74	0.49	0.74	0.91	0.14	0.62	0.47	0.14	0.13	0.95	0.45
48.8	36.8	6.9	38.5	49.2	1.1	20.5	15.5	2.6	23.4	59.7	7.2
48.8	36.8	6.9	38.5	49.2	1.1	20.5	15.5	2.6	23.4	59.7	7.2
D	D	A	D	D	A	C	B	A	C	E	A
31.1			44.4			14.8				40.0	
C			D			B				D	
Intersection Summary											
Cycle Length: 90											
Actuated Cycle Length: 90											
Offset: 0 (0%), Referenced to phase 2EBTL, Start of Green											
Natural Cycle: 80											
Control Type: Actuated-Coordinated											
Maximum v/c Ratio: 0.95											
Intersection Signal Delay: 33.9											
Intersection Capacity Utilization 78.8%											
Analysis Period (min) 15											

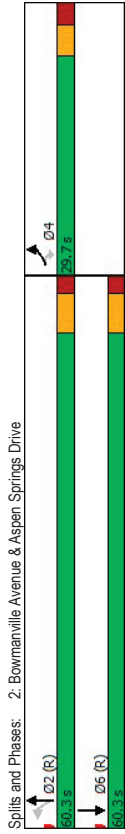


EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
135	562	203	158	688	46	183	261	83	28	473	240
135	562	203	158	688	46	183	261	83	28	473	240
1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	0.97	1.00	1.00	0.97	1.00	1.00	1.00	0.98	1.00	1.00	0.97
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
1587	3147	1344	1585	3174	1253	1547	1562	1474	1444	1601	1360
0.17	1.00	1.00	0.27	1.00	1.00	0.19	1.00	1.00	0.65	1.00	1.00
283	3147	1344	459	3174	1253	312	1562	1474	836	1601	1360
0.79	0.92	0.75	0.81	0.91	0.79	0.95	0.74	0.75	0.75	0.95	0.86
171	611	271	195	756	58	193	363	111	37	498	279
0	0	200	0	0	43	0	0	0	57	0	0
171	611	71	195	756	15	193	353	54	37	498	112
2	10	10	10	10	2	15	3	3	3	3	15
15%	16%	18%	15%	15%	27%	18%	23%	9%	26%	20%	16%
pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm
5	2	2	6	6	6	8	8	8	4	4	4
310	23.6	23.6	30.8	23.5	23.5	43.4	43.4	43.4	29.6	29.6	29.6
31.0	23.6	23.6	30.8	23.5	23.5	43.4	43.4	43.4	29.6	29.6	29.6
0.34	0.26	0.26	0.34	0.26	0.26	0.48	0.48	0.48	0.33	0.33	0.33
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
204	825	352	248	828	327	298	763	710	274	526	447
c0.07	0.19	0.06	c0.24	0.06	c0.24	0.08	0.23	0.04	0.04	c0.31	0.08
0.22	0.05	0.21	0.01	0.23	0.01	0.23	0.04	0.04	0.14	0.95	0.25
0.84	0.74	0.20	0.79	0.91	0.05	0.65	0.47	0.08	0.14	0.95	0.25
22.9	30.4	25.9	23.7	32.3	24.9	16.6	12.5	12.5	21.2	29.4	22.1
1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85	0.81	1.00	1.00	1.00
24.8	5.9	1.3	15.1	14.3	0.1	4.5	0.4	0.0	0.2	26.3	0.3
47.8	36.3	27.2	38.7	46.6	24.9	21.2	13.7	10.2	21.4	55.7	22.4
D	D	C	D	D	C	C	B	B	C	E	C
35.8			43.8			15.3				42.7	
D			D			B				D	
Intersection Summary											
HCM 2000 Control Delay 35.9											
HCM 2000 Level of Service D											
HCM 2000 Volume to Capacity ratio 0.88											
Actuated Cycle Length (s) 90.0											
Sum of lost time (s) 18.7											
Intersection Capacity Utilization 78.8%											
ICU Level of Service D											
Analysis Period (min) 15											
c Critical Lane Group											

Timings <Existing> Weekday AM Peak Hour
12/22/2021

HCM Signalized Intersection Capacity Analysis <Existing> Weekday AM Peak Hour
12/22/2021

	EBL	EBR	NBL	NBT	SBT
Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations	←	←	←	←	←
Traffic Volume (vph)	123	90	84	404	730
Future Volume (vph)	123	90	84	404	730
Turn Type	Prot	Perm	Perm	NA	NA
Protected Phases	4			2	6
Permitted Phases	4			2	6
Detector Phase	4			2	6
Switch Phase					
Minimum Initial (s)	8.0	8.0	20.0	20.0	20.0
Minimum Split (s)	24.0	24.0	27.0	27.0	27.0
Total Split (s)	29.7	29.7	60.3	60.3	60.3
Total Split (%)	33.0%	33.0%	67.0%	67.0%	67.0%
Yellow Time (s)	3.3	3.3	4.2	4.2	4.2
All-Red Time (s)	2.6	2.6	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	6.3	6.3	6.3
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	14.0	14.0	63.8	63.8	63.8
Actuated g/C Ratio	0.16	0.16	0.71	0.71	0.71
v/c Ratio	0.62	0.39	0.37	0.41	0.82
Control Delay	45.3	9.2	8.6	5.6	12.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	45.3	9.2	8.6	5.6	12.7
LOS	D	A	A	A	B
Approach Delay	28.9		6.1	12.7	
Approach LOS	C		A	B	
Intersection Summary					
Cycle Length: 90					
Actuated Cycle Length: 90					
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBT, Start of Green					
Natural Cycle: 80					
Control Type: Actuated-Coordinated					
Maximum v/c Ratio: 0.82					
Intersection Signal Delay: 13.4					
Intersection Capacity Utilization 83.7%					
Analysis Period (min) 15					



	EBL	EBR	NBL	NBT	SBT	SBR
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	←	←	←	←	←	←
Traffic Volume (vph)	123	90	84	404	730	103
Future Volume (vph)	123	90	84	404	730	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.9	5.9	6.3	6.3	6.3	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.98	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1722	1512	1644	1562	1564	
Flt Permitted	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (perm)	1722	1512	382	1562	1564	
Peak-hour factor, PHF	0.74	0.65	0.83	0.88	0.94	0.75
Adj. Flow (vph)	166	138	101	459	777	137
RTOR Reduction (vph)	0	117	0	0	5	0
Lane Group Flow (vph)	166	21	101	459	909	0
Conf. Peds. (#/hr)			9			9
Heavy Vehicles (%)	6%	8%	11%	23%	19%	23%
Turn Type	Prot	Perm	Perm	NA	NA	NA
Protected Phases	4			2	6	
Permitted Phases	4			2	6	
Actuated Green, G (s)	14.0	14.0	63.8	63.8	63.8	
Effective Green, g (s)	14.0	14.0	63.8	63.8	63.8	
Actuated g/C Ratio	0.16	0.16	0.71	0.71	0.71	
Clearance Time (s)	5.9	5.9	6.3	6.3	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	267	235	270	1107	1108	
v/s Ratio Prot	0.10		0.29		0.38	
v/s Ratio Perm	0.62	0.09	0.37	0.41	0.82	
Uniform Delay, d1	35.5	32.6	5.2	5.4	9.1	
Progression Factor	1.00	1.00	0.67	0.73	0.69	
Incremental Delay, d2	4.4	0.2	3.6	1.1	4.3	
Delay (s)	40.0	32.7	7.1	5.0	10.5	
Level of Service	D	C	A	A	B	
Approach Delay (s)	36.7		5.4	10.5		
Approach LOS	D		A	B		
Intersection Summary						
HCM 2000 Control Delay			13.4	HCM 2000 Level of Service		B
HCM 2000 Volume to Capacity ratio	0.78					
Actuated Cycle Length (s)	90.0					
Intersection Capacity Utilization	83.7%					
Analysis Period (min)	15					
c Critical Lane Group	E					

Timings
3: Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

<Existing> Weekday AM Peak Hour
12/22/2021

EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
20	0	34	1	1	28	466	4	791
20	0	34	1	1	28	466	4	791
Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
4	4	4	4	4	2	2	2	2
8.0	8.0	8.0	8.0	8.0	20.0	20.0	20.0	20.0
24.3	24.3	24.3	24.3	24.3	27.0	27.0	27.0	27.0
29.7	29.7	29.7	29.7	29.7	60.3	60.3	60.3	60.3
33.0%	33.0%	33.0%	33.0%	33.0%	67.0%	67.0%	67.0%	67.0%
3.3	3.3	3.3	3.3	3.3	4.8	4.8	4.8	4.8
3.0	3.0	3.0	3.0	3.0	1.8	1.8	1.8	1.8
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6
None	None	None	None	None	C-Max	C-Max	C-Max	C-Max
8.4	8.4	8.4	8.4	8.4	72.8	72.8	72.8	72.8
0.09	0.09	0.09	0.09	0.09	0.81	0.81	0.81	0.81
0.21	0.24	0.03	0.10	0.44	0.01	0.67		
41.5	15.2	30.7	3.6	4.9	3.8	6.2		
0.0	0.0	0.0	0.0	0.0	0.0	0.0		
41.5	15.2	30.7	3.6	4.9	3.8	6.2		
D	B	C	A	A	A	A	A	A
25.5			30.7		4.8		6.1	
C	C	C			A		A	
Intersection Summary								
Cycle Length: 90								
Actuated Cycle Length: 90								
Offset: 0 (0%), Referenced to phase 2: NBSB and 6., Start of Green								
Natural Cycle: 80								
Control Type: Actuated-Coordinated								
Maximum v/c Ratio: 0.67								
Intersection Signal Delay: 6.6								
Intersection Capacity Utilization 72.5%								
Analysis Period (min) 15								



HCM Signalized Intersection Capacity Analysis
3: Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

<Existing> Weekday AM Peak Hour
12/22/2021

EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
20	0	34	1	1	28	466	4	791
20	0	34	1	1	28	466	4	791
1900	1900	1900	1900	1900	1900	1900	1900	1900
6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	0.85	0.93	0.93	0.93	0.95	1.00	0.95	1.00
1825	1541	1769	1644	1575	1811	1615		
0.76	1.00	0.91	0.28	1.00	0.44	1.00		
1451	1541	1622	486	1575	843	1615		
0.68	0.92	0.75	0.82	0.82	0.68	0.84	0.92	0.95
29	0	45	1	1	2	41	555	0
0	0	42	0	2	0	0	0	0
0	29	3	0	2	0	41	555	0
0%	0%	6%	0%	0%	11%	22%	0%	18%
Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
4	4	4	4	4	2	2	2	2
6.8	6.8	6.8	6.8	6.8	70.3	70.3	70.3	70.3
6.8	6.8	6.8	6.8	6.8	70.3	70.3	70.3	70.3
0.08	0.08	0.08	0.08	0.08	0.78	0.78	0.78	0.78
6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
109	116	122	379	1230	668	1261		
c0.02	0.00	0.00	0.08	0.00	0.00	0.00		
0.27	0.03	0.02	0.11	0.45	0.01	0.69		
39.2	38.5	38.5	2.4	3.3	2.2	4.7		
1.00	1.00	1.00	1.00	1.00	1.37	0.78		
1.3	0.1	0.1	0.6	1.2	0.0	2.1		
40.6	38.6	38.6	2.9	4.5	3.0	5.7		
D	D	D	A	A	A	A	A	A
39.4			38.6		4.4		5.7	
D	D	D	D	D	A	A	A	A
Intersection Summary								
HCM 2000 Control Delay 6.9 HCM 2000 Level of Service A								
HCM 2000 Volume to Capacity ratio 0.65								
Actuated Cycle Length (s) 90.0 Sum of lost time (s) 12.9								
Intersection Capacity Utilization 72.5% ICU Level of Service C								
Analysis Period (min) 15								
c Critical Lane Group								

HCM Unsignalized Intersection Capacity Analysis
 4: Bonnycastle Drive & Aspen Springs Drive

HCM Unsignalized Intersection Capacity Analysis
 5: Fry Crescent (East) & Aspen Springs Drive

<Existing> Weekday AM Peak Hour
 12/22/2021

<Existing> Weekday AM Peak Hour
 12/22/2021

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	187	21	12	175	38	26
Traffic Volume (veh/h)	187	21	12	175	38	26
Future Volume (Veh/h)	Free	Free	Free	Stop	Stop	Stop
Sign Control	0%	0%	0%	0%	0%	0%
Grade	0.93	0.93	0.93	0.93	0.93	0.93
Peak Hour Factor	201	23	13	188	41	28
Hourly flow rate (vph)						
Pedestrians					2	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (m)					165	
pX, platoon unblocked						
vC, conflicting volume					226	428
vC1, stage 1 conf vol						214
vC2, stage 2 conf vol						
vCu, unblocked vol					226	428
IC, single (s)					4.1	6.4
IC, 2 stage (s)					2.2	3.5
p0 queue free %					99	93
CM capacity (veh/h)					1352	580
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	224	201	69			
Volume Left	0	13	41			
Volume Right	23	0	28			
cSH	1700	1352	661			
Volume to Capacity	0.13	0.01	0.10			
Queue Length 95th (m)	0.0	0.2	2.6			
Control Delay (s)	0.0	0.6	11.1			
Lane LOS	A	A	B			
Approach Delay (s)	0.0	0.6	11.1			
Approach LOS	B	B	B			
Intersection Summary						
Average Delay					1.8	
Intersection Capacity Utilization					29.4%	ICU Level of Service A
Analysis Period (min)					15	

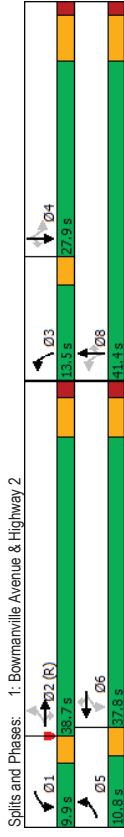
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	201	3	4	209	11	7
Traffic Volume (veh/h)	201	3	4	209	11	7
Future Volume (Veh/h)	Free	Free	Free	Stop	Stop	Stop
Sign Control	0%	0%	0%	0%	0%	0%
Grade	0.92	0.92	0.92	0.92	0.92	0.92
Peak Hour Factor	218	3	4	227	12	8
Hourly flow rate (vph)						
Pedestrians					2	4
Lane Width (m)					3.7	3.7
Walking Speed (m/s)					1.1	1.1
Percent Blockage					0	0
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (m)					250	
pX, platoon unblocked						
vC, conflicting volume					225	458
vC1, stage 1 conf vol						226
vC2, stage 2 conf vol						
vCu, unblocked vol					225	458
IC, single (s)					4.1	6.4
IC, 2 stage (s)					2.2	3.5
p0 queue free %					100	98
CM capacity (veh/h)					1350	560
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	221	231	20			
Volume Left	0	4	12			
Volume Right	3	0	8			
cSH	1700	1350	640			
Volume to Capacity	0.13	0.00	0.03			
Queue Length 95th (m)	0.0	0.1	0.7			
Control Delay (s)	0.0	0.2	10.8			
Lane LOS	A	A	B			
Approach Delay (s)	0.0	0.2	10.8			
Approach LOS	B	B	B			
Intersection Summary						
Average Delay					0.5	
Intersection Capacity Utilization					24.9%	ICU Level of Service A
Analysis Period (min)					15	

12/22/2021
 HCM Unsignalized Intersection Capacity Analysis
 <Existing> Weekday AM Peak Hour
 6: Fry Crescent (West)/Existing Condo Access & Aspen Springs Drive

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	11	177	1	4	206	9	4	0	8	19	0
Traffic Volume (veh/h)	11	177	1	4	206	9	4	0	8	19	0
Future Volume (veh/h)	11	177	1	4	206	9	4	0	8	19	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	12	195	1	4	226	10	4	0	9	21	0
Pedestrians											
Lane Width (m)											
Walking Speed (m/s)											
Percent Blockage											
Right turn flare (veh)											
Median type											
Median storage (veh)											
Upstream signal (m)											
pX platoon unblocked											
vC, conflicting volume	244			199			484	474	198	476	470
vC1, stage 1 conf vol											
vC2, stage 2 conf vol											
vCv, unblocked vol	244			199			484	474	198	476	470
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5
IC, 2 stage (s)											
p0 queue free %	2.2			2.2			3.5	4.0	3.3	3.5	4.0
p0 queue free (veh)	99			100			99	100	99	96	100
CM capacity (veh/h)	1324			1381			473	481	845	485	483
Direction, Lane #	EB 1	WB 1	NB 1	SB 1							
Volume Total	208	240	13	43							
Volume Left	12	4	4	21							
Volume Right	1	10	9	22							
cSH	1324	1381	681	607							
Volume to Capacity	0.01	0.00	0.02	0.07							
Queue Length 95th (m)	0.2	0.1	0.4	1.7							
Control Delay (s)	0.5	0.2	10.4	11.4							
Lane LOS	A	A	B	B							
Approach Delay (s)	0.5	0.2	10.4	11.4							
Approach LOS	B	B									
Intersection Summary											
Average Delay	1.5										
Intersection Capacity Utilization	25.5%										
Analysis Period (min)	15										
	ICU Level of Service A										

03-14-2022
 <Existing> Weekday PM Peak Hour
 1: Bowmanville Avenue & Highway 2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	1	1	1	1	1	1	1	1	1	1	1
Traffic Volume (vph)	265	1049	289	130	806	61	241	439	162	84	326
Future Volume (vph)	265	1049	289	130	806	61	241	439	162	84	326
Turn Type	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA
Protected Phases	5	2	2	1	6		3	8		4	
Permitted Phases	2	2	2	1	6	6	3	8	8	4	4
Detector Phase	5	2	2	1	6	6	3	8	8	4	4
Switch Phase											
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	5.0	12.0	12.0	12.0	12.0
Minimum Split (s)	9.0	28.0	28.0	9.0	28.0	28.0	9.0	26.0	26.0	26.0	26.0
Total Split (s)	10.8	38.7	38.7	9.9	37.8	37.8	13.5	41.4	41.4	27.9	27.9
Total Split (%)	12.0%	43.0%	43.0%	11.0%	42.0%	42.0%	15.0%	46.0%	46.0%	31.0%	31.0%
Yellow Time (s)	3.0	4.3	4.3	3.0	4.3	4.3	3.0	4.9	4.9	4.9	4.9
All-Red Time (s)	0.0	1.9	1.9	0.0	1.9	1.9	0.0	1.6	1.6	1.6	1.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	None	None	None	None	None	None	None
Ad Eff Green (s)	43.5	32.5	32.5	41.7	31.6	31.6	38.4	34.9	34.9	21.4	21.4
Actuated g/C Ratio	0.48	0.36	0.36	0.46	0.35	0.35	0.43	0.39	0.39	0.24	0.24
v/C Ratio	0.96	0.96	0.96	0.74	0.74	0.74	0.90	0.80	0.80	0.28	0.28
Control Delay	60.7	46.8	46.8	37.1	30.4	30.4	44.5	30.7	30.7	125.8	82.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	60.7	46.8	46.8	37.1	30.4	30.4	44.5	30.7	30.7	125.8	82.0
LOS	E	D	A	D	C	A	D	C	A	F	F
Approach Delay	42.0										
Approach LOS	D										
Intersection Summary											
Cycle Length: 90											
Actuated Cycle Length: 90											
Offset: 0 (0%), Referenced to phase 2EBTL, Start of Green											
Natural Cycle: 90											
Control Type: Actuated-Coordinated											
Maximum v/C Ratio: 1.00											
Intersection Signal Delay: 39.9											
Intersection Capacity Utilization 89.4%											
Analysis Period (min) 15											



1: Bowmanville Avenue & Highway 2

HCM Signalized Intersection Capacity Analysis

<Existing> Weekday PM Peak Hour

03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	265	1049	289	130	806	61	241	439	162	84	326	207
Future Volume (vph)	265	1049	289	130	806	61	241	439	162	84	326	207
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	2200	3202	1356	1630	3230	1326	1599	1601	1409	1570	1601	1384
Flt Permitted	0.19	1.00	1.00	0.13	1.00	1.00	0.21	1.00	1.00	0.46	1.00	1.00
Satd. Flow (perm)	321	3202	1356	217	3230	1326	356	1601	1409	455	1601	1384
Peak-hour factor, PHF	0.87	0.95	0.90	0.84	0.96	0.82	0.91	0.88	0.87	0.78	0.86	0.84
Adj. Flow (vph)	305	1104	321	155	840	74	265	499	186	108	379	246
RTOR Reduction (vph)	0	0	167	0	0	48	0	0	113	0	0	165
Lane Group Flow (vph)	305	1104	154	155	840	26	285	499	73	108	379	81
Confl. Peds. (#/hr)	2	10	10	10	10	2	15	3	3	3	3	15
Heavy Vehicles (%)	16%	14%	17%	12%	13%	20%	14%	20%	14%	16%	20%	14%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6		3	8				4
Permitted Phases	2	2	6	6	6	8	8	8	4	4	4	4
Actuated Green, G (s)	40.3	32.5	38.5	31.6	31.6	34.9	34.9	34.9	21.4	21.4	21.4	21.4
Effective Green, g (s)	40.3	32.5	38.5	31.6	31.6	34.9	34.9	34.9	21.4	21.4	21.4	21.4
Actuated G/C Ratio	0.45	0.36	0.36	0.43	0.35	0.35	0.39	0.39	0.24	0.24	0.24	0.24
Clearance Time (s)	3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	306	1156	489	201	1134	465	283	620	546	108	380	329
v/s Ratio Prot	0.09	0.34		0.06	0.26		0.11	0.31			0.24	
v/s Ratio Perm	0.36		0.11	0.27		0.02	0.25		0.05	0.24		0.06
v/c Ratio	1.00	0.96	0.31	0.77	0.74	0.06	0.94	0.80	0.13	1.00	1.00	0.24
Uniform Delay, d1	18.7	28.0	20.7	19.4	25.6	19.3	22.5	24.5	17.8	34.3	34.3	27.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.84	0.87	0.82	1.00	1.00	1.00
Incremental Delay, d2	50.2	17.7	1.7	16.6	2.6	0.1	30.1	5.7	0.1	86.6	45.1	0.4
Delay (s)	68.9	45.7	22.4	35.9	28.3	19.4	49.0	27.0	14.7	120.9	79.4	28.2
Level of Service	E	D	C	D	C	B	D	C	B	F	E	C
Approach Delay (s)	45.5			28.8			30.7			68.3		
Approach LOS	D			C			C			E		
Intersection Summary												
HCM 2000 Control Delay	42.1 HCM 2000 Level of Service D											
HCM 2000 Volume to Capacity ratio	1.02											
Actuated Cycle Length (s)	90.0 Sum of lost time (s)											
Intersection Capacity Utilization	89.4% ICU Level of Service E											
Analysis Period (min)	15											
c Critical Lane Group												

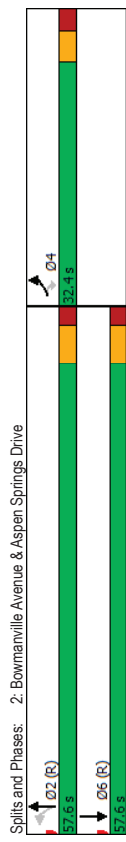
2: Bowmanville Avenue & Aspen Springs Drive

Timings

<Existing> Weekday PM Peak Hour

03-14-2022

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations	←	←	←	←	←
Traffic Volume (vph)	154	86	99	688	619
Future Volume (vph)	154	86	99	688	619
Turn Type	Prot	Perm	Perm	NA	NA
Protected Phases	4			2	6
Permitted Phases	4	4	2	2	6
Detector Phase	4	4	2	2	6
Switch Phase					
Minimum Initial (s)	8.0	8.0	20.0	20.0	20.0
Minimum Split (s)	24.0	24.0	27.0	27.0	27.0
Total Split (s)	32.4	32.4	57.6	57.6	57.6
Total Split (%)	36.0%	36.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.3	3.3	4.2	4.2	4.2
All-Red Time (s)	2.6	2.6	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	6.3	6.3	6.3
Lead-Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
Act Effect Green (s)	16.1	16.1	61.7	61.7	61.7
Actuated G/C Ratio	0.18	0.18	0.69	0.69	0.69
v/c Ratio	0.68	0.35	0.40	0.73	0.78
Control Delay	44.9	8.1	9.5	11.1	10.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	44.9	8.1	9.5	11.1	10.3
LOS	D	A	A	B	B
Approach Delay	30.6		10.9	10.3	
Approach LOS	C		B	B	
Intersection Summary					
Cycle Length, 90					
Actuated Cycle Length, 90					
Offset, 0 (0%), Referenced to phase 2:NBT1 and 6:SBT, Start of Green					
Natural Cycle, 70					
Control Type, Actuated-Coordinated					
Maximum v/c Ratio: 0.78					
Intersection Signal Delay: 13.9					
Intersection Capacity Utilization 81.0%					
Analysis Period (min) 15					



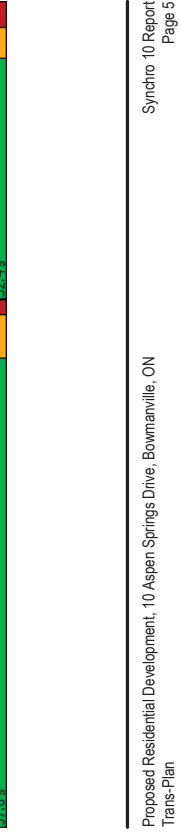
2. Bowmanville Avenue & Aspen Springs Drive
 <Existing> Weekday PM Peak Hour
 03-14-2022

3. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access
 <Existing> Weekday PM Peak Hour
 03-14-2022

Movement	EBL	EBR	NBL	NBT	SBR	SBT
Lane Configurations	154	86	99	688	619	126
Traffic Volume (vph)	154	86	99	688	619	126
Future Volume (vph)	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	5.9	5.9	6.3	6.3	6.3	6.3
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	1.00	1.00	1.00	1.00	0.99	1.00
Fpb. ped/bikes	1.00	0.85	1.00	1.00	0.97	1.00
Frt	0.95	1.00	0.95	1.00	1.00	1.00
Flt Protected	1722	1512	1644	1562	1546	1546
Satd. Flow (prot)	0.95	1.00	0.95	1.00	1.00	1.00
Flt Permitted	1722	1512	437	1562	1546	1546
Satd. Flow (perm)	0.74	0.65	0.83	0.88	0.94	0.75
Peak-hour factor, PHF	208	132	119	782	659	168
Adj. Flow (vph)	0	108	0	0	8	0
RTOR Reduction (vph)	208	24	119	782	819	0
Lane Group Flow (vph)	6%	8%	11%	23%	19%	23%
Heavy Vehicles (%)	Prot	Perm	Perm	NA	NA	NA
Turn Type	4	2	2	6	6	6
Protected Phases	16.1	16.1	61.7	61.7	61.7	61.7
Permitted Phases	16.1	16.1	61.7	61.7	61.7	61.7
Actuated Green, G (s)	0.18	0.18	0.69	0.69	0.69	0.69
Effective Green, g (s)	5.9	5.9	6.3	6.3	6.3	6.3
Actuated g/C Ratio	3.0	3.0	3.0	3.0	3.0	3.0
Incremental Delay, d2	308	270	299	1070	1059	1059
Clearance Time (s)	v/s Ratio Prot	c0.12	0.50	c0.53		
Vehicle Extension (s)	v/s Ratio Perm	0.68	0.09	0.40	0.73	0.77
Lane Grp Cap (vph)	v/c Ratio	34.5	30.8	6.1	8.9	9.5
v/s Ratio Prot	Uniform Delay, d1	1.00	1.00	0.77	0.68	0.52
v/s Ratio Perm	Progression Factor	5.8	0.1	2.9	3.3	3.5
v/c Ratio	Incremental Delay, d2	40.3	31.0	7.6	9.3	8.5
Uniform Delay, d1	Level of Service	D	C	A	A	A
Progression Factor	Approach Delay (s)	36.7		9.1	8.5	8.5
Incremental Delay, d2	Approach LOS	D		A	A	A
Level of Service	Intersection Summary					
Approach Delay (s)	HCM 2000 Control Delay	13.4		HCM 2000 Level of Service	B	
Approach LOS	HCM 2000 Volume to Capacity ratio	0.75				
Intersection Summary	Actuated Cycle Length (s)	90.0		Sum of lost time (s)	12.2	
HCM 2000 Control Delay	Intersection Capacity Utilization	81.0%		ICU Level of Service	D	
HCM 2000 Volume to Capacity ratio	Analysis Period (min)	15				
Actuated Cycle Length (s)	c Critical Lane Group					
Intersection Capacity Utilization						
Analysis Period (min)						
c Critical Lane Group						

Proposed Residential Development, 10 Aspen Springs Drive, Bowmanville, ON
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Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	33	0	59	3	2	72	747	4	656
Traffic Volume (vph)	33	0	59	3	2	72	747	4	656
Future Volume (vph)	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Turn Type	4	4	4	4	4	2	2	2	2
Protected Phases	4	4	4	4	4	2	2	2	2
Permitted Phases	4	4	4	4	4	2	2	2	2
Detector Phase	4	4	4	4	4	2	2	2	2
Switch Phase	8.0	8.0	8.0	8.0	8.0	20.0	20.0	20.0	20.0
Minimum Initial (s)	23.0	23.0	23.0	23.0	23.0	27.0	27.0	27.0	27.0
Minimum Split (s)	32.4	32.4	32.4	32.4	32.4	57.6	57.6	57.6	57.6
Total Split (s)	36.0%	36.0%	36.0%	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%
Total Split (%)	3.3	3.3	3.3	3.3	3.3	4.8	4.8	4.8	4.8
Yellow Time (s)	All-Red Time (s)	3.0	3.0	3.0	3.0	1.8	1.8	1.8	1.8
All-Red Time (s)	Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	Total Lost Time (s)	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6
Total Lost Time (s)	Lead-Lag								
Lead-Lag	Lead-Lag Optimize?	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Recall Mode	Recall Mode	9.3	9.3	9.3	9.3	72.0	72.0	72.0	72.0
Act Effct Green (s)	Actuated g/C Ratio	0.10	0.10	0.10	0.10	0.80	0.80	0.80	0.80
Actuated g/C Ratio	v/c Ratio	0.33	0.34	0.08	0.23	0.71	0.01	0.60	0.60
v/c Ratio	Control Delay	43.2	13.3	26.6	5.0	10.3	4.5	6.1	6.1
Control Delay	Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	Total Delay	43.2	13.3	26.6	5.0	10.3	4.5	6.1	6.1
Total Delay	LOS	D	B	C	A	B	A	A	A
LOS	Approach Delay	24.8		26.6		9.7	6.1	6.1	6.1
Approach Delay	Approach LOS	C		C		A	A	A	A
Approach LOS	Intersection Summary								
Intersection Summary	Cycle Length, 90								
Cycle Length, 90	Actuated Cycle Length, 90								
Actuated Cycle Length, 90	Offset: 0 (0%), Referenced to phase 2:NBSB and 6., Start of Green								
Offset: 0 (0%), Referenced to phase 2:NBSB and 6., Start of Green	Natural Cycle: 80								
Natural Cycle: 80	Control Type: Actuated-Coordinated								
Control Type: Actuated-Coordinated	Maximum v/c Ratio: 0.71								
Maximum v/c Ratio: 0.71	Intersection Signal Delay: 9.4								
Intersection Signal Delay: 9.4	Intersection Capacity Utilization 77.3%								
Intersection Capacity Utilization 77.3%	Analysis Period (min) 15								
Analysis Period (min) 15									



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HCM Signalized Intersection Capacity Analysis
 3: Bowmannville Avenue & Hartwell Avenue/Existing Condo Access

HCM Unsignalized Intersection Capacity Analysis
 4: Bonnycastle Drive & Aspen Springs Drive

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	33	0	59	3	2	6	72	747	3	4	656	45
Future Volume (vph)	33	0	59	3	2	6	72	747	3	4	656	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	0.93	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.99
Flt Protected	1825	1541	1754	1643	1575	1825	1602	1825	1602	1825	1602	1825
Satd. Flow (prot)	0.75	1.00	0.88	0.33	1.00	0.27	1.00	0.27	1.00	0.27	1.00	0.27
Flt Permitted	1439	1541	1565	588	1575	515	1602	515	1602	515	1602	515
Satd. Flow (perm)	0.68	0.92	0.75	0.82	0.82	0.88	0.84	0.92	0.92	0.95	0.95	0.60
Peak-hour factor, PHF	0.68	0.92	0.75	0.82	0.82	0.88	0.84	0.92	0.92	0.95	0.95	0.60
Adj. Flow (vph)	49	0	79	4	2	7	106	889	3	4	691	75
RTOR Reduction (vph)	0	0	72	0	6	0	0	0	0	0	0	2
Lane Group Flow (vph)	0	49	7	0	7	0	106	892	0	4	764	0
Conf. Ped. (#/hr)	0%	0%	6%	0%	0%	0%	11%	22%	0%	0%	18%	17%
Heavy Vehicles (%)	0%	0%	6%	0%	0%	0%	11%	22%	0%	0%	18%	17%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4		4	4	4	2	2	2	2	2	2	2
Permitted Phases	4		4	4	4	2	2	2	2	2	2	2
Actuated Green, G (s)	7.7	7.7	7.7	7.7	7.7	69.4	69.4	69.4	69.4	69.4	69.4	69.4
Effective Green, g (s)	7.7	7.7	7.7	7.7	7.7	69.4	69.4	69.4	69.4	69.4	69.4	69.4
Actuated G/C Ratio	0.09	0.09	0.09	0.09	0.09	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Clearance Time (s)	6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	123	131	133	133	133	437	1214	437	1214	397	1235	135
v/s Ratio Prot												
v/s Ratio Perm	c0.03	0.00	0.00	0.00	0.19	0.57	0.57	0.57	0.57	0.01	0.48	0.48
v/c Ratio	0.40	0.05	0.05	0.05	0.24	0.73	0.73	0.73	0.73	0.01	0.62	0.62
Uniform Delay, d1	39.0	37.8	37.8	37.8	2.9	5.4	5.4	5.4	5.4	2.4	4.5	4.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.35	0.87	0.87
Incremental Delay, d2	2.1	0.2	0.2	0.2	1.3	4.0	4.0	4.0	4.0	0.0	1.7	1.7
Delay (s)	41.1	36.0	37.9	37.9	4.2	9.4	9.4	9.4	9.4	3.2	5.6	5.6
Level of Service	D	D	D	D	A	A	A	A	A	A	A	A
Approach Delay (s)	39.2		37.9		37.9	8.9	8.9	8.9	8.9	5.6	5.6	5.6
Approach LOS	D		D		D	A	A	A	A	A	A	A
Intersection Summary												
HCM 2000 Control Delay	9.8 HCM 2000 Level of Service A											
HCM 2000 Volume to Capacity ratio	0.70											
Actuated Cycle Length (s)	90.0 Sum of lost time (s)											
Intersection Capacity Utilization	77.3% ICU Level of Service D											
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 4: Bonnycastle Drive & Aspen Springs Drive

Movement	EBT	EBR	WBL	WBT	WBR	NBL	NBR
Lane Configurations							
Traffic Volume (veh/h)	216	42	28	197	42	24	24
Future Volume (Veh/h)	216	42	28	197	42	24	24
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	232	45	30	212	45	26	26
Pedestrians						2	
Lane Width (m)						3.7	
Walking Speed (m/s)						1.1	
Percent Blockage						0	
Right turn flare (veh)						None	
Median type						None	
Median storage (veh)						165	
Upstream signal (m)						165	
pk. platoon unblocked						279	528
v/c, conflicting volume						528	256
v/c1, stage 1 conf vol							
v/c2, stage 2 conf vol							
ICU, unblocked vol						279	528
IC, single (s)						4.1	6.4
IC, 2 stage (s)						2.2	3.5
p0 queue free %						98	91
qM capacity (veh/h)						1293	501
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	277	242	71				
Volume Left	0	30	45				
Volume Right	45	0	26				
cSH	1700	1293	578				
Volume to Capacity	0.16	0.02	0.12				
Queue Length 95th (m)	0.0	0.5	3.2				
Control Delay (s)	0.0	1.2	12.1				
Lane LOS	A	B	B				
Approach Delay (s)	0.0	1.2	12.1				
Approach LOS	B	B	B				
Intersection Summary							
Average Delay	1.9						
Intersection Capacity Utilization	39.7%						
Analysis Period (min)	15						
ICU Level of Service	A						

HCM Unsignalized Intersection Capacity Analysis
 5. Fry Crescent (East) & Aspen Springs Drive
 <Existing> Weekday PM Peak Hour
 03-14-2022

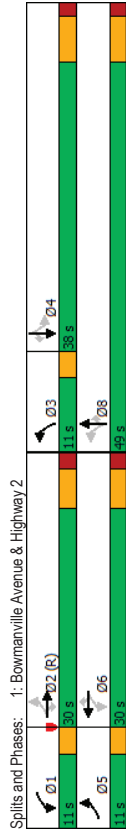
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	WB	WB	NB	NB
Traffic Volume (veh/h)	249	14	11	228	7	8
Future Volume (Veh/h)	249	14	11	228	7	8
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	271	15	12	248	8	9
Pedestrians					2	4
Lane Width (m)					3.7	3.7
Walking Speed (m/s)					1.1	1.1
Percent Blockage					0	0
Right turn flare (veh)					None	None
Median type					None	None
Median storage (veh)						
Upstream signal (m)					250	
pX platoon unblocked						
VC, conflicting volume			280		554	284
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol			280		554	284
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			99		98	99
CM capacity (veh/h)			1278		490	755
Direction_Lane #	EB 1	WB 1	NB 1	NB 1		
Volume Total	286	280	17			
Volume Left	0	12	8			
Volume Right	15	0	9			
cSH	1700	1278	602			
Volume to Capacity	0.17	0.01	0.03			
Queue Length 95th (m)	0.0	0.2	0.7			
Control Delay (s)	0.0	0.4	11.2			
Lane LOS	A	A	B			
Approach Delay (s)	0.0	0.4	11.2			
Approach LOS	B	B	B			
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			31.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 6. Fry Crescent (West)/Existing Condo Access & Aspen Springs Drive
 <Existing> Weekday PM Peak Hour
 03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Traffic Volume (veh/h)	15	246	16	7	197	31	8	1	2	16	0	8
Future Volume (Veh/h)	15	246	16	7	197	31	8	1	2	16	0	8
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	16	270	18	8	216	34	9	1	2	18	0	9
Pedestrians												8
Lane Width (m)												3.7
Walking Speed (m/s)												1.1
Percent Blockage												1
Right turn flare (veh)												0
Median type												None
Median storage (veh)												None
Upstream signal (m)												328
pX platoon unblocked												
VC, conflicting volume							291		572	588	282	570
VC1, stage 1 conf vol												241
VC2, stage 2 conf vol												
VCU, unblocked vol							291		572	588	282	570
IC, single (s)							4.1		7.1	6.5	6.2	7.1
IC, 2 stage (s)												6.2
IF (s)							2.2		2.2	4.0	3.3	4.0
p0 queue free %							99		98	100	96	100
CM capacity (veh/h)							1308		1279	418	412	759
Direction_Lane #	EB 1	WB 1	NB 1	NB 1	NB 1	SB 1						
Volume Total	304	258	12	27								
Volume Left	16	8	9	18								
Volume Right	18	34	2	9								
cSH	1308	1279	452	499								
Volume to Capacity	0.01	0.01	0.03	0.05								
Queue Length 95th (m)	0.3	0.1	0.6	1.3								
Control Delay (s)	0.5	0.3	13.2	12.6								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.5	0.3	13.2	12.6								
Approach LOS	B	B	B	B								
Intersection Summary												
Average Delay							1.2					
Intersection Capacity Utilization							30.6%		ICU Level of Service			A
Analysis Period (min)							15					

Timings 03-14-2022
 1: Bowmanville Avenue & Highway 2 <Background> 2024 Weekday AM Peak Hour

EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
154	638	229	167	741	49	197	277	88	30	502	259
154	638	229	167	741	49	197	277	88	30	502	259
pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	3	8	Perm	NA	Perm
5	2	2	1	6	6	8	8	8	4	4	4
2	2	2	1	6	6	3	8	8	4	4	4
5.0	20.0	20.0	5.0	20.0	20.0	5.0	12.0	12.0	12.0	12.0	12.0
9.0	28.2	28.2	9.0	28.2	28.2	9.0	26.0	26.0	30.5	30.5	30.5
11.0	30.0	30.0	11.0	30.0	30.0	11.0	49.0	49.0	38.0	38.0	38.0
12.2%	33.3%	33.3%	12.2%	33.3%	33.3%	12.2%	54.4%	54.4%	42.2%	42.2%	42.2%
3.0	4.3	4.3	3.0	4.3	4.3	3.0	4.9	4.9	4.9	4.9	4.9
0.0	1.9	1.9	0.0	1.9	1.9	0.0	1.6	1.6	1.6	1.6	1.6
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lag
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
None	C-Max	C-Max	None	None	None	None	None	None	None	None	None
35.4	23.8	23.8	35.4	23.8	23.8	45.6	42.1	42.1	31.1	31.1	31.1
0.39	0.26	0.26	0.39	0.26	0.26	0.51	0.47	0.47	0.35	0.35	0.35
0.84	0.83	0.53	0.81	0.97	0.15	0.80	0.51	0.16	0.14	0.95	0.47
51.3	41.6	7.0	45.1	58.7	1.6	36.2	16.5	2.3	21.7	59.0	6.8
51.3	41.6	7.0	45.1	58.7	1.6	36.2	16.5	2.3	21.7	59.0	6.8
D	D	A	D	E	A	D	B	A	C	E	A
34.3	C	D	52.8	D	D	B	20.0	D	D	D	D
Intersection Summary											
Cycle Length: 90											
Actuated Cycle Length: 90											
Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green											
Natural Cycle: 90											
Control Type: Actuated-Coordinated											
Maximum v/c Ratio: 0.97											
Intersection Signal Delay: 38.0											
Intersection Capacity Utilization 83.6%											
Analysis Period (min) 15											

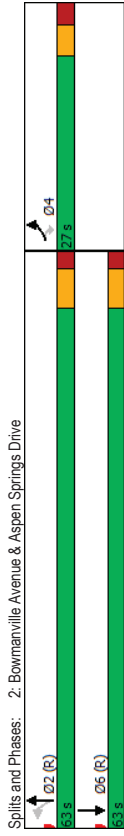


HCM Signalized Intersection Capacity Analysis <Background> 2024 Weekday AM Peak Hour 03-14-2022
 1: Bowmanville Avenue & Highway 2

EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
154	638	229	167	741	49	197	277	88	30	502	259
154	638	229	167	741	49	197	277	88	30	502	259
1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	1.00	0.97
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
1587	3147	1344	1586	3174	1253	1547	1562	1474	1445	1601	1360
0.17	1.00	1.00	0.21	1.00	1.00	0.18	1.00	1.00	0.54	1.00	1.00
281	3147	1344	359	3174	1253	294	1562	1474	820	1601	1360
0.79	0.92	0.75	0.81	0.91	0.79	0.95	0.74	0.75	0.75	0.95	0.86
195	693	305	206	814	62	207	374	117	40	528	301
0	0	224	0	0	46	0	0	62	0	0	174
195	693	81	206	814	16	207	374	55	40	528	127
2	10	10	2	15	3	3	3	3	3	3	15
15%	16%	18%	15%	15%	27%	18%	23%	9%	26%	20%	16%
5	2	2	1	6	6	8	8	8	4	4	4
2	2	2	1	6	6	8	8	8	4	4	4
32.2	23.8	23.8	32.2	23.8	23.8	42.1	42.1	42.1	31.1	31.1	31.1
32.2	23.8	23.8	32.2	23.8	23.8	42.1	42.1	42.1	31.1	31.1	31.1
0.36	0.26	0.26	0.36	0.26	0.26	0.47	0.47	0.47	0.35	0.35	0.35
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
222	832	355	242	839	331	248	730	689	283	553	469
0.08	0.22	0.06	0.22	0.01	0.32	0.07	0.24	0.04	0.05	0.33	0.09
0.88	0.83	0.23	0.85	0.97	0.05	0.83	0.51	0.08	0.14	0.95	0.27
22.8	31.2	25.9	22.5	32.7	24.7	18.1	16.8	13.2	20.3	28.8	21.3
1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.82	0.68	1.00	1.00	1.00
30.0	9.6	1.5	23.8	23.9	0.1	19.8	0.6	0.0	0.2	27.1	0.3
52.7	40.8	27.4	46.4	56.6	24.7	37.3	14.3	9.1	20.5	55.9	21.6
D	D	C	D	E	C	D	B	A	C	E	C
39.3	D	D	52.9	D	D	20.2	C	D	42.4	D	D
Intersection Summary											
HCM 2000 Control Delay 40.4 HCM 2000 Level of Service D											
HCM 2000 Volume to Capacity ratio 0.94											
Actuated Cycle Length (s) 90.0 Sum of lost time (s) 18.7											
Intersection Capacity Utilization 83.6% ICU Level of Service E											
Analysis Period (min) 15											
c Critical Lane Group											

Timings 2: Bowmanville Avenue & Aspen Springs Drive <Background> 2024 Weekday AM Peak Hour 03-14-2022

	EBL	EBR	NBL	NBT	SBT
Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations	131	95	89	431	789
Traffic Volume (vph)	131	95	89	431	789
Future Volume (vph)	131	95	89	431	789
Turn Type	Prot	Perm	Perm	NA	NA
Protected Phases	4			2	6
Permitted Phases	4	4	2	2	6
Detector Phase	4	4	2	2	6
Switch Phase					
Minimum Initial (s)	8.0	8.0	20.0	20.0	20.0
Minimum Split (s)	24.0	24.0	27.0	27.0	27.0
Total Split (s)	27.0	27.0	63.0	63.0	63.0
Total Split (%)	30.0%	30.0%	70.0%	70.0%	70.0%
Yellow Time (s)	3.3	3.3	4.2	4.2	4.2
All-Red Time (s)	2.6	2.6	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	6.3	6.3	6.3
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	14.5	14.5	63.3	63.3	63.3
Actuated g/C Ratio	0.16	0.16	0.70	0.70	0.70
v/c Ratio	0.64	0.40	0.49	0.45	0.89
Control Delay	45.5	8.9	13.2	5.6	19.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	45.5	8.9	13.2	5.6	19.7
LOS	D	A	B	A	B
Approach Delay	28.9		7.0	19.7	
Approach LOS	C		A	B	
Intersection Summary					
Cycle Length: 90					
Actuated Cycle Length: 90					
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBT, Start of Green					
Natural Cycle: 90					
Control Type: Actuated-Coordinated					
Maximum v/c Ratio: 0.89					
Intersection Signal Delay: 17.3					
Intersection Capacity Utilization 87.6%					
Analysis Period (min) 15					

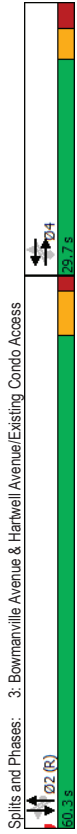


HCM Signalized Intersection Capacity Analysis <Background> 2024 Weekday AM Peak Hour 03-14-2022

	EBL	EBR	NBL	NBT	SBT	SBR
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	131	95	89	431	789	109
Traffic Volume (vph)	131	95	89	431	789	109
Future Volume (vph)	131	95	89	431	789	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.9	5.9	6.3	6.3	6.3	6.3
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	0.98	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1722	1512	1644	1562	1564	
Flt Permitted	0.95	1.00	0.18	1.00	1.00	
Satd. Flow (perm)	1722	1512	313	1562	1564	
Peak-Hour factor, PHF	0.74	0.65	0.83	0.88	0.94	0.75
Adj. Flow (vph)	177	146	107	490	839	145
RTOR Reduction (vph)	0	122	0	0	6	0
Lane Group Flow (vph)	177	24	107	490	978	0
Confl. Peds. (#/hr)			9			9
Heavy Vehicles (%)	6%	8%	11%	23%	19%	23%
Turn Type	Prot	Perm	Perm	NA	NA	NA
Protected Phases	4			2	6	
Permitted Phases	4	4	2	2	6	
Actuated Green, G (s)	14.5	14.5	63.3	63.3	63.3	
Effective Green, g (s)	14.5	14.5	63.3	63.3	63.3	
Actuated g/C Ratio	0.16	0.16	0.70	0.70	0.70	
Clearance Time (s)	5.9	5.9	6.3	6.3	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	277	243	220	1098	1100	
v/s Ratio Prot	c0.10			0.31	c0.63	
v/c Ratio Perm	0.64	0.10	0.49	0.45	0.89	
Uniform Delay, d1	35.3	32.2	6.0	5.8	10.6	
Progression Factor	1.00	1.00	0.68	0.66	0.95	
Incremental Delay, d2	4.8	0.2	6.9	1.2	6.8	
Delay (s)	40.1	32.3	10.9	5.0	16.9	
Level of Service	D	C	B	A	B	
Approach Delay (s)	36.6		6.1	16.9		
Approach LOS	D		A	B		
Intersection Summary						
HCM 2000 Control Delay			16.8		HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.84			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	12.2
Intersection Capacity Utilization			87.6%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						

Timings
3. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access <Background> 2024 Weekday AM Peak Hour 03-14-2022

EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
21	0	36	1	1	30	498	4	853
21	0	36	1	1	30	498	4	853
Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
4	4	4	4	4	2	2	2	2
4	4	4	4	4	2	2	2	2
8.0	8.0	8.0	8.0	8.0	20.0	20.0	20.0	20.0
23.0	23.0	23.0	23.0	27.0	27.0	27.0	27.0	27.0
29.7	29.7	29.7	29.7	60.3	60.3	60.3	60.3	60.3
33.0%	33.0%	33.0%	33.0%	67.0%	67.0%	67.0%	67.0%	67.0%
3.3	3.3	3.3	3.3	4.8	4.8	4.8	4.8	4.8
3.0	3.0	3.0	3.0	1.8	1.8	1.8	1.8	1.8
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6
None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max
8.5	8.5	8.5	8.5	72.8	72.8	72.8	72.8	72.8
0.09	0.09	0.09	0.09	0.81	0.81	0.81	0.81	0.81
0.23	0.26	0.03	0.13	0.47	0.01	0.72		
41.7	15.0	30.3	4.0	5.2	4.2	8.0		
0.0	0.0	0.0	0.0	0.0	0.0	0.0		
41.7	15.0	30.3	4.0	5.2	4.2	8.0		
D	B	C	A	A	A	A	A	A
25.5	C	C	C	5.1	7.9			
C	C	C	C	A	A	A	A	A
Intersection Summary								
Cycle Length: 90								
Actuated Cycle Length: 90								
Offset: 0 (0%), Referenced to phase 2: NBSB and 6: Start of Green								
Natural Cycle: 80								
Control Type: Actuated-Coordinated								
Maximum v/c Ratio: 0.72								
Intersection Signal Delay: 7.7								
Intersection Capacity Utilization 75.8%								
Analysis Period (min) 15								



HCM Signalized Intersection Capacity Analysis <Background> 2024 Weekday AM Peak Hour 03-14-2022
3. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
21	0	36	1	1	2	30	498	0
21	0	36	1	1	2	30	498	0
1900	1900	1900	1900	1900	1900	1900	1900	1900
6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6	6.6
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	0.85	0.93	1.00	1.00	1.00	1.00	0.99	1.00
0.95	1.00	0.99	1.00	0.99	1.00	1.00	0.95	1.00
1825	1541	1769	1644	1575	1812	1616		
0.76	1.00	0.91	0.25	1.00	0.42	1.00		
1451	1541	1622	433	1575	803	1616		
0.68	0.92	0.75	0.82	0.82	0.68	0.84	0.92	0.95
31	0	48	1	2	44	593	0	4
0	0	44	0	2	0	0	0	0
0	31	4	0	2	0	44	593	0
0%	6%	0%	0%	0%	11%	22%	0%	18%
Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
4	4	4	4	4	2	2	2	2
6.9	6.9	6.9	6.9	70.2	70.2	70.2	70.2	70.2
6.9	6.9	6.9	6.9	70.2	70.2	70.2	70.2	70.2
0.08	0.08	0.08	0.08	0.78	0.78	0.78	0.78	0.78
6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
111	118	124	337	1228	626	1260		
c0.02	0.00	0.00	0.10	0.10	0.00	0.00		
0.28	0.03	0.02	0.13	0.48	0.01	0.01		
39.2	38.5	38.4	2.4	3.5	2.2	5.2		
1.00	1.00	1.00	1.00	1.00	1.49	0.94		
1.4	0.1	0.1	0.8	1.4	0.0	2.3		
40.6	38.6	38.5	3.2	4.9	3.3	7.2		
D	D	D	D	A	A	A	A	A
39.4		38.5	4.7			7.2		
D	D	D	D	A	A	A	A	A
Intersection Summary								
HCM 2000 Control Delay	7.9	HCM 2000 Level of Service	A					
HCM 2000 Volume to Capacity ratio	0.70							
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.9					
Intersection Capacity Utilization	75.8%	ICU Level of Service	D					
Analysis Period (min)	15							
c Critical Lane Group								

HCM Unsignalized Intersection Capacity Analysis<Background> 2024 Weekday AM Peak Hour
 4: Bonnycastle Drive & Aspen Springs Drive 03-14-2022

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	WB	WB	NB	NB
Traffic Volume (veh/h)	199	22	14	185	41	28
Future Volume (Veh/h)	199	22	14	185	41	28
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.93	0.93	0.83	0.93	0.93	0.93
Hourly flow rate (vph)	214	24	15	199	44	30
Pedestrians					2	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)					None	
Median type					None	
Median storage (veh)					160	
Upstream signal (m)					160	
pX, platoon unblocked					240	457
VC, conflicting volume					240	457
VC1, stage 1 conf vol					240	457
VC2, stage 2 conf vol					240	457
VCu, unblocked vol					4.1	6.4
IC, single (s)					2.2	3.5
IC, 2 stage (s)					99	92
p0 queue free %					1336	558
CM capacity (veh/h)					1336	558
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	238	214	74			
Volume Left	0	15	44			
Volume Right	24	0	30			
cSH	1700	1336	640			
Volume to Capacity	0.14	0.01	0.12			
Queue Length 95th (m)	0.0	0.3	3.0			
Control Delay (s)	0.0	0.6	11.4			
Lane LOS	A	A	B			
Approach Delay (s)	0.0	0.6	11.4			
Approach LOS	B	B	B			
Intersection Summary						
Average Delay			1.9			
Intersection Capacity Utilization			31.9%			A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis<Background> 2024 Weekday AM Peak Hour
 5: Fry Crescent (East) & Aspen Springs Drive 03-14-2022

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	WB	WB	NB	NB
Traffic Volume (veh/h)	213	3	4	222	11	8
Future Volume (Veh/h)	213	3	4	222	11	8
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	232	3	4	241	12	9
Pedestrians					2	4
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)					None	
Median type					None	
Median storage (veh)					245	
Upstream signal (m)					245	
pX, platoon unblocked					239	486
VC, conflicting volume					239	486
VC1, stage 1 conf vol					239	486
VC2, stage 2 conf vol					239	486
VCu, unblocked vol					4.1	6.4
IC, single (s)					2.2	3.5
IC, 2 stage (s)					100	98
p0 queue free %					1334	540
CM capacity (veh/h)					1334	540
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	235	245	21			
Volume Left	0	4	12			
Volume Right	3	0	9			
cSH	1700	1334	627			
Volume to Capacity	0.14	0.00	0.03			
Queue Length 95th (m)	0.0	0.1	0.8			
Control Delay (s)	0.0	0.2	10.9			
Lane LOS	A	A	B			
Approach Delay (s)	0.0	0.2	10.9			
Approach LOS	B	B	B			
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			25.5%			A
Analysis Period (min)			15			

6: Fry Crescent (West)/Existing Condo Access & Aspen Springs Drive
03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	188	1	4	219	10	4	0	9	20	0	21
Future Volume (Veh/h)	12	188	1	4	219	10	4	0	9	20	0	21
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	13	207	1	4	241	11	4	0	10	22	0	23
Pedestrians							3				8	
Lane Width (m)							3.7				3.7	
Walking Speed (m/s)							1.1				1.1	
Percent Blockage							0				1	
Right turn flare (veh)							None				None	
Median type							None				None	
Median storage (veh)							323					
Upstream signal (m)												
pX platoon unblocked												
VC, conflicting volume	260			211			514	504	210	506	500	254
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	260			211			514	504	210	506	500	254
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, 2 stage (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			99	100	99	95	100	97
CM capacity (veh/h)	1306			1368			451	462	832	462	465	783
Direction_Lane #	EB 1	WB 1	NB 1	SB 1	EB 1	WB 1	NB 1	SB 1	EB 1	WB 1	NB 1	SB 1
Volume Total	221	256	14	45								
Volume Left	13	4	4	22								
Volume Right	1	11	10	23								
cSH	1306	1368	670	585								
Volume to Capacity	0.01	0.00	0.02	0.08								
Queue Length 95th (m)	0.2	0.1	0.5	1.9								
Control Delay (s)	0.5	0.1	10.5	11.7								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.5	0.1	10.5	11.7								
Approach LOS	B	B	B	B								
Intersection Summary												
Average Delay	1.5											
Intersection Capacity Utilization	27.2%											
ICU Level of Service	A											
Analysis Period (min)	15											

7: Aspen Springs Drive & 10 Aspen Springs Drive Access
03-14-2022

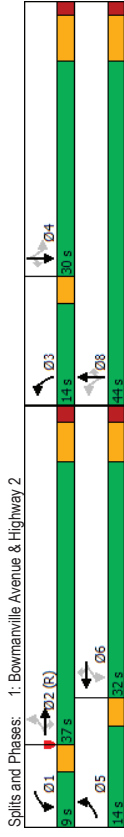
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	226	199	0	0	0	0	0	0	0	0	0
Future Volume (Veh/h)	0	226	199	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	246	216	0	0	0	0	0	0	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (m)									79			
pX platoon unblocked												
VC, conflicting volume	216									462	216	
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	216									462	216	
IC, single (s)	4.1									6.4	6.2	
IC, 2 stage (s)	2.2									3.5	3.3	
p0 queue free %	100									100	100	
CM capacity (veh/h)	1354									558	824	
Direction_Lane #	EB 1	WB 1	SB 1	EB 1	WB 1	SB 1	EB 1	WB 1	SB 1	EB 1	WB 1	SB 1
Volume Total	246	216	0									
Volume Left	0	0	0									
Volume Right	0	0	0									
cSH	1354	1700	1700									
Volume to Capacity	0.00	0.13	0.00									
Queue Length 95th (m)	0.0	0.0	0.0									
Control Delay (s)	0.0	0.0	0.0									
Lane LOS	A	A	A									
Approach Delay (s)	0.0	0.0	0.0									
Approach LOS	A	A	A									
Intersection Summary												
Average Delay	0.0											
Intersection Capacity Utilization	15.2%											
ICU Level of Service	A											
Analysis Period (min)	15											

8: HCM Unsignalized Intersection Capacity Analysis<Background> 2024 Weekday AM Peak Hour
 03-14-2022

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	563	899	0
Future Volume (Veh/h)	0	0	0	563	899	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	612	977	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				117	379	
pX platoon unblocked	0.79	0.73	0.73			
vC, conflicting volume	1589	977	977			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vC, unblocked vol	1287	786	786			
IC, single (s)	6.4	6.2	4.1			
IC, 2 stage (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
CM capacity (veh/h)	143	287	610			
Direction_Lane #	EB 1	NB 1	SB 1			
Volume Total	0	612	977			
Volume Left	0	0	0			
Volume Right	0	0	0			
cSH	1700	1700	1700			
Volume to Capacity	0.00	0.36	0.57			
Queue Length 95th (m)	0.0	0.0	0.0			
Control Delay (s)	0.0	0.0	0.0			
Lane LOS	A	A	A			
Approach Delay (s)	0.0	0.0	0.0			
Approach LOS	A	A	A			
Intersection Summary						
Average Delay				0.0		
Intersection Capacity Utilization				50.6%		
Analysis Period (min)				15		
ICU Level of Service				A		

1: Bowmanville Avenue & Highway 2
 <Background> 2024 Weekday PM Peak Hour
 03-14-2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	291	1149	317	138	910	65	270	466	171	89	346	234
Future Volume (vph)	291	1149	317	138	910	65	270	466	171	89	346	234
Turn Type	NA	Perm	pmt-pt	NA	Perm	pmt-pt	NA	Perm	pmt-pt	NA	Perm	NA
Protected Phases	5	2	2	1	6	6	3	8	8	4	4	4
Permitted Phases	5	2	2	1	6	6	3	8	8	4	4	4
Detector Phase												
Switch Phase												
Minimum Initial (s)	4.5	20.0	20.0	4.0	20.0	20.0	4.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	9.0	28.2	28.2	7.0	28.2	28.2	7.0	30.5	30.5	25.0	25.0	25.0
Total Split (s)	14.0	37.0	37.0	9.0	32.0	32.0	14.0	44.0	44.0	30.0	30.0	30.0
Total Split (%)	15.6%	41.1%	41.1%	10.0%	35.6%	35.6%	15.6%	48.9%	48.9%	33.3%	33.3%	33.3%
Yellow Time (s)	3.0	4.3	4.3	3.0	4.3	4.3	3.0	4.9	4.9	4.9	4.9	4.9
All-Red Time (s)	0.0	1.9	1.9	0.0	1.9	1.9	0.0	1.6	1.6	1.6	1.6	1.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	None	None	None	None	None	None	None	None
Act Effct Green (s)	43.0	30.8	30.8	35.0	25.8	25.8	41.0	37.5	37.5	23.5	23.5	23.5
Actuated g/C Ratio	0.48	0.34	0.34	0.39	0.29	0.29	0.46	0.42	0.42	0.26	0.26	0.26
v/C Ratio	0.95	1.10	1.10	0.85	1.02	1.02	0.85	0.79	0.79	0.28	0.28	0.28
Queue Delay	62.9	90.2	10.7	54.0	69.2	0.7	34.7	27.1	2.6	44.7	70.3	9.2
Control Delay	62.9	90.2	10.7	54.0	69.2	0.7	34.7	27.1	2.6	44.7	70.3	9.2
Queue Delay	62.9	90.2	10.7	54.0	69.2	0.7	34.7	27.1	2.6	44.7	70.3	9.2
LOS	E	F	B	D	E	A	C	C	A	D	E	A
Approach Delay		70.6		62.5			24.3			45.2		
Approach LOS		E		E			C			D		
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 90												
Offset: 0 (0%), Referenced to phase 2EBTL, Start of Green												
Natural Cycle: 90												
Control Type: Actuated-Coordinated												
Maximum v/C Ratio: 1.10												
Intersection Signal Delay: 55.1												
Intersection Capacity Utilization 95.1%												
Analysis Period (min) 15												



1. Bowmanville Avenue & Highway 2

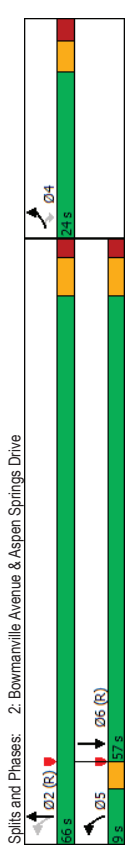
HCM Signalized Intersection Capacity Analysis <Background> 2024 Weekday PM Peak Hour
03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	291	1149	317	138	910	65	270	466	171	89	346	234
Future Volume (vph)	291	1149	317	138	910	65	270	466	171	89	346	234
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	2200	3202	1356	1630	3230	1326	1599	1601	1409	1570	1601	1384
Flt Permitted	0.14	1.00	1.00	0.16	1.00	1.00	0.22	1.00	1.00	0.44	1.00	1.00
Satd. Flow (perm)	230	3202	1356	266	3230	1326	363	1601	1409	726	1601	1384
Peak-hour factor, PHF	0.87	0.95	0.90	0.84	0.96	0.82	1.00	0.88	0.87	0.78	0.86	0.84
Adj. Flow (vph)	334	1209	352	164	948	79	270	530	197	114	402	279
RTOR Reduction (vph)	0	0	168	0	0	56	0	0	113	0	0	182
Lane Group Flow (vph)	334	1209	184	164	948	23	270	530	84	114	402	97
Confl. Peds. (#/hr)	2	10	10	10	10	2	15	3	3	3	3	15
Heavy Vehicles (%)	16%	14%	17%	12%	13%	20%	14%	20%	14%	16%	20%	14%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6		3	8				4
Permitted Phases	2	2	6	6	8	8	8	8	4	4	4	4
Actuated Green, G (s)	39.8	30.8	31.8	25.8	25.8	37.5	37.5	37.5	23.5	23.5	23.5	23.5
Effective Green, g (s)	39.8	30.8	31.8	25.8	25.8	37.5	37.5	37.5	23.5	23.5	23.5	23.5
Actuated G/C Ratio	0.44	0.34	0.34	0.29	0.29	0.42	0.42	0.42	0.26	0.26	0.26	0.26
Clearance Time (s)	3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	342	1095	464	184	925	380	302	667	587	189	418	361
v/s Ratio Prot	0.12	0.38		0.06	0.29		0.11	0.33				0.25
v/s Ratio Perm	0.31		0.14	0.25		0.02	0.26		0.06	0.16		0.07
v/c Ratio	0.98	1.10	0.40	0.89	1.02	0.06	0.89	0.79	0.14	0.60	0.96	0.27
Uniform Delay, d1	26.3	29.6	22.5	24.9	32.1	23.3	20.4	22.9	16.3	29.2	32.8	26.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.83	0.85	0.67	1.00	1.00	1.00
Incremental Delay, d2	42.0	60.4	2.5	37.4	66.1	0.1	19.7	4.5	0.1	5.3	34.0	0.4
Delay (s)	68.2	90.0	25.1	62.4	98.2	23.4	36.7	23.8	10.9	34.5	66.8	26.8
Level of Service	E	F	C	E	E	C	D	C	B	C	E	C
Approach Delay (s)		74.1		64.4		24.8					48.2	
Approach LOS		E		E		C					D	
Intersection Summary												
HCM 2000 Control Delay	57.4 HCM 2000 Level of Service E											
HCM 2000 Volume to Capacity ratio	1.05											
Actuated Cycle Length (s)	90.0 Sum of lost time (s) 18.7											
Intersection Capacity Utilization	95.1% ICU Level of Service F											
Analysis Period (min)	15											
c Critical Lane Group												

2. Bowmanville Avenue & Aspen Springs Drive

Timings <Background> 2024 Weekday PM Peak Hour
03-14-2022

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations	←	←	←	←	←
Traffic Volume (vph)	163	92	105	744	667
Future Volume (vph)	163	92	105	744	667
Turn Type	Prot	Perm	pm+pt	NA	NA
Protected Phases	4		5	2	6
Permitted Phases	4	4	5	2	6
Detector Phase					
Switch Phase					
Minimum Initial (s)	8.0	8.0	5.0	20.0	20.0
Minimum Split (s)	24.0	24.0	8.0	27.0	27.0
Total Split (s)	24.0	24.0	9.0	66.0	57.0
Total Split (%)	26.7%	26.7%	10.0%	73.3%	63.3%
Yellow Time (s)	3.3	3.3	3.0	4.2	4.2
All-Red Time (s)	2.6	2.6	0.0	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	3.0	6.3	6.3
Lead/Lag			Lead		Lag
Lead-Lag Optimize?			Yes		Yes
Recall Mode	None	None	None	C-Max	C-Max
Act Effct Green (s)	15.0	15.0	66.1	62.8	53.3
Actuated G/C Ratio	0.17	0.17	0.73	0.70	0.59
v/c Ratio	0.71	0.38	0.57	0.76	1.01
Control Delay	50.2	9.0	22.9	10.6	42.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	50.2	9.0	22.9	10.6	42.9
LOS	D	A	C	B	D
Approach Delay		33.1		12.1	42.9
Approach LOS		C		B	D
Intersection Summary					
Cycle Length, 90					
Actuated Cycle Length, 90					
Offset, 0 (0%), Referenced to phase 2:NBT1 and 6:SBT, Start of Green					
Natural Cycle, 90					
Control Type, Actuated-Coordinated					
Maximum v/c Ratio: 1.01					
Intersection Signal Delay: 28.2					
Intersection Capacity Utilization 71.6%					
Analysis Period (min) 15					



2. Bowmerville Avenue & Aspen Springs Drive

3. Bowmerville Avenue & Hartwell Avenue/Existing Condo Access

HCM Signalized Intersection Capacity Analysis <Background> 2024 Weekday PM Peak Hour
03-14-2022

Timings <Background> 2024 Weekday PM Peak Hour
03-14-2022

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	163	92	105	744	667	134
Traffic Volume (vph)	163	92	105	744	667	134
Future Volume (vph)	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	5.9	5.9	3.0	6.3	6.3	
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Fpb. ped/bikes	1.00	0.85	1.00	1.00	0.98	
Ft	0.95	1.00	0.95	1.00	1.00	
Flt Protected	1601	1471	1644	1642	1641	
Satd. Flow (prot)	0.95	1.00	0.08	1.00	1.00	
Flt Permitted	1601	1471	143	1642	1641	
Satd. Flow (perm)	0.86	0.68	0.87	0.85	0.80	0.89
Peak-hour factor, PHF	190	135	121	875	834	151
Adj. Flow (vph)	0	113	0	0	7	0
RTOR Reduction (vph)	190	23	121	875	978	0
Lane Group Flow (vph)	3		1			1
Confl. Peds. (#/hr)	14%	11%	11%	17%	15%	10%
Heavy Vehicles (%)						
Turn Type	Prot	Perm	pm+pt	NA	NA	NA
Protected Phases	4		5	2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	15.0	15.0	62.8	62.8	53.3	
Effective Green, g (s)	15.0	15.0	62.8	62.8	53.3	
Actuated g/C Ratio	0.17	0.17	0.70	0.70	0.59	
Clearance Time (s)	5.9	5.9	3.0	6.3	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	266	245	208	1145	971	
v/s Ratio Prot	c0.12		0.04	c0.53	c0.60	
v/s Ratio Perm		0.02	0.36			
v/c Ratio	0.71	0.09	0.58	0.76	1.01	
Uniform Delay, d1	35.5	31.7	16.6	8.8	18.4	
Progression Factor	1.00	1.00	1.79	0.67	0.71	
Incremental Delay, d2	8.8	0.2	2.8	3.3	26.1	
Delay (s)	44.2	31.9	32.4	9.2	39.2	
Level of Service	D	C	C	A	D	
Approach Delay (s)	39.1			12.0	39.2	
Approach LOS	D			B	D	
Intersection Summary						
HCM 2000 Control Delay			27.4			HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio			0.93			
Actuated Cycle Length (s)			90.0			Sum of lost time (s) 15.2
Intersection Capacity Utilization			71.6%			ICU Level of Service C
Analysis Period (min)			15			
c Critical Lane Group						

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Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	35	0	63	3	2	76	807	4	707
Traffic Volume (vph)	35	0	63	3	2	76	807	4	707
Future Volume (vph)	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Turn Type	4		4	4	4	2	2	2	2
Protected Phases	4		4	4	4	2	2	2	2
Permitted Phases	4	4	4	4	4	2	2	2	2
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	23.0	23.0	23.0	23.0	23.0	27.0	27.0	27.0	27.0
Total Split (s)	32.4	32.4	32.4	32.4	32.4	57.6	57.6	57.6	57.6
Total Split (%)	36.0%	36.0%	36.0%	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	4.8	4.8	4.8	4.8
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	8.7	8.7	8.7	72.1	72.1	72.1	72.1	72.1	72.1
Actuated g/C Ratio	0.10	0.10	0.10	0.10	0.10	0.80	0.80	0.80	0.80
v/c Ratio	0.37	0.38	0.09	0.27	0.76	0.01	0.64	0.01	0.64
Control Delay	44.8	13.6	25.2	5.6	12.6	5.2	8.3	5.2	8.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.8	13.6	25.2	5.6	12.6	5.2	8.3	5.2	8.3
LOS	D	B	C	A	B	A	A	A	A
Approach Delay	25.4		25.2		11.8		8.2		8.2
Approach LOS	C		C		B		A		A
Intersection Summary									
Cycle Length, 90									
Actuated Cycle Length, 90									
Offset, 0 (0%), Referenced to phase 2:NBSB and 6., Start of Green									
Natural Cycle, 90									
Control Type: Actuated-Coordinated									
Maximum v/c Ratio: 0.76									
Intersection Signal Delay: 11.4									
Intersection Capacity Utilization 69.2%									
Analysis Period (min) 15									



Splits and Phases: 3: Bowmerville Avenue & Hartwell Avenue/Existing Condo Access
57.6 s 4.8 s 1.8 s 0.0 s
D04
57.6 s

Proposed Residential Development, 10 Aspen Springs Drive, Bowmerville, ON
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HCM Signalized Intersection Capacity Analysis <Background> 2024 Weekday PM Peak Hour
 3: Bowmannville Avenue & Hartwell Avenue/Existing Condo Access

03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	35	0	63	3	2	7	76	807	3	4	707	47	
Future Volume (veh/h)	35	0	63	3	2	7	76	807	3	4	707	47	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Flt Protected	0.95	1.00	0.99	0.99	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.99	
Satd. Flow (prot)	1825	1541	1742	1643	1575	1825	1603	1825	1603	1825	1603	1603	
Flt Permitted	0.75	1.00	0.89	0.89	1.00	0.30	1.00	0.24	1.00	0.24	1.00	1.00	
Satd. Flow (perm)	1436	1541	1575	522	1575	452	1603	452	1603	452	1603	1603	
Peak-hour factor, PHF	0.68	0.92	0.75	0.82	0.82	0.82	0.84	0.92	0.84	0.92	0.95	0.60	
Adj. Flow (vph)	51	0	84	4	2	9	112	961	3	4	744	78	
RTOR Reduction (vph)	0	0	77	0	8	0	0	0	0	0	0	2	
Lane Group Flow (vph)	0	51	7	0	7	0	112	964	0	4	820	0	
Confl. Peds. (#/hr)	0%	0%	6%	0%	0%	0%	11%	22%	0%	0%	18%	17%	
Heavy Vehicles (%)	0%	0%	6%	0%	0%	0%	11%	22%	0%	0%	18%	17%	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	
Protected Phases	4		4	4	4	2	2	2	2	2	2	2	
Permitted Phases	4		4	4	4	2	2	2	2	2	2	2	
Actuated Green, G (s)	7.6	7.6	7.6	7.6	69.5	69.5	69.5	69.5	69.5	69.5	69.5	69.5	
Effective Green, g (s)	7.6	7.6	7.6	7.6	69.5	69.5	69.5	69.5	69.5	69.5	69.5	69.5	
Actuated G/C Ratio	0.08	0.08	0.08	0.08	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	
Clearance Time (s)	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	121	130	133	133	403	421	403	421	403	421	403	1237	
v/s Ratio Prot													
v/s Ratio Perm	c0.04	0.00	0.00	0.00	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.51	
v/c Ratio	0.42	0.05	0.05	0.05	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.66	
Uniform Delay, d1	39.1	37.9	37.9	37.9	3.0	6.0	6.0	6.0	6.0	6.0	6.0	4.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.26	
Incremental Delay, d2	2.4	0.2	0.2	0.2	1.7	5.4	5.4	5.4	5.4	5.4	5.4	1.1	
Delay (s)	41.5	38.1	38.0	38.0	4.7	11.4	11.4	11.4	11.4	11.4	11.4	7.1	
Level of Service	D	D	D	D	A	B	B	B	B	B	B	A	
Approach Delay (s)	39.4			38.0			10.7					7.1	
Approach LOS	D			D			B					A	
Intersection Summary													
HCM 2000 Control Delay	11.3											HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76												
Actuated Cycle Length (s)	90.0											Sum of lost time (s)	12.9
Intersection Capacity Utilization	69.2%											ICU Level of Service	C
Analysis Period (min)	15												
c Critical Lane Group													

HCM Unsignalized Intersection Capacity Analysis<Background> 2024 Weekday PM Peak Hour
 4: Bonnycastle Drive & Aspen Springs Drive

03-14-2022

Movement	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	
Lane Configurations									
Traffic Volume (veh/h)	230	44	29	209	45	25	45	25	
Future Volume (Veh/h)	230	44	29	209	45	25	45	25	
Sign Control	Free	Free	Free	Free	Free	Stop	Stop	Stop	
Grade	0%	0%	0%	0%	0%	0%	0%	0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	
Hourly flow rate (vph)	247	47	31	225	48	27	48	27	
Pedestrians						2			
Lane Width (m)						3.7			
Walking Speed (m/s)						1.1			
Percent Blockage						0			
Right turn flare (veh)						None			
Median type						None			
Median storage (veh)						160			
Upstream signal (m)						160			
Pk. platoon unblocked						296		560	
v/c, conflicting volume						296		560	
v/c1, stage 1 conf vol						296		560	
v/c2, stage 2 conf vol						4.1		6.2	
IC, unblocked vol						4.1		6.2	
IC, single (s)						2.2		3.3	
IC, 2 stage (s)						2.2		3.3	
p0 queue free %						98		90	
qM capacity (veh/h)						1274		480	
qM capacity (veh/h)						1274		480	
Direction, Lane #	EB 1	WB 1	NB 1						
Volume Total	294	256	75						
Volume Left	0	31	48						
Volume Right	47	0	27						
cSH	1700	1274	555						
Volume to Capacity	0.17	0.02	0.14						
Queue Length 95th (m)	0.0	0.6	3.5						
Control Delay (s)	0.0	1.2	12.5						
Lane LOS	A	A	B						
Approach Delay (s)	0.0	1.2	12.5						
Approach LOS	B	B	B						
Intersection Summary									
Average Delay	2.0							ICU Level of Service	A
Intersection Capacity Utilization	41.4%								
Analysis Period (min)	15								

HCM Unsignalized Intersection Capacity Analysis<Background> 2024 Weekday PM Peak Hour
 5. Fry Crescent (East) & Aspen Springs Drive
 03-14-2022

Movement	EBT	EBR	WBL	WBT	NBL	NBR	Diagram
Lane Configurations	EB	EB	WB	WB	NB	NB	↔
Traffic Volume (veh/h)	264	14	12	242	8	9	
Future Volume (Veh/h)	264	14	12	242	8	9	
Sign Control	Free	Free	Free	Free	Stop	Stop	
Grade	0%	0%	0%	0%	0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	287	15	13	263	9	10	
Pedestrians					2	4	
Lane Width (m)					3.7	3.7	
Walking Speed (m/s)					1.1	1.1	
Percent Blockage					0	0	
Right turn flare (veh)					None	None	
Median type					None	None	
Median storage (veh)							
Upstream signal (m)					245		
pX platoon unblocked							
VC, conflicting volume			306		588	300	
VC1, stage 1 conf vol							
VC2, stage 2 conf vol							
VCu, unblocked vol			306		588	300	
IC, single (s)			4.1		6.4	6.2	
IC, 2 stage (s)							
IF (s)			2.2		3.5	3.3	
p0 queue free %			99		98	99	
CM capacity (veh/h)			1261		468	739	
Direction, Lane #	EB 1	WB 1	NB 1				
Volume Total	302	276	19				
Volume Left	0	13	9				
Volume Right	15	0	10				
cSH	1700	1261	580				
Volume to Capacity	0.18	0.01	0.03				
Queue Length 95th (m)	0.0	0.2	0.8				
Control Delay (s)	0.0	0.5	11.4				
Lane LOS	A	A	B				
Approach Delay (s)	0.0	0.5	11.4				
Approach LOS	B	B	B				
Intersection Summary							
Average Delay			0.6				
Intersection Capacity Utilization			33.2%		ICU Level of Service	A	
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis<Background> 2024 Weekday PM Peak Hour
 6. Fry Crescent (West)<Existing Condo Access & Aspen Springs Drive
 03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Diagram
Lane Configurations	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB	↔
Traffic Volume (veh/h)	15	261	17	8	209	33	9	1	2	17	0	9	
Future Volume (Veh/h)	15	261	17	8	209	33	9	1	2	17	0	9	
Sign Control	Free	Free	Free	Free	Free	Free	Stop	0%	0%	0%	0%	0%	
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	
Hourly flow rate (vph)	16	287	19	9	230	36	10	1	2	19	0	10	
Pedestrians								3			8		
Lane Width (m)								3.7			3.7		
Walking Speed (m/s)								1.1			1.1		
Percent Blockage								0			1		
Right turn flare (veh)								None			None		
Median type								None			None		
Median storage (veh)													
Upstream signal (m)								323					
pX platoon unblocked													
VC, conflicting volume				309			608	624	300	605	615	256	
VC1, stage 1 conf vol													
VC2, stage 2 conf vol													
VCu, unblocked vol				309			608	624	300	605	615	256	
IC, single (s)				4.1			7.1	6.5	6.2	7.1	6.5	6.2	
IC, 2 stage (s)													
IF (s)				2.2			3.5	4.0	3.3	3.5	4.0	3.3	
p0 queue free %				99			97	100	100	95	100	99	
CM capacity (veh/h)				1291			395	393	743	398	397	781	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	322	275	13	29									
Volume Left	16	9	10	19									
Volume Right	19	36	2	10									
cSH	1291	1259	426	479									
Volume to Capacity	0.01	0.01	0.03	0.06									
Queue Length 95th (m)	0.3	0.2	0.7	1.5									
Control Delay (s)	0.5	0.3	13.7	13.0									
Lane LOS	A	A	B	B									
Approach Delay (s)	0.5	0.3	13.7	13.0									
Approach LOS	B	B	B	B									
Intersection Summary													
Average Delay				1.3									
Intersection Capacity Utilization				31.3%			ICU Level of Service	A					
Analysis Period (min)				15									

HCM Unsignalized Intersection Capacity Analysis<Background> 2024 Weekday PM Peak Hour
 7: Aspen Springs Drive & 10 Aspen Springs Drive Access

03-14-2022



Movement	EBL	EBT	WBT	SBL	WBR	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	255	238	0	0	0
Future Volume (Veh/h)	0	255	238	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	277	259	0	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			
Median storage (veh)						
Upstream signal (m)			79			
pX, platoon unblocked				536	259	
VC, conflicting volume	259					
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	259			536	259	
IC, single (s)	4.1			6.4	6.2	
IC, 2 stage (s)	2.2			3.5	3.3	
p0 queue free %	100			100	100	
CM capacity (veh/h)	1306			505	780	
Direction_Lane #	EB 1	WB 1	SB 1			
Volume Total	277	259	0			
Volume Left	0	0	0			
Volume Right	0	0	0			
cSH	1306	1700	1700			
Volume to Capacity	0.00	0.15	0.00			
Queue Length 95th (m)	0.0	0.0	0.0			
Control Delay (s)	0.0	0.0	0.0			
Lane LOS	A	A	A			
Approach Delay (s)	0.0	0.0	0.0			
Approach LOS	A	A	A			
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization		16.8%			ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis<Background> 2024 Weekday PM Peak Hour
 8: Bowmanville Avenue & Shared Siter/MetroInfx Laneway

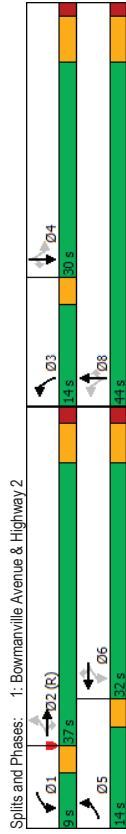
03-14-2022



Movement	EBL	EBR	NBL	SBT	SBR	
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	907	800	
Future Volume (Veh/h)	0	0	0	907	800	
Sign Control	Stop	Free	Free	Free	Free	
Grade	0%	0%	0%	0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	0	0	0	986	870	
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)				None	None	
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				117	379	
pX, platoon unblocked	0.74	0.82	0.82			
VC, conflicting volume	1856	870	870			
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	1431	731	731			
IC, single (s)	6.4	6.2	4.1			
IC, 2 stage (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
CM capacity (veh/h)	109	345	715			
Direction_Lane #	EB 1	NB 1	SB 1			
Volume Total	0	986	870			
Volume Left	0	0	0			
Volume Right	0	0	0			
cSH	1700	1700	1700			
Volume to Capacity	0.00	0.58	0.51			
Queue Length 95th (m)	0.0	0.0	0.0			
Control Delay (s)	0.0	0.0	0.0			
Lane LOS	A	A	A			
Approach Delay (s)	0.0	0.0	0.0			
Approach LOS	A	A	A			
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization		51.1%			ICU Level of Service	A
Analysis Period (min)			15			

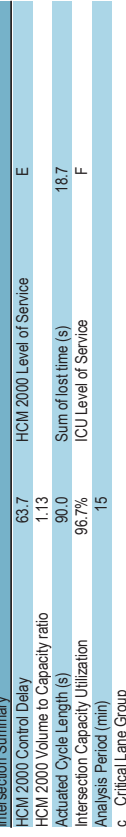
Timings 03-14-2022
 1: Bowmanville Avenue & Highway 2 <Total> 2024 Weekday PM Peak Hour

EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
291	1149	344	156	910	65	287	495	178	89	381	234
291	1149	344	156	910	65	287	495	178	89	381	234
pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	NA	Perm	NA
5	2	2	1	6	3	8	8	8	4	4	4
4.5	20.0	20.0	4.0	20.0	20.0	4.0	12.0	12.0	12.0	12.0	12.0
9.0	28.2	28.2	7.0	28.2	28.2	7.0	30.5	30.5	25.0	25.0	25.0
14.0	37.0	37.0	9.0	32.0	32.0	14.0	44.0	44.0	30.0	30.0	30.0
15.6%	41.1%	41.1%	10.0%	35.6%	35.6%	15.6%	48.9%	48.9%	33.3%	33.3%	33.3%
3.0	4.3	4.3	3.0	4.3	4.3	3.0	4.9	4.9	4.9	4.9	4.9
0.0	1.9	1.9	0.0	1.9	1.9	0.0	1.6	1.6	1.6	1.6	1.6
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
None	C-Max	None	None	None	None	None	None	None	None	None	None
43.0	30.8	30.8	35.0	25.8	25.8	41.0	37.5	37.5	23.5	23.5	23.5
0.48	0.34	0.34	0.39	0.29	0.29	0.46	0.42	0.42	0.26	0.26	0.26
0.95	1.10	0.89	1.02	0.76	0.76	1.01	0.84	0.29	0.68	1.06	0.52
62.9	90.2	11.2	76.7	69.2	0.7	68.5	29.8	3.7	53.0	95.1	10.2
62.9	90.2	11.2	76.7	69.2	0.7	68.5	29.8	3.7	53.0	95.1	10.2
E	F	B	E	E	A	E	C	A	D	F	B
69.8	65.9	65.9	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2
E	E	E	D	D	D	D	D	D	E	E	E
90	90	90	90	90	90	90	90	90	90	90	90
0	0	0	0	0	0	0	0	0	0	0	0
110	110	110	110	110	110	110	110	110	110	110	110
Coordinated	Coordinated	Coordinated	Coordinated	Coordinated	Coordinated	Coordinated	Coordinated	Coordinated	Coordinated	Coordinated	Coordinated
1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
60.1	60.1	60.1	60.1	60.1	60.1	60.1	60.1	60.1	60.1	60.1	60.1
96.7%	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%
15	15	15	15	15	15	15	15	15	15	15	15



HCM Signalized Intersection Capacity Analysis 03-14-2022
 1: Bowmanville Avenue & Highway 2 <Total> 2024 Weekday PM Peak Hour

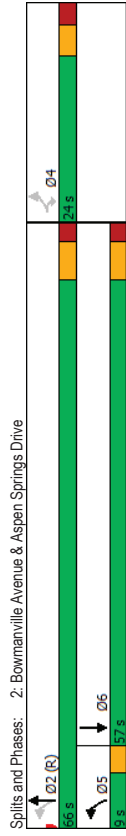
EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
291	1149	344	156	910	65	287	495	178	89	381	234
291	1149	344	156	910	65	287	495	178	89	381	234
1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
2200	3202	1356	1630	3230	1326	1601	1601	1409	1570	1601	1384
0.14	1.00	1.00	0.16	1.00	1.00	0.16	1.00	1.00	0.39	1.00	1.00
230	3202	1356	266	3230	1326	267	1601	1409	641	1601	1384
0.87	0.95	0.90	0.84	0.96	0.82	1.00	0.88	0.87	0.78	0.86	0.84
334	1209	382	186	948	79	287	562	205	114	443	279
0	182	0	0	56	0	0	110	0	0	172	0
334	1209	200	186	948	23	287	563	95	114	443	107
2	10	10	2	15	2	15	3	3	3	15	15
16%	14%	17%	12%	13%	20%	14%	20%	14%	16%	20%	14%
5	2	2	1	6	3	8	8	8	4	4	4
2	2	2	6	6	6	8	8	8	4	4	4
39.8	30.8	30.8	31.8	25.8	25.8	37.5	37.5	37.5	23.5	23.5	23.5
39.8	30.8	30.8	31.8	25.8	25.8	37.5	37.5	37.5	23.5	23.5	23.5
0.44	0.34	0.34	0.35	0.29	0.29	0.42	0.42	0.42	0.26	0.26	0.26
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
342	1095	464	184	925	380	274	667	587	167	418	361
c0.12	c0.38	0.07	0.29	0.02	0.13	0.35	0.07	0.18	0.28	0.08	0.08
0.31	1.10	0.43	1.01	1.02	0.06	1.05	0.84	0.16	0.68	1.06	0.30
26.3	29.6	22.8	27.0	32.1	23.3	21.7	23.6	16.4	29.9	33.2	26.6
1.00	1.00	1.00	1.00	1.00	1.00	1.11	0.86	0.87	1.00	1.00	1.00
42.0	60.4	2.9	69.2	66.1	0.1	55.2	6.0	0.1	10.9	60.7	0.5
E	F	C	F	E	C	E	C	B	D	F	C
73.5	69.6	69.6	38.4	38.4	38.4	38.4	38.4	38.4	38.4	38.4	38.4
E	E	E	D	D	D	D	D	D	E	E	E
63.7	63.7	63.7	63.7	63.7	63.7	63.7	63.7	63.7	63.7	63.7	63.7
1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
96.7%	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%	96.7%
15	15	15	15	15	15	15	15	15	15	15	15



Timings <Total> 2024 Weekday PM Peak Hour 03-14-2022

2. Bowmanville Avenue & Aspen Springs Drive

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Volume (vph)	216	110	169	744	676	214
Future Volume (vph)	216	110	169	744	676	214
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.9	5.9	3.0	6.3	6.3	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Fpb. ped/bikes	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.97	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1588	1471	1644	1642	1628	
Flt Permitted	0.95	1.00	0.07	1.00	1.00	
Satd. Flow (perm)	1588	1471	129	1642	1628	
Peak-Hour factor, PHF	0.86	0.68	0.87	0.85	0.80	0.89
Adj. Flow (vph)	251	162	194	875	845	240
RTOR Reduction (vph)	0	132	0	0	11	0
Lane Group Flow (vph)	251	30	194	875	1074	0
Confl. Peds. (#/hr)	3		1		1	
Heavy Vehicles (%)	14%	11%	11%	17%	15%	10%
Turn Type	Perm	Perm	pm-pt	NA	NA	
Protected Phases			5	2	6	
Permitted Phases	4	4	2			
Actuated Green, G (s)	16.9	16.9	60.9	60.9	50.7	
Effective Green, g (s)	16.9	16.9	60.9	60.9	50.7	
Actuated g/C Ratio	0.19	0.19	0.68	0.68	0.56	
Clearance Time (s)	5.9	5.9	3.0	6.3	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	288	276	208	1111	917	
v/s Ratio Prot			c0.07	0.53	c0.66	
v/s Ratio Perm	c0.16	0.02	0.56			
v/c Ratio	0.84	0.11	0.93	0.79	1.17	
Uniform Delay, d1	35.3	30.3	27.4	10.1	19.6	
Progression Factor	1.00	1.00	1.63	0.56	0.89	
Incremental Delay, d2	18.9	0.2	31.2	3.4	84.5	
Delay (s)	54.2	30.5	75.9	9.1	102.0	
Level of Service	D	C	E	A	F	
Approach Delay (s)	44.9		21.2	102.0		
Approach LOS	D		C	F		
Intersection Summary						
HCM 2000 Control Delay	59.2 HCM 2000 Level of Service E					
HCM 2000 Volume to Capacity ratio	1.07					
Actuated Cycle Length (s)	90.0 Sum of lost time (s) 15.2					
Intersection Capacity Utilization	83.5% ICU Level of Service E					
Analysis Period (min)	15					
c. Critical Lane Group						

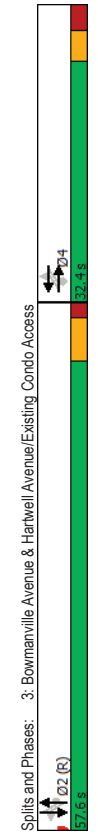


2. Bowmanville Avenue & Aspen Springs Drive

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Volume (vph)	216	110	169	744	676	214
Future Volume (vph)	216	110	169	744	676	214
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.9	5.9	3.0	6.3	6.3	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Fpb. ped/bikes	0.99	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.97	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1588	1471	1644	1642	1628	
Flt Permitted	0.95	1.00	0.07	1.00	1.00	
Satd. Flow (perm)	1588	1471	129	1642	1628	
Peak-Hour factor, PHF	0.86	0.68	0.87	0.85	0.80	0.89
Adj. Flow (vph)	251	162	194	875	845	240
RTOR Reduction (vph)	0	132	0	0	11	0
Lane Group Flow (vph)	251	30	194	875	1074	0
Confl. Peds. (#/hr)	3		1		1	
Heavy Vehicles (%)	14%	11%	11%	17%	15%	10%
Turn Type	Perm	Perm	pm-pt	NA	NA	
Protected Phases			5	2	6	
Permitted Phases	4	4	2			
Actuated Green, G (s)	16.9	16.9	60.9	60.9	50.7	
Effective Green, g (s)	16.9	16.9	60.9	60.9	50.7	
Actuated g/C Ratio	0.19	0.19	0.68	0.68	0.56	
Clearance Time (s)	5.9	5.9	3.0	6.3	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	288	276	208	1111	917	
v/s Ratio Prot			c0.07	0.53	c0.66	
v/s Ratio Perm	c0.16	0.02	0.56			
v/c Ratio	0.84	0.11	0.93	0.79	1.17	
Uniform Delay, d1	35.3	30.3	27.4	10.1	19.6	
Progression Factor	1.00	1.00	1.63	0.56	0.89	
Incremental Delay, d2	18.9	0.2	31.2	3.4	84.5	
Delay (s)	54.2	30.5	75.9	9.1	102.0	
Level of Service	D	C	E	A	F	
Approach Delay (s)	44.9		21.2	102.0		
Approach LOS	D		C	F		
Intersection Summary						
HCM 2000 Control Delay	59.2 HCM 2000 Level of Service E					
HCM 2000 Volume to Capacity ratio	1.07					
Actuated Cycle Length (s)	90.0 Sum of lost time (s) 15.2					
Intersection Capacity Utilization	83.5% ICU Level of Service E					
Analysis Period (min)	15					
c. Critical Lane Group						

Timings <Total> 2024 Weekday PM Peak Hour 03-14-2022
 3. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
35	0	63	3	2	76	871	4	733
35	0	63	3	2	76	871	4	733
Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
4	4	4	4	4	2	2	2	2
5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
23.0	23.0	23.0	23.0	27.0	27.0	27.0	27.0	27.0
32.4	32.4	32.4	32.4	57.6	57.6	57.6	57.6	57.6
36.0%	36.0%	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%	64.0%
3.3	3.3	3.3	3.3	4.8	4.8	4.8	4.8	4.8
3.0	3.0	3.0	3.0	1.8	1.8	1.8	1.8	1.8
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6
None	None	None	None	None	C-Max	C-Max	C-Max	C-Max
8.7	8.7	8.7	72.1	72.1	72.1	72.1	72.1	72.1
0.10	0.10	0.10	0.80	0.80	0.80	0.80	0.80	0.80
0.37	0.38	0.09	0.28	0.82	0.01	0.66		
44.8	13.6	25.2	5.9	15.7	5.8	10.8		
44.8	13.6	25.2	5.9	15.7	5.8	10.8		
D	B	C	A	B	A	B	A	B
25.4	C	C	14.7	10.7				
Intersection Summary								
Cycle Length: 90								
Actuated Cycle Length: 90								
Offset: 0 (0%), Referenced to phase 2: NBSB and 6: Start of Green								
Natural Cycle: 90								
Control Type: Actuated-Coordinated								
Maximum v/c Ratio: 0.82								
Intersection Signal Delay: 13.9								
Intersection Capacity Utilization 72.6%								
Analysis Period (min) 15								



Splits and Phases: 3. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access
 57.6 s
 3.3 s
 3.3 s
 3.3 s
 3.3 s
 4.8 s
 4.8 s
 4.8 s
 4.8 s
 90 s

HCM Signalized Intersection Capacity Analysis <Total> 2024 Weekday PM Peak Hour 03-14-2022
 3. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
35	0	63	3	2	76	871	3	4	733
35	0	63	3	2	76	871	3	4	733
1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	0.85	0.92	1.00	1.00	1.00	1.00	1.00	0.99	0.99
1825	1541	1742	1643	1575	1825	1603			
0.75	1.00	0.89	0.29	1.00	0.20	1.00			
1436	1541	1575	498	1575	385	1603			
0.68	0.92	0.75	0.82	0.82	0.68	0.84	0.92	0.95	0.60
51	0	84	4	2	9	112	1037	3	4
0	0	77	0	8	0	0	0	0	2
0	51	7	0	7	0	112	1040	0	4
0%	6%	0%	0%	0%	11%	22%	0%	18%	17%
Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
4	4	4	4	4	2	2	2	2	2
7.6	7.6	7.6	7.6	69.5	69.5	69.5	69.5	69.5	69.5
7.6	7.6	7.6	7.6	69.5	69.5	69.5	69.5	69.5	69.5
0.08	0.08	0.08	0.08	0.77	0.77	0.77	0.77	0.77	0.77
6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6	6.6
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
121	130	133	384	1216	297	1237			
c0.04	0.00	0.00	0.22	0.22	0.01	0.01	0.01	0.01	0.53
0.42	0.05	0.05	0.29	0.86	0.01	0.69			
39.1	37.9	37.9	3.0	6.9	2.4	5.0			
1.00	1.00	1.00	1.00	1.00	1.71	1.73			
2.4	0.2	0.2	1.9	7.8	0.0	0.3			
41.5	38.1	38.0	4.9	14.7	4.0	8.9			
D	D	D	A	B	A	A			
39.4	D	D	38.0	13.7	8.8	8.8			
D	D	D	D	B	A	A			
Intersection Summary									
HCM 2000 Control Delay 13.6 HCM 2000 Level of Service B									
HCM 2000 Volume to Capacity ratio 0.81									
Actuated Cycle Length (s) 90.0 Sum of lost time (s) 12.9									
Intersection Capacity Utilization 72.6% ICU Level of Service C									
Analysis Period (min) 15									
c. Critical Lane Group									

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 Synchro 10 Report
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HCM Unsignalized Intersection Capacity Analysis
 4: Bonnycastle Drive & Aspen Springs Drive

HCM Unsignalized Intersection Capacity Analysis
 5: Fry Crescent (East) & Aspen Springs Drive

<Total> 2024 Weekday PM Peak Hour
 03-14-2022

<Total> 2024 Weekday PM Peak Hour
 03-14-2022

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	WB	WB	NB	NB
Traffic Volume (veh/h)	264	44	29	255	45	25
Future Volume (Veh/h)	264	44	29	255	45	25
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.93	0.93	0.83	0.93	0.93	0.93
Hourly flow rate (vph)	284	47	31	274	48	27
Pedestrians					2	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)	None				None	
Median type					None	
Median storage (veh)					160	
Upstream signal (m)					160	
pX, platoon unblocked					333	646
VC, conflicting volume					333	646
VC1, stage 1 conf vol					333	646
VC2, stage 2 conf vol					4.1	6.4
VCu, unblocked vol					2.2	3.5
IC, single (s)					97	89
IC, 2 stage (s)					1235	428
p0 queue free %						
CM capacity (veh/h)						
Direction, Lane #	EB 1	WB 1	NB 1	NB 1		
Volume Total	331	305	75			
Volume Left	0	31	48			
Volume Right	47	0	27			
cSH	1700	1235	503			
Volume to Capacity	0.19	0.03	0.15			
Queue Length 95th (m)	0.0	0.6	4.0			
Control Delay (s)	0.0	1.0	13.4			
Lane LOS	A	A	B			
Approach Delay (s)	0.0	1.0	13.4			
Approach LOS	B	B	B			
Intersection Summary						
Average Delay			1.9			
Intersection Capacity Utilization			45.6%			
Analysis Period (min)			15			
					ICU Level of Service	A

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	WB	WB	NB	NB
Traffic Volume (veh/h)	298	14	12	289	8	9
Future Volume (Veh/h)	298	14	12	289	8	9
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	324	15	13	314	9	10
Pedestrians					2	4
Lane Width (m)					3.7	3.7
Walking Speed (m/s)					1.1	1.1
Percent Blockage					0	0
Right turn flare (veh)	None				None	
Median type					None	
Median storage (veh)					245	
Upstream signal (m)					245	
pX, platoon unblocked					343	676
VC, conflicting volume					343	676
VC1, stage 1 conf vol					343	676
VC2, stage 2 conf vol					4.1	6.4
VCu, unblocked vol					2.2	3.5
IC, single (s)					99	98
IC, 2 stage (s)					1222	416
p0 queue free %						
CM capacity (veh/h)						
Direction, Lane #	EB 1	WB 1	NB 1	NB 1		
Volume Total	339	327	19			
Volume Left	0	13	9			
Volume Right	15	0	10			
cSH	1700	1222	531			
Volume to Capacity	0.20	0.01	0.04			
Queue Length 95th (m)	0.0	0.2	0.8			
Control Delay (s)	0.0	0.4	12.0			
Lane LOS	A	A	B			
Approach Delay (s)	0.0	0.4	12.0			
Approach LOS	B	B	B			
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			35.6%			
Analysis Period (min)			15			
					ICU Level of Service	A

6: Fry Crescent (West)/Existing Condo Access & Aspen Springs Drive <Total> 2024 Weekday PM Peak Hour 03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	295	17	8	255	33	9	1	2	17	0	9
Future Volume (Veh/h)	15	295	17	8	255	33	9	1	2	17	0	9
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	16	324	19	9	280	36	10	1	2	19	0	10
Pedestrians							3				8	
Lane Width (m)							3.7				3.7	
Walking Speed (m/s)							1.1				1.1	
Percent Blockage							0				1	
Right turn flare (veh)												
Median type							None					
Median storage (veh)												
Upstream signal (m)							323					
pX platoon unblocked												
VC, conflicting volume	324			346			694	710	336	692	702	306
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCU, unblocked vol	324			346			694	710	336	692	702	306
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, 2 stage (s)												
p0 queue free %	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
IF (s)	99			99			97	100	100	95	100	99
CM capacity (veh/h)	1237			1221			345	350	708	348	354	733
Direction_Lane #	EB 1	WB 1	NB 1	SB 1	EB 1	WB 1	NB 1	SB 1	EB 1	WB 1	NB 1	SB 1
Volume Total	359	325	13	29	359	325	13	29	359	325	13	29
Volume Left	16	9	10	19	16	9	10	19	16	9	10	19
Volume Right	19	36	2	10	19	36	2	10	19	36	2	10
cSH	1237	1221	375	425	1237	1221	375	425	1237	1221	375	425
Volume to Capacity	0.01	0.01	0.03	0.07	0.01	0.01	0.03	0.07	0.01	0.01	0.03	0.07
Queue Length 95th (m)	0.3	0.2	0.8	1.7	0.3	0.2	0.8	1.7	0.3	0.2	0.8	1.7
Control Delay (s)	0.5	0.3	14.9	14.1	0.5	0.3	14.9	14.1	0.5	0.3	14.9	14.1
Lane LOS	A	A	B	B	A	A	B	B	A	A	B	B
Approach Delay (s)	0.5	0.3	14.9	14.1	0.5	0.3	14.9	14.1	0.5	0.3	14.9	14.1
Approach LOS	B	B	B	B	B	B	B	B	B	B	B	B
Intersection Summary												
Average Delay	1.2											
Intersection Capacity Utilization	33.5%											
ICU Level of Service	A											
Analysis Period (min)	15											

7: Aspen Springs Drive & 10 Aspen Springs Drive Access <Total> 2024 Weekday PM Peak Hour 03-14-2022

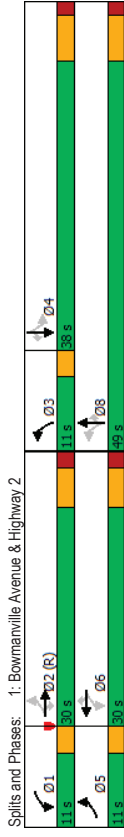
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (veh/h)	34	255	238	145	64	47	64	47	47
Future Volume (Veh/h)	34	255	238	145	64	47	64	47	47
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	37	277	259	158	70	51	70	51	51
Pedestrians									
Lane Width (m)									
Walking Speed (m/s)									
Percent Blockage									
Right turn flare (veh)									
Median type							None		
Median storage (veh)									
Upstream signal (m)							79		
pX platoon unblocked									
VC, conflicting volume	417						689	338	
VC1, stage 1 conf vol									
VC2, stage 2 conf vol									
VCU, unblocked vol	417						689	338	
IC, single (s)	4.1						6.4	6.2	
IC, 2 stage (s)									
p0 queue free %	2.2						3.5	3.3	
IF (s)	97						82	93	
CM capacity (veh/h)	1142						398	704	
Direction_Lane #	EB 1	WB 1	SB 1	EB 1	WB 1	SB 1	EB 1	WB 1	SB 1
Volume Total	314	417	121	314	417	121	314	417	121
Volume Left	37	0	70	37	0	70	37	0	70
Volume Right	0	158	51	0	158	51	0	158	51
cSH	1142	1700	487	1142	1700	487	1142	1700	487
Volume to Capacity	0.03	0.25	0.25	0.03	0.25	0.25	0.03	0.25	0.25
Queue Length 95th (m)	0.8	0.0	7.4	0.8	0.0	7.4	0.8	0.0	7.4
Control Delay (s)	1.3	0.0	14.8	1.3	0.0	14.8	1.3	0.0	14.8
Lane LOS	A	A	B	A	A	B	A	A	B
Approach Delay (s)	1.3	0.0	14.8	1.3	0.0	14.8	1.3	0.0	14.8
Approach LOS	B	B	B	B	B	B	B	B	B
Intersection Summary									
Average Delay	2.6								
Intersection Capacity Utilization	53.1%								
ICU Level of Service	A								
Analysis Period (min)	15								

8: HCM Unsignalized Intersection Capacity Analysis <Total> 2024 Weekday PM Peak Hour
 03-14-2022
 8: Bowmanville Avenue & Shared Stier/MetroInX Laneway

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	6	0	960	881	0
Future Volume (Veh/h)	0	6	0	960	881	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	7	0	1043	958	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type						
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked	0.60	0.79	0.79		117	379
vC, conflicting volume	2001	958	958			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
IC, unblocked vol	1564	818	818			
IC, single (s)	6.4	6.2	4.1			
IC, 2 stage (s)	3.5	3.3	2.2			
p0 queue free %	100	98	100			
CM capacity (veh/h)	73	299	644			
Direction_Lane #	EB 1	NB 1	SB 1			
Volume Total	7	1043	958			
Volume Left	0	0	0			
Volume Right	7	0	0			
cSH	299	1700	1700			
Volume to Capacity	0.02	0.61	0.56			
Queue Length 95th (m)	0.5	0.0	0.0			
Control Delay (s)	17.3	0.0	0.0			
Lane LOS	C					
Approach Delay (s)	17.3	0.0	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay						0.1
Intersection Capacity Utilization						56.4%
Analysis Period (min)						15
ICU Level of Service						B

Timings <Total> 2024 Weekday AM Peak Hour
 03-14-2022
 1: Bowmanville Avenue & Highway 2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	154	638	236	172	741	49	215	311	99	30	519	259
Future Volume (vph)	154	638	236	172	741	49	215	311	99	30	519	259
Turn Type	NA	pm-pt	NA	pm-pt	NA	pm-pt	NA	pm-pt	NA	pm-pt	NA	pm-pt
Protected Phases	5	2	2	6	1	6	3	8				4
Permitted Phases	5	2	2	6	1	6	3	8	8	8	4	4
Detector Phase	5	2	2	6	1	6	3	8	8	8	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	5.0	12.0	12.0	12.0	12.0	12.0
Minimum Split (s)	9.0	28.2	28.2	9.0	28.2	28.2	9.0	26.0	26.0	30.5	30.5	30.5
Total Split (s)	11.0	30.0	30.0	11.0	30.0	30.0	11.0	49.0	49.0	38.0	38.0	38.0
Total Split (%)	12.2%	33.3%	33.3%	12.2%	33.3%	33.3%	12.2%	54.4%	54.4%	42.2%	42.2%	42.2%
Yellow Time (s)	3.0	4.3	4.3	3.0	4.3	4.3	3.0	4.9	4.9	4.9	4.9	4.9
All-Red Time (s)	0.0	1.9	1.9	0.0	1.9	1.9	0.0	1.6	1.6	1.6	1.6	1.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lead	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)	35.0	23.8	23.8	35.0	23.8	23.8	46.0	42.5	42.5	31.5	31.5	31.5
Actuated g/C Ratio	0.39	0.26	0.26	0.39	0.26	0.26	0.51	0.47	0.47	0.35	0.35	0.35
v/C Ratio	0.87	0.83	0.85	0.87	0.85	0.85	1.16	0.90	0.90	0.72	0.72	0.72
Queue Delay	55.4	41.6	41.6	58.7	41.6	41.6	51.0	17.6	17.6	21.9	63.2	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.4	41.6	41.6	58.7	41.6	41.6	51.0	17.6	17.6	21.9	63.2	4.7
LOS	E	D	A	D	E	A	D	B	A	C	E	A
Approach Delay												
Approach LOS												
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 90												
Offset: 0 (0%), Referenced to phase 2EBTL, Start of Green												
Natural Cycle: 90												
Control Type: Actuated-Coordinated												
Maximum v/c Ratio: 0.97												
Intersection Signal Delay: 39.9												
Intersection Capacity Utilization 85.5%												
Analysis Period (min) 15												



1: Bowmanville Avenue & Highway 2

HCM Signalized Intersection Capacity Analysis

<Total> 2024 Weekday AM Peak Hour

03-14-2022

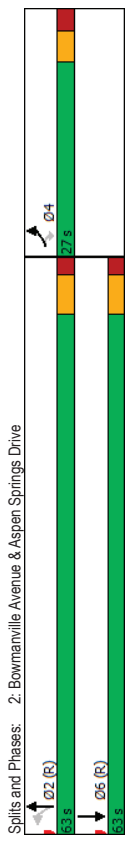
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	154	638	236	172	741	49	215	311	99	30	519	259
Future Volume (vph)	154	638	236	172	741	49	215	311	99	30	519	259
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
Flt Util. Factor	1.00	1.00	0.97	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1587	3147	1344	1586	3174	1253	1547	1562	1474	1445	1601	1360
Flt Permitted	0.17	1.00	1.00	0.21	1.00	1.00	0.17	1.00	1.00	0.52	1.00	1.00
Satd. Flow (perm)	281	3147	1344	359	3174	1253	272	1562	1474	786	1601	1360
Peak-hour factor, PHF	0.79	0.92	0.75	0.81	0.91	0.79	0.95	0.74	0.75	0.75	0.95	0.86
Adj. Flow (vph)	195	693	315	212	814	62	226	420	132	40	546	301
RTOR Reduction (vph)	0	0	218	0	0	46	0	0	70	0	0	167
Lane Group Flow (vph)	195	693	97	212	814	16	226	420	62	40	546	134
Confl. Peds. (#/hr)	2	10	10	10	10	2	15	3	3	3	3	15
Heavy Vehicles (%)	15%	16%	18%	15%	15%	27%	18%	23%	9%	26%	20%	16%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases	5	2	NA	6	6	3	8	8	8	4	4	4
Permitted Phases	2	2	6	6	8	8	8	8	8	4	4	4
Actuated Green, G (s)	31.8	23.8	23.8	31.8	23.8	23.8	42.5	42.5	42.5	31.5	31.5	31.5
Effective Green, g (s)	31.8	23.8	23.8	31.8	23.8	23.8	42.5	42.5	42.5	31.5	31.5	31.5
Actuated G/C Ratio	0.35	0.26	0.26	0.35	0.26	0.26	0.47	0.47	0.47	0.35	0.35	0.35
Clearance Time (s)	3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	215	832	355	235	839	331	241	737	696	275	560	476
v/s Ratio Prot	c0.08	0.22	0.08	c0.26	0.08	c0.08	0.27	0.04	0.05	0.04	0.05	0.10
v/s Ratio Perm	0.24	0.07	0.24	0.01	c0.36	0.01	c0.36	0.04	0.05	0.04	0.05	0.10
v/c Ratio	0.91	0.83	0.27	0.90	0.97	0.05	0.94	0.57	0.09	0.15	0.97	0.28
Uniform Delay, d1	23.3	31.2	26.2	23.8	32.7	24.7	18.8	17.1	13.1	20.0	28.9	21.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.03	0.83	0.77	1.00	1.00	1.00
Incremental Delay, d2	36.6	9.6	1.9	33.6	23.9	0.1	38.1	0.9	0.1	0.2	31.4	0.3
Delay (s)	59.9	40.8	28.1	57.5	56.6	24.7	57.5	15.1	10.1	20.3	60.3	21.4
Level of Service	E	D	C	E	E	C	E	B	B	C	E	C
Approach Delay (s)	40.6	55.0	55.0	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6	26.6
Approach LOS	D	D	D	C	C	C	C	C	C	D	D	D
Intersection Summary												
HCM 2000 Control Delay	42.8 HCM 2000 Level of Service D											
HCM 2000 Volume to Capacity ratio	0.98											
Actuated Cycle Length (s)	90.0 Sum of lost time (s)											
Intersection Capacity Utilization	85.5% ICU Level of Service E											
Analysis Period (min)	15											
c Critical Lane Group												

2: Bowmanville Avenue & Aspen Springs Drive

<Total> 2024 Weekday AM Peak Hour

03-14-2022

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations	↔	↔	↔	↔	↔
Traffic Volume (vph)	183	118	104	431	800
Future Volume (vph)	183	118	104	431	800
Turn Type	Prot	Perm	Perm	NA	NA
Protected Phases	4	4	2	2	6
Permitted Phases	4	4	2	2	6
Detector Phase	4	4	2	2	6
Switch Phase	8.0	8.0	20.0	20.0	20.0
Minimum Initial (s)	24.0	24.0	27.0	27.0	27.0
Minimum Split (s)	27.0	27.0	63.0	63.0	63.0
Total Split (s)	30.0%	30.0%	70.0%	70.0%	70.0%
Yellow Time (s)	3.3	3.3	4.2	4.2	4.2
All-Red Time (s)	2.6	2.6	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	6.3	6.3	6.3
Lead-Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	C-Max	C-Max	C-Max
Act Effct Green (s)	17.8	17.8	60.0	60.0	60.0
Actuated g/C Ratio	0.20	0.20	0.67	0.67	0.67
v/c Ratio	0.77	0.41	0.87	0.47	0.99
Control Delay	49.1	7.9	62.2	6.7	36.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	49.1	7.9	62.2	6.7	36.5
LOS	D	A	E	A	D
Approach Delay	32.2	18.0	36.5	36.5	36.5
Approach LOS	C	B	B	D	D
Intersection Summary					
Cycle Length: 90					
Actuated Cycle Length: 90					
Offset: 0 (0%), Referenced to phase 2:NBT1 and 6:SBT. Start of Green					
Natural Cycle: 90					
Control Type: Actuated-Coordinated					
Maximum v/c Ratio: 0.99					
Intersection Signal Delay: 30.1					
Intersection Capacity Utilization 93.4%					
Analysis Period (min) 15					

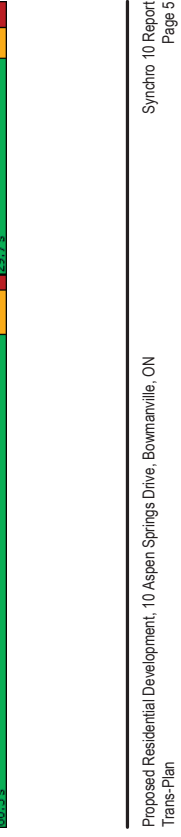


2. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access
 <Total> 2024 Weekday AM Peak Hour
 03-14-2022

3. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access
 <Total> 2024 Weekday AM Peak Hour
 03-14-2022

Movement	EBL	EBR	NBL	NBT	SBR	SBT
Lane Configurations	183	118	104	431	800	138
Traffic Volume (vph)	183	118	104	431	800	138
Future Volume (vph)	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	5.9	5.9	6.3	6.3	6.3	6.3
Total Lost time (s)	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	1.00	1.00	1.00	1.00	0.99	1.00
Fpb. ped/bikes	1.00	0.85	1.00	1.00	0.98	1.00
Frt	0.95	1.00	0.95	1.00	1.00	1.00
Flt Protected	1722	1512	1644	1562	1554	1554
Satd. Flow (prot)	0.95	1.00	0.12	1.00	1.00	1.00
Flt Permitted	1722	1512	216	1562	1554	1554
Satd. Flow (perm)	0.74	0.65	0.83	0.88	0.94	0.75
Peak-hour factor, PHF	261	182	125	490	851	184
Adj. Flow (vph)	0	144	0	0	8	0
RTOR Reduction (vph)	261	38	125	490	1027	0
Lane Group Flow (vph)	9					
Conf. Ped. (#/hr)	9					
Heavy Vehicles (%)	6%, 8%, 11%, 23%, 19%, 23%					
Turn Type	Prot	Perm	Perm	NA	NA	NA
Protected Phases	4					
Permitted Phases	4 2					
Actuated Green, G (s)	17.8 17.8 60.0 60.0 60.0					
Effective Green, g (s)	17.8 17.8 60.0 60.0 60.0					
Actuated g/C Ratio	0.20 0.20 0.67 0.67 0.67					
Clearance Time (s)	5.9 5.9 6.3 6.3 6.3					
Vehicle Extension (s)	3.0 3.0 3.0 3.0 3.0					
Lane Grp Cap (vph)	340 299 144 1041 1036					
v/s Ratio Prot	c0.15					
v/s Ratio Perm	0.03 0.68					
v/c Ratio	0.77 0.13 0.87 0.47 0.99					
Uniform Delay, d1	34.1 29.7 11.9 7.3 14.8					
Progression Factor	1.00 1.00 0.76 0.64 0.97					
Incremental Delay, d2	10.0 0.2 43.1 1.4 19.3					
Delay (s)	44.1 29.9 52.2 6.1 33.6					
Level of Service	D C D A C					
Approach Delay (s)	38.3					
Approach LOS	D B C					
Intersection Summary	Intersection Summary					
HCM 2000 Control Delay	29.3 HCM 2000 Level of Service C					
HCM 2000 Volume to Capacity ratio	0.94					
Actuated Cycle Length (s)	90.0					
Intersection Capacity Utilization	93.4%					
Analysis Period (min)	15					
c Critical Lane Group	F					

Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	21	0	36	1	1	30	512	4	872
Traffic Volume (vph)	21	0	36	1	1	30	512	4	872
Future Volume (vph)	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Turn Type	4								
Protected Phases	4								
Permitted Phases	4 4 4 4 4 2 2 2 2								
Detector Phase	4 4 4 4 4 2 2 2 2								
Switch Phase	8.0 8.0 8.0 8.0 8.0 20.0 20.0 20.0 20.0								
Minimum Initial (s)	23.0 23.0 23.0 23.0 23.0 27.0 27.0 27.0 27.0								
Minimum Split (s)	29.7 29.7 29.7 29.7 29.7 60.3 60.3 60.3 60.3								
Total Split (%)	33.0% 33.0% 33.0% 33.0% 33.0% 67.0% 67.0% 67.0% 67.0%								
Yellow Time (s)	3.3 3.3 3.3 3.3 3.3 4.8 4.8 4.8 4.8								
All-Red Time (s)	3.0 3.0 3.0 3.0 3.0 1.8 1.8 1.8 1.8								
Lost Time Adjust (s)	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0								
Total Lost Time (s)	6.3 6.3 6.3 6.3 6.3 6.6 6.6 6.6 6.6								
Lead-Lag	6.3 6.3 6.3 6.3 6.3 6.6 6.6 6.6 6.6								
Lead-Lag Optimize?	None								
Recall Mode	None								
Act Effct Green (s)	8.5 8.5 8.5 72.8 72.8 72.8 72.8								
Actuated g/C Ratio	0.09 0.09 0.09 0.09 0.09 0.81 0.81 0.81 0.81								
v/c Ratio	0.23 0.26 0.03 0.13 0.48 0.01 0.74								
Control Delay	41.7 15.0 30.3 4.1 5.3 4.2 8.9								
Queue Delay	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0								
Total Delay	41.7 15.0 30.3 4.1 5.3 4.2 8.9								
LOS	D B C A A A A								
Approach Delay	25.5 30.3 5.3 5.3 8.9								
Approach LOS	C C A A								
Intersection Summary	Intersection Summary								
Cycle Length, 90	90								
Actuated Cycle Length: 90	90								
Offset: 0 (0%), Referenced to phase 2:NBSB and 6., Start of Green	0								
Natural Cycle: 80	80								
Control Type: Actuated-Coordinated	Actuated-Coordinated								
Maximum v/c Ratio: 0.74	0.74								
Intersection Signal Delay: 8.3	8.3								
Intersection Capacity Utilization 76.8%	76.8%								
Analysis Period (min) 15	15								



HCM Signalized Intersection Capacity Analysis <Total> 2024 Weekday AM Peak Hour
 3: Bowmannville Avenue & Hartwell Avenue/Existing Condo Access 03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	0	36	1	1	2	30	512	0	4	872	26
Future Volume (vph)	21	0	36	1	1	2	30	512	0	4	872	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.99
Frt	1.00	0.85	0.93	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.99
Flt Protected	0.95	1.00	0.99	1.00	0.99	1.00	1.00	1.00	1.00	0.95	1.00	0.99
Satd. Flow (prot)	1825	1541	1769	1644	1575	1813	1616					
Flt Permitted	0.76	1.00	0.91	1.00	0.91	1.00	0.41	1.00	0.41	1.00	0.41	1.00
Satd. Flow (perm)	1451	1541	1622	1622	1575	1622	786	1616	786	1616	786	1616
Peak-hour factor, PHF	0.68	0.92	0.75	0.82	0.82	0.82	0.88	0.84	0.92	0.92	0.95	0.60
Adj. Flow (vph)	31	0	48	1	1	2	44	610	0	4	918	43
RTOR Reduction (vph)	0	0	44	0	2	0	0	0	0	0	0	1
Lane Group Flow (vph)	0	31	4	0	2	0	44	610	0	4	960	0
Confl. Peds. (#/hr)	0%	0%	6%	0%	0%	0%	11%	22%	0%	0%	18%	17%
Heavy Vehicles (%)	0%	0%	6%	0%	0%	0%	11%	22%	0%	0%	18%	17%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4		4	4		4	2		2		2	
Permitted Phases	4		4	4		4	2		2		2	
Actuated Green, G (s)	6.9	6.9	6.9	6.9	6.9	70.2	70.2	70.2	70.2	70.2	70.2	70.2
Effective Green, g (s)	6.9	6.9	6.9	6.9	6.9	70.2	70.2	70.2	70.2	70.2	70.2	70.2
Actuated G/C Ratio	0.08	0.08	0.08	0.08	0.08	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Clearance Time (s)	6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	111	118	124	124	124	325	1228	613	1260	613	1260	1260
v/s Ratio Prot						0.39						c0.59
v/s Ratio Perm	c0.02	0.00	0.00	0.00	0.11	0.11	0.01	0.01	0.01	0.01	0.01	0.76
v/c Ratio	0.28	0.03	0.02	0.02	0.14	0.50	0.14	0.50	0.14	0.50	0.14	0.76
Uniform Delay, d1	39.2	36.5	38.4	38.4	2.4	3.6	2.2	3.6	2.2	3.6	2.2	5.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.48	1.09	1.09	1.09
Incremental Delay, d2	1.4	0.1	0.1	0.1	0.9	1.4	0.9	1.4	0.9	1.4	0.9	2.0
Level of Service	D	D	D	D	A	A	A	A	A	A	A	A
Approach Delay (s)	39.4				38.5	4.9				7.8		
Approach LOS	D				D	A				A		
Intersection Summary												
HCM 2000 Control Delay	8.2 HCM 2000 Level of Service A											
HCM 2000 Volume to Capacity ratio	0.72											
Actuated Cycle Length (s)	90.0 Sum of lost time (s) 12.9											
Intersection Capacity Utilization	76.8% ICU Level of Service D											
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis <Total> 2024 Weekday AM Peak Hour
 4: Bonnycastle Drive & Aspen Springs Drive 03-14-2022

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	208	22	14	222	41	28
Future Volume (Veh/h)	208	22	14	222	41	28
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	224	24	15	239	44	30
Pedestrians				2		
Lane Width (m)				3.7		
Walking Speed (m/s)				1.1		
Percent Blockage				0		
Right turn flare (veh)				None		
Median type				None		
Median storage (veh)				160		
Upstream signal (m)						
pX, platoon unblocked				250		238
vC, conflicting volume						
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				250		238
IC, single (s)				4.1		6.2
IC, 2 stage (s)				2.2		3.5
p0 queue free %				99		92
p0 capacity (veh/h)				1325		804
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	248	254	74			
Volume Left	0	15	44			
Volume Right	24	0	30			
cSH	1700	1325	609			
Volume to Capacity	0.15	0.01	0.12			
Queue Length 95th (m)	0.0	0.3	3.1			
Control Delay (s)	0.0	0.6	11.7			
Lane LOS	A	B	B			
Approach Delay (s)	0.0	0.6	11.7			
Approach LOS		B				
Intersection Summary						
Average Delay	1.8					
Intersection Capacity Utilization	33.8%					
Analysis Period (min)	15					
ICU Level of Service	A					

5: Fry Crescent (East) & Aspen Springs Drive
 HCM Unsignalized Intersection Capacity Analysis
 <Total> 2024 Weekday AM Peak Hour
 03-14-2022

Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	EB	EB	WB	WB	NB	NB	
Traffic Volume (veh/h)	223	3	4	259	11	8	
Future Volume (Veh/h)	223	3	4	259	11	8	
Sign Control	Free	Free	Free	Free	Stop	Stop	
Grade	0%	0%	0%	0%	0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	242	3	4	282	12	9	
Pedestrians					2	4	
Lane Width (m)					3.7	3.7	
Walking Speed (m/s)					1.1	1.1	
Percent Blockage					0	0	
Right turn flare (veh)					None	None	
Median type					None	None	
Median storage (veh)							
Upstream signal (m)					245		
pX platoon unblocked							
VC, conflicting volume		249			538	250	
VC1, stage 1 conf vol							
VC2, stage 2 conf vol							
VCu, unblocked vol		249			538	250	
IC, single (s)		4.1			6.4	6.2	
IC, 2 stage (s)							
IF (s)		2.2			3.5	3.3	
p0 queue free %		100			98	99	
CM capacity (veh/h)		1323			504	789	
Direction, Lane #	EB 1	WB 1	NB 1	NB 1			
Volume Total	245	286	21				
Volume Left	0	4	12				
Volume Right	3	0	9				
cSH	1700	1323	597				
Volume to Capacity	0.14	0.00	0.04				
Queue Length 95th (m)	0.0	0.1	0.8				
Control Delay (s)	0.0	0.1	11.3				
Lane LOS	A	A	B				
Approach Delay (s)	0.0	0.1	11.3				
Approach LOS		B					
Intersection Summary							
Average Delay		0.5					
Intersection Capacity Utilization		27.5%			ICU Level of Service	A	
Analysis Period (min)		15					

6: Fry Crescent (West) Existing Condo Access & Aspen Springs Drive
 HCM Unsignalized Intersection Capacity Analysis
 <Total> 2024 Weekday AM Peak Hour
 03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Traffic Volume (veh/h)	12	197	1	4	255	10	4	0	9	20	0	21
Future Volume (Veh/h)	12	197	1	4	255	10	4	0	9	20	0	21
Sign Control	Free	Free	Free	Free	Free	Free	Stop	0%	0%	0%	0%	0%
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	13	216	1	4	280	11	4	0	10	22	0	23
Pedestrians							3					8
Lane Width (m)							3.7					3.7
Walking Speed (m/s)							1.1					1.1
Percent Blockage							0					1
Right turn flare (veh)							None					None
Median type							None					None
Median storage (veh)												
Upstream signal (m)												323
pX platoon unblocked												
VC, conflicting volume		299				220	562	562	220	554	548	294
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol		299				220	562	562	220	554	548	294
IC, single (s)		4.1				4.1	7.1	6.5	6.2	7.1	6.5	6.2
IC, 2 stage (s)												
IF (s)		2.2				2.2	3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %		99				100	99	100	99	95	100	97
CM capacity (veh/h)		1264				1357	418	434	823	429	436	745
Direction, Lane #	EB 1	WB 1	NB 1	NB 1	SB 1	SB 1						
Volume Total	230	295	14	45								
Volume Left	13	4	4	22								
Volume Right	1	11	10	23								
cSH	1264	1357	645	548								
Volume to Capacity	0.01	0.00	0.02	0.08								
Queue Length 95th (m)	0.2	0.1	0.5	2.0								
Control Delay (s)	0.5	0.1	10.7	12.2								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.5	0.1	10.7	12.2								
Approach LOS		B		B								
Intersection Summary												
Average Delay				1.5								
Intersection Capacity Utilization				27.9%			ICU Level of Service	A				
Analysis Period (min)				15								

HCM Unsignalized Intersection Capacity Analysis <Total> 2024 Weekday AM Peak Hour
 7: Aspen Springs Drive & 10 Aspen Springs Drive Access 03-14-2022

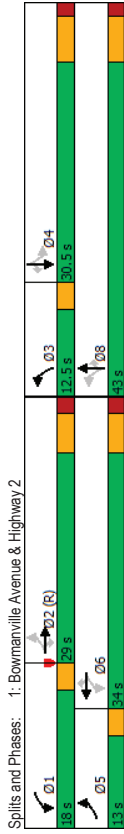
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	226	199	43	81	37
Future Volume (Veh/h)	10	226	199	43	81	37
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	246	216	47	88	40
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type						
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	263				508	240
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	263				508	240
iC, single (s)	4.1				6.4	6.2
iC, 2 stage (s)	2.2				3.5	3.3
p0 queue free %	99				83	95
CM capacity (veh/h)	1301				521	799
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	257	263	128			
Volume Left	11	0	88			
Volume Right	0	47	40			
cSH	1301	1700	584			
Volume to Capacity	0.01	0.15	0.22			
Queue Length 95th (m)	0.2	0.0	6.3			
Control Delay (s)	0.4	0.0	12.9			
Lane LOS	A		B			
Approach Delay (s)	0.4	0.0	12.9			
Approach LOS			B			
Intersection Summary						
Average Delay			2.7			
Intersection Capacity Utilization			33.4%			
ICU Level of Service			A			
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis <Total> 2024 Weekday AM Peak Hour
 8: Bowmanville Avenue & Shared Siter/MetroInfx Laneway 03-14-2022

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	29	0	624	927	0
Future Volume (Veh/h)	0	29	0	624	927	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	32	0	678	1008	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type						
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	0.78	0.72	0.72	117	379	
vC1, stage 1 conf vol	1686	1008	1008			
vC2, stage 2 conf vol						
vCu, unblocked vol	1366	813	813			
iC, single (s)	6.4	6.2	4.1			
iC, 2 stage (s)	3.5	3.3	2.2			
p0 queue free %	100	88	100			
CM capacity (veh/h)	127	271	583			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	32	678	1008			
Volume Left	0	0	0			
Volume Right	32	0	0			
cSH	271	1700	1700			
Volume to Capacity	0.12	0.40	0.59			
Queue Length 95th (m)	3.0	0.0	0.0			
Control Delay (s)	20.1	0.0	0.0			
Lane LOS	C		C			
Approach Delay (s)	20.1	0.0	0.0			
Approach LOS			C			
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			58.8%			
ICU Level of Service			B			
Analysis Period (min)			15			

Timings 03-14-2022
 1: Bowmanville Avenue & Highway 2 <Background> 2029 Weekday AM Peak Hour

EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
176	740	263	250	885	73	227	306	111	37	554	298
176	740	263	250	885	73	227	306	111	37	554	298
pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	NA	Perm	NA
5	2	2	6	6	6	8	8	8	4	4	4
5	2	2	1	6	6	3	8	8	4	4	4
5.0	20.0	20.0	5.0	20.0	20.0	5.0	12.0	12.0	12.0	12.0	12.0
9.0	28.2	28.2	9.0	28.2	28.2	9.0	26.0	26.0	30.5	30.5	30.5
13.0	29.0	29.0	18.0	34.0	34.0	12.5	43.0	43.0	30.5	30.5	30.5
14.4%	32.2%	32.2%	20.0%	37.8%	37.8%	13.9%	47.8%	47.8%	33.9%	33.9%	33.9%
3.0	4.3	4.3	3.0	4.3	4.3	3.0	4.9	4.9	4.9	4.9	4.9
0.0	1.9	1.9	0.0	1.9	1.9	0.0	1.6	1.6	1.6	1.6	1.6
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
None	C-Max	None	None	None	None	None	None	None	None	None	None
38.1	24.5	24.5	45.6	29.1	29.1	38.4	34.9	34.9	22.4	22.4	22.4
0.42	0.27	0.27	0.51	0.32	0.32	0.43	0.39	0.39	0.25	0.25	0.25
0.84	0.94	0.60	0.95	0.19	0.81	0.36	0.22	0.26	0.77	0.61	0.61
47.5	53.0	10.9	50.5	49.8	4.0	37.7	16.5	2.6	30.2	38.9	10.6
47.5	53.0	10.9	50.5	49.8	4.0	37.7	16.5	2.6	30.2	38.9	10.6
D	D	B	D	D	A	D	B	A	C	D	B
41.4			46.9			20.3			28.4		
D	D	D	D	D	D	C	C	C	C	C	C
Intersection Summary											
Cycle Length: 90											
Actuated Cycle Length: 90											
Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green											
Natural Cycle: 90											
Control Type: Actuated-Coordinated											
Maximum v/c Ratio: 0.95											
Intersection Signal Delay: 36.5											
Intersection Capacity Utilization 79.4%											
Analysis Period (min) 15											

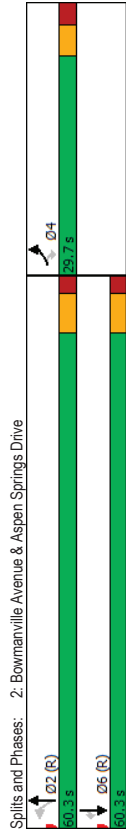


HCM Signalized Intersection Capacity Analysis <Background> 2029 Weekday AM Peak Hour 03-14-2022
 1: Bowmanville Avenue & Highway 2

EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
176	740	263	250	885	73	227	306	111	37	554	298
176	740	263	250	885	73	227	306	111	37	554	298
1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
1587	3147	1344	1587	3174	1266	1544	2968	1474	1445	3042	1360
0.16	1.00	1.00	0.15	1.00	1.00	0.26	1.00	1.00	0.51	1.00	1.00
273	3147	1344	243	3174	1266	415	2968	1474	775	3042	1360
0.79	0.92	0.75	0.81	0.91	0.79	0.95	0.74	0.75	0.75	0.95	0.86
223	804	351	309	973	92	239	414	148	49	583	347
0	0	217	0	0	62	0	0	91	0	0	227
223	804	134	309	973	30	239	414	57	49	583	120
2	10	10	2	15	2	15	3	3	3	3	15
15%	16%	18%	15%	15%	27%	18%	23%	9%	26%	20%	16%
pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm
5	2	2	6	6	6	8	8	8	4	4	4
34.8	24.5	24.5	42.4	29.1	29.1	34.9	34.9	34.9	22.4	22.4	22.4
34.8	24.5	24.5	42.4	29.1	29.1	34.9	34.9	34.9	22.4	22.4	22.4
0.39	0.27	0.27	0.47	0.32	0.32	0.39	0.39	0.39	0.25	0.25	0.25
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5	6.5	6.5
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
255	856	365	336	1026	409	280	1150	571	192	757	338
0.10	0.26	0.10	0.28	0.31	0.09	0.14	0.09	0.14	0.06	0.09	0.19
0.87	0.94	0.37	0.92	0.95	0.07	0.85	0.36	0.10	0.26	0.77	0.36
21.3	32.0	26.5	22.5	29.7	21.1	21.4	19.6	17.6	27.1	31.4	27.9
1.00	1.00	1.00	1.00	1.00	1.00	0.83	0.81	0.58	1.00	1.00	1.00
26.5	19.1	2.8	29.1	16.9	0.1	21.0	0.2	0.1	0.7	4.9	0.6
47.8	51.2	29.3	51.6	46.6	21.2	38.9	16.0	10.2	27.8	36.3	28.5
D	D	C	D	D	C	D	B	B	C	D	C
45.0			46.0			21.8			33.1		
D	D	D	D	D	D	C	C	C	C	C	C
Intersection Summary											
HCM 2000 Control Delay 38.6 HCM 2000 Level of Service D											
HCM 2000 Volume to Capacity ratio 0.96											
Actuated Cycle Length (s) 90.0 Sum of lost time (s) 18.7											
Intersection Capacity Utilization 79.4% ICU Level of Service D											
Analysis Period (min) 15											
c Critical Lane Group											

Timings 2: Bowmanville Avenue & Aspen Springs Drive <Background> 2029 Weekday AM Peak Hour 03-14-2022

	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	148	105	99	495	927	121
Traffic Volume (vph)	148	105	99	495	927	121
Future Volume (vph)	148	105	99	495	927	121
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases	4	4	2	2	6	6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	8.0	8.0	20.0	20.0	20.0	20.0
Minimum Split (s)	24.0	24.0	27.0	27.0	27.0	27.0
Total Split (s)	29.7	29.7	60.3	60.3	60.3	60.3
Total Split (%)	33.0%	33.0%	67.0%	67.0%	67.0%	67.0%
Yellow Time (s)	3.3	3.3	4.2	4.2	4.2	4.2
All-Red Time (s)	2.6	2.6	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	6.3	6.3	6.3	6.3
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	15.7	15.7	62.1	62.1	62.1	62.1
Actuated g/C Ratio	0.17	0.17	0.69	0.69	0.69	0.69
v/c Ratio	0.67	0.45	0.38	0.27	0.47	0.17
Control Delay	45.2	14.2	9.2	5.0	4.8	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.2	14.2	9.2	5.0	4.8	0.7
LOS	D	B	A	A	A	A
Approach Delay	31.3		5.7	4.2		
Approach LOS	C		A	A	A	A
Intersection Summary						
Cycle Length: 90						
Actuated Cycle Length: 90						
Offset: 0 (0%), Referenced to phase 2:NBL and 6:SBT, Start of Green						
Natural Cycle: 60						
Control Type: Actuated-Coordinated						
Maximum v/c Ratio: 0.67						
Intersection Signal Delay: 9.2						
Intersection Capacity Utilization 65.9%						
Analysis Period (min) 15						



HCM Signalized Intersection Capacity Analysis <Background> 2029 Weekday AM Peak Hour 03-14-2022

	EBL	EBR	NBL	NBT	SBT	SBR
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	148	105	99	495	927	121
Traffic Volume (vph)	148	105	99	495	927	121
Future Volume (vph)	148	105	99	495	927	121
Ideal Flow (vphpb)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.9	5.9	6.3	6.3	6.3	6.3
Flow Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Fpb. ped/bikes	1.00	1.00	0.99	1.00	1.00	1.00
Fpb. ped/bikes	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1722	1512	1636	2968	3067	1270
Flt Permitted	0.95	1.00	0.27	1.00	1.00	1.00
Satd. Flow (perm)	1722	1512	460	2968	3067	1270
Peak-Hour factor, PHF	0.74	0.65	0.83	0.88	0.94	0.75
Adj. Flow (vph)	200	162	119	562	986	161
RTOR Reduction (vph)	0	98	0	0	0	50
Lane Group Flow (vph)	200	64	119	563	986	111
Confl. Peds. (#/hr)			9			9
Heavy Vehicles (%)	6%	8%	11%	23%	19%	23%
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases	4	4	2	2	6	6
Actuated Green, G (s)	15.7	15.7	62.1	62.1	62.1	62.1
Effective Green, g (s)	15.7	15.7	62.1	62.1	62.1	62.1
Actuated g/C Ratio	0.17	0.17	0.69	0.69	0.69	0.69
Clearance Time (s)	5.9	5.9	6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	300	263	317	2047	2116	876
v/s Ratio Prot	c0.12		0.19	c0.32		
v/s Ratio Perm	0.67	0.24	0.38	0.28	0.47	0.13
Uniform Delay, d1	34.7	32.0	5.8	5.3	6.4	4.7
Progression Factor	1.00	1.00	0.75	0.78	0.61	0.37
Incremental Delay, d2	5.5	0.5	3.3	0.3	0.5	0.2
Delay (s)	40.2	32.5	7.6	4.5	4.4	1.9
Level of Service	D	C	A	A	A	A
Approach Delay (s)	36.8		5.0	4.0		
Approach LOS	D		A	A	A	A
Intersection Summary						
HCM 2000 Control Delay	9.8					
HCM 2000 Volume to Capacity ratio	0.51					
Actuated Cycle Length (s)	90.0					
Intersection Capacity Utilization	65.9%					
Analysis Period (min)	15					
c Critical Lane Group	A					

Timings
3. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

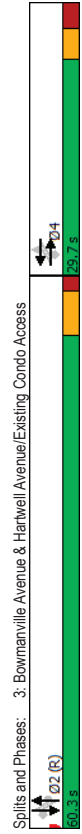
HCM Signalized Intersection Capacity Analysis <Background> 2029 Weekday AM Peak Hour
3. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

03-14-2022

03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	23	0	40	1	1	33	569	5	1008	29
Future Volume (vph)	23	0	40	1	1	33	569	5	1008	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98
Fibb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.89
Frt	1.00	0.85	0.93	1.00	1.00	1.00	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.99	1.00	0.99	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1541	1769	1643	2992	1643	2992	1812	3093	1363
Flt Permitted	0.76	1.00	0.91	0.26	1.00	0.26	1.00	0.39	1.00	1.00
Satd. Flow (perm)	1451	1541	1622	451	2992	451	2992	762	3093	1363
Peak-Hour factor, PHF	0.68	0.92	0.75	0.82	0.82	0.68	0.84	0.92	0.92	0.60
Adj. Flow (vph)	34	0	53	1	1	2	49	677	0	5
RTOR Reduction (vph)	0	0	49	0	2	0	0	0	0	0
Lane Group Flow (vph)	0	34	4	0	2	0	49	677	0	5
Confl. Peds. (#/hr)	0%	0%	6%	0%	0%	11%	22%	0%	0%	18%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	17%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4			4			2			2
Permitted Phases	4		4	4		2	2		2	2
Actuated Green, G (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Effective Green, g (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Actuated g/C Ratio	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Clearance Time (s)	6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	112	119	126	126	351	2330	585	2409	1061	1061
v/s Ratio Phot					0.23					0.34
v/s Ratio Perm	c0.02	0.00	0.00	0.00	0.11	0.14	0.29	0.01	0.01	0.04
v/c Ratio	0.30	0.03	0.02	0.02	0.14	0.29	0.01	0.01	0.01	0.04
Uniform Delay, d1	39.2	38.4	38.3	38.3	2.5	2.8	2.2	3.3	2.3	2.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.73	0.54	0.49
Incremental Delay, d2	1.5	0.1	0.1	0.1	0.8	0.3	0.0	0.5	0.1	0.1
Delay (s)	40.7	38.5	38.4	38.4	3.3	3.2	1.6	2.4	1.2	1.2
Level of Service	D	D	D	D	A	A	A	A	A	A
Approach Delay (s)	39.4		38.4		3.2		2.3			
Approach LOS	D		D		A		A			
Intersection Summary										
HCM 2000 Control Delay	4.4 HCM 2000 Level of Service A									
HCM 2000 Volume to Capacity ratio	0.43									
Actuated Cycle Length (s)	90.0									
Intersection Capacity Utilization	57.2% ICU Level of Service B									
Analysis Period (min)	15									
c Critical Lane Group										

Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	23	0	40	1	1	33	569	5	1008	29
Future Volume (vph)	23	0	40	1	1	33	569	5	1008	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98
Fibb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.89
Frt	1.00	0.85	0.93	1.00	1.00	1.00	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.99	1.00	0.99	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1541	1769	1643	2992	1643	2992	1812	3093	1363
Flt Permitted	0.76	1.00	0.91	0.26	1.00	0.26	1.00	0.39	1.00	1.00
Satd. Flow (perm)	1451	1541	1622	451	2992	451	2992	762	3093	1363
Peak-Hour factor, PHF	0.68	0.92	0.75	0.82	0.82	0.68	0.84	0.92	0.92	0.60
Adj. Flow (vph)	34	0	53	1	1	2	49	677	0	5
RTOR Reduction (vph)	0	0	49	0	2	0	0	0	0	0
Lane Group Flow (vph)	0	34	4	0	2	0	49	677	0	5
Confl. Peds. (#/hr)	0%	0%	6%	0%	0%	11%	22%	0%	0%	18%
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	17%
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	4			4			2			2
Permitted Phases	4		4	4		2	2		2	2
Actuated Green, G (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Effective Green, g (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Actuated g/C Ratio	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Clearance Time (s)	6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	112	119	126	126	351	2330	585	2409	1061	1061
v/s Ratio Phot					0.23					0.34
v/s Ratio Perm	c0.02	0.00	0.00	0.00	0.11	0.14	0.29	0.01	0.01	0.04
v/c Ratio	0.30	0.03	0.02	0.02	0.14	0.29	0.01	0.01	0.01	0.04
Uniform Delay, d1	39.2	38.4	38.3	38.3	2.5	2.8	2.2	3.3	2.3	2.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.73	0.54	0.49
Incremental Delay, d2	1.5	0.1	0.1	0.1	0.8	0.3	0.0	0.5	0.1	0.1
Delay (s)	40.7	38.5	38.4	38.4	3.3	3.2	1.6	2.4	1.2	1.2
Level of Service	D	D	D	D	A	A	A	A	A	A
Approach Delay (s)	39.4		38.4		3.2		2.3			
Approach LOS	D		D		A		A			
Intersection Summary										
HCM 2000 Control Delay	4.4 HCM 2000 Level of Service A									
HCM 2000 Volume to Capacity ratio	0.43									
Actuated Cycle Length (s)	90.0									
Intersection Capacity Utilization	57.2% ICU Level of Service B									
Analysis Period (min)	15									
c Critical Lane Group										



HCM Unsignalized Intersection Capacity Analysis<Background> 2029 Weekday AM Peak Hour
 4: Bonnycastle Drive & Aspen Springs Drive 03-14-2022

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	WB	WB	NB	NB
Traffic Volume (veh/h)	223	24	15	205	45	30
Future Volume (Veh/h)	223	24	15	205	45	30
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.93	0.93	0.83	0.93	0.93	0.93
Hourly flow rate (vph)	240	26	16	220	48	32
Pedestrians					2	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)					None	
Median type					None	
Median storage (veh)					160	
Upstream signal (m)					160	
pX, platoon unblocked					268	507
VC, conflicting volume					268	507
VC1, stage 1 conf vol					268	507
VC2, stage 2 conf vol					4.1	6.4
VCu, unblocked vol					2.2	3.5
IC, single (s)					99	91
IC, 2 stage (s)					1305	521
p0 queue free %					100	97
CM capacity (veh/h)					1308	504
Direction, Lane #	EB 1	WB 1	NB 1	NB 1		
Volume Total	266	236	80			
Volume Left	0	16	48			
Volume Right	26	0	32			
cSH	1700	1305	603			
Volume to Capacity	0.16	0.01	0.13			
Queue Length 95th (m)	0.0	0.3	3.5			
Control Delay (s)	0.0	0.6	11.9			
Lane LOS	A	A	B			
Approach Delay (s)	0.0	0.6	11.9			
Approach LOS		B				
Intersection Summary						
Average Delay			1.9			
Intersection Capacity Utilization			34.1%			ICU Level of Service A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis<Background> 2029 Weekday AM Peak Hour
 5: Fry Crescent (East) & Aspen Springs Drive 03-14-2022

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	WB	WB	NB	NB
Traffic Volume (veh/h)	235	4	5	245	12	9
Future Volume (Veh/h)	235	4	5	245	12	9
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	255	4	5	266	13	10
Pedestrians					2	4
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)					None	
Median type					None	
Median storage (veh)					245	
Upstream signal (m)					245	
pX, platoon unblocked					263	537
VC, conflicting volume					263	537
VC1, stage 1 conf vol					263	537
VC2, stage 2 conf vol					4.1	6.4
VCu, unblocked vol					2.2	3.5
IC, single (s)					100	97
IC, 2 stage (s)					1308	504
p0 queue free %					100	97
CM capacity (veh/h)					1308	504
Direction, Lane #	EB 1	WB 1	NB 1	NB 1		
Volume Total	259	271	23			
Volume Left	0	5	13			
Volume Right	4	0	10			
cSH	1700	1308	595			
Volume to Capacity	0.15	0.00	0.04			
Queue Length 95th (m)	0.0	0.1	0.9			
Control Delay (s)	0.0	0.2	11.3			
Lane LOS	A	A	B			
Approach Delay (s)	0.0	0.2	11.3			
Approach LOS		B				
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			27.5%			ICU Level of Service A
Analysis Period (min)			15			

6: Fry Crescent (West)/Existing Condo Access & Aspen Springs Drive
03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	207	1	5	241	11	5	0	10	22	0	23
Future Volume (Veh/h)	13	207	1	5	241	11	5	0	10	22	0	23
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	14	227	1	5	265	12	5	0	11	24	0	25
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (m)												
pX platoon unblocked												
VC, conflicting volume	285			231			564	554	230	556	548	279
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCu, unblocked vol	285			231			564	554	230	556	548	279
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			99	100	99	94	100	97
CM capacity (veh/h)	1279			1345			415	432	811	427	435	759
Direction_Lane #	EB 1	WB 1	NB 1	SB 1	EB 1	WB 1	NB 1	SB 1	EB 1	WB 1	NB 1	SB 1
Volume Total	242	282	16	49								
Volume Left	14	5	5	24								
Volume Right	1	12	11	25								
cSH	1279	1345	625	550								
Volume to Capacity	0.01	0.00	0.03	0.09								
Queue Length 95th (m)	0.3	0.1	0.6	2.2								
Control Delay (s)	0.5	0.2	10.9	12.2								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.5	0.2	10.9	12.2								
Approach LOS	B	B	B	B								
Intersection Summary												
Average Delay	1.6											
Intersection Capacity Utilization	28.6%											
ICU Level of Service	A											
Analysis Period (min)	15											

7: Aspen Springs Drive & 10 Aspen Springs Drive Access
03-14-2022

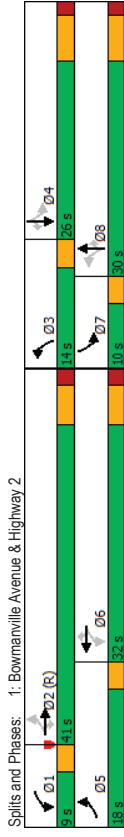
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBT	SBR
Lane Configurations									
Traffic Volume (veh/h)	0	253	219	0	0	0	0	0	0
Future Volume (Veh/h)	0	253	219	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	275	238	0	0	0	0	0	0
Pedestrians									
Lane Width (m)									
Walking Speed (m/s)									
Percent Blockage									
Right turn flare (veh)									
Median type									
Median storage (veh)									
Upstream signal (m)									
pX platoon unblocked									
VC, conflicting volume	238						513	238	
VC1, stage 1 conf vol									
VC2, stage 2 conf vol									
VCu, unblocked vol	238						513	238	
IC, single (s)	4.1						6.4	6.2	
IC, 2 stage (s)									
IF (s)	2.2						3.5	3.3	
p0 queue free %	100						100	100	
CM capacity (veh/h)	1329						521	801	
Direction_Lane #	EB 1	WB 1	SB 1	EB 1	WB 1	SB 1	EB 1	WB 1	SB 1
Volume Total	275	238	0						
Volume Left	0	0	0						
Volume Right	0	0	0						
cSH	1329	1700	1700						
Volume to Capacity	0.00	0.14	0.00						
Queue Length 95th (m)	0.0	0.0	0.0						
Control Delay (s)	0.0	0.0	0.0						
Lane LOS	A	A	A						
Approach Delay (s)	0.0	0.0	0.0						
Approach LOS	A	A	A						
Intersection Summary									
Average Delay	0.0								
Intersection Capacity Utilization	16.6%								
ICU Level of Service	A								
Analysis Period (min)	15								

8: HCM Unsignalized Intersection Capacity Analysis<Background> 2029 Weekday AM Peak Hour
 03-14-2022

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	643	1059	8
Future Volume (Veh/h)	0	0	0	643	1059	8
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	699	1151	9
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				117	379	
pX platoon unblocked	0.92	0.90	0.90			
vC, conflicting volume	1505	580	1160			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCn, unblocked vol	1185	323	964			
IC, single (s)	6.8	6.9	4.1			
IC, 2 stage (s)						
IF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
CM capacity (veh/h)	168	608	641			
Direction_Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	0	350	350	767	393	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	9	
cSH	1700	1700	1700	1700	1700	
Volume to Capacity	0.00	0.21	0.21	0.45	0.23	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	
Lane LOS	A	A	A	A	A	
Approach Delay (s)	0.0	0.0	0.0	0.0	0.0	
Approach LOS	A	A	A	A	A	
Intersection Summary						
Average Delay	0.0					
Intersection Capacity Utilization	32.9%					
ICU Level of Service	A					
Analysis Period (min)	15					

1: Bowmansville Avenue & Highway 2
 <Background> 2029 Weekday PM Peak Hour
 03-14-2022

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	335	1353	365	183	1062	81	311	514	251	118	382	269
Future Volume (vph)	335	1353	365	183	1062	81	311	514	251	118	382	269
Turn Type	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm	pm-pt	NA	Perm
Protected Phases	5	2	2	1	6	6	3	8	8	7	4	4
Permitted Phases	5	2	2	1	6	6	3	8	8	7	4	4
Detector Phase												
Switch Phase												
Minimum Initial (s)	4.5	20.0	20.0	4.5	20.0	20.0	4.5	12.0	12.0	5.0	12.0	12.0
Minimum Split (s)	9.0	28.2	28.2	9.0	28.2	28.2	9.0	27.0	27.0	9.0	24.5	24.5
Total Split (s)	18.0	41.0	41.0	9.0	32.0	32.0	14.0	30.0	30.0	10.0	26.0	26.0
Total Split (%)	20.0%	45.6%	45.6%	10.0%	35.6%	35.6%	15.6%	33.3%	33.3%	11.1%	28.9%	28.9%
Yellow Time (s)	3.0	4.3	4.3	3.0	4.3	4.3	3.0	4.9	4.9	3.0	4.9	4.9
All-Red Time (s)	0.0	1.9	1.9	0.0	1.9	1.9	0.0	1.6	1.6	0.0	1.6	1.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	3.0	6.5	6.5
Lead/Lag	Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)	47.9	34.8	34.8	38.5	27.8	27.8	35.5	22.0	22.0	28.5	18.0	18.0
Actuated g/C Ratio	0.53	0.39	0.39	0.43	0.31	0.31	0.39	0.24	0.24	0.32	0.20	0.20
v/C Ratio	0.89	1.15	1.15	0.99	1.11	1.11	0.79	0.59	0.59	0.86	0.73	0.61
Control Delay	47.1	105.3	111.2	82.6	95.4	95.4	63.8	27.3	27.3	10.3	34.0	41.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.1	105.3	111.2	82.6	95.4	95.4	63.8	27.3	27.3	10.3	34.0	41.2
LOS	D	F	B	F	F	F	A	E	C	B	C	D
Approach Delay	77.9						86.8			28.9		
Approach LOS	E						F			C		
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 90												
Offset: 0 (0%), Referenced to phase 2EBTL, Start of Green												
Natural Cycle: 100												
Control Type: Actuated-Coordinated												
Maximum v/C Ratio: 1.15												
Intersection Signal Delay: 63.0												
Intersection Capacity Utilization 94.7%												
ICU Level of Service F												
Analysis Period (min) 15												



1: Bowmerville Avenue & Highway 2

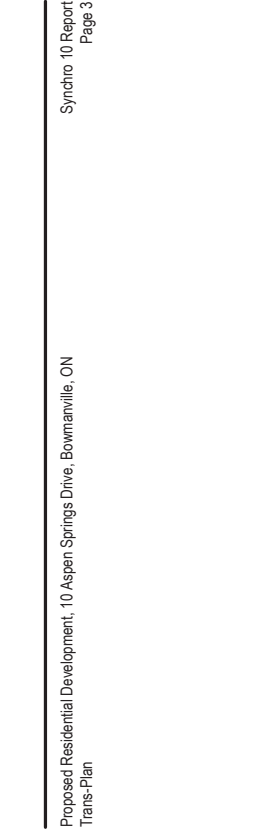
2: Bowmerville Avenue & Aspen Springs Drive

03-14-2022 <Background> 2029 Weekday PM Peak Hour

03-14-2022 <Background> 2029 Weekday PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	335	1353	365	183	1062	81	311	514	251	118	382	269
Future Volume (vph)	335	1353	365	183	1062	81	311	514	251	118	382	269
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	3.0	6.5	6.5	6.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	2200	3202	1356	1630	3230	1340	1596	3042	1409	1572	3042	1384
Flt Permitted	0.13	1.00	1.00	0.14	1.00	1.00	0.32	1.00	1.00	0.35	1.00	1.00
Satd. Flow (perm)	215	3202	1356	247	3230	1340	545	3042	1409	455	3042	1384
Peak-hour factor, PHF	0.87	0.95	0.90	0.84	0.96	0.82	0.91	0.88	0.87	0.78	0.86	0.84
Adj. Flow (vph)	385	1424	406	218	1106	99	342	584	289	151	444	320
RTOR Reduction (vph)	0	0	164	0	0	68	0	0	149	0	0	250
Lane Group Flow (vph)	385	1424	242	218	1106	31	342	584	140	151	444	70
Confl. Peds. (#/hr)	2	10	10	10	10	2	15	3	3	3	3	15
Heavy Vehicles (%)	16%	14%	17%	12%	13%	20%	14%	20%	14%	16%	20%	14%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2	2	6	6	8	8	8	8	8	4	4	4
Actuated Green, G (s)	45.3	34.8	34.8	35.3	27.8	27.8	32.0	22.0	22.0	25.0	18.0	18.0
Effective Green, g (s)	45.3	34.8	34.8	35.3	27.8	27.8	32.0	22.0	22.0	25.0	18.0	18.0
Actuated G/C Ratio	0.30	0.39	0.39	0.31	0.31	0.31	0.36	0.24	0.24	0.28	0.20	0.20
Clearance Time (s)	3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	3.0	6.5	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	428	1238	524	212	997	413	322	743	344	213	608	276
v/s Ratio Prot	60.14	c0.44		c0.09	0.34		c0.13	0.19		0.06	0.15	
v/s Ratio Perm	0.31	1.15	0.46	1.03	1.11	1.07	1.06	0.79	0.41	0.71	0.73	0.25
Uniform Delay, d1	26.7	27.6	20.6	24.1	31.1	22.0	26.2	31.8	28.5	26.1	33.7	30.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.60	0.63	0.58	1.00	1.00	1.00
Incremental Delay, d2	21.1	77.3	2.9	69.4	63.4	0.1	64.4	4.9	0.7	10.3	4.5	0.5
Delay (s)	47.9	104.9	23.5	93.4	94.5	22.1	80.2	24.8	17.4	36.4	38.2	30.8
Level of Service	D	F	C	F	C	F	C	F	B	D	D	C
Approach Delay (s)	80.1			89.3			38.7				35.3	
Approach LOS	F			F			D				D	
Intersection Summary												
HCM 2000 Control Delay	66.5 HCM 2000 Level of Service E											
HCM 2000 Volume to Capacity ratio	1.15											
Actuated Cycle Length (s)	90.0 Sum of lost time (s) 18.7											
Intersection Capacity Utilization	94.7% ICU Level of Service F											
Analysis Period (min)	15											
c Critical Lane Group												

Lane Group	EBL	EBR	NBL	NBT	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	196	101	116	880	761	147	147
Future Volume (vph)	196	101	116	880	761	147	147
Turn Type	Prot	Perm	Perm	NA	NA	Perm	Perm
Protected Phases	4			2	2	6	
Permitted Phases	4	4	2	2	2	6	6
Detector Phase	4	4	2	2	2	6	6
Switch Phase							
Minimum Initial (s)	8.0	8.0	20.0	20.0	20.0	20.0	20.0
Minimum Split (s)	24.0	24.0	27.0	27.0	27.0	27.0	27.0
Total Split (s)	32.4	32.4	57.6	57.6	57.6	57.6	57.6
Total Split (%)	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.3	3.3	4.2	4.2	4.2	4.2	4.2
All-Red Time (s)	2.6	2.6	2.1	2.1	2.1	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	6.3	6.3	6.3	6.3	6.3
Lead-Lag							
Lead-Lag Optimize?							
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	19.0	19.0	58.8	58.8	58.8	58.8	58.8
Actuated g/C Ratio	0.21	0.21	0.65	0.65	0.65	0.65	0.65
v/c Ratio	0.73	0.35	0.38	0.52	0.40	0.22	0.22
Control Delay	44.4	6.8	10.1	9.2	5.1	0.7	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.4	6.8	10.1	9.2	5.1	0.7	0.7
LOS	D	A	B	A	A	A	A
Approach Delay	30.6		9.3	4.2			
Approach LOS	C		A	A			
Intersection Summary							
Cycle Length, 90							
Actuated Cycle Length, 90							
Offset, 0 (0%), Referenced to phase 2:NBLT and 6:SBT, Start of Green							
Natural Cycle, 60							
Control Type, Actuated-Coordinated							
Maximum v/c Ratio: 0.73							
Intersection Signal Delay: 10.8	Intersection LOS: B						
Intersection Capacity Utilization 64.0%	ICU Level of Service B						
Analysis Period (min) 15							



Splits and Phases: 2: Bowmerville Avenue & Aspen Springs Drive

↑ D02 (R) 57.6 s

↑ D04 37.4 s

↓ D06 (R) 57.6 s

2. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access
 HCM Signalized Intersection Capacity Analysis <Background> 2029 Weekday PM Peak Hour
 03-14-2022

Movement	EBL	EBR	NBL	NBT	SBL	SBR
Lane Configurations	EBL	EBR	NBL	NBT	SBL	SBR
Traffic Volume (vph)	196	101	116	880	761	147
Future Volume (vph)	196	101	116	880	761	147
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.9	5.9	6.3	6.3	6.3	6.3
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96
Fpb. ped/bikes	1.00	1.00	0.89	1.00	1.00	1.00
Ft	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1722	1512	1633	2968	3067	1270
Flt Permitted	0.95	1.00	0.33	1.00	1.00	1.00
Satd. Flow (perm)	1722	1512	560	2968	3067	1270
Peak-hour factor, PHF	0.74	0.65	0.83	0.88	0.94	0.75
Adj. Flow (vph)	265	155	140	1000	810	196
RTOR Reduction (vph)	0	122	0	0	0	68
Lane Group Flow (vph)	265	33	140	1000	810	128
Confl. Peds. (#/hr)	6	8%	11%	23%	19%	23%
Heavy Vehicles (%)	6	8%	11%	23%	19%	23%
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases	4	2	2	2	6	6
Actuated Green, G (s)	19.0	19.0	58.8	58.8	58.8	58.8
Effective Green, g (s)	19.0	19.0	58.8	58.8	58.8	58.8
Actuated G/C Ratio	0.21	0.21	0.65	0.65	0.65	0.65
Clearance Time (s)	5.9	5.9	6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	363	319	365	1939	2003	829
v/s Ratio Prot	0.15			0.34	0.26	
v/s Ratio Perm	0.73	0.10	0.38	0.52	0.40	0.15
v/c Ratio	33.1	28.6	7.2	8.2	7.3	6.0
Uniform Delay, d1	1.00	1.00	0.94	0.96	0.57	0.25
Progression Factor	7.4	0.1	1.3	0.4	0.4	0.3
Incremental Delay, d2	40.5	28.8	8.0	8.3	4.6	1.8
Level of Service	D	C	A	A	A	A
Approach Delay (s)	36.1			8.2	4.0	
Approach LOS	D			A	A	
Intersection Summary						
HCM 2000 Control Delay			11.2	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio			0.57			
Actuated Cycle Length (s)			90.0	Sum of lost time (s)	12.2	
Intersection Capacity Utilization			64.0%	ICU Level of Service	B	
Analysis Period (min)			15			
c Critical Lane Group						

3. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access
 Timings <Background> 2029 Weekday PM Peak Hour
 03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Traffic Volume (vph)	39	0	69	4	2	84	950	5	819	52
Future Volume (vph)	39	0	69	4	2	84	950	5	819	52
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4			8			2		6	
Permitted Phases	4	4	4	8	8	2	2	6	6	6
Detector Phase	4	4	4	8	8	2	2	6	6	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead-Lag										
Lead-Lag Optimize?										
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
v/c Ratio	0.10	0.14	0.02	0.73	0.95	0.03	0.70	0.15	0.15	0.15
Control Delay	9.1	5.0	6.4	43.7	32.4	12.6	21.9	6.7	6.7	6.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.1	5.0	6.4	43.7	32.4	12.6	21.9	6.7	6.7	6.7
LOS	A	A	A	D	C	B	C	A	A	A
Approach Delay	6.6	6.4	6.4	33.6	20.5					
Approach LOS	A	A	A	C	C					
Intersection Summary										
Cycle Length, 45										
Actuated Cycle Length, 45										
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green										
Natural Cycle: 55										
Control Type: Pretimed										
Maximum v/c Ratio: 0.95										
Intersection Signal Delay: 26.4										
Intersection Capacity Utilization 47.6%										
Analysis Period (min) 15										



3. Bowmannville Avenue & Hartwell Avenue/Existing Condo Access

4. Bonnycastle Drive & Aspen Springs Drive

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	0	69	4	2	7	84	950	4	5	819	52
Future Volume (veh/h)	39	0	69	4	2	7	84	950	4	5	819	52
Ideal Flow (vehph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	0.95	1.00	0.98	1.00	0.98	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1825	1541	1748	1644	2992	1823	3093	1366	1823	3093	1366	1366
Flt Permitted	0.75	1.00	0.95	1.00	0.95	1.00	0.24	1.00	0.22	1.00	0.22	1.00
Satd. Flow (perm)	1435	1541	1688	1688	423	2992	426	3093	426	3093	1366	1366
Peak-hour factor, PHF	0.68	0.92	0.75	0.82	0.82	0.82	0.68	0.84	0.92	0.92	0.95	0.60
Adj. Flow (vph)	57	0	92	5	2	9	124	1131	4	5	862	87
RTOR Reduction (vph)	0	0	37	0	5	0	0	1	0	0	0	52
Lane Group Flow (vph)	0	57	55	0	11	0	124	1134	0	5	862	35
Conf. Ped. (#/hr)	0%	0%	6%	0%	0%	0%	11%	22%	0%	0%	18%	17%
Heavy Vehicles (%)	0%	0%	6%	0%	0%	0%	11%	22%	0%	0%	18%	17%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4			8		2				6		6
Permitted Phases	4		4	8		2				6		6
Actuated Green, G (s)	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Effective Green, g (s)	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Actuated G/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lane Grp Cap (vph)	574	616	675	675	1196	169	1196	170	1237	546	1237	546
v/s Ratio Prot	c0.04	0.04	0.01	0.01	0.29	0.29	0.01	0.01	0.01	0.01	0.28	0.03
v/s Ratio Perm	0.10	0.09	0.02	0.02	0.73	0.95	0.03	0.70	0.06	0.06	0.70	0.06
Uniform Delay, d1	8.4	8.4	8.2	8.2	11.5	13.1	8.2	11.2	8.3	8.2	11.2	8.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.46	1.65	2.97	1.46	1.65	2.97
Incremental Delay, d2	0.3	0.3	0.0	0.0	24.4	16.3	0.3	3.1	0.2	0.3	3.1	0.2
Delay (s)	8.8	8.7	8.2	8.2	35.9	29.3	12.3	21.6	24.9	12.3	21.6	24.9
Level of Service	A	A	A	A	D	C	B	C	C	B	C	C
Approach Delay (s)	8.7		8.2		30.0		12.3		21.6	12.3		24.9
Approach LOS	A		A		C		B		C	B		C
Intersection Summary												
HCM 2000 Control Delay	25.2 HCM 2000 Level of Service C											
HCM 2000 Volume to Capacity ratio	0.52											
Actuated Cycle Length (s)	45.0 Sum of lost time (s)											
Intersection Capacity Utilization	47.6% ICU Level of Service A											
Analysis Period (min)	15											
c Critical Lane Group												

4. Bonnycastle Drive & Aspen Springs Drive

Movement	EBT	EBR	WBL	WBR	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	269	49	33	230	49	28
Future Volume (Veh/h)	269	49	33	230	49	28
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	289	53	35	247	53	30
Pedestrians					2	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)	None	None	None	None	None	None
Median type						
Median storage (veh)						
Upstream signal (m)					160	
pX platoon unblocked						
vC, conflicting volume		344			634	318
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol		344			634	318
iC, single (s)		4.1			6.4	6.2
iC, 2 stage (s)		2.2			3.5	3.3
p0 queue free %		97			88	96
qM capacity (veh/h)		1224			433	726
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	342	282	83			
Volume Left	0	35	53			
Volume Right	63	0	30			
cSH	1700	1224	507			
Volume to Capacity	0.20	0.03	0.16			
Queue Length 95th (m)	0.0	0.7	4.4			
Control Delay (s)	0.0	1.2	13.5			
Lane LOS	A	A	B			
Approach Delay (s)	0.0	1.2	13.5			
Approach LOS		B				
Intersection Summary						
Average Delay	2.1					
Intersection Capacity Utilization	45.5% ICU Level of Service A					
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis<Background> 2029 Weekday PM Peak Hour
 5. Fry Crescent (East) & Aspen Springs Drive

03-14-2022

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	WB	WB	NB	NB
Traffic Volume (veh/h)	291	16	13	267	9	10
Future Volume (Veh/h)	291	16	13	267	9	10
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	316	17	14	290	10	11
Pedestrians					2	4
Lane Width (m)					3.7	3.7
Walking Speed (m/s)					1.1	1.1
Percent Blockage					0	0
Right turn flare (veh)					None	None
Median type					None	None
Median storage (veh)						
Upstream signal (m)					245	
pX, platoon unblocked						
VC, conflicting volume			337		646	330
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol			337		646	330
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			99		98	98
CM capacity (veh/h)			1229		432	711
Direction_Lane #	EB 1	WB 1	NB 1			
Volume Total	333	304	21			
Volume Left	0	14	10			
Volume Right	17	0	11			
cSH	1700	1229	544			
Volume to Capacity	0.20	0.01	0.04			
Queue Length 95th (m)	0.0	0.3	0.9			
Control Delay (s)	0.0	0.5	11.9			
Lane LOS	A	A	B			
Approach Delay (s)	0.0	0.5	11.9			
Approach LOS		B				
Intersection Summary						
Average Delay		0.6				
Intersection Capacity Utilization		35.3%			ICU Level of Service	A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis<Background> 2029 Weekday PM Peak Hour
 6. Fry Crescent (West)/Existing Condo Access & Aspen Springs Drive

03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	NB	NB
Traffic Volume (veh/h)	17	288	18	9	230	37	10	1	2	18	0	10
Future Volume (Veh/h)	17	288	18	9	230	37	10	1	2	18	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	0%	0%	0%	0%	0%
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	19	316	20	10	253	41	11	1	2	20	0	11
Pedestrians								3			8	
Lane Width (m)								3.7			3.7	
Walking Speed (m/s)								1.1			1.1	
Percent Blockage								0			1	
Right turn flare (veh)								None			None	
Median type								None			None	
Median storage (veh)												
Upstream signal (m)								323				
pX, platoon unblocked												
VC, conflicting volume								339		672	689	678
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCU, unblocked vol								339		672	689	678
IC, single (s)								4.1		7.1	6.5	7.1
IC, 2 stage (s)												
IF (s)								2.2		3.5	4.0	3.3
p0 queue free %								99		97	100	94
CM capacity (veh/h)								1261		357	359	715
Direction_Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	355	304	14	31								
Volume Left	19	10	11	20								
Volume Right	20	41	2	11								
cSH	1261	1228	384	443								
Volume to Capacity	0.02	0.01	0.04	0.07								
Queue Length 95th (m)	0.3	0.2	0.9	1.7								
Control Delay (s)	0.6	0.3	14.7	13.7								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.6	0.3	14.7	13.7								
Approach LOS		B	B	B								
Intersection Summary												
Average Delay			1.3									
Intersection Capacity Utilization			33.5%							ICU Level of Service		A
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis<Background> 2029 Weekday PM Peak Hour
 7: Aspen Springs Drive & 10 Aspen Springs Drive Access

03-14-2022



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		←	←	←	←	←
Traffic Volume (veh/h)	0	297	263	0	0	0
Future Volume (Veh/h)	0	297	263	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	323	286	0	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None	None	None	None
Median storage (veh)						
Upstream signal (m)			79			
pX platoon unblocked					609	286
VC, conflicting volume	286					
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol	286				609	286
IC, single (s)	4.1				6.4	6.2
IC, 2 stage (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
CM capacity (veh/h)	1276				458	753
Direction_Lane #	EB 1	WB 1	SB 1			
Volume Total	323	286	0			
Volume Left	0	0	0			
Volume Right	0	0	0			
cSH	1276	1700	1700			
Volume to Capacity	0.00	0.17	0.00			
Queue Length 95th (m)	0.0	0.0	0.0			
Control Delay (s)	0.0	0.0	0.0			
Lane LOS	A	A	A			
Approach Delay (s)	0.0	0.0	0.0			
Approach LOS	A	A	A			
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization		19.0%			ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis<Background> 2029 Weekday PM Peak Hour
 8: Bowmanville Avenue & Shared Siter/MetroInflx Laneway

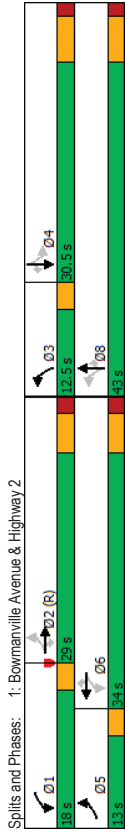
03-14-2022



Movement	EBL	EBR	NBL	NBT	SBL	SBR
Lane Configurations		←	←	←	←	←
Traffic Volume (veh/h)	0	0	0	1076	923	7
Future Volume (Veh/h)	0	0	0	1076	923	7
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1170	1003	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)				None	None	None
Median type				None	None	None
Median storage (veh)						
Upstream signal (m)				117	379	
pX platoon unblocked	0.87	0.95	0.95			
VC, conflicting volume	1582	506	1011			
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol	1140	381	912			
IC, single (s)	6.8	6.9	4.1			
IC, 2 stage (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
CM capacity (veh/h)	170	587	708			
Direction_Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	0	585	585	669	342	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	8	
cSH	1700	1700	1700	1700	1700	
Volume to Capacity	0.00	0.34	0.34	0.39	0.20	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	
Lane LOS	A	A	A	A	A	
Approach Delay (s)	0.0	0.0	0.0	0.0	0.0	
Approach LOS	A	A	A	A	A	
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization		33.1%		ICU Level of Service	A	
Analysis Period (min)			15			

Timings 03-14-2022
 1: Bowmanville Avenue & Highway 2 <Total> 2029 Weekday AM Peak Hour

EBL	EBT	EBR	WBL	WBR	NBL	NBR	SBL	SBT	SBR
176	740	270	255	885	73	245	340	121	37
176	740	270	255	885	73	245	340	121	37
1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.2	6.5	6.5
1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00
1587	3147	1344	1587	3174	1266	1545	2968	1474	1445
0.17	1.00	1.00	0.15	1.00	1.00	0.24	1.00	1.00	0.49
276	3147	1344	246	3174	1266	397	2968	1474	742
0.79	0.92	0.75	0.81	0.91	0.79	0.95	0.74	0.75	0.75
223	804	360	315	973	92	258	459	161	49
0	0	215	0	0	62	0	0	98	0
223	804	145	315	973	30	258	459	63	49
2	10	10	2	15	2	15	3	3	3
15%	16%	18%	15%	15%	27%	18%	23%	9%	26%
5	2	2	1	6	3	3	8	20%	16%
2	2	2	6	6	8	8	8	4	4
34.5	24.2	24.2	42.2	28.9	28.9	35.1	35.1	22.6	22.6
34.5	24.2	24.2	42.2	28.9	28.9	35.1	35.1	22.6	22.6
0.38	0.27	0.27	0.47	0.32	0.32	0.39	0.39	0.25	0.25
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
255	846	361	338	1019	406	276	1157	574	186
0.10	0.26	0.11	0.28	0.31	0.15	0.15	0.15	0.20	0.20
0.87	0.95	0.40	0.93	0.95	0.07	0.93	0.40	0.11	0.26
21.5	32.3	27.0	22.8	29.9	21.2	22.7	19.8	17.5	27.0
1.00	1.00	1.00	1.00	1.00	1.00	0.82	0.78	0.63	1.00
26.5	21.0	3.3	31.8	48.2	0.1	35.7	0.2	0.1	0.8
48.0	53.3	30.3	54.5	48.1	21.3	54.4	15.6	11.1	27.8
D	D	C	D	D	C	D	B	B	C
46.5	D	D	47.8	D	D	26.2	C	C	33.5
D	D	D	D	D	C	C	C	C	C
Intersection Summary									
HCM 2000 Control Delay 40.2 HCM 2000 Level of Service D									
HCM 2000 Volume to Capacity ratio 1.01									
Actuated Cycle Length (s) 90.0 Sum of lost time (s) 18.7									
Intersection Capacity Utilization 81.2% ICU Level of Service D									
Analysis Period (min) 15									
c Critical Lane Group									



HCM Signalized Intersection Capacity Analysis 03-14-2022
 1: Bowmanville Avenue & Highway 2 <Total> 2029 Weekday AM Peak Hour

EBL	EBT	EBR	WBL	WBR	NBL	NBR	SBL	SBT	SBR
176	740	270	255	885	73	245	340	121	37
176	740	270	255	885	73	245	340	121	37
1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.2	6.5	6.5
1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00
1587	3147	1344	1587	3174	1266	1545	2968	1474	1445
0.17	1.00	1.00	0.15	1.00	1.00	0.24	1.00	1.00	0.49
276	3147	1344	246	3174	1266	397	2968	1474	742
0.79	0.92	0.75	0.81	0.91	0.79	0.95	0.74	0.75	0.75
223	804	360	315	973	92	258	459	161	49
0	0	215	0	0	62	0	0	98	0
223	804	145	315	973	30	258	459	63	49
2	10	10	2	15	2	15	3	3	3
15%	16%	18%	15%	15%	27%	18%	23%	9%	26%
5	2	2	1	6	3	3	8	20%	16%
2	2	2	6	6	8	8	8	4	4
34.5	24.2	24.2	42.2	28.9	28.9	35.1	35.1	22.6	22.6
34.5	24.2	24.2	42.2	28.9	28.9	35.1	35.1	22.6	22.6
0.38	0.27	0.27	0.47	0.32	0.32	0.39	0.39	0.25	0.25
3.0	6.2	6.2	3.0	6.2	6.2	3.0	6.5	6.5	6.5
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
255	846	361	338	1019	406	276	1157	574	186
0.10	0.26	0.11	0.28	0.31	0.15	0.15	0.15	0.20	0.20
0.87	0.95	0.40	0.93	0.95	0.07	0.93	0.40	0.11	0.26
21.5	32.3	27.0	22.8	29.9	21.2	22.7	19.8	17.5	27.0
1.00	1.00	1.00	1.00	1.00	1.00	0.82	0.78	0.63	1.00
26.5	21.0	3.3	31.8	48.2	0.1	35.7	0.2	0.1	0.8
48.0	53.3	30.3	54.5	48.1	21.3	54.4	15.6	11.1	27.8
D	D	C	D	D	C	D	B	B	C
46.5	D	D	47.8	D	D	26.2	C	C	33.5
D	D	D	D	D	C	C	C	C	C
Intersection Summary									
HCM 2000 Control Delay 40.2 HCM 2000 Level of Service D									
HCM 2000 Volume to Capacity ratio 1.01									
Actuated Cycle Length (s) 90.0 Sum of lost time (s) 18.7									
Intersection Capacity Utilization 81.2% ICU Level of Service D									
Analysis Period (min) 15									
c Critical Lane Group									

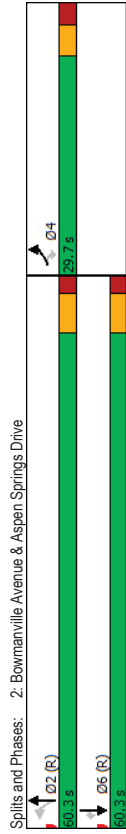


Timings <Total> 2029 Weekday AM Peak Hour 03-14-2022

2. Bowmanville Avenue & Aspen Springs Drive

HCM Signalized Intersection Capacity Analysis <Total> 2029 Weekday AM Peak Hour 03-14-2022

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Volume (vph)	210	128	114	495	938	149
Future Volume (vph)	210	128	114	495	938	149
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.9	5.9	6.3	6.3	6.3	6.3
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1722	1512	1636	2968	3067	1270
Flt Permitted	0.95	1.00	0.25	1.00	1.00	1.00
Satd. Flow (perm)	1722	1512	438	2968	3067	1270
Peak-Hour factor, PHF	0.74	0.65	0.83	0.88	0.94	0.75
Adj. Flow (vph)	284	197	137	562	998	199
RTOR Reduction (vph)	0	91	0	0	0	70
Lane Group Flow (vph)	284	106	137	563	998	129
Confl. Peds. (#/hr)	9					
Heavy Vehicles (%)	6%	8%	11%	23%	19%	23%
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4					
Permitted Phases	4 2					
Actuated Green, G (s)	19.3	19.3	58.5	58.5	58.5	58.5
Effective Green, g (s)	19.3	19.3	58.5	58.5	58.5	58.5
Actuated g/C Ratio	0.21	0.21	0.65	0.65	0.65	0.65
Clearance Time (s)	5.9	5.9	6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	369	324	284	1929	1993	825
v/s Ratio Prot	c0.16					
v/s Ratio Perm	0.07 0.31					
v/c Ratio	0.77 0.33 0.48 0.29 0.50 0.16					
Uniform Delay, d1	33.3 29.9 8.0 6.8 8.2 6.1					
Progression Factor	1.00 1.00 0.77 0.75 0.73 0.76					
Incremental Delay, d2	9.3 0.6 5.6 0.4 0.6 0.3					
Delay (s)	42.6 30.5 11.8 5.4 6.5 5.0					
Level of Service	D C B A A A					
Approach Delay (s)	37.6 6.7 6.3					
Approach LOS	D A A					
Intersection Summary						
HCM 2000 Control Delay	12.7 HCM 2000 Level of Service B					
HCM 2000 Volume to Capacity ratio	0.57					
Actuated Cycle Length (s)	90.0 Sum of lost time (s) 12.2					
Intersection Capacity Utilization	69.6% ICU Level of Service C					
Analysis Period (min)	15					
c Critical Lane Group						



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Volume (vph)	210	128	114	495	938	149
Future Volume (vph)	210	128	114	495	938	149
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.9	5.9	6.3	6.3	6.3	6.3
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Fpb. ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1722	1512	1636	2968	3067	1270
Flt Permitted	0.95	1.00	0.25	1.00	1.00	1.00
Satd. Flow (perm)	1722	1512	438	2968	3067	1270
Peak-Hour factor, PHF	0.74	0.65	0.83	0.88	0.94	0.75
Adj. Flow (vph)	284	197	137	562	998	199
RTOR Reduction (vph)	0	91	0	0	0	70
Lane Group Flow (vph)	284	106	137	563	998	129
Confl. Peds. (#/hr)	9					
Heavy Vehicles (%)	6%	8%	11%	23%	19%	23%
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4					
Permitted Phases	4 2					
Actuated Green, G (s)	19.3	19.3	58.5	58.5	58.5	58.5
Effective Green, g (s)	19.3	19.3	58.5	58.5	58.5	58.5
Actuated g/C Ratio	0.21	0.21	0.65	0.65	0.65	0.65
Clearance Time (s)	5.9	5.9	6.3	6.3	6.3	6.3
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	369	324	284	1929	1993	825
v/s Ratio Prot	c0.16					
v/s Ratio Perm	0.07 0.31					
v/c Ratio	0.77 0.33 0.48 0.29 0.50 0.16					
Uniform Delay, d1	33.3 29.9 8.0 6.8 8.2 6.1					
Progression Factor	1.00 1.00 0.77 0.75 0.73 0.76					
Incremental Delay, d2	9.3 0.6 5.6 0.4 0.6 0.3					
Delay (s)	42.6 30.5 11.8 5.4 6.5 5.0					
Level of Service	D C B A A A					
Approach Delay (s)	37.6 6.7 6.3					
Approach LOS	D A A					
Intersection Summary						
HCM 2000 Control Delay	12.7 HCM 2000 Level of Service B					
HCM 2000 Volume to Capacity ratio	0.57					
Actuated Cycle Length (s)	90.0 Sum of lost time (s) 12.2					
Intersection Capacity Utilization	69.6% ICU Level of Service C					
Analysis Period (min)	15					
c Critical Lane Group						

Timings
 3. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

HCM Signalized Intersection Capacity Analysis
 3. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

<Total> 2029 Weekday AM Peak Hour
 03-14-2022

<Total> 2029 Weekday AM Peak Hour
 03-14-2022

EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
23	0	40	1	1	33	583	5	1027	29
23	0	40	1	1	33	583	5	1027	29
Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm
4	4	4	4	4	2	2	2	2	2
8.0	8.0	8.0	8.0	8.0	20.0	20.0	20.0	20.0	20.0
24.3	24.3	24.3	24.3	24.3	27.0	27.0	27.0	27.0	27.0
29.7	29.7	29.7	29.7	29.7	60.3	60.3	60.3	60.3	60.3
33.0%	33.0%	33.0%	33.0%	33.0%	67.0%	67.0%	67.0%	67.0%	67.0%
3.3	3.3	3.3	3.3	3.3	4.8	4.8	4.8	4.8	4.8
3.0	3.0	3.0	3.0	3.0	1.8	1.8	1.8	1.8	1.8
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6
None	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max
8.6	8.6	8.6	8.6	8.6	72.7	72.7	72.7	72.7	72.7
0.10	0.10	0.10	0.10	0.10	0.81	0.81	0.81	0.81	0.81
0.25	0.27	0.03	0.14	0.29	0.01	0.43	0.04	0.04	0.04
41.9	14.7	30.3	4.2	3.4	2.2	2.4	2.4	2.4	0.5
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41.9	14.7	30.3	4.2	3.4	2.2	2.4	2.4	2.4	0.5
D	B	C	A	A	A	A	A	A	A
25.3	C	C	C	C	3.4	3.4	2.4	2.4	A
Intersection Summary									
Cycle Length: 90									
Actuated Cycle Length: 90									
Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green									
Natural Cycle: 60									
Control Type: Actuated-Coordinated									
Maximum v/c Ratio: 0.43									
Intersection Signal Delay: 3.8									
Intersection Capacity Utilization 57.7%									
Analysis Period (min) 15									



Splits and Phases: 3. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
23	0	40	1	1	2	33	583	0	5
23	0	40	1	1	2	33	583	0	5
1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6
1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.89
1.00	0.85	0.93	1.00	1.00	1.00	1.00	1.00	1.00	0.85
0.95	1.00	0.99	1.00	0.99	1.00	0.95	1.00	0.95	1.00
1825	1541	1769	1643	2992	1812	3093	1363	1363	1363
0.76	1.00	0.91	0.25	1.00	0.39	1.00	1.00	1.00	1.00
1451	1541	1622	440	2992	740	3093	1363	1363	1363
0.68	0.92	0.75	0.82	0.82	0.68	0.84	0.92	0.92	0.95
34	0	53	1	1	2	49	694	0	5
0	0	49	0	2	0	0	0	0	0
0	34	4	0	2	0	49	694	0	5
0%	6%	0%	0%	0%	11%	22%	0%	0%	18%
Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA
4	4	4	4	4	2	2	2	2	2
4	4	4	4	4	2	2	2	2	2
7.0	7.0	7.0	7.0	7.0	70.1	70.1	70.1	70.1	70.1
7.0	7.0	7.0	7.0	7.0	70.1	70.1	70.1	70.1	70.1
0.08	0.08	0.08	0.08	0.08	0.78	0.78	0.78	0.78	0.78
6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
112	119	126	342	2330	576	2409	1061	1061	1061
c0.02	0.00	0.00	0.11	0.11	0.01	0.01	0.01	0.01	0.03
0.30	0.03	0.02	0.14	0.30	0.01	0.01	0.45	0.04	0.04
39.2	38.4	38.3	2.5	2.9	2.2	3.4	2.3	2.3	2.3
1.00	1.00	1.00	1.00	1.00	1.00	0.74	0.54	0.46	0.46
1.5	0.1	0.1	0.9	0.3	0.0	0.5	0.1	0.1	0.1
40.7	38.5	38.4	3.4	3.2	1.7	2.3	1.1	1.1	1.1
D	D	D	A	A	A	A	A	A	A
39.4	38.4	38.4	3.2	3.2	2.3	2.3	2.3	2.3	2.3
D	D	D	A	A	A	A	A	A	A
Intersection Summary									
HCM 2000 Control Delay 4.3 HCM 2000 Level of Service A									
HCM 2000 Volume to Capacity ratio 0.44									
Actuated Cycle Length (s) 90.0 Sum of lost time (s) 12.9									
Intersection Capacity Utilization 57.7% ICU Level of Service B									
Analysis Period (min) 15									
c Critical Lane Group									

Splits and Phases: 3. Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

HCM Unsignalized Intersection Capacity Analysis
 4: Bonnycastle Drive & Aspen Springs Drive

HCM Unsignalized Intersection Capacity Analysis
 5: Fry Crescent (East) & Aspen Springs Drive

<Total> 2029 Weekday AM Peak Hour
 03-14-2022

<Total> 2029 Weekday AM Peak Hour
 03-14-2022

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	WB	WB	NB	NB
Traffic Volume (veh/h)	232	24	15	242	45	30
Future Volume (Veh/h)	232	24	15	242	45	30
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.93	0.93	0.83	0.93	0.93	0.93
Hourly flow rate (vph)	249	26	16	260	48	32
Pedestrians					2	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)					None	
Median type					None	
Median storage (veh)						
Upstream signal (m)					160	
pX, platoon unblocked						
VC, conflicting volume			277		556	264
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol			277		556	264
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
p0 queue free %			2.2		3.5	3.3
IF (s)			99		90	96
CM capacity (veh/h)			1295		488	778
Direction, Lane #	EB 1	WB 1	NB 1	NB 1		
Volume Total	275	276	80			
Volume Left	0	16	48			
Volume Right	26	0	32			
cSH	1700	1295	574			
Volume to Capacity	0.16	0.01	0.14			
Queue Length 95th (m)	0.0	0.3	3.7			
Control Delay (s)	0.0	0.6	12.3			
Lane LOS	A	A	B			
Approach Delay (s)	0.0	0.6	12.3			
Approach LOS		B				
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization			36.0%		ICU Level of Service	A
Analysis Period (min)			15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	EB	EB	WB	WB	NB	NB
Traffic Volume (veh/h)	245	4	5	282	12	9
Future Volume (Veh/h)	245	4	5	282	12	9
Sign Control	Free	Free	Free	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	266	4	5	307	13	10
Pedestrians					2	4
Lane Width (m)					3.7	3.7
Walking Speed (m/s)					1.1	1.1
Percent Blockage					0	0
Right turn flare (veh)					None	
Median type					None	
Median storage (veh)						
Upstream signal (m)					245	
pX, platoon unblocked						
VC, conflicting volume			274		589	274
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCu, unblocked vol			274		589	274
IC, single (s)			4.1		6.4	6.2
IC, 2 stage (s)						
p0 queue free %			2.2		3.5	3.3
IF (s)			100		97	99
CM capacity (veh/h)			1296		470	765
Direction, Lane #	EB 1	WB 1	NB 1	NB 1		
Volume Total	270	312	23			
Volume Left	0	5	13			
Volume Right	4	0	10			
cSH	1700	1296	565			
Volume to Capacity	0.16	0.00	0.04			
Queue Length 95th (m)	0.0	0.1	1.0			
Control Delay (s)	0.0	0.2	11.6			
Lane LOS	A	A	B			
Approach Delay (s)	0.0	0.2	11.6			
Approach LOS		B				
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			29.5%		ICU Level of Service	A
Analysis Period (min)			15			

6: Fry Crescent (West)/Existing Condo Access & Aspen Springs Drive <Total> 2029 Weekday AM Peak Hour 03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	217	1	5	278	11	5	0	10	22	0	23
Future Volume (Veh/h)	13	217	1	5	278	11	5	0	10	22	0	23
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	14	238	1	5	305	12	5	0	11	24	0	25
Pedestrians							3				8	
Lane Width (m)							3.7				3.7	
Walking Speed (m/s)							1.1				1.1	
Percent Blockage							0				1	
Right turn flare (veh)							None				None	
Median type							None				None	
Median storage (veh)							323					
Upstream signal (m)												
pX platoon unblocked												
VC, conflicting volume	325			242			616	604	242	606	599	319
VC1, stage 1 conf vol												
VC2, stage 2 conf vol												
VCU, unblocked vol	325			242			616	604	242	606	599	319
IC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
IC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			99	100	99	94	100	97
CM capacity (veh/h)	1236			1332			363	404	800	395	407	721
Direction_Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	253	322	16	49								
Volume Left	14	5	5	24								
Volume Right	1	12	11	25								
cSH	1236	1332	597	513								
Volume to Capacity	0.01	0.00	0.03	0.10								
Queue Length 95th (m)	0.3	0.1	0.6	2.4								
Control Delay (s)	0.5	0.2	11.2	12.8								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.5	0.2	11.2	12.8								
Approach LOS	B	B	B	B								
Intersection Summary												
Average Delay				1.5								
Intersection Capacity Utilization				29.4%								A
Analysis Period (min)				15								

7: Aspen Springs Drive & 10 Aspen Springs Drive Access <Total> 2029 Weekday AM Peak Hour 03-14-2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR
Lane Configurations								
Traffic Volume (veh/h)	10	253	219	43	81	37		
Future Volume (Veh/h)	10	253	219	43	81	37		
Sign Control	Free	Free	Free	Free	Free	Stop		
Grade	0%	0%	0%	0%	0%	0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92		
Hourly flow rate (vph)	11	275	238	47	88	40		
Pedestrians								
Lane Width (m)								
Walking Speed (m/s)								
Percent Blockage								
Right turn flare (veh)								
Median type								
Median storage (veh)								
Upstream signal (m)						79		
pX platoon unblocked								
VC, conflicting volume	285						558	262
VC1, stage 1 conf vol								
VC2, stage 2 conf vol								
VCU, unblocked vol	285						558	262
IC, single (s)	4.1						6.4	6.2
IC, 2 stage (s)								
IF (s)	2.2						3.5	3.3
p0 queue free %	99						82	95
CM capacity (veh/h)	1277						486	777
Direction_Lane #	EB 1	WB 1	SB 1					
Volume Total	286	285	128					
Volume Left	11	0	88					
Volume Right	0	47	40					
cSH	1277	1700	551					
Volume to Capacity	0.01	0.17	0.23					
Queue Length 95th (m)	0.2	0.0	6.8					
Control Delay (s)	0.4	0.0	13.5					
Lane LOS	A	A	B					
Approach Delay (s)	0.4	0.0	13.5					
Approach LOS	B	B	B					
Intersection Summary								
Average Delay			2.6					
Intersection Capacity Utilization			34.8%					A
Analysis Period (min)			15					

8: HCM Unsignalized Intersection Capacity Analysis <Total> 2029 Weekday AM Peak Hour
 03-14-2022
 8: Bowmanville Avenue & Shared Site/MetroInX Laneway

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	29	0	705	1088	0
Future Volume (Veh/h)	0	29	0	705	1088	0
Sign Control	Stop	Free	Free	Free	Free	Free
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	32	0	766	1183	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type						
Median storage (veh)						
Upstream signal (m)						
pX platoon unblocked	0.92	0.90	0.90			379
VC, conflicting volume	1566	592	1183			
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
VCU, unblocked vol	1207	319	977			
IC, single (s)	6.8	6.9	4.1			
IC, 2 stage (s)						
p0 queue free %	3.5	3.3	2.2			
p0 queue free (s)	100	95	100			
CM capacity (veh/h)	162	608	630			
Direction_Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	32	383	383	789	394	
Volume Left	0	0	0	0	0	
Volume Right	32	0	0	0	0	
cSH	608	1700	1700	1700	1700	
Volume to Capacity	0.05	0.23	0.23	0.46	0.23	
Queue Length 95th (m)	1.3	0.0	0.0	0.0	0.0	
Control Delay (s)	11.2	0.0	0.0	0.0	0.0	
Lane LOS	B					
Approach Delay (s)	11.2	0.0	0.0	0.0	0.0	
Approach LOS	B					
Intersection Summary						
Average Delay	0.2					
Intersection Capacity Utilization	40.1%					
Analysis Period (min)	15					
ICU Level of Service	A					

Timings <Total> 2029 Weekday PM Peak Hour
 03-14-2022
 3: Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	39	0	69	4	2	84	1012	5	845	52
Future Volume (vph)	39	0	69	4	2	84	1012	5	845	52
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	4		4	4	4	2	2	2	2	2
Permitted Phases	4	4	4	4	4	2	2	2	2	2
Detector Phase										
Switch Phase										
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	20.0	20.0	20.0	20.0	20.0
Minimum Split (s)	24.3	24.3	24.3	24.3	24.3	27.0	27.0	27.0	27.0	27.0
Total Split (s)	32.4	32.4	32.4	32.4	32.4	57.6	57.6	57.6	57.6	57.6
Total Split (%)	36.0%	36.0%	36.0%	36.0%	36.0%	64.0%	64.0%	64.0%	64.0%	64.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	1.8	1.8	1.8	1.8	1.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3	6.6	6.6	6.6	6.6	6.6
Lead-Lag										
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	9.6	9.6	9.6	7.17	7.17	7.17	7.17	7.17	7.17	7.17
Actuated g/C Ratio	0.11	0.11	0.11	0.11	0.11	0.80	0.80	0.80	0.80	0.80
v/C Ratio	0.37	0.37	0.37	0.09	0.28	0.51	0.02	0.36	0.08	0.08
Control Delay	43.9	12.7	25.0	5.9	5.3	3.4	3.5	3.5	3.5	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.9	12.7	25.0	5.9	5.3	3.4	3.4	3.5	3.5	3.5
LOS	D	B	C	A	A	A	A	A	A	A
Approach Delay	24.6		25.0		5.4		3.3			
Approach LOS	C		C		A		A			
Intersection Summary										
Cycle Length: 90										
Actuated Cycle Length: 90										
Offset: 0 (0%), Referenced to phase 2:NBSB and 6:, Start of Green										
Natural Cycle: 60										
Control Type: Actuated-Coordinated										
Maximum v/c Ratio: 0.51										
Intersection Signal Delay: 5.8										
Intersection Capacity Utilization 67.7%										
Analysis Period (min) 15										
ICU Level of Service C										
Splits and Phases: 3: Bowmanville Avenue & Hartwell Avenue/Existing Condo Access										

Queuing and Blocking Report

<Total> 2024 Weekday AM Peak Hour
01/24/2022

Intersection: 3: Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

Movement	EB	EB	WB	NB	SB	TR
	LT	R	LTR	L	TR	
Directions Served	21.6	21.6	7.5	44.8	356.5	124.0
Maximum Queue (m)	14.1	9.1	1.1	16.1	115.1	60.1
Average Queue (m)	21.3	20.9	5.4	47.2	302.7	139.0
95th Queue (m)	116.2		77.1		647.6	250.0
Link Distance (m)						
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)	10.0			20.0		
Storage Blk Time (%)	33	7		0	44	15
Queuing Penalty (veh)	12	1		0	13	1

Intersection: 4: Bonnycastle Drive & Aspen Springs Drive

Movement	WB	NB
	LT	LR
Directions Served	9.2	16.5
Maximum Queue (m)	1.3	7.5
Average Queue (m)	6.6	16.3
95th Queue (m)	76.0	71.8
Link Distance (m)		
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Fry Crescent (East) & Aspen Springs Drive

Movement	WB
	LT
Directions Served	9.3
Maximum Queue (m)	2.6
Average Queue (m)	9.4
95th Queue (m)	74.6
Link Distance (m)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Queuing and Blocking Report

<Total> 2024 Weekday AM Peak Hour
01/24/2022

Intersection: 6: Fry Crescent (West)/Existing Condo Access & Aspen Springs Drive

Movement	EB	NB	SB
	LTR	LTR	LTR
Directions Served	8.6	9.0	9.1
Maximum Queue (m)	1.2	2.4	7.5
Average Queue (m)	6.2	8.8	12.6
95th Queue (m)	126.5	58.9	56.9
Link Distance (m)			
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: Aspen Springs Drive & 10 Aspen Springs Drive Access

Movement	EB	SB
	LT	LR
Directions Served	16.1	12.9
Maximum Queue (m)	4.5	6.8
Average Queue (m)	16.3	10.9
95th Queue (m)	76.0	75.4
Link Distance (m)		
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Bowmanville Avenue & Shared Site/Metrolinx Laneway

Movement	EB	SB	B18
	R	TR	T
Directions Served	19.6	79.7	17.4
Maximum Queue (m)	7.9	11.4	2.5
Average Queue (m)	18.1	57.4	12.5
95th Queue (m)	63.4	63.6	211.2
Link Distance (m)			
Upstream Blk Time (%)		1	
Queuing Penalty (veh)		11	
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 868

Queuing and Blocking Report
 Proposed Residential Development, 10 Aspen Springs Drive, Bowmanville, ON 01/24/2022

Queuing and Blocking Report
 Proposed Residential Development, 10 Aspen Springs Drive, Bowmanville, ON 01/24/2022

Intersection: 1: Bowmanville Avenue & Highway 2

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	B17	SB
	L	T	R	L	T	R	L	T	R	L	T	L
Directions Served												
Maximum Queue (m)	180.0	377.0	376.3	100.0	45.8	95.9	88.0	66.2	81.7	66.3	136.5	129.7
Average Queue (m)	179.8	344.9	342.5	99.6	32.4	73.6	71.9	58.0	77.6	37.7	42.2	43.5
95th Queue (m)	179.9	400.0	401.3	101.1	50.9	103.0	96.6	73.2	93.9	91.5	97.7	102.7
Link Distance (m)		365.0	365.0		605.2	605.2		66.3			211.2	
Upstream Blk Time (%)		17	19				18	33		1		
Queuing Penalty (veh)		0	0				0	312		0		
Storage Bay Dist (m)	80.0			50.0	100.0		85.0		50.0			55.0
Storage Blk Time (%)	90	58	61	4	0	22	18	43				
Queuing Penalty (veh)	519	170	212	24	0	14	121	200				

Intersection: 1: Bowmanville Avenue & Highway 2

Movement	SB	SB
	T	R
Directions Served		
Maximum Queue (m)	266.7	100.0
Average Queue (m)	109.3	36.4
95th Queue (m)	230.8	103.3
Link Distance (m)		340.9
Upstream Blk Time (%)		
Queuing Penalty (veh)		50.0
Storage Bay Dist (m)		37
Storage Blk Time (%)		121

Intersection: 2: Bowmanville Avenue & Aspen Springs Drive

Movement	EB	EB	NB	NB	SB	SB
	L	R	L	T	TR	
Directions Served						
Maximum Queue (m)	54.1	57.3	79.2	66.3	108.6	
Average Queue (m)	29.5	27.3	48.7	37.8	75.2	
95th Queue (m)	51.5	53.2	90.7	75.8	144.8	
Link Distance (m)		57.3		250.0	106.3	
Upstream Blk Time (%)		1			3	
Queuing Penalty (veh)		0	4		23	
Storage Bay Dist (m)				25.0		
Storage Blk Time (%)		1		66	8	
Queuing Penalty (veh)		1	3	488	14	

Queuing and Blocking Report
 Proposed Residential Development, 10 Aspen Springs Drive, Bowmanville, ON 01/24/2022

Intersection: 3: Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

Movement	EB	EB	WB	WB	NB	NB	SB	SB
	LT	R	LTR	L	TR	L	TR	TR
Directions Served								
Maximum Queue (m)	9.2	22.4	8.4	44.9	663.5	43.8	254.3	
Average Queue (m)	3.9	10.8	3.4	24.9	653.3	0.0	216.1	
95th Queue (m)	11.3	22.8	9.8	52.6	678.1	0.0	283.2	
Link Distance (m)		116.2		77.1	647.6		250.0	
Upstream Blk Time (%)					78		3	
Queuing Penalty (veh)					0		21	
Storage Bay Dist (m)		10.0		20.0		20.0		
Storage Blk Time (%)		4		13		18		60
Queuing Penalty (veh)		3		5		162		2

Intersection: 4: Bonnycastle Drive & Aspen Springs Drive

Movement	WB	NB
	LT	LR
Directions Served		
Maximum Queue (m)	9.0	16.3
Average Queue (m)	3.8	10.9
95th Queue (m)	11.0	16.0
Link Distance (m)		76.0
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Fry Crescent (East) & Aspen Springs Drive

Movement	EB	NB
	TR	LR
Directions Served		
Maximum Queue (m)	9.1	9.0
Average Queue (m)	1.3	3.7
95th Queue (m)	6.6	10.7
Link Distance (m)		65.2
Upstream Blk Time (%)		70.2
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Fry Crescent (West)/Existing Condo Access & Aspen Springs Drive

Movement	EB	NB	SB	EB	NB	SB	EB	NB	SB	EB	NB	SB
Directions Served	LTR	LTR	LTR									
Maximum Queue (m)	8.7	8.8	9.1									
Average Queue (m)	1.2	6.2	2.6									
95th Queue (m)	6.3	12.7	9.2									
Link Distance (m)	126.5	58.9	56.9									
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 7: Aspen Springs Drive & 10 Aspen Springs Drive Access

Movement	EB	SB	EB	SB	EB	SB	EB	SB	EB	SB	EB	SB
Directions Served	LT	LR										
Maximum Queue (m)	22.5	20.3										
Average Queue (m)	6.8	10.1										
95th Queue (m)	21.1	18.8										
Link Distance (m)	76.0	70.7										
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 8: Bowmanville Avenue & Shared Site/Metrolinx Laneway

Movement	EB	SB	EB	SB	EB	SB	EB	SB	EB	SB	EB	SB
Directions Served	R	TR										
Maximum Queue (m)	9.0	64.5										
Average Queue (m)	2.6	22.5										
95th Queue (m)	9.2	66.8										
Link Distance (m)	63.3	63.4										
Upstream Blk Time (%)	0											
Queuing Penalty (veh)	3											
Storage Bay Dist (m)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Network Summary
 Network wide Queuing Penalty: 2466

Intersection: 6: Fry Crescent (West)/Existing Condo Access & Aspen Springs Drive

Movement	EB	NB	SB	EB	NB	SB	EB	NB	SB	EB	NB	SB
Directions Served	L	T	R									
Maximum Queue (m)	52.7	84.0	81.2	44.2	71.6	89.3	108.4	69.3	53.4	51.2	26.8	83.1
Average Queue (m)	29.8	65.2	59.6	6.3	43.7	67.6	79.4	47.2	27.1	24.2	5.1	49.0
95th Queue (m)	48.9	88.8	78.6	31.8	72.9	92.4	103.3	68.7	51.5	47.1	20.5	67.6
Link Distance (m)												
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 7: Bowmanville Avenue & Highway 2

Movement	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB
Directions Served	T	R										
Maximum Queue (m)	73.3	49.8										
Average Queue (m)	47.6	21.9										
95th Queue (m)	68.7	50.8										
Link Distance (m)												
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 8: Bowmanville Avenue & Aspen Springs Drive

Movement	EB	EB	NB	NB	SB	SB	SB	SB	SB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	T	T	T	T	R
Maximum Queue (m)	49.3	53.3	28.8	28.1	38.0	64.8	42.8	22.3				
Average Queue (m)	34.8	23.7	21.8	14.1	15.0	33.3	24.0	13.4				
95th Queue (m)	46.7	50.8	27.4	27.4	22.5	62.1	43.0	25.2				
Link Distance (m)												
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 1: Bowmanville Avenue & Highway 2

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	L	T	T	T	T	L	T	T	L	L	T
Maximum Queue (m)	52.7	84.0	81.2	44.2	71.6	89.3	108.4	69.3	53.4	51.2	26.8	83.1			
Average Queue (m)	29.8	65.2	59.6	6.3	43.7	67.6	79.4	47.2	27.1	24.2	5.1	49.0			
95th Queue (m)	48.9	88.8	78.6	31.8	72.9	92.4	103.3	68.7	51.5	47.1	20.5	67.6			
Link Distance (m)															
Upstream Blk Time (%)															
Queuing Penalty (veh)															
Storage Bay Dist (m)															
Storage Blk Time (%)															
Queuing Penalty (veh)															

Intersection: 1: Bowmanville Avenue & Highway 2

Movement	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB
Directions Served	T	R										
Maximum Queue (m)	73.3	49.8										
Average Queue (m)	47.6	21.9										
95th Queue (m)	68.7	50.8										
Link Distance (m)												
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 2: Bowmanville Avenue & Aspen Springs Drive

Movement	EB	EB	NB	NB	SB	SB	SB	SB	SB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	T	T	T	T	R
Maximum Queue (m)	49.3	53.3	28.8	28.1	38.0	64.8	42.8	22.3				
Average Queue (m)	34.8	23.7	21.8	14.1	15.0	33.3	24.0	13.4				
95th Queue (m)	46.7	50.8	27.4	27.4	22.5	62.1	43.0	25.2				
Link Distance (m)												
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)												
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 3: Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

Movement	EB	WB	NB	SB	EB	WB	NB	SB	EB	WB	NB	SB	EB	WB	NB	SB
Directions Served	LT	R	LTR	L	LT	R	LT	TR	T	T	R	T	T	R	T	R
Maximum Queue (m)	13.2	12.5	8.2	14.1	33.8	39.0	38.9	32.9	13.5							
Average Queue (m)	5.5	6.7	0.6	4.3	18.4	11.6	18.3	10.8	1.9							
95th Queue (m)	12.7	13.1	2.9	13.1	38.8	36.2	42.9	30.0	9.7							
Link Distance (m)	108.8		73.4		647.8	647.8	249.0	249.0								
Upstream Blk Time (%)																
Queuing Penalty (veh)																
Storage Bay Dist (m)	10.0			60.0				60.0								
Storage Blk Time (%)	4	2						5								
Queuing Penalty (veh)	2	0						0								

Intersection: 4: Bonnycastle Drive & Aspen Springs Drive

Movement	WB	NB	LT	LR
Directions Served	LT	LR		
Maximum Queue (m)	15.6	21.5		
Average Queue (m)	6.0	10.7		
95th Queue (m)	15.2	18.0		
Link Distance (m)	76.0	71.8		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Fry Crescent (East) & Aspen Springs Drive

Movement	NB	LR
Directions Served	LR	
Maximum Queue (m)	8.9	
Average Queue (m)	6.2	
95th Queue (m)	12.7	
Link Distance (m)	70.2	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Fry Crescent (West)/Existing Condo Access & Aspen Springs Drive

Movement	EB	NB	SB	LT	LR
Directions Served	LT	LR			
Maximum Queue (m)	8.6	8.7	14.9		
Average Queue (m)	1.2	3.0	8.5		
95th Queue (m)	5.9	9.0	15.1		
Link Distance (m)	126.5	58.9	56.9		
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: Aspen Springs Drive & 10 Aspen Springs Drive Access

Movement	EB	SB	LT	LR
Directions Served	LT	LR		
Maximum Queue (m)	15.2	12.7		
Average Queue (m)	0.0	6.8		
95th Queue (m)	0.0	10.8		
Link Distance (m)	76.0	75.4		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 8: Bowmanville Avenue & Shared Site/Metrolinx Laneway

Movement	EB	R
Directions Served	R	
Maximum Queue (m)	9.3	
Average Queue (m)	5.2	
95th Queue (m)	12.5	
Link Distance (m)	58.0	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary
 Network wide Queuing Penalty: 89

Queuing and Blocking Report
 Proposed Residential Development, 10 Aspen Springs Drive, Bowmanville, ON 01/24/2022

<Total> 2029 Weekday PM Peak Hour
 Proposed Residential Development, 10 Aspen Springs Drive, Bowmanville, ON 01/24/2022

Intersection: 1: Bowmanville Avenue & Highway 2

Movement	EB	EB	EB	WB	WB	WB	WB	WB	WB	NB	NB	NB	NB	R
	L	T	R	L	T	R	L	T	R	L	T	R	L	T
Directions Served														
Maximum Queue (m)	179.9	384.2	380.8	100.0	164.9	192.1	180.4	115.0	150.0	330.9	284.4	380.0	330.9	284.4
Average Queue (m)	179.9	380.0	377.1	94.8	127.3	132.3	133.5	65.0	149.9	250.7	181.9	10.3	250.7	181.9
95th Queue (m)	179.9	385.6	381.3	114.8	175.9	207.7	198.8	157.8	150.0	340.6	343.4	37.4	340.6	343.4
Link Distance (m)		365.0	365.0		601.6	601.6				361.3	361.3		361.3	361.3
Upstream Blk Time (%)		75	57											
Queuing Penalty (veh)		0	0											
Storage Bay Dist (m)	80.0			50.0	100.0		50.0	85.0		100.0		50.0		
Storage Blk Time (%)	95	38	56	4	38	30	49		100		0			
Queuing Penalty (veh)	640	126	220	29	200	61	40	272		272		0		

Intersection: 3: Bowmanville Avenue & Hartwell Avenue/Existing Condo Access

Movement	EB	EB	EB	WB	WB	WB	WB	WB	WB	NB	NB	NB	NB	R
	L	T	R	L	T	R	L	T	R	L	T	R	L	T
Directions Served														
Maximum Queue (m)	13.8	12.3	7.7	40.1	81.6	106.4	9.0	77.2	86.4	9.0	77.2	86.4	9.0	8.0
Average Queue (m)	6.0	5.2	1.1	18.4	45.4	51.7	3.3	36.7	43.1	3.3	36.7	43.1	3.3	2.3
95th Queue (m)	13.3	11.3	5.6	38.3	74.2	91.0	9.8	75.6	81.7	9.8	75.6	81.7	9.8	8.2
Link Distance (m)		108.8		73.4		647.8		249.0		249.0		249.0		249.0
Upstream Blk Time (%)														
Queuing Penalty (veh)														
Storage Bay Dist (m)		10.0			60.0		20.0					60.0		
Storage Blk Time (%)		4		2		4		17				3		
Queuing Penalty (veh)		3		1		3		1				1		1

Intersection: 1: Bowmanville Avenue & Highway 2

Movement	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB	SB
	L	T	T	R	L	T	R	L	T	R	L	T	R	L
Directions Served														
Maximum Queue (m)	33.9	70.4	77.0	44.8										
Average Queue (m)	23.1	50.5	45.9	15.7										
95th Queue (m)	33.9	76.8	74.4	35.4										
Link Distance (m)		340.9	340.9											
Upstream Blk Time (%)														
Queuing Penalty (veh)														
Storage Bay Dist (m)	55.0			50.0										
Storage Blk Time (%)	2	3	0											
Queuing Penalty (veh)	3	7	0											

Intersection: 4: Bonnycastle Drive & Aspen Springs Drive

Movement	WB	NB	NB	LR	LR
Directions Served					
Maximum Queue (m)	9.2	15.7			
Average Queue (m)	3.9	10.0			
95th Queue (m)	11.4	13.8			
Link Distance (m)		76.0	71.8		
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 2: Bowmanville Avenue & Aspen Springs Drive

Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB	SB	SB	SB	SB	R
	L	R	T	L	T	R	L	T	R	L	T	R	L	T
Directions Served														
Maximum Queue (m)	53.1	53.5	71.6	60.1	77.0	48.0	46.4	28.8						
Average Queue (m)	33.4	31.4	35.5	33.0	41.6	34.8	16.3	15.3						
95th Queue (m)	55.3	63.9	63.0	59.1	79.5	56.1	40.9	27.6						
Link Distance (m)		53.5		249.0	249.0	108.4								
Upstream Blk Time (%)		0	1											
Queuing Penalty (veh)		0	5											
Storage Bay Dist (m)		100.0		25.0		60.0								
Storage Blk Time (%)		0	1	24	9									
Queuing Penalty (veh)		0	4	107	15									

Intersection: 5: Fry Crescent (East) & Aspen Springs Drive

Movement	WB	NB	NB	LR	LR
Directions Served					
Maximum Queue (m)	9.2	8.5			
Average Queue (m)	1.3	1.2			
95th Queue (m)	6.7	6.1			
Link Distance (m)		74.6	70.2		
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Queuing and Blocking Report
 Proposed Residential Development, 10 Aspen Springs Drive, Bowmanville, ON

<Total> 2029 Weekday PM Peak Hour
 01/24/2022

Intersection: 6: Fry Crescent (West)/Existing Condo Access & Aspen Springs Drive

Movement	EB	WB	NB	SB
	LTR	LTR	LTR	LTR
Directions Served				
Maximum Queue (m)	8.6	21.6	9.1	9.0
Average Queue (m)	1.2	4.2	5.0	6.2
95th Queue (m)	6.2	16.8	12.1	12.6
Link Distance (m)	126.5	63.2	56.9	56.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Aspen Springs Drive & 10 Aspen Springs Drive Access

Movement	EB	SB
	LT	LR
Directions Served		
Maximum Queue (m)	8.6	20.4
Average Queue (m)	2.5	10.1
95th Queue (m)	8.9	19.0
Link Distance (m)	76.0	70.7
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Bowmanville Avenue & Shared Site/Metrolinx Laneway

Movement	EB
	R
Directions Served	
Maximum Queue (m)	8.5
Average Queue (m)	1.2
95th Queue (m)	6.1
Link Distance (m)	57.9
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 1738



APPENDIX E

Level of Service Definitions

LEVEL OF SERVICE ANALYSIS AT SIGNALIZED INTERSECTIONS

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

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

LEVEL OF SERVICE ANALYSIS AT UNSIGNALIZED INTERSECTIONS⁽¹⁾

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

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

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



APPENDIX F

Municipality of Clarington Zoning By-law 84-63,
Excerpts

Section 3

Parking Space Requirement Table	
Type or nature of use	Minimum off street parking requirement
Post Office, Museum, Art Gallery, Public Library	1 parking space for each 40 square metres of gross floor area.
Residential (i) Apartment, Four-plex, Six-plex or Converted Dwelling House	<p style="text-align: right;"><i>Amended by By-law 85-51</i> <i>Amended by By-law 2012-035</i> <i>Replaced by By-Law 2015-062</i></p> 1 Bedroom Apartment - 1 space per unit 2 Bedroom Apartment - 1.25 spaces per unit Apartment containing 3 or more bedrooms, four-plex, converted dwelling or triplex house - 1.5 spaces per unit Plus 0.25 visitor spaces per dwelling, 10% of which are to be accessible parking spaces.
(ii) Boarding or Rooming House	<p style="text-align: right;"><i>Replaced by By-Law 2015-062</i></p> 1 parking space for each dwelling unit plus 1 parking space per room provided for separate living accommodation.
(iii) Mobile Home Park	(a) 2 parking spaces for each Mobile Home site and 1 visitor's parking space for each 4 Mobile Home sites. (b) 1 parking space for each 28 square metres of total floor area for all accessory commercial uses within the community hall. (c) 1 parking space for each 12 square metres of total floor area for all uses other than accessory commercial uses within the community hall.

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Parking Space Requirement Table	
Type or nature of use	Minimum off street parking requirement
Schools; Public and/or Private (i) Elementary	The greater of: (a) 1 and one-half parking spaces per classroom; or (b) 1 parking space per 10 square metres of floor area in the general purpose room; or (c) 1 parking space per 10 square metres of floor area in the auditorium
(ii) Secondary	The greater of: (a) 4 parking spaces per classroom; or (b) 1 parking space per 10 square metres of floor area in the general purpose room; or (c) 1 parking space per 10 square metres of floor area in the auditorium
Shopping Centre	1 parking space for each 20 square metres of total leasable floor area.
Undertaking Establishment	1 parking space for each five seating spaces or fraction thereof with a minimum of ten parking spaces.
Uses permitted by this By-law other than those listed in this table	1 parking space per 30 square metres of total floor area.
Vacation Farm Establishment	<i>Added By By-law 85-44</i> 1 parking space per guest room

Added by By-Law 99-170

f. Private Garage or Carport

Where a private garage or carport provides one of the required parking spaces for a single detached, semi-detached or townhouse dwelling unit, the minimum area inside the private garage or carport shall be 18.58 square metres and the minimum width shall be 3.0 metres. This provision shall apply to all lots registered after January 1, 2000.

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entering upon or making use of the said premises, from time to time, parking spaces and areas accordingly.

*Added by By-law 99-169
Deleted by By-law 2006-046
Replaced by By-Law 2015-062*

b. Accessible Parking Spaces

- i) Each accessible parking space shall be a minimum 4.5 metres wide and 5.7 metres long. When paired, the width can be reduced to 3.4 metres, provided a 1.5 metre access aisle is located between the paired spaces.

Added by By-Law 2006-046

- ii) Accessible Parking Space Requirement Table

Accessible Parking Space Requirement Table	
Number of Parking Spaces Required By Parking Space Requirement Table 3.16	Accessible Persons Parking Spaces
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1000	2% of total
Greater than 1000	21 spaces plus 1 space for every additional 100 spaces or part thereof over 1000 parking spaces
Nursing homes, retirement homes, hospitals, medical and dental clinics shall provide twice the number of Accessible Parking Spaces as shown in the column above.	

c. Parking Space Sizes

Replaced by By-Law 2015-062

- i) Each parking space shall be a minimum of 5.7 metres by 2.75 metres.
- ii) Where the two outdoor parking spaces for single detached, semi-detached and/or townhouse units are provided side by side the

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combined minimum width of the two spaces may be reduced to 4.6 metres.

- iii) Parking spaces provided in the front yard for detached, semi-detached and/or townhouse units must not reduce the minimum landscaped open space within the front yard below 30 percent/
- iv) Parking space size perpendicular to a landscaping strip having a minimum width of 3.0 metres may not be reduced in size to 5.2 metres in length by 2.75 metres in width.

d. Parking Aisle Requirements

Each aisle shall be a minimum width of 6.0 metres for two-way traffic and 4.5 metres for one-way traffic.

e. Parking Off-Site

Notwithstanding Section 3.16 a. where parking spaces are provided in a location other than on the same lot as the use requiring such spaces, they shall be located not more than 150 metres from the same lot, and shall be located within the same zone as the said lot.

Parking Space Requirement Table	
Type or nature of use	Minimum off street parking requirement
<p style="text-align: center;"><i>Amended by By-law 86-40</i></p> <p>Assembly Hall, Auction Room, Auditorium, Arena, Community Centre, Place of Entertainment, Place of Worship, Private Club or other similar places of assembly herein</p>	<p>The greater of:</p> <ul style="list-style-type: none"> a. 1 parking space per 5 fixed seats or 3 metres of bench seating or portion thereof; or b. 1 parking space per 9 square metres of gross floor area; or c. 1 parking space for each 4 persons that may be legally accommodated at any one time.

Section 16A

Building Elements		MU1	MU2	MU3
Amount of transparent glazing within the business establishment street façade		50%	50%	50%
Location of Entrance	Residential Entrance	Within a street façade; or Along the side of the building but no more than half the width of the building from a street façade.		
	Non-Residential Entrance	At least one public entrance for each business located on the first floor shall be located within a street façade.		
Maximum size of non-residential units (square metres)		600	600	No limit
Maximum amount of non-residential floor space per property (square metres)		3,000	3,000	No limit
Landscape Requirements		MU1	MU2	MU3
Landscaped Open Space (minimum)		15%	15%	15%
Minimum planting strip abutting an Urban Residential zone (metres)		3.0	3.0	3.0
Parking and Loading		MU1	MU2	MU3
Minimum number of loading spaces (4 metres x 9 metres)		1	1	1
Minimum distance between a parking space and a building where a walkway is located beside the building (metres)		2.5	2.5	2.5
Minimum number of parking spaces based on the gross floor area of bank, professional office, retail commercial establishments and personal service shop		1 for every 40 m ²	1 for every 40 m ²	1 for every 40 m ²
Minimum number of parking spaces per apartment dwelling unit – (including visitor parking spaces)		1.0	1.0	1.0

16A.5 Additional Regulations in the Mixed-Use Zone

- a. Notwithstanding Section 3.7a., no new uses may be established on a lot that contains less than the minimum required lot area and frontage.



APPENDIX G

TAC Guidelines, Excerpts

contrasting construction materials across the driveway assists in defining a pedestrian crossing zone to the driver.

The radius of the curb return style or the flare required to accommodate an equivalent turning radius is meaningful only when considered in combination with the width of the driveway throat.

8.9.5 WIDTH

The width of a two-way driveway is measured parallel to the road since turns are generally oriented at right angles. The dimension is typically measured beyond any entrance flare. The width of one-way driveways, which are normally skewed, is measured perpendicular to the driveway.

It is desirable to state suitable driveway widths as a design domain. Dimensions at the lower end of the domain are intended to define the minimum spatial and operational requirements. The maximum dimensions assist in preventing driveways from becoming unwieldy with large paved areas and poorly defined travel paths. The most appropriate width of a driveway is determined in combination with the radius of the curb return (or the design vehicle turning radius and flare dimensions, if a straight flared design is adopted), the desired operating characteristics such as turning speed, and physical limitations which may exist at the site.

Table 8.9.1 provides a typical design domain for driveway throat widths and radii for both two-way and one-way operation. In locations where special vehicles such as long combination vehicles or similar vehicles are present, wider driveway throat dimensions or larger radii may be required.

Table 8.9.1: Typical Driveway^c Dimensions

Dimension (m)	Land Use		
	Residential	Commercial	Industrial
Width (W)			
- One way	3.0 ^a – 4.3	4.5 ^a – 7.5	5.0 – 9.0
- Two way	2.0 ^a – 7.3	7.2 ^a – 12.0 ^b	9.0 ^a – 15.0 ^b
Right turn radius (R)	3.0 – 4.5	4.5 – 12.0	9.0 – 15.0

Notes:

- Minimum widths are normally used with radii at or near the upper end of the specified range
- Increased widths may be considered for capacity purposes; where up to 3 exit lanes and 2 entry lanes are employed, 17.0 m is the maximum width exclusive of any median
- Applicable to driveways only, not road intersections

8.9.6 ANGLE OF DRIVEWAY

Two-way driveways normally intersect the roadway curb at or near 90°. However, a minimum acute angle of 70°, as measured from the roadway curb line, normally operates in an acceptable manner.

For one-way driveways, where a skewed intersection assists in efficient traffic operation, skews in the range of 45° to 60° are appropriate in industrial areas where pedestrians are infrequent. For commercial and residential land uses, where pedestrian volumes are normally moderate to high, minimum skew angles in the range of 60° to 70° are preferred to improve the driver’s visibility of the pedestrian, and vice versa, and to encourage lower turning speeds.

collector roadways, while a 3.0 m minimum is the suggested dimension for both commercial and industrial land uses. If there is a need to provide parallel parking between driveways along the roadway, a spacing of 6.0 to 7.5 m is suitable. If the spacing provided is in the range of 3.0 to 5.0 m, the space may appear inviting to a driver wishing to park, but if used, severely hampers the operation of the driveways by reducing sight lines and interfering with the turning paths of the vehicles.

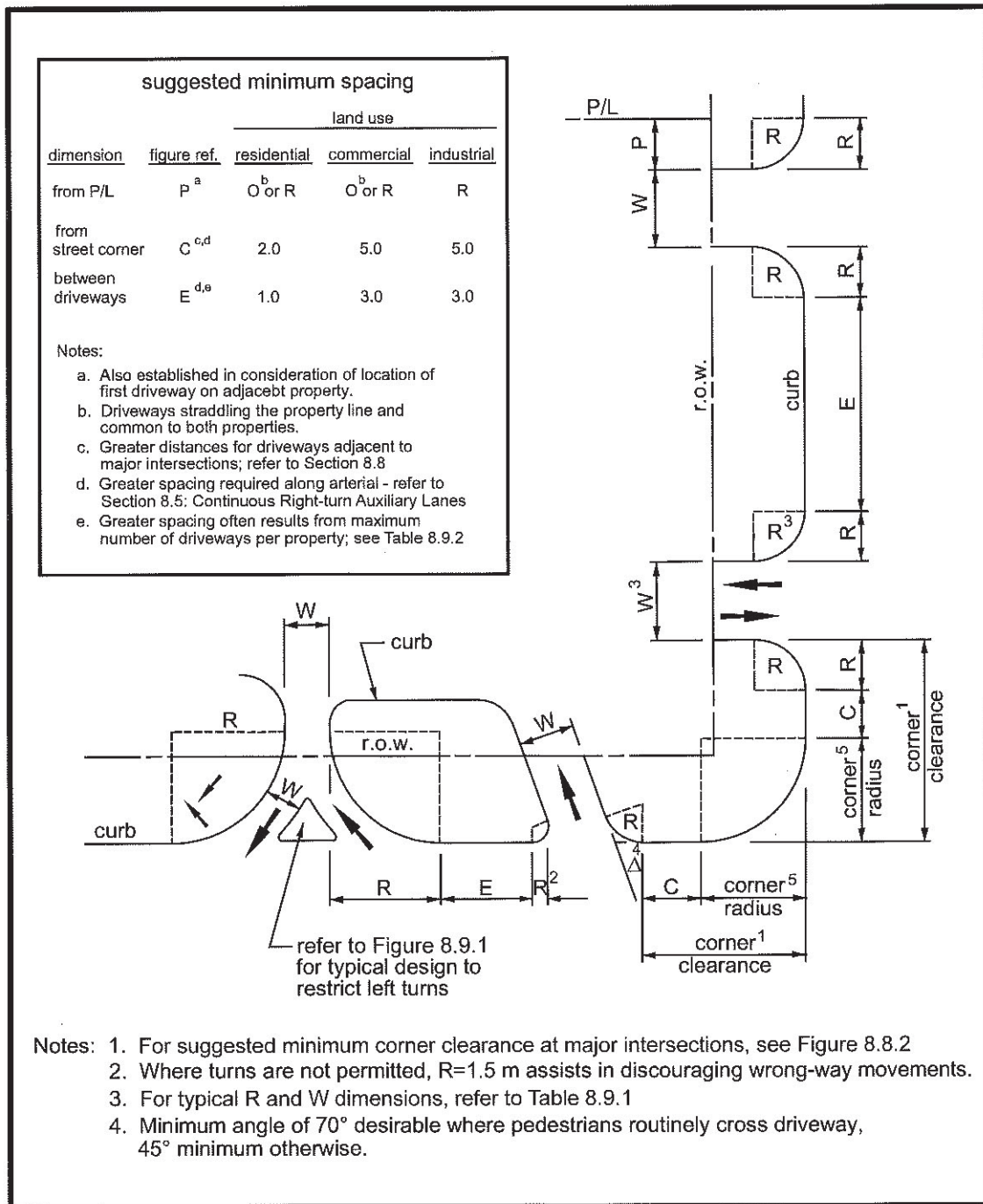


Figure 8.9.2: Driveway Spacing Guidelines – Locals and Collectors