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Memorandum

To	Sarah Schmied (Golder Associates Ltd.)	Page	1
CC	Ilya Sher (AECOM), Hossein Zarei (AECOM)		
Subject	**Alternative Low Carbon Fuel Use at the St Marys Cement Bowmanville Plant – Traffic Impact Study – Summary Memo**		
From	Ilia Merkoulovitch (AECOM), Arash Mirhoseini (AECOM)		
Date	January 24, 2020	Project Number	60618950

This document is intended to present a summary of the information included in the Traffic Impact Study technical memorandum that is appended to the back of this document.

St Marys Cement (SMC) a company of Votorantim Cimentos North America (VCNA) is undertaking an initiative to use Alternative Low Carbon Fuels (ALCFs) as an energy source for their Bowmanville Cement Plant (the Site). This initiative will help reduce greenhouse gas (GHG) emissions in Ontario while diverting materials from landfills. The Site is located at 410 Bowmanville Avenue, in the Municipality of Clarington, in Durham Region, south of Highway 401.

SMC currently has an Environmental Compliance Approval to use woody materials as an ALCF at the Site and is preparing an ALCF Application under Ontario Regulation (O. Reg 79/15) of the *Environmental Protection Act* to expand the current use of ALCFs at the Site. SMC is preparing an application to support the following:

- Thermal replacement of 30% of the conventional fuels (coal, petroleum coke) used at the Site with ALCFs, which is an approximate increase from the current 96 tonnes of ALCFs used per day to 400 tonnes of ALCFs per day;
- Adding biomass, cellulosic and plastic materials derived from industrial and/or post-consumer sources, which cannot be recycled, are not considered hazardous and are not derived from animals or the processing and preparations of food, to the list of approved ALCFs at the Site based on the recent demonstration project;
- Installing new equipment at the Site to accommodate the ALCFs; and
- Increasing the capacity of the current ALCFs storage at the Site using enclosed containers and buildings.

The expanded use of ALCFs at the Site is anticipated to result in an increase of up to 35 two-way trips per day by heavy vehicles in and out the Site throughout a typical day for deliveries of ALCFs, thus, AECOM Canada Ltd. has been retained to evaluate potential impacts of the increase in heavy vehicle volumes on traffic operations at the Highway 401 / Bowmanville Avenue interchange, the interchange adjacent to the Site and to recommend potential mitigation measures, if required. For the purpose of this traffic impact study, the AECOM project team have undertaken the following tasks:

- Collect data and assess the existing traffic conditions (2019) during the typical weekday peak periods;
- Forecast annual growth in traffic volumes at the interchange and assess future background traffic conditions (i.e., future traffic conditions in the absence of the noted increase in heavy

vehicle volumes in / out of the Site) in 2024 (i.e., the five-year horizon) during the same peak periods;
- Assess traffic conditions under the future total scenario (i.e., the future background traffic volumes plus the noted increase in heavy vehicle volumes) in 2024 and compare with those under the future background scenario during the same peak periods; and
- Summarize the traffic assessment findings and provide mitigation measures, where necessary.

As detailed in the Traffic Impact Study technical memorandum appended to the back of this document, the assessment showed that although specific movements at the study area intersections would operate at unacceptable level of service (LOS) and / or over capacity, these noted failing operations are not the result of the additional volume of traffic that would be generated by the Site. In fact, the additional heavy vehicle volumes to be generated as a result of the expanded use of ALCFs at the Site would constitute only less than 1% of the total traffic volumes entering the study area intersections and are expected to result in no change to the LOS at the study area intersections and their individual movements; i.e., no change to the estimated LOS for all the individual movements at the study area intersections as compared to the "business-as-usual" conditions (i.e., without any additional Site-generated traffic).

Given the expected failing operations of the specific individual movements at the three stop-controlled study area intersections under both the "business-and-usual" and "with additional site traffic" scenarios and although not caused by the additional Site traffic, a set of signal warrant analyses were also performed to assess need and justification for signalization of the study area intersections. The signal warrant analyses showed that among the three study area intersections, only the intersection of Bowmanville Avenue and Energy Drive meets the justification for installation of traffic signals in both the "business-as-usual" and "with additional site traffic" conditions. The other two intersections do not meet the warrant for signalization under neither the "business-and-usual" nor "with additional site traffic" scenarios.

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- Collect data and assess the existing traffic conditions (2019) during the typical weekday peak periods;
- Forecast annual growth in traffic volumes at the interchange and assess future background traffic conditions (i.e., future traffic conditions in the absence of the noted increase in heavy vehicle volumes in / out of the Site) in 2024 (i.e., the five-year horizon) during the same peak periods;

- Assess traffic conditions under the future total scenario (i.e., the future background traffic volumes plus the noted increase in heavy vehicle volumes) in 2024 and compare with those under the future background scenario during the same peak periods; and
- Summarize the traffic assessment findings and provide mitigation measures, where necessary.

Study Area

A study area has been selected with the intention of capturing the intersections with the largest expected impact as a result of the increase in truck volume. As per the information provided by the client the noted additional volume of heavy vehicles would originate from and be destined for Highway 401. As such, the noted increase in heavy vehicle volumes would increase the total entering traffic volumes to the following three intersections only (shown in **Figure 1**).

- Bowmanville Avenue and Highway 401 Westbound Off-Ramp (North Ramp Terminal - Unsignalized)
- Bowmanville Avenue and Energy Drive (Unsignalized)
- Energy Drive and Highway 401 Eastbound Off-Ramp (South Ramp Terminal - Unsignalized)

Figure 1: Study Area Intersections

Existing Conditions

A recently-collected set of turning movement counts for the study area intersections were obtained from MTO. The turning movement counts were collected on Wednesday, November 21st, 2018.

An additional set of turning movement counts as well as a new set of 24-hour 7-day automatic traffic recorder (ATR) data were commissioned by the AECOM project team in order to verify the data provided by MTO; i.e., to confirm that there have been no significant changes in the study area traffic patterns and volumes since when the MTO data were collected. On behalf of AECOM, Ontario Traffic Inc. (OTI) visited the study area intersections and collected the traffic data on Tuesday, November 19th, 2019. A review of the 2018 and 2019 data showed very similar traffic patterns and overall volumes. However, the 2018 traffic volumes provided by MTO were identified to be slightly greater than those collected by OTI in 2019, and as such the 2018 traffic volumes were selected as the existing condition volumes. In addition, based on the review of the traffic data, 07:15AM – 08:15AM

and 04:15PM – 05:15PM on a typical weekday have been identified as the two critical time periods for the purpose of this traffic analysis.

The turning movement volumes at the three study area intersections in the existing conditions during the identified AM and PM peak hours are shown in **Figure 2** and **Figure 3**, respectively.

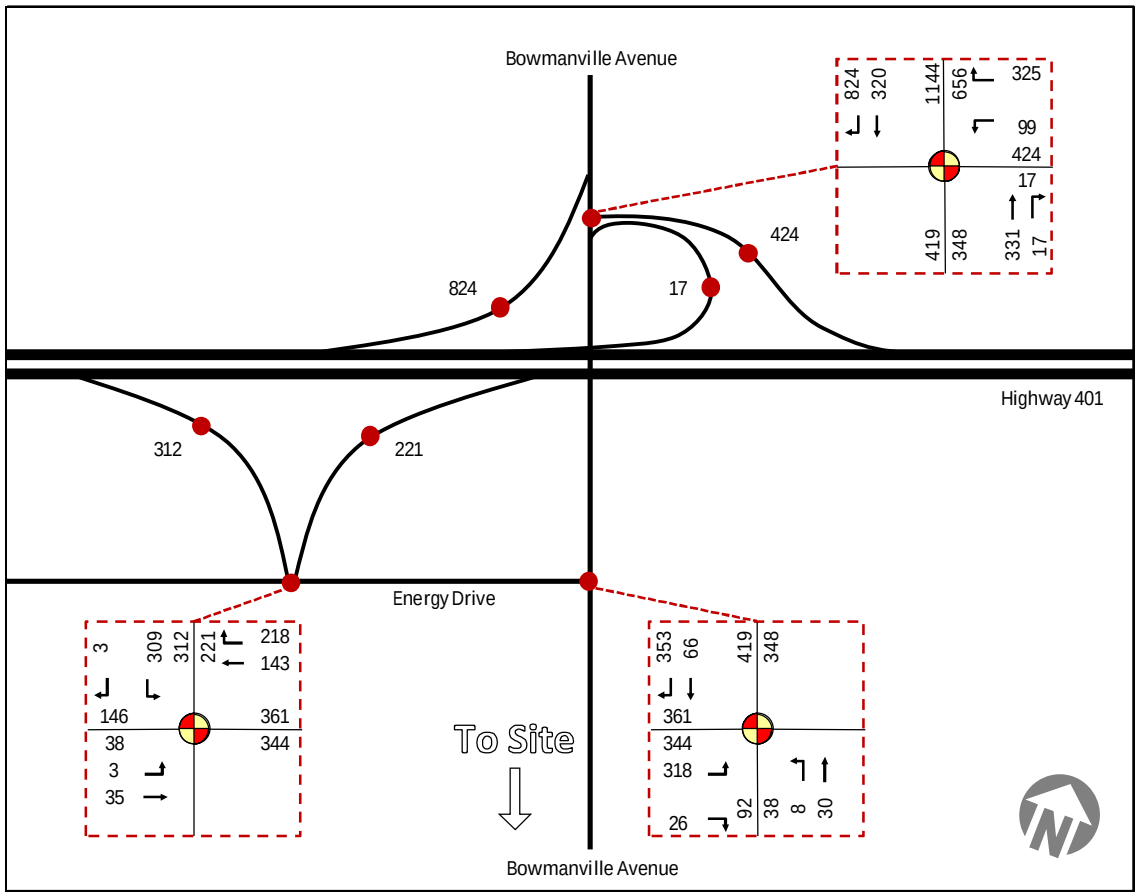


Figure 2: Existing (2019) Turning Movement Volumes – AM Peak Hour

The traffic operations at the study area intersections were analyzed using the noted traffic volumes in **Figure 2** and **Figure 3**. Synchro 9.2 software was used for the analysis, which is generally based on the methodology found in the Highway Capacity Manual (HCM). HCM 2010 methodology was selected to be used for reporting the traffic operations at each intersection.

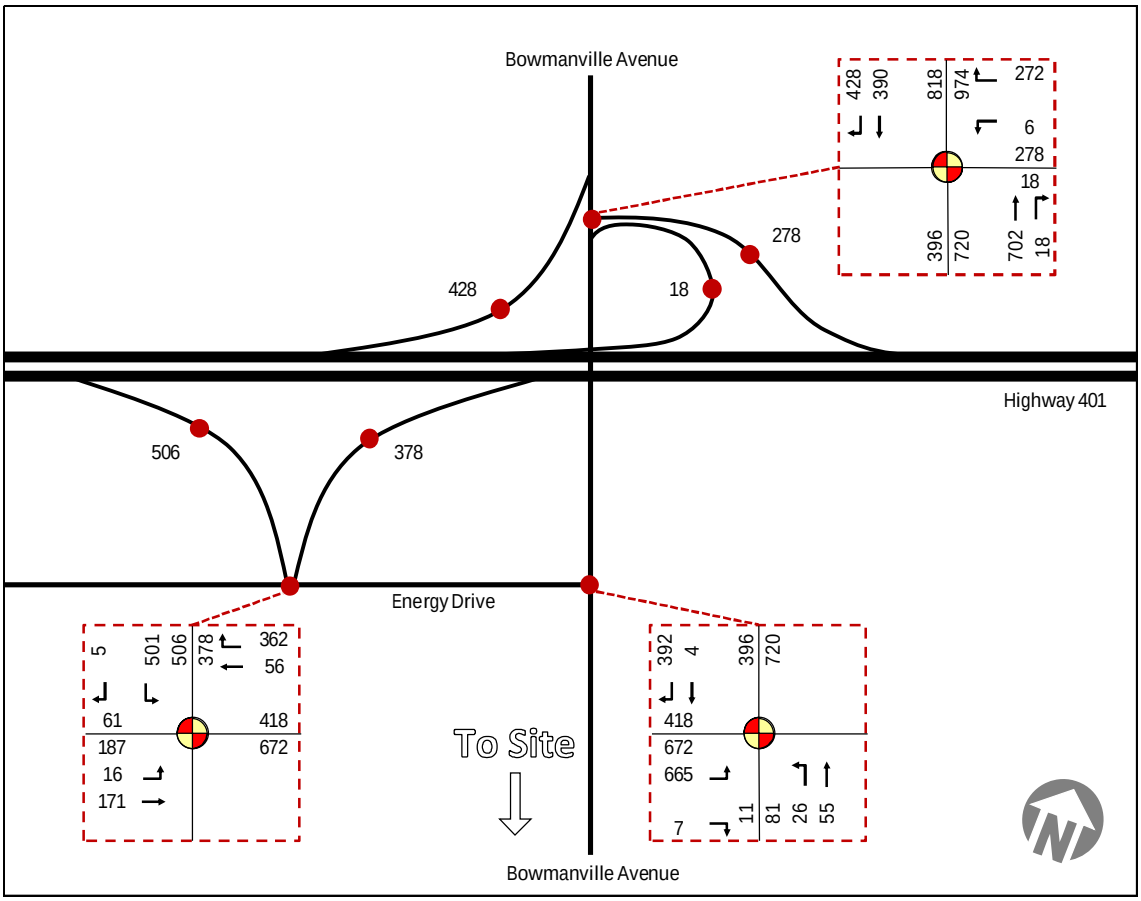


Figure 3: Existing (2019) Turning Movement Volumes – PM Peak Hour

The existing AM and PM peak hour traffic operations are analyzed using the Level of Service (LOS), volume-to-capacity ratio (V/C), control delay, and 95th percentile queue length for the subject intersections. LOS is a qualifying measure of traffic operations at an intersection, relating the delay per vehicle for a 15-minute analysis period. LOS A through D typically reflect adequate operations, while LOS E reflects increasing congestion and at capacity operations, and LOS F reflects long delays and, in some cases, severe traffic congestion. The LOS criteria for signalized and unsignalized intersection traffic controls are summarized in **Table 1**. The V/C ratio is a measure of the proportion of the calculated intersection capacity that is utilized by the actual or modeled traffic volumes. Critical movements in the table are bolded. The movements with either a V/C ratio greater than 0.85 or LOS worse than D are defined as critical. The summary of the existing conditions analysis is presented in **Table 2**.The detailed analysis outputs related to the existing conditions scenario are provided in **Appendix B**.

Table 1: Intersection LOS Criteria

Levels of Service	Average Control Delay (seconds / vehicle)	
	Traffic Signal Control	Stop Control
A	0 to 10	0 to 10
B	>10 to 20	>10 to 15
C	>20 to 35	>15 to 25
D	>35 to 55	>25 to 35
E	>55 to 80	>35 to 50
F	>80	>50

Source: Highway Capacity Manual (2010)

Table 2: Summary of Traffic Operations in the Existing (2019) Conditions

Intersection	Movement	AM Peak Hour				PM Peak Hour			
		Delay	LOS	V/C Ratio	95th % Queue (m)	Delay	LOS	V/C Ratio	95th % Queue (m)
Bowmanville Avenue and Highway 401 Westbound Off-Ramp	WBLR	**36.4**	**E**	**0.84**	**67**	29.8	D	0.68	37
	NBTR	0.0	A	-	-	0.0	A	-	-
	SBLT	0.0	A	-	-	0.0	A	-	-
Bowmanville Avenue and Energy Drive	EBL	15.5	C	0.50	21	**65.1**	**F**	**1.02**	**126**
	EBR	10.1	B	0.04	1	10.1	B	0.01	0
	NBL	8.8	A	0.01	0	8.2	A	0.02	1
	NBT	0.0	A	-	-	0.0	A	-	-
	SBT	0.0	A	-	-	0.0	A	-	-
	SBR	0.0	A	-	-	0.0	A	-	-
Energy Drive and Highway 401 Eastbound Off-Ramp	EBTL	8.0	A	0.01	0	8.2	A	0.01	0
	EBT	0.0	A	-	-	0.1	A	-	-
	WBT	0.0	A	-	-	0.0	A	-	-
	WBR	0.0	A	-	-	0.0	A	-	-
	SBL	15.2	C	0.48	20	34.8	D	0.84	69
	SBR	9.6	A	0.01	0	9.5	A	0.01	0

Under the existing conditions, the only two critical movements in the existing conditions are as follows:

- Bowmanville Avenue and Highway 401 Westbound Off-Ramp (North Ramp Terminal)
  - The westbound shared left / right turn movement operates at LOS E with a delay of 36.4 seconds during the AM peak hour.
- Bowmanville Avenue and Energy Drive
  - The eastbound left-turn movement operates at LOS F with a delay of 65.1 seconds and a V/C ratio of 1.02, an indication that the movement operates above capacity during the PM peak hour.

The 95th percentile queue for the eastbound left-turn movement at the intersection of Bowmanville Avenue and Energy Drive was estimated at 126 metres and shown to reach the upstream intersection (i.e., the Highway 401 south ramp terminal).

Future Background Conditions

The road network and lane configurations used in the analysis of the future background conditions are the same as those used in the existing conditions analysis. As stated earlier, the horizon year of 2024 was employed for the analysis.

In order to account for the growth in the traffic volumes entering the study area intersections due to the background developments by 2024, the most recent available historical AADT volumes on the section of Highway 401 in proximity of the Bowmanville Avenue interchange area used. The historical AADT volumes were for the five-year period between 2012 and 2016. Using the noted AADT volumes and assuming a linear growth in the historical traffic volumes, the annual growth rate was estimated at an average of 1.36% per annum. The 1.36% annual growth rate was applied to the existing (2018) turning movement volumes to project the turning movement volumes in 2024 under the future background scenario. The projected turning movement volumes at the study area intersections in the future background conditions during the AM peak hour and PM peak hour are shown in **Figure 4** and **Figure 5**, respectively.

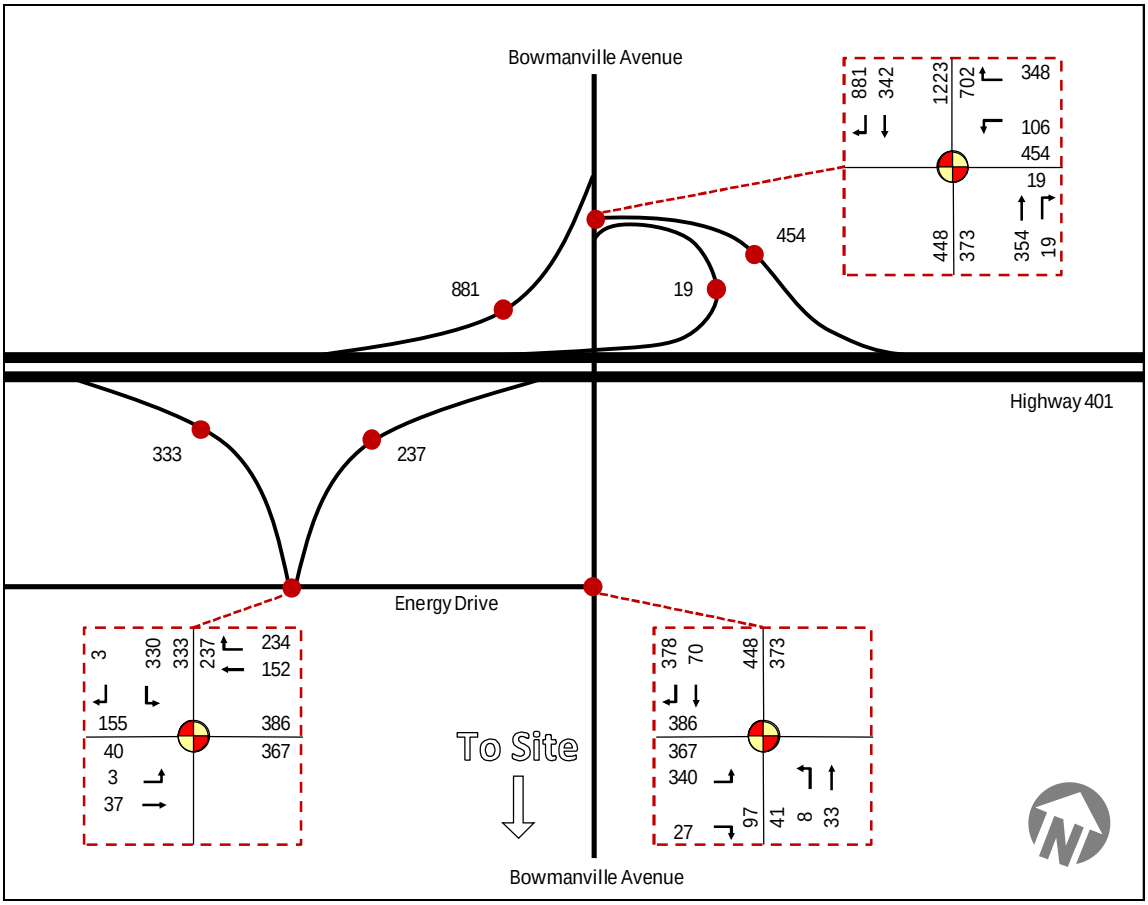


Figure 4: Future Background (2024) Turning Movement Volumes – AM Peak Hour

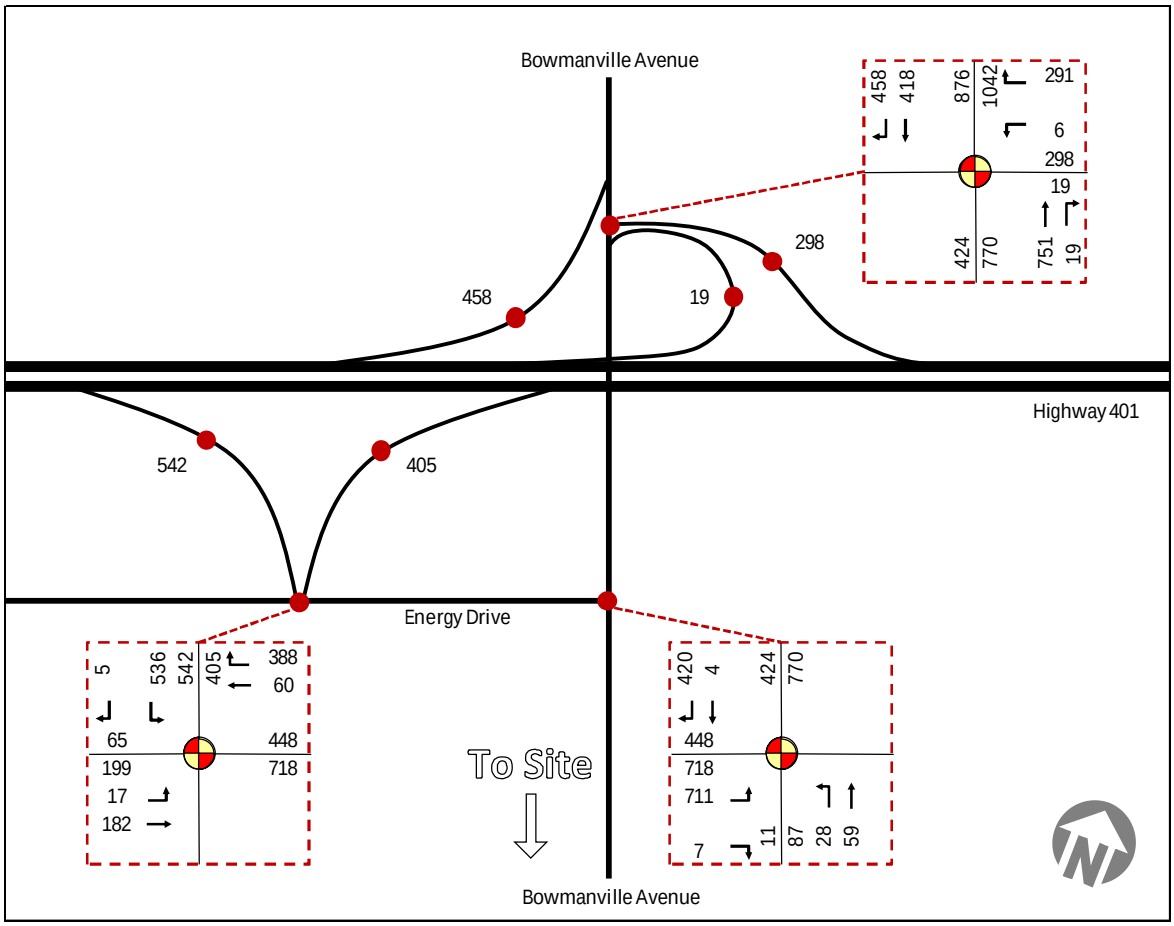


Figure 5: Future Background (2024) Turning Movement Volumes – PM Peak Hour

The future background AM and PM peak hour traffic operations are summarized in **Table 3**. The detailed analysis outputs pertaining to the future background scenario are provided in **Appendix B**.

The assessment of the future background conditions revealed generally worsened traffic operations at the study area intersections during both the AM and PM peak hours, as compared to those in the existing conditions.

During the AM peak hour, the performance of the westbound shared left / right turn movement at the north ramp terminal as the only critical movement at the three study area intersections would worsen from LOS E and V/C ratio of 0.84 in the existing conditions to LOS F and V/C ratio of 0.95 in the future background conditions. This indicates that the noted movement would be nearing capacity (i.e., a V/C ratio of 1.00 indicates the movement operates at capacity). In comparison to the existing conditions, there would be no new critical movements during the AM peak hour.

Unlike the future background conditions during the AM peak hour, in the future background conditions during the PM peak hour, there would be two (2) additional critical movements as compared to that in the existing conditions, bringing the total to three (3) critical movements. While the eastbound left-turn movement at the intersection of Bowmanville Avenue and Energy Drive would continue to operate over capacity with a V/C ratio of 1.13. The southbound left-turn movement at the South Ramp Terminal and the westbound shared left / right turn movement at the north ramp terminal are expected to reach critical conditions under the future background scenario during the PM peak hour.

Table 3: Summary of Traffic Operations in the Future Background (2024) Conditions

Intersection	Movement	AM Peak Hour				PM Peak Hour			
		Delay	LOS	V/C Ratio	95th % Queue (m)	Delay	LOS	V/C Ratio	95th % Queue (m)
Bowmanville Avenue and Highway 401 Westbound Off-Ramp	WBLR	**53.9**	**F**	**0.95**	**91**	**39.3**	**E**	**0.77**	**49**
	NBTR	0.0	A	-	-	0.0	A	-	-
	SBLT	0.0	A	-	-	0.0	A	-	-
Bowmanville Avenue and Energy Drive	EBL	16.9	C	0.55	25	**99.4**	**F**	**1.13**	**168**
	EBR	10.2	B	0.04	1	10.2	B	0.01	0
	NBL	8.9	A	0.01	0	8.3	A	0.03	1
	NBT	0.0	A	-	-	0.0	A	-	-
	SBT	0.0	A	-	-	0.0	A	-	-
	SBR	0.0	A	-	-	0.0	A	-	-
Energy Drive and Highway 401 Eastbound Off-Ramp	EBTL	8.1	A	0.01	0	8.3	A	0.02	0
	EBT	0.0	A	-	-	0.1	A	-	-
	WBT	0.0	A	-	-	0.0	A	-	-
	WBR	0.0	A	-	-	0.0	A	-	-
	SBL	16.4	C	0.53	23	**50.6**	**F**	**0.94**	**93**
	SBR	9.8	A	0.01	0	9.6	A	0.01	0

The following movements were noted as critical in the future background conditions in 2024:

- Bowmanville Avenue and Highway 401 Westbound Off-Ramp (North Ramp Terminal)
  - The westbound shared left / right turn movement would operate at LOS F with a delay of 53.9 seconds and a V/C ratio of 0.95 during the AM peak hour and at LOS E with a delay of 39.3 seconds and a V/C ratio of 0.77 during the PM peak hour.
- Bowmanville Avenue and Energy Drive
  - The eastbound left-turn movement would operate at LOS F with a delay of 99.4 seconds and a V/C ratio of 1.13 during the PM peak hour.
- Energy Drive and Highway 401 Eastbound Off-Ramp (South Ramp Terminal)
  - The southbound left-turn movement would operate at LOS F with a delay of 50.6 seconds and a V/C ratio of 0.94 during the PM peak hour.

The 95th percentile queue for the eastbound left-turn movement at the intersection of Bowmanville Avenue and Energy Drive was estimated at 168 metres; thus, it would reach the upstream intersection (i.e., the Highway 401 south ramp terminal).

Future Total Conditions

The road network and lane configurations used in the analysis of the future total conditions are the same as those used in the existing and future background conditions analyses. The future horizon year of 2024 was used in order to identify the impact of the increase in heavy vehicle volumes by comparing the traffic conditions in the future total scenario with those in the future background scenario.

As per the information provided by the client, the expanded use of ALCFs at the Site is anticipated to result in an increase of up to 35 two-way trips per day by heavy vehicles in and out the Site. Specific details on origins, destinations, and schedule of these additional heavy vehicle trips were not available at the time of preparation of this technical memorandum. Hence, for the purpose of this traffic analysis and as described in the following two paragraphs, the AECOM project team have made some conservative assumptions in estimating the unknown information.

The 24-hour 7-day ATR data collected at the south leg of the Bowmanville Avenue and Energy Drive intersection in November 19th, 2019 captures the temporal distribution of heavy vehicles in and out of the Site on a typical weekday in the existing (2019) conditions. For the purpose of estimating the number of additional heavy vehicle trips produced by and attracted to the Site during the AM and PM peak hours under the future total scenario, it is assumed that the temporal distribution of the additional heavy vehicle volumes (i.e., the additional 35 two-way trips per day by heavy vehicles) would be identical to those in the existing conditions. The review of the ATR data showed that the AM and PM peak hours of the heavy vehicle travel in and out of the Site are different from the previously-identified AM and PM peak hours for the traffic analysis which were described in the "Existing Conditions" Section of this technical memorandum. However, it has been conservatively assumed that the peak-hour volumes of the additional heavy vehicle traffic would be entering / exiting the Site during the previously-identified AM and PM peak hours for the traffic analysis. Based on the ATR data, the inbound traffic volumes to the Site during the AM peak hour and PM peak hour constitute almost 20% and 5%, respectively of the total inbound daily traffic volumes to the Site. The ATR data also show that almost 10% and 15% of the total outbound daily traffic volumes from the Site occur during the AM peak hour and PM peak hour respectively. Accordingly, it is estimated that there would be an additional seven (7) inbound and four (4) outbound heavy vehicles during the AM peak hour as well as additional two (2) inbound and six (6) outbound heavy vehicles during the PM peak hour under the future total scenario.

In addition and in order to consider the worst-case scenario regarding the distribution of additional heavy vehicle trips (i.e., with the highest level of potential impacts on traffic conditions in the study area road network), it is conservatively assumed that the additional heavy vehicle volumes would select an inbound and outbound routes to / from the Site with the highest potential impact on traffic operations at the study area intersections; i.e., it is assumed that the additional inbound heavy vehicles would make a westbound left-turn movement at the north ramp terminal and travel southbound along Bowmanville Avenue to reach the Site and the additional outbound heavy vehicles would make a northbound left-turn movement at the Bowmanville Avenue and Energy Drive intersection to access the eastbound on-ramp at the south ramp terminal.

The additional heavy vehicle volumes generated by the Site under the future total scenario during the AM and PM peak hours are shown in **Figure 6** and **Figure 7**, respectively.

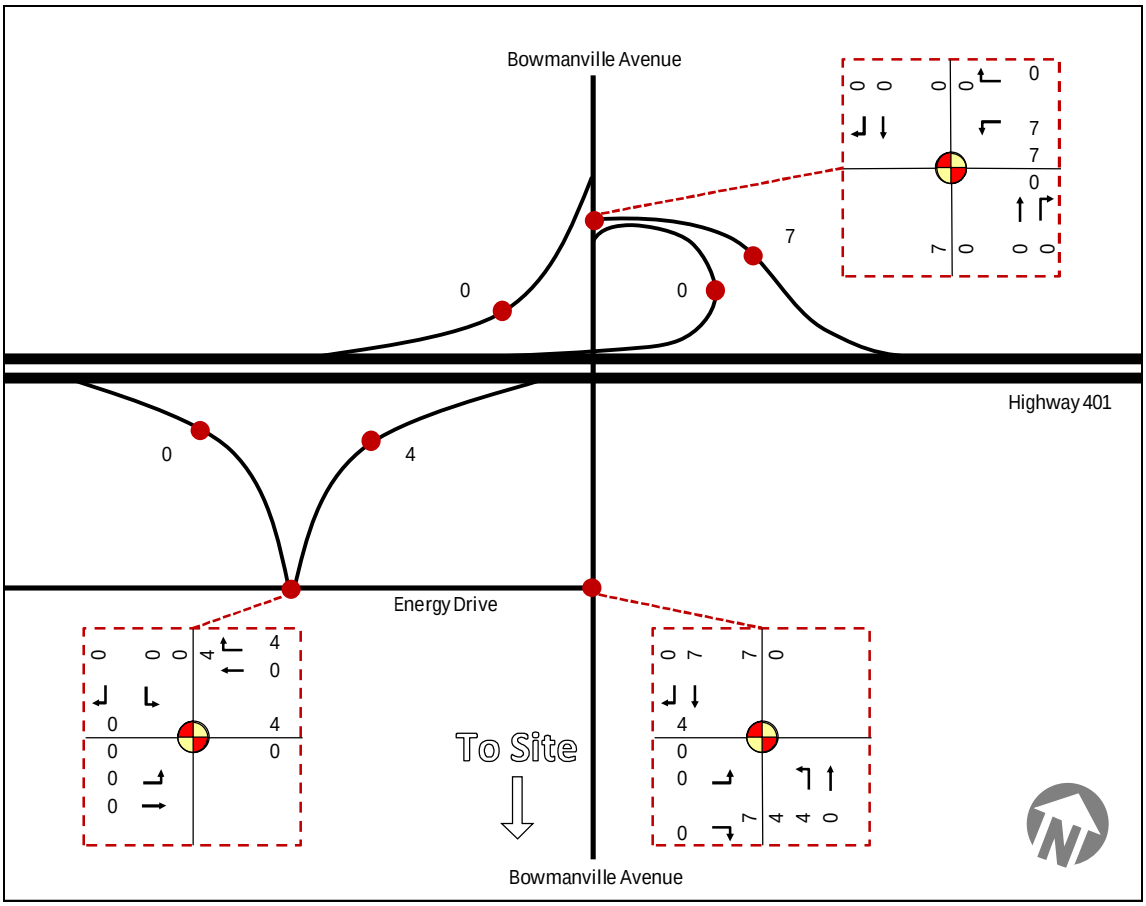


Figure 6: Additional Number of Heavy Vehicle Trips Generated by the Site in the Future Total (2024) Conditions – AM Peak Hour

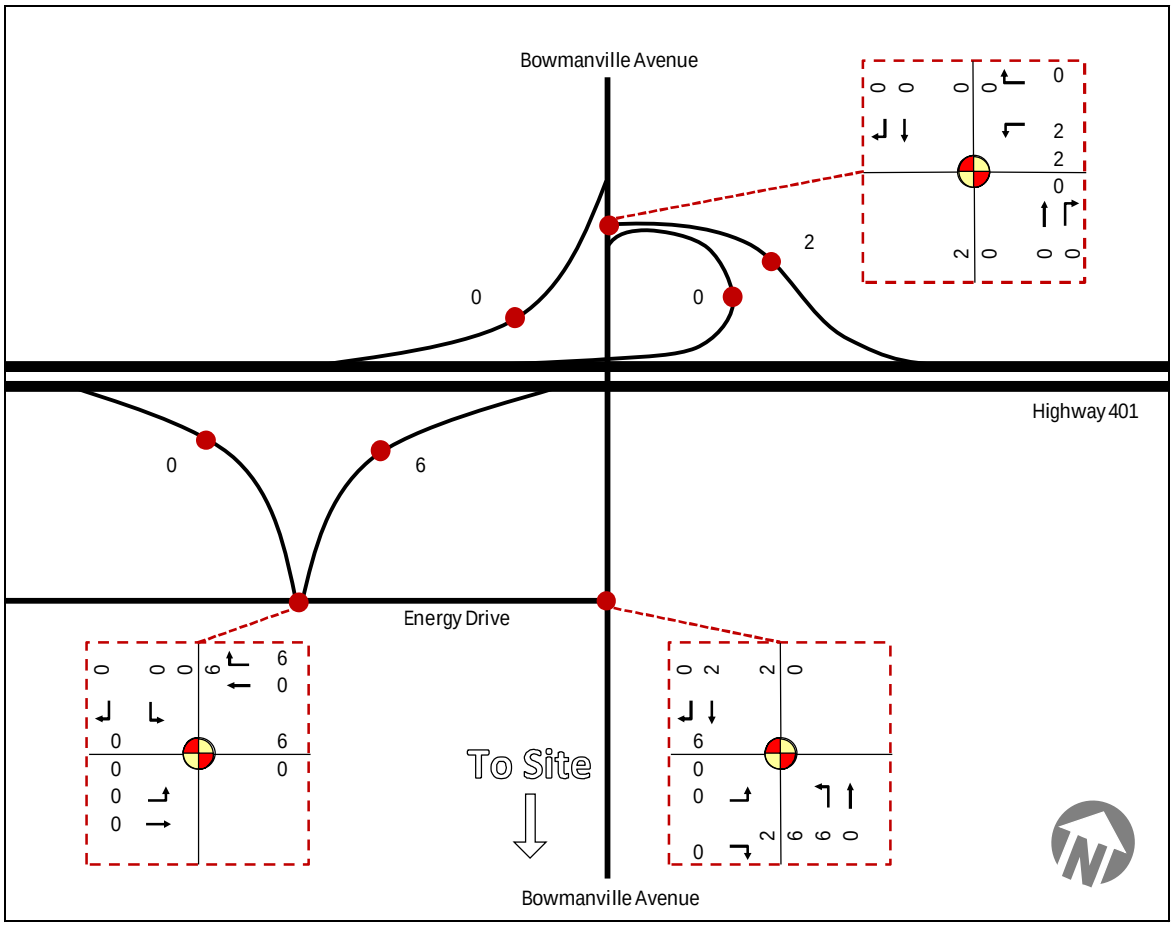


Figure 7: Additional Number of Heavy Vehicle Trips Generated by the Site in the Future Total (2024) Conditions – PM Peak Hour

The turning movement volumes at the study area intersection under the future total scenario during the AM and PM peak hours were estimated by adding the respective turning movement volumes in the future background conditions and the additional number of heavy vehicle trips generated due to the proposed expansion of the Site. The turning movement volumes under the future total scenario during the AM peak hour and PM peak hour are shown in **Figure 8** and **Figure 9**, respectively.

The future total AM and PM peak hour traffic operations are summarized in **Table 4**. The detailed analysis outputs pertaining to the future total scenario are provided in **Appendix B**.

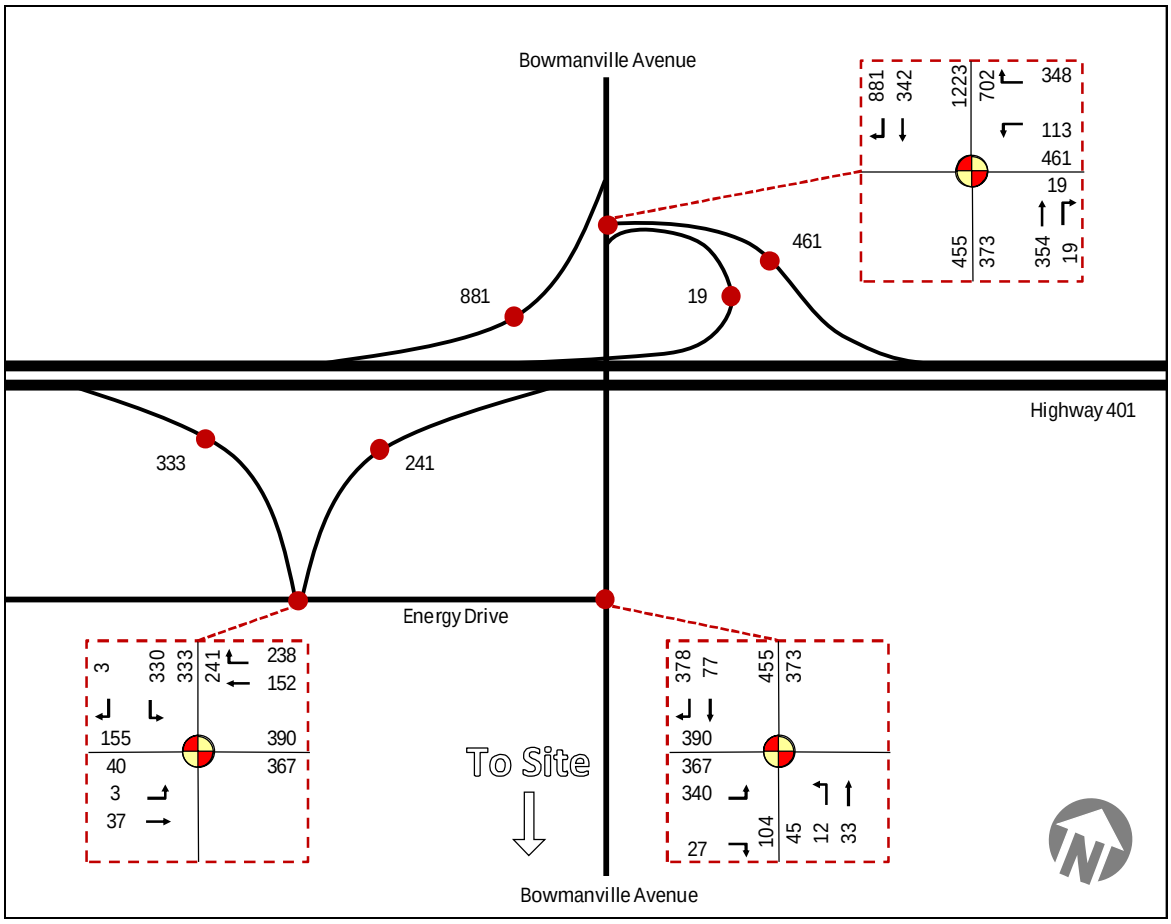


Figure 8: Future Total (2024) Turning Movement Volumes – AM Peak Hour

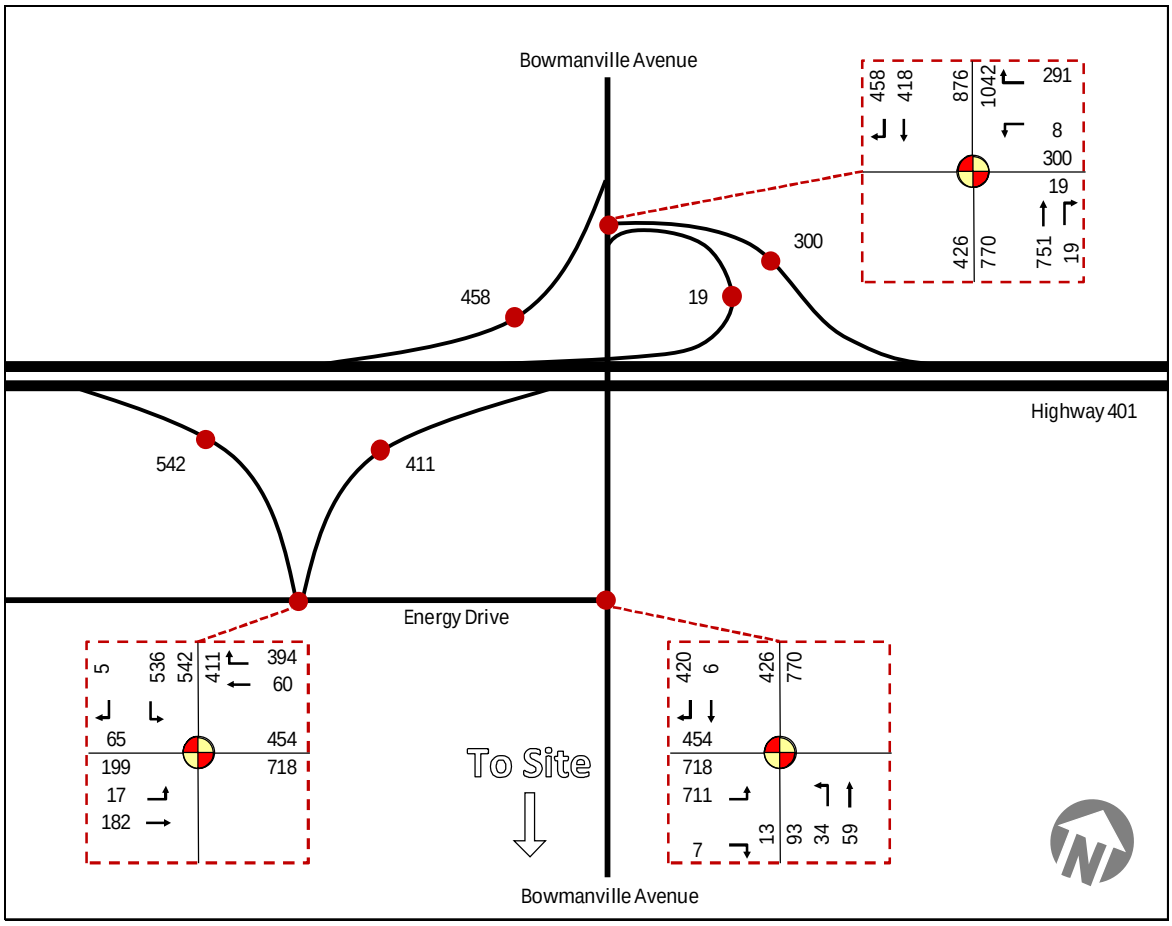


Figure 9: Future Total (2024) Turning Movement Volumes – PM Peak Hour

Table 4: Summary of Traffic Operations in the Future Total (2024) Conditions

Intersection	Movement	AM Peak Hour				PM Peak Hour			
		Delay	LOS	V/C Ratio	95th % Queue (m)	Delay	LOS	V/C Ratio	95th % Queue (m)
Bowmanville Avenue and Highway 401 Westbound Off-Ramp	WBLR	**61.1**	**F**	**0.97**	**98**	**41.3**	**E**	**0.79**	**50**
	NBTR	0.0	A	-	-	0.0	A	-	-
	SBLT	0.0	A	-	-	0.0	A	-	-
Bowmanville Avenue and Energy Drive	EBL	17.7	C	0.56	26	**111.9**	**F**	**1.16**	**179**
	EBR	10.3	B	0.04	1	10.2	B	0.01	0
	NBL	9.3	A	0.02	0	8.6	A	0.03	1
	NBT	0.0	A	-	-	0.0	A	-	-
	SBT	0.0	A	-	-	0.0	A	-	-
	SBR	0.0	A	-	-	0.0	A	-	-
Energy Drive and Highway 401 Eastbound Off-Ramp	EBTL	8.1	A	0.01	0	8.3	A	0.02	0
	EBT	0.0	A	-	-	0.1	A	-	-
	WBT	0.0	A	-	-	0.0	A	-	-
	WBR	0.0	A	-	-	0.0	A	-	-
	SBL	16.5	C	0.53	23	**51.3**	**F**	**0.94**	**94**
	SBR	9.8	A	0.01	0	9.7	A	0.01	0

The assessment of the future total conditions showed marginal changes (if any) in the traffic conditions at the study area intersections as compared to those in the future background conditions. The LOS for the individual movements and at the overall intersection level in the future total conditions would remain unchanged from the future background conditions.

As compared to the future background conditions, there would be only marginal increases (if any) in the average vehicle delays for the individual movements in the future total conditions, with the longest increase in average vehicle delay of 12.5 seconds (equivalent to 12.6% increase) experienced by eastbound left-turning motorists at the intersection of Bowmanville Avenue and Energy Drive during the PM peak hour. However, and as described above in the "Future Background Conditions" Section, the noted movement is expected to operate under unstable traffic conditions at an unacceptable LOS F with a delay of 99.4 seconds, and over capacity with a V/C ratio of 1.13 even in the future background conditions. This explains why traffic conditions pertaining to the noted movement show a high sensitivity to even the minimal increase in traffic volumes of eight (8) additional heavy vehicles, accounting for only 0.3% of the total entering traffic volumes to the intersection of Bowmanville Avenue and Energy Drive.

During the AM peak hour, the longest increase in average vehicle delay is estimated at 7.2 seconds and to be experienced by westbound shared left / right turning motorists at the north ramp terminal.

The following movements were noted as critical in the future total conditions in 2024:

- Bowmanville Avenue and Highway 401 Westbound Off-Ramp (North Ramp Terminal)
    - The westbound shared left / right turn movement would operate at LOS F with a delay of 61.1 seconds and a V/C ratio of 0.97 during the AM peak hour and at LOS E with a delay of 41.3 seconds and a V/C ratio of 0.79 during the PM peak hour.
- Bowmanville Avenue and Energy Drive
    - The eastbound left-turn movement would operate at LOS F with a delay of 111.9 seconds and a V/C ratio of 1.16 during the PM peak hour.
- Energy Drive and Highway 401 Eastbound Off-Ramp (South Ramp Terminal)
    - The southbound left-turn movement would operate at LOS F with a delay of 51.3 seconds and a V/C ratio of 0.94 during the PM peak hour.

The 95th percentile queue for the eastbound left-turn movement at the intersection of Bowmanville Avenue and Energy Drive was estimated at 179 metres; thus, similar to the future background conditions, it would reach the upstream intersection (i.e., the Highway 401 South Ramp Terminal).

Signal Warrant Analysis

Given the expected failing operations of the specific individual movements at the three stop-controlled study area intersections under both the future background and future total conditions and although not caused by the additional Site traffic, a set of signal warrant analyses were performed to assess needs and justification for signalization of the study area intersections. The signal warrant analyses were performed as per the guidelines provided in Ontario Traffic Manual (OTM) Book 12. As per the guidelines provided in OTM Book 12, the peak-hour traffic volumes were used to estimate the other highest hourly traffic volumes (i.e., the highest hourly traffic volumes other than the AM and PM peak hour volumes) during a typical weekday that were needed for undertaking the signal warrant analysis.

The signal warrant analyses showed that among the three study area intersections, only the intersection of Bowmanville Avenue and Energy Drive meets the justification for installation of traffic signals in the future background conditions, and thus, obviously in the future total conditions. The specific justification that is met is the Minimum Vehicular Volume justification (i.e., the OTM Justification #1). The other two intersections do not meet the warrant for signalization under neither of the future background nor future total scenarios. Note that the signal warrant analysis also showed that the north ramp terminal would meet the Minimum Four-Hour Vehicle Volume justification (i.e., the

OTM Justification #4) for signalization under the future background conditions, however, MTO does not use the Minimum Four-Hour Vehicle Volume justification (i.e., the OTM Justification #4) for assessing ramp terminals / intersections[1]. Signal warrant sheets are included in **Appendix C**.

Analysis of Sensitivity to Type of Control Device at the Intersection of Bowmanville Avenue and Energy Drive

Given the signal warrant analysis findings, the traffic conditions at the Bowmanville Avenue and Energy Drive intersection were reassessed as if it would operate as a signalized intersection under both the future background and future total conditions. A standard signal phasing setup with no protected left-turn movements was used for the intersection.

Table 5 presents the summary of traffic conditions at the intersection of Bowmanville Avenue and Energy Drive under the signalized operation in the future background conditions. Unlike the unsignalized scenario, all the individual movements under the signalized scenario would operate at an acceptable LOS D or better. The southbound right-turn movement is the only movement that would operate at a critical level during the PM peak hour with a V/C ratio of 0.89. The queue of the eastbound left-turning vehicles was estimated at 94 metres; thus, it would still extend to the upstream intersection (i.e., the South Ramp Terminal), however, the queue would be notably shorter than the 168-metre queue that would form under the unsignalized scenario.

Table 5: Summary of Traffic Conditions at the Bowmanville Avenue and Energy Drive Intersection under the Signalized Operation in the Future Background (2024) Conditions

Intersection	Movement	AM Peak Hour				PM Peak Hour			
		Delay	LOS	V/C Ratio	95th % Queue (m)	Delay	LOS	V/C Ratio	95th % Queue (m)
Bowmanville Avenue and Energy Drive	EBL	17.1	B	0.54	51	15.9	B	0.75	94
	EBR	11.5	B	0.05	4	6.4	A	0.01	1
	NBL	18.7	B	0.03	2	30.6	C	0.18	8
	NBT	9.3	A	0.07	6	15.3	B	0.11	12
	SBT	0.0	A	0.00	19	0.0	A	0.00	17
	SBR	17.7	B	0.67		41.4	D	0.89	

Table 6 presents the summary of traffic conditions at the intersection of Bowmanville Avenue and Energy Drive under the signalized operation in the future total conditions. similar to the future background conditions, all the individual movements under the future total scenario would operate at an acceptable LOS D or better and that the only critical movement would be the southbound right-turn movement during the PM peak hour with a V/C ratio of 0.90. The eastbound left-turn queue would be 94 metres which is the same length as that in the future background conditions; thus, it would also reach the upstream intersection (i.e., the South Ramp Terminal). Compared to the respective future background conditions, the additional heavy vehicle volumes would result in only marginal (if any) changes in traffic operations. The largest increase in delay would be 1.6 seconds and experienced by the northbound left-turning motorists during the PM peak hour.

[1] *Ontario Traffic Manual Book 12 – Traffic Signals, March 2012, page 83.*

Table 6: Summary of Traffic Conditions at the Bowmanville Avenue and Energy Drive under the Signalized Operation in the Future Total (2024) Conditions

Intersection	Movement	AM Peak Hour				PM Peak Hour			
		Delay	LOS	V/C Ratio	95th % Queue (m)	Delay	LOS	V/C Ratio	95th % Queue (m)
Bowmanville Avenue and Energy Drive	EBL	17.1	B	0.54	51	15.9	B	0.75	94
	EBR	11.5	B	0.05	4	6.4	A	0.01	1
	NBL	19.6	B	0.05	3	32.2	C	0.23	10
	NBT	9.3	A	0.07	6	15.3	B	0.11	12
	SBT	0.0	A	0.00	20	0.0	A	0.00	17
	SBR	18.3	B	0.69		42.5	D	0.90	

Overall, the assessment of the Bowmanville Avenue and Energy Drive intersection under the signalized conditions revealed either marginal or no impact in traffic operations as a result of the increase in heavy vehicle volumes entering / exiting the Site. As the intersection would be no longer operate over-capacity, the increase in heavy vehicle volumes is expected to result in only minor incremental changes in delays and queue lengths. The detailed analysis outputs for the Bowmanville Avenue and Energy Drive intersection under the signalized operation are provided in **Appendix B**.

Concluding Statement

The additional heavy vehicle volumes (estimated at up to 35 vehicles per day) to be generated as a result of the expanded use of ALCFs at the Site would constitute only less than 1% of the total traffic volumes entering the study area intersections and are expected to result in no change to the LOS at the study area intersections and their individual movements. In addition and although not driven by the additional Site traffic, the intersection of Bowmanville Avenue and Energy Drive meets the OTM justification for installation of traffic signals.

Appendix A

Traffic Data Collected

Ministry of Transportation
Ministère des Transports

Intersection Layout Sheet

Version: 1.0 Feb 1, 2016

Contract # 9015-E-0008
Work Order # 153

2018

Date: November / 21 Day: Wen / Hrs: 7 - 9 + 11 - 14 + 15 - 18

Location: HWY 401 & Waverly Rd IC-431 North Ramps Ramps: NRT /

Reg/Mun: CR Town/City: Bowmanville Area:

File Name: 1475770000 Device: Gretch / Jamar Unit # 16 / Interval 1: (AM) / NN / PM

Observer: Alena Marinskaya Weather: Cloudy / Cloudy Road Condition: Partial snow covered / Wet

LHRS & O/S: 47577 0.00

GPS: G-Star IV

Datum: WGS 84 (Y) / N

Lat: 43.885832

Long: -78.680066

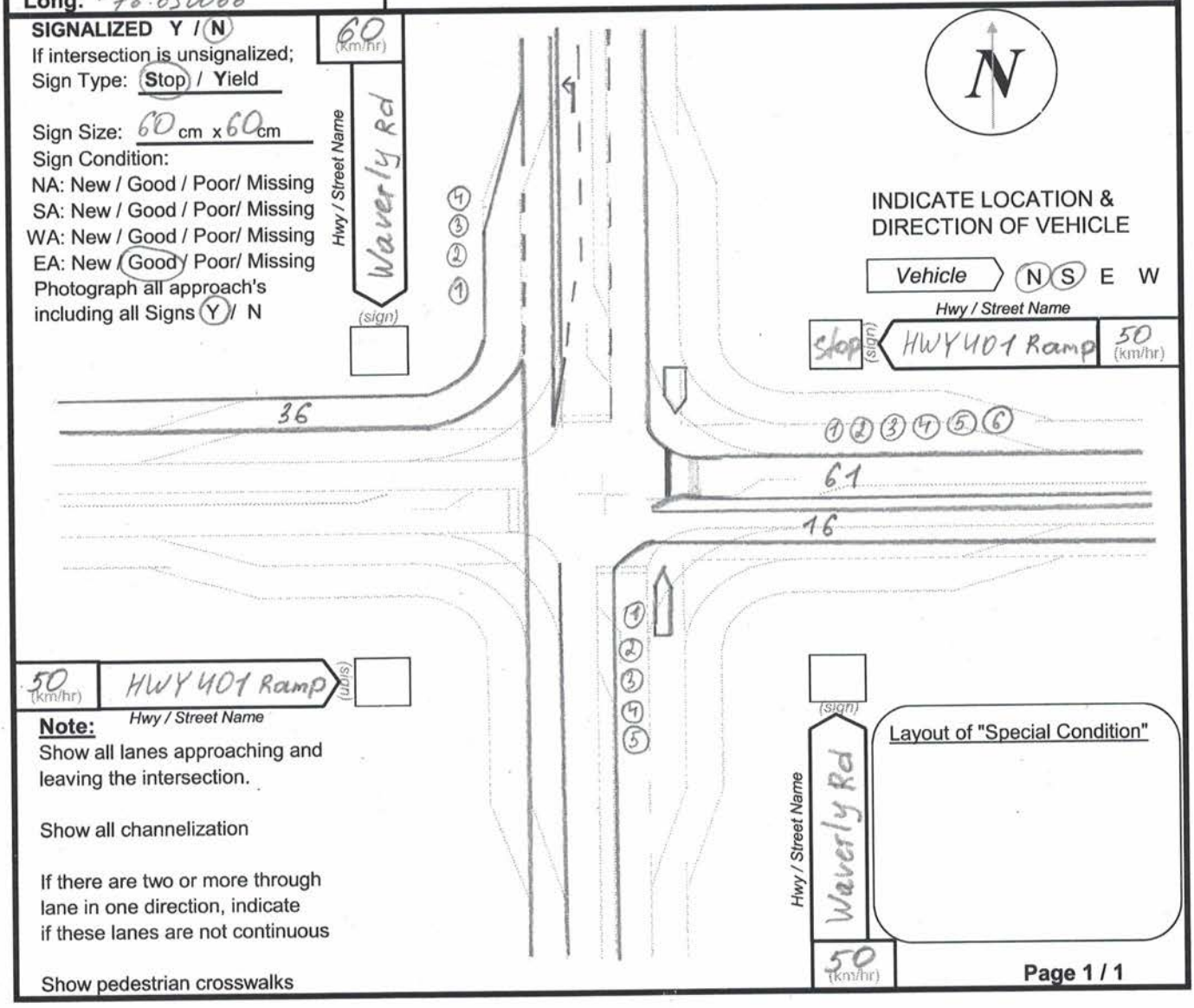
Comments:

SIGNALIZED Y / (N)

If intersection is unsignalized;
Sign Type: (Stop) / Yield

Sign Size: 60 cm x 60 cm

Sign Condition:
NA: New / Good / Poor/ Missing
SA: New / Good / Poor/ Missing
WA: New / Good / Poor/ Missing
EA: New / (Good) / Poor/ Missing
Photograph all approach's including all Signs (Y) / N



Note:
Show all lanes approaching and leaving the intersection.

Show all channelization

If there are two or more through lane in one direction, indicate if these lanes are not continuous

Show pedestrian crosswalks

(sign)
Hwy / Street Name
Waverly Rd
50 (km/hr)

Layout of "Special Condition"

Ontario

Ministry of Transportation

TVIS II - Traffic Volume Information System

Turning Movement Total Count and Peak Summary Report

Description: HWY 401 @ WAVERLEY RD IC 431 (NRT)

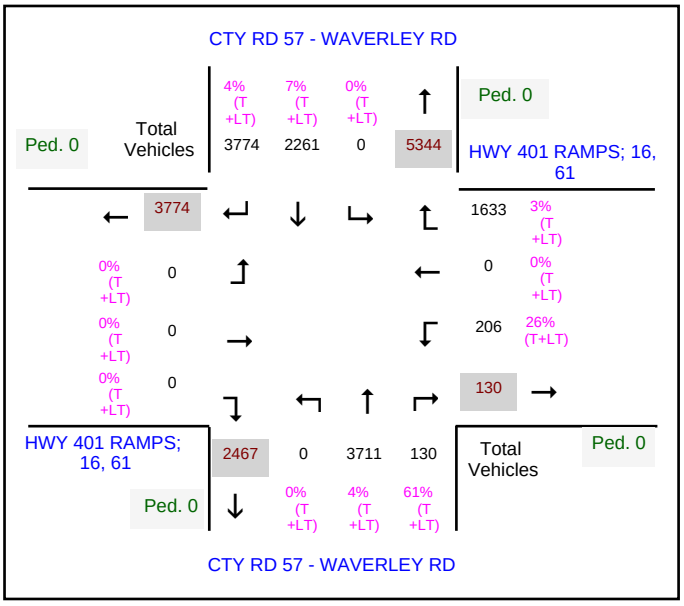
Region: CENTRAL | **Survey Type:** TM – Interchange | **Hwy:** 401

Start Date: 21-Nov-2018 (Wed) | **I/C Side:** N | **LHRS:** 47577

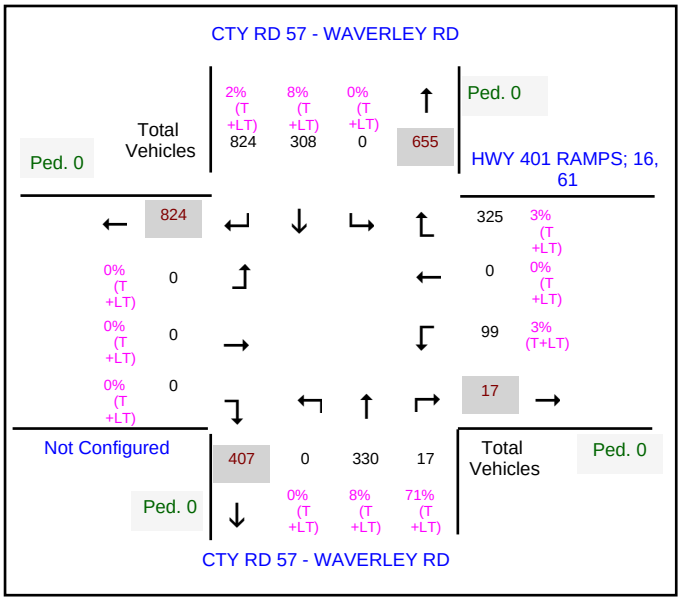
End Date: 21-Nov-2018 (Wed) | **Int. Type:** T - E | **Offset:** 0

Schedule Summary: TUES-THURS, 07:00-09:00, 11:00-14:00, 15:00-18:00

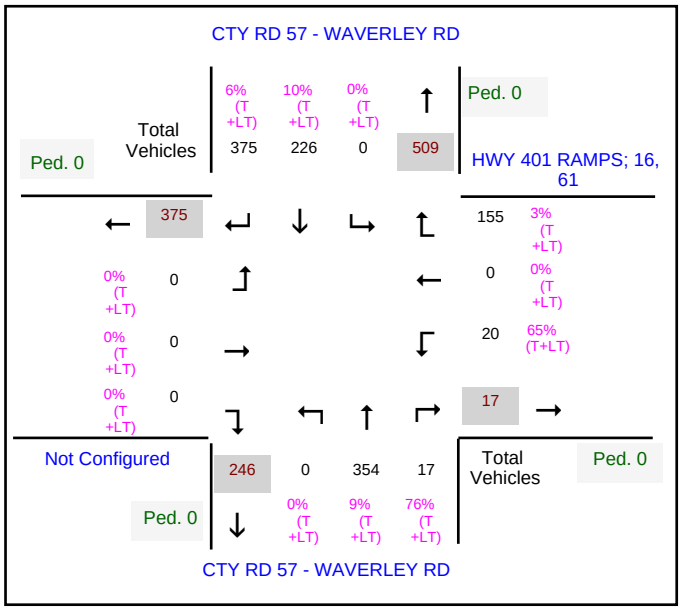
Total Count — Number of hours: 8



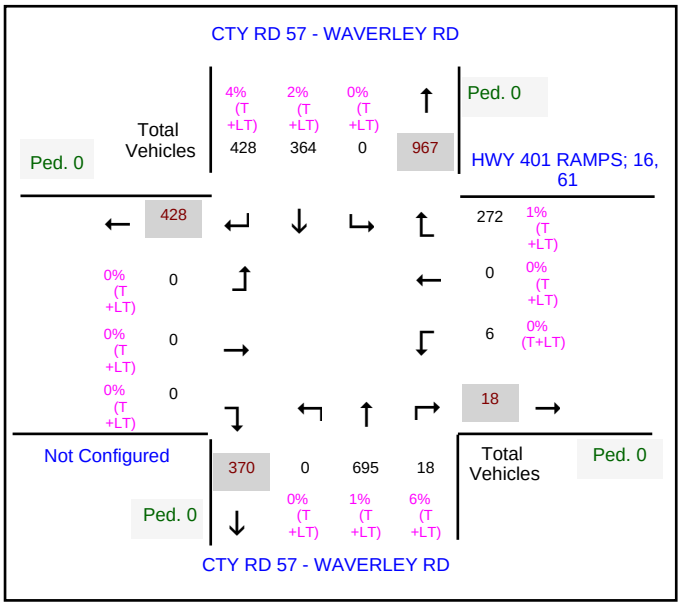
AM Peak Hour Report — Start Time: 07:15



Midday Peak Hour Report — Start Time: 11:30



PM Peak Hour Report — Start Time: 16:30



Ontario

Ministry of Transportation

TVIS II - Traffic Volume Information System

Turning Movement 15 Minute Report

Description: HWY 401 @ WAVERLEY RD IC 431 (NRT)
Region: CENTRAL **Survey Type:** TM – Interchange **Hwy:** 401
Start Date: 21-Nov-2018 (Wed) **I/C Side:** N **LHRS:** 47577
End Date: 21-Nov-2018 (Wed) **Int. Type:** T - E **Offset:** 0
Schedule Summary: TUES-THURS, 07:00-09:00, 11:00-14:00, 15:00-18:00

	Major Road Approaches																				Minor Road Approaches																				
	North CTY RD 57 - WAVERLEY RD										South CTY RD 57 - WAVERLEY RD										East HWY 401 RAMPS: Ramp(s): 16, 61										Not Configured										
Start Time	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Heavy Trucks			Ped	Total Veh.
	←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		
Period 1																																									
07:00	0	67	180	0	1	1	0	4	3	0	0	43	0	0	1	0	0	2	5	0	7	0	25	0	0	1	0	0	0	0											340
07:15	0	71	204	0	2	4	0	8	2	0	0	70	0	0	1	0	0	5	3	0	5	0	41	0	0	0	1	0	1	0											418
07:30	0	71	223	0	1	2	0	7	2	0	0	67	2	0	4	1	0	7	4	0	44	0	92	0	0	1	0	0	5	0											533
07:45	0	77	180	0	1	2	0	2	1	0	0	78	0	0	3	0	0	2	2	0	34	0	99	0	0	0	1	0	1	0											483
08:00	0	63	203	0	2	0	0	3	1	0	0	89	3	0	3	0	0	1	2	0	13	0	84	1	0	0	0	0	1	0											469
08:15	0	61	175	0	3	2	0	8	3	0	0	64	0	0	6	1	0	3	1	0	6	0	63	0	0	1	2	0	0	0											399
08:30	0	48	181	0	2	3	0	6	6	0	0	79	1	0	4	1	0	2	3	0	5	0	48	0	0	1	1	0	0	0											391
08:45	0	44	115	0	0	4	0	7	7	0	0	75	0	0	4	0	0	3	5	0	2	0	45	0	0	0	0	0	0	0											311
Period 2																																									
11:00	0	31	83	0	3	2	0	3	6	0	0	78	1	0	3	0	0	7	6	0	1	0	30	0	0	3	6	0	0	0											263
11:15	0	47	75	0	3	2	0	5	2	0	0	86	1	0	5	0	0	3	1	0	3	0	37	0	0	0	2	0	1	0											273
11:30	0	46	115	0	0	6	0	3	3	0	0	79	1	0	5	2	0	3	4	0	1	0	42	0	0	0	5	0	0	0											315
11:45	0	42	68	0	4	3	0	4	1	0	0	82	2	0	4	0	0	2	3	0	2	0	36	0	0	1	2	0	2	0											258
12:00	0	53	90	0	3	3	0	4	4	0	0	86	1	0	3	0	0	4	1	0	3	0	38	0	0	1	1	0	0	0											295
12:15	0	63	79	0	0	1	0	4	2	0	0	76	0	0	7	0	0	3	3	0	1	0	35	0	0	0	5	0	0	0											279
12:30	0	51	96	0	4	5	0	4	1	0	0	89	0	0	2	0	0	4	4	0	1	0	30	0	0	1	1	0	0	0											293
12:45	0	57	78	0	1	1	0	0	1	0	0	87	2	0	0	0	0	1	2	0	2	0	33	0	0	0	3	0	0	0											268
13:00	0	70	74	0	1	0	0	2	2	0	0	75	3	0	2	0	0	4	3	0	0	0	30	0	0	1	0	0	1	0											268
13:15	0	54	91	0	1	1	0	4	5	0	0	73	0	0	4	1	0	2	5	0	0	0	33	0	0	3	2	0	2	0											281
13:30	0	49	90	0	2	4	0	0	3	0	0	78	0	0	1	1	0	4	2	0	2	0	32	0	0	0	5	0	1	0											274
13:45	0	56	91	0	0	2	0	2	4	0	0	88	3	0	1	0	0	5	3	0	1	0	27	0	0	1	5	0	1	0											290
Period 3																																									
15:00	0	80	102	0	2	3	0	0	2	0	0	143	3	0	1	0	0	5	1	0	0	0	40	0	0	0	0	0	1	0											383
15:15	0	61	84	0	2	0	0	4	4	0	0	161	2	0	1	0	0	5	1	0	2	0	57	0	0	2	3	0	1	0											390

Ontario

Ministry of Transportation

TVIS II - Traffic Volume Information System

Turning Movement 15 Minute Report

Description: HWY 401 @ WAVERLEY RD IC 431 (NRT)
Region: CENTRAL **Survey Type:** TM – Interchange **Hwy:** 401
Start Date: 21-Nov-2018 (Wed) **I/C Side:** N **LHRS:** 47577
End Date: 21-Nov-2018 (Wed) **Int. Type:** T - E **Offset:** 0
Schedule Summary: TUES-THURS, 07:00-09:00, 11:00-14:00, 15:00-18:00

	Major Road Approaches																				Minor Road Approaches																
	North CTY RD 57 - WAVERLEY RD										South CTY RD 57 - WAVERLEY RD										East HWY 401 RAMPS: Ramp(s): 16, 61										Not Configured									
Start Time	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Heavy Trucks			Ped	Total Veh.
	←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		
15:30	0	58	87	0	3	0	0	2	3	0	0	170	1	0	0	1	0	5	1	0	1	0	45	1	0	1	3	0	1	0											**383**
15:45	0	89	95	0	0	3	0	4	1	0	0	165	0	0	1	0	0	3	1	0	2	0	54	0	0	1	1	0	1	0											**421**
16:00	0	89	77	0	3	2	0	4	7	0	0	166	2	0	3	0	0	2	0	0	2	0	58	1	0	0	1	0	1	0											**418**
16:15	0	100	92	0	1	1	0	4	4	0	0	169	3	0	0	0	0	1	4	0	1	0	48	0	0	0	0	0	2	0											**430**
16:30	0	96	101	0	0	1	0	2	8	0	0	160	4	0	2	0	0	1	0	0	3	0	57	0	0	0	0	0	1	0											**436**
16:45	0	84	95	0	0	1	0	0	3	0	0	167	9	0	1	0	0	1	1	0	1	0	72	0	0	0	0	0	1	0											**436**
17:00	0	98	104	0	1	2	0	1	1	0	0	180	2	0	1	0	0	0	0	0	2	0	61	0	0	1	0	0	0	0											**454**
17:15	0	80	109	0	0	2	0	2	1	0	0	181	2	0	1	0	0	0	0	0	0	0	78	0	0	1	0	0	0	0											**457**
17:30	0	93	98	0	1	1	0	0	3	0	0	167	0	0	0	0	0	1	0	0	4	0	55	0	0	0	0	0	0	0											**423**
17:45	0	61	75	0	1	2	0	0	2	0	0	175	3	0	0	0	0	0	0	0	2	0	60	0	0	2	0	0	0	0											**383**

Ministry of Transportation
Ministère des Transports

Version: 1.0 Feb 1, 2016

Intersection Layout Sheet

Contract # 2018 9015-E-0009
Work Order # 160

Date: November 21 Day: Wed / Hrs: 7 - 9 + 11 - 14 + 15 - 18

Location: HWY 401 & Waverly Rd IC-131 South Ramps Ramps: SRT /

Reg/Mun: CR Town/City: Bowmanville Area:

File Name: 2475770000 Device: Gretch / Jamar Unit # 16 / Interval 1: (AM) / NN / PM

Observer: Alena Mariyskaya Weather: Cloudy / Cloudy Road Condition: Partial snow covered / Wet

LHRS & O/S: 47577 0.00 Comments:

GPS: G-Star IV

Datum: WGS 84 (Y) / N

Lat: 43.892819

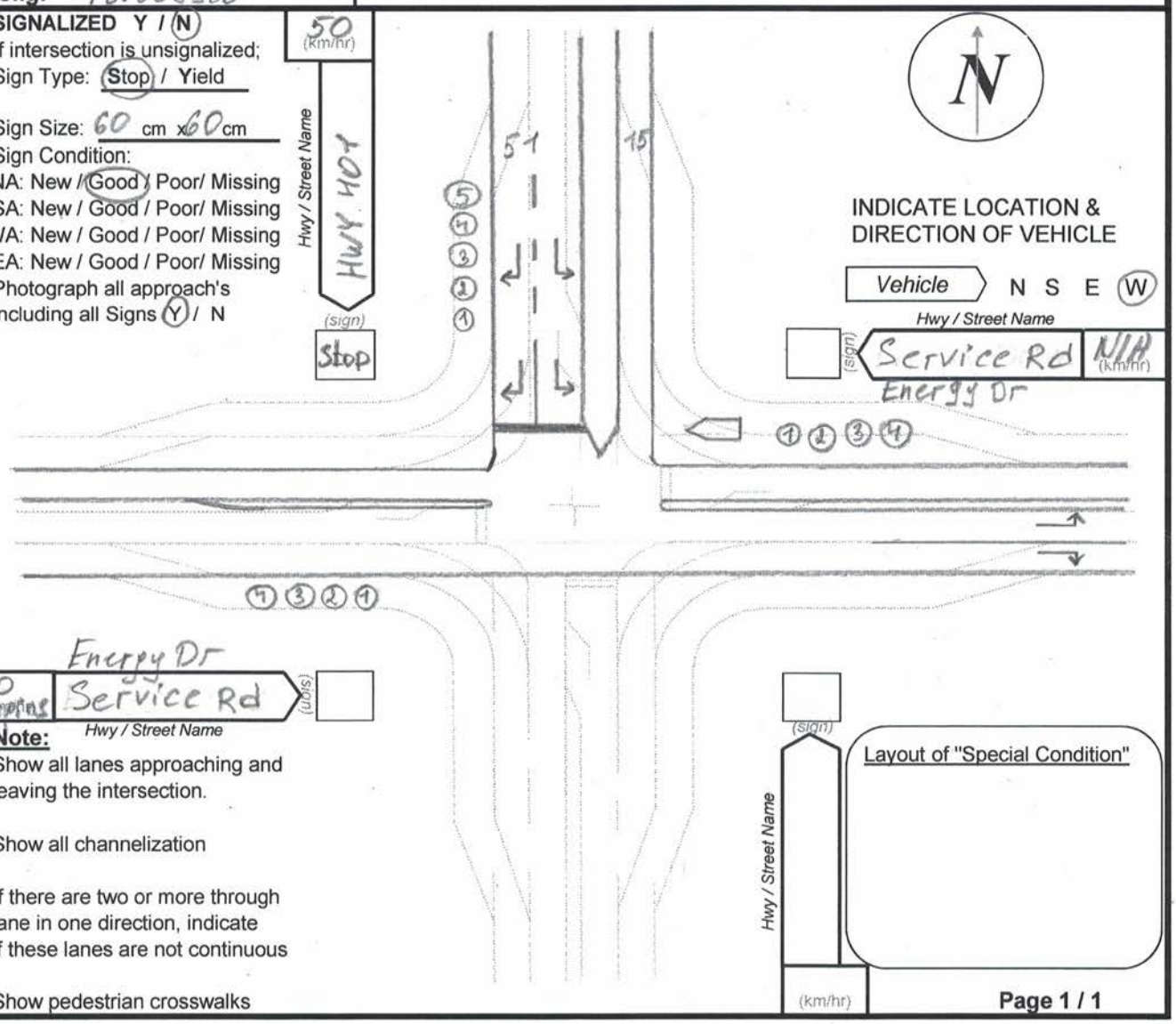
Long: -78.689986

SIGNALIZED Y / (N)

If intersection is unsignalized;
Sign Type: (Stop) / Yield

Sign Size: 60 cm x 60 cm

Sign Condition:
NA: New / (Good) / Poor/ Missing
SA: New / Good / Poor/ Missing
WA: New / Good / Poor/ Missing
EA: New / Good / Poor/ Missing
Photograph all approach's including all Signs (Y) / N



Note:
Show all lanes approaching and leaving the intersection.

Show all channelization

If there are two or more through lane in one direction, indicate if these lanes are not continuous

Show pedestrian crosswalks

Layout of "Special Condition"

Ontario

Ministry of Transportation

TVIS II - Traffic Volume Information System

Turning Movement Total Count and Peak Summary Report

Description: HWY 401 @ WAVERLEY RD IC 431 (SRT)

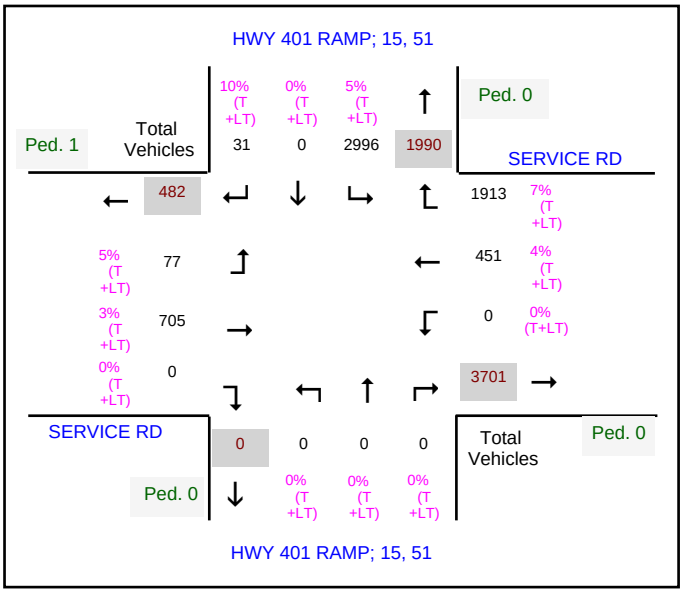
Region: CENTRAL | **Survey Type:** TM – Interchange | **Hwy:** 401

Start Date: 21-Nov-2018 (Wed) | **I/C Side:** S | **LHRS:** 47577

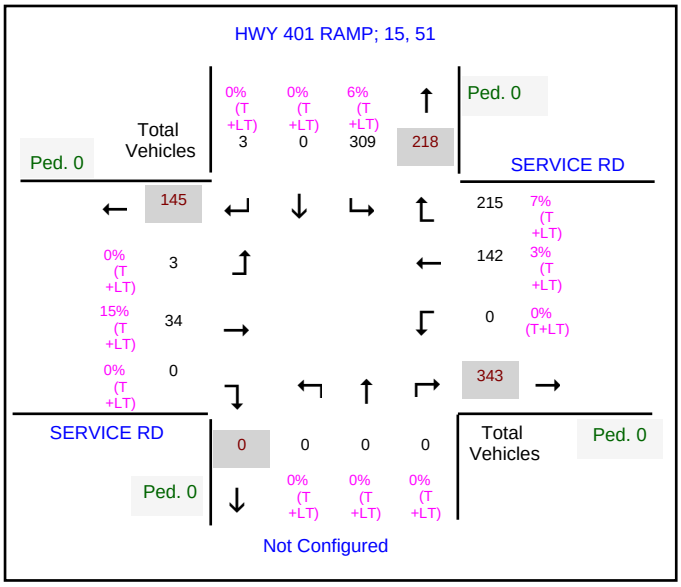
End Date: 21-Nov-2018 (Wed) | **Int. Type:** T - N | **Offset:** 0

Schedule Summary: TUES-THURS, 07:00-09:00, 11:00-14:00, 15:00-18:00

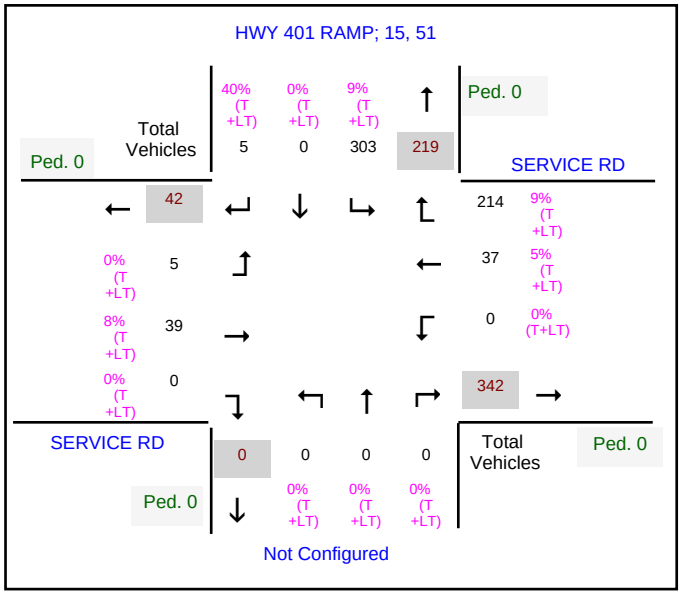
Total Count — Number of hours: 8



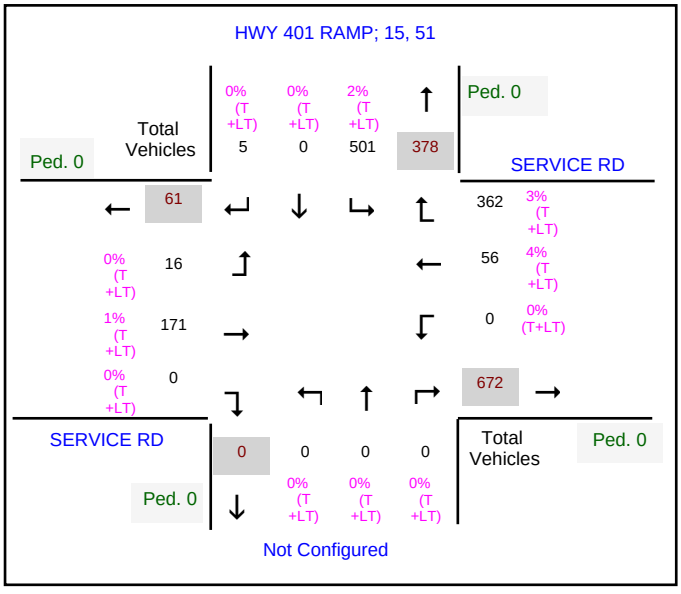
AM Peak Hour Report — Start Time: 07:15



Midday Peak Hour Report — Start Time: 12:30



PM Peak Hour Report — Start Time: 16:15



Ontario

Ministry of Transportation

TVIS II - Traffic Volume Information System

Turning Movement 15 Minute Report

Description: HWY 401 @ WAVERLEY RD IC 431 (SRT)
Region: CENTRAL **Survey Type:** TM – Interchange **Hwy:** 401
Start Date: 21-Nov-2018 (Wed) **I/C Side:** S **LHRS:** 47577
End Date: 21-Nov-2018 (Wed) **Int. Type:** T - N **Offset:** 0
Schedule Summary: TUES-THURS, 07:00-09:00, 11:00-14:00, 15:00-18:00

	Major Road Approaches																				Minor Road Approaches																				
	East SERVICE RD										West SERVICE RD										North HWY 401 RAMP: Ramp(s): 15, 51										Not Configured										
Start Time	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Heavy Trucks			Ped	Total Veh.
	←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		
Period 1																																										
07:00	0	26	39	0	0	0	0	0	3	0	0	9	0	0	0	0	0	0	0	0	35	0	0	2	0	0	1	0	0	0											**115**
07:15	0	29	49	0	2	1	0	0	1	0	0	9	0	0	0	0	0	0	0	0	66	0	2	1	0	0	4	0	0	0											**164**
07:30	0	43	43	0	0	1	0	0	3	0	2	6	0	0	0	0	0	0	0	0	67	0	0	5	0	0	3	0	0	0											**173**
07:45	0	42	51	0	0	0	0	1	3	0	0	5	0	0	2	0	0	0	0	0	79	0	0	1	0	0	2	0	0	0											**186**
08:00	0	24	56	0	1	1	0	0	6	0	1	9	0	0	2	0	0	1	0	0	78	0	1	1	0	0	2	0	0	0											**183**
08:15	0	8	55	0	1	1	0	0	2	0	0	4	0	0	1	0	0	0	0	0	64	0	0	3	0	0	7	0	0	0											**146**
08:30	0	11	41	0	1	2	0	0	1	0	1	9	0	1	0	0	0	0	0	0	69	0	1	6	0	0	3	0	0	0											**146**
08:45	0	10	40	0	0	0	0	0	4	0	3	13	0	0	1	0	0	0	0	0	61	0	0	2	0	0	7	0	0	0											**141**
Period 2																																									
11:00	0	4	30	0	1	1	0	0	3	0	0	16	0	0	1	0	0	0	0	0	63	0	0	3	0	0	2	0	0	0											**124**
11:15	0	14	34	0	0	2	0	1	8	0	4	26	0	0	0	0	0	0	0	0	65	0	2	4	0	0	4	0	0	0											**164**
11:30	0	17	28	0	0	1	0	0	4	0	1	11	0	0	1	0	0	1	0	1	66	0	0	3	0	0	2	0	0	0											**135**
11:45	0	13	34	0	1	2	0	0	9	0	2	18	0	0	1	0	0	0	0	0	58	0	2	3	0	0	4	0	0	0											**147**
12:00	0	10	45	0	1	2	0	0	1	0	3	14	0	1	0	0	0	1	0	0	66	0	0	1	0	0	3	0	0	0											**148**
12:15	0	11	43	0	0	0	0	0	1	0	1	12	0	0	3	0	0	0	0	0	61	0	0	3	0	0	4	0	0	0											**139**
12:30	0	8	45	0	1	3	0	1	2	0	2	10	0	0	1	0	0	0	0	0	74	0	2	2	0	0	5	0	0	0											**156**
12:45	0	10	50	0	0	0	0	0	4	0	1	13	0	0	0	0	0	0	0	0	69	0	1	0	0	0	4	0	0	0											**152**
13:00	0	8	57	0	0	1	0	0	5	0	0	7	0	0	1	0	0	0	0	0	67	0	0	1	0	1	7	0	0	0											**155**
13:15	0	9	42	0	0	2	0	0	3	0	2	6	0	0	1	0	0	0	0	0	66	0	0	2	0	1	6	0	0	0											**140**
13:30	0	8	37	0	0	2	0	0	3	0	3	6	0	0	1	0	1	0	0	0	79	0	0	1	0	0	3	0	0	0											**144**
13:45	0	8	46	0	0	0	0	0	3	0	2	12	0	0	0	0	0	0	0	0	78	0	0	0	0	0	6	0	0	0											**155**
Period 3																																									
15:00	0	5	78	0	0	1	0	0	5	0	1	26	0	0	0	0	0	0	0	0	115	0	2	1	0	0	5	0	0	0											**239**
15:15	0	3	54	0	1	0	0	0	5	0	6	38	0	0	0	0	0	0	0	0	125	0	1	1	0	0	5	0	1	0											**240**

Ontario

Ministry of Transportation

TVIS II - Traffic Volume Information System

Turning Movement 15 Minute Report

Description: HWY 401 @ WAVERLEY RD IC 431 (SRT)
Region: CENTRAL **Survey Type:** TM – Interchange **Hwy:** 401
Start Date: 21-Nov-2018 (Wed) **I/C Side:** S **LHRS:** 47577
End Date: 21-Nov-2018 (Wed) **Int. Type:** T - N **Offset:** 0
Schedule Summary: TUES-THURS, 07:00-09:00, 11:00-14:00, 15:00-18:00

	Major Road Approaches																					Minor Road Approaches																					
	East SERVICE RD										West SERVICE RD										North HWY 401 RAMP: Ramp(s): 15, 51										Not Configured														
Start Time	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Heavy Trucks			Ped	Total Veh.
	←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		
15:30	0	6	61	0	1	2	0	1	6	0	7	48	0	0	1	0	1	1	0	0	112	0	2	0	0	0	4	0	0	0													**253**
15:45	0	10	70	0	0	0	0	1	3	0	4	36	0	0	0	0	0	0	0	0	134	0	6	2	0	0	1	0	0	0													**267**
16:00	0	10	86	0	0	2	0	2	3	0	3	39	0	0	0	0	0	0	0	0	124	0	0	1	0	0	2	0	0	0													**272**
16:15	0	16	88	0	2	2	0	0	2	0	4	35	0	0	0	0	0	0	0	0	133	0	1	0	0	0	1	0	0	0													**284**
16:30	0	18	101	0	0	0	0	0	3	0	3	33	0	0	0	0	0	0	0	0	116	0	2	1	0	0	2	0	0	0													**279**
16:45	0	11	76	0	0	0	0	0	1	0	4	45	0	0	0	0	0	0	0	0	128	0	1	1	0	0	1	0	0	0													**268**
17:00	0	9	86	0	0	2	0	0	1	0	5	57	0	0	1	0	0	0	0	0	116	0	1	1	0	0	1	0	0	0													**280**
17:15	0	5	83	0	0	0	0	0	2	0	3	43	0	0	0	0	0	0	0	0	136	0	0	2	0	0	0	0	0	0													**274**
17:30	0	18	71	0	0	1	0	0	2	0	2	38	0	0	0	0	0	0	0	0	126	0	1	0	0	0	2	0	0	0													**261**
17:45	0	7	58	0	0	2	0	0	0	0	3	30	0	0	0	0	0	0	0	0	141	0	0	1	0	0	1	0	0	0													**243**

Ministry of Transportation
Ministère des Transports

Version: 1.0 Feb 1, 2016

Intersection Layout Sheet

Contract # 2015-E-0009
Work Order # 161

2018

Date: November 21 Day: Wen / Hrs: 7 - 9 + 11 - 14 + 15 - 18

Location: HWY401 & Service Rd/Waverley Rd (Energy Dr) Ramps: /

Reg/Mun: CR Town/City: Bowmanville Area:

File Name: 0475770000 Device: Gretch / Jamar Unit # 16 / Interval 1: (AM) / NN / PM

Observer: Alena Mariyskaya Weather: Cloudy / Cloudy Road Condition: Partial Snow Covered / wet

LHRS & O/S: 47577 0.00

GPS: G-Star IV

Datum: WGS 84 (Y) / N

Lat: 43, 893278

Long: -78.688828

Comments:

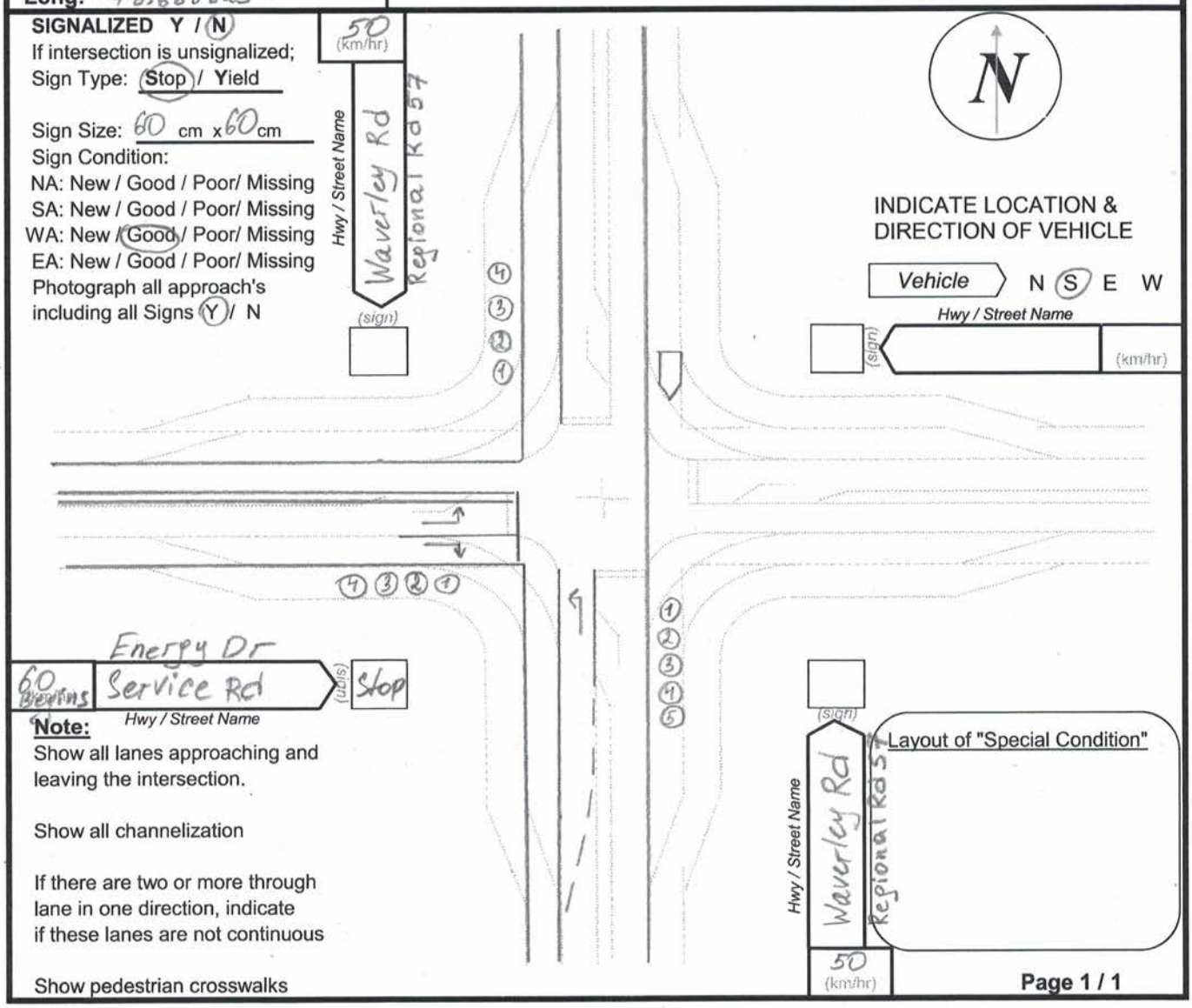
SIGNALIZED Y / (N)

If intersection is unsignalized;
Sign Type: (Stop) / Yield

Sign Size: 60 cm x 60 cm

Sign Condition:
NA: New / Good / Poor/ Missing
SA: New / Good / Poor/ Missing
WA: New / (Good) / Poor/ Missing
EA: New / Good / Poor/ Missing

Photograph all approach's including all Signs (Y) / N



Note:
Show all lanes approaching and leaving the intersection.

Show all channelization

If there are two or more through lane in one direction, indicate if these lanes are not continuous

Show pedestrian crosswalks

Layout of "Special Condition"

Ontario

Ministry of Transportation

TVIS II - Traffic Volume Information System

Turning Movement Total Count and Peak Summary Report

Description: HWY 401 - SERVICE RD/WAVERLEY RD

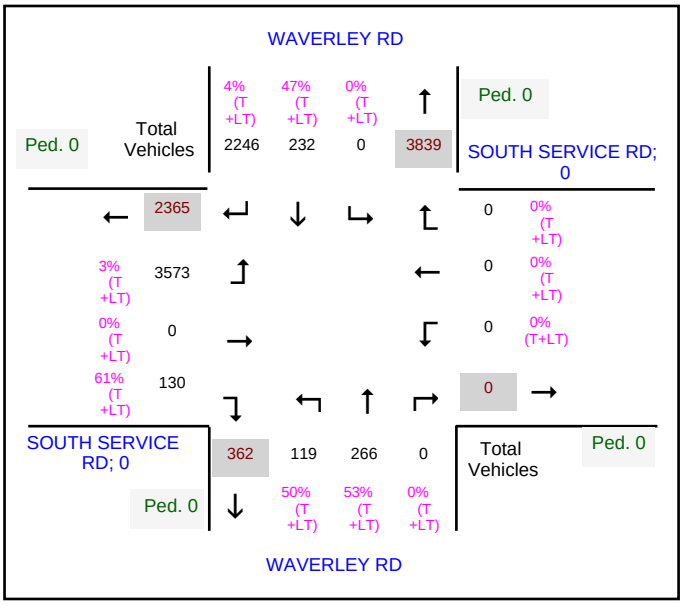
Region: CENTRAL | **Survey Type:** TM – Interchange | **Hwy:** 401

Start Date: 21-Nov-2018 (Wed) | **I/C Side:** S | **LHRS:** 47577

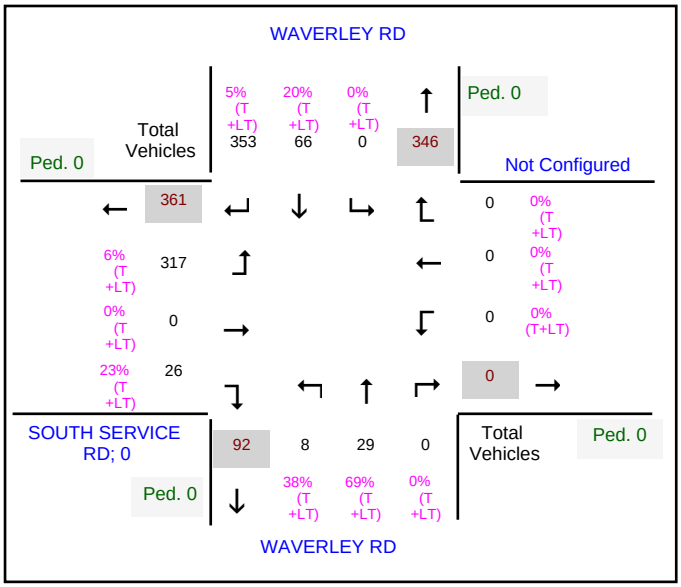
End Date: 21-Nov-2018 (Wed) | **Int. Type:** T - W | **Offset:** 0.100

Schedule Summary: TUES-THURS, 07:00-09:00, 11:00-14:00, 15:00-18:00

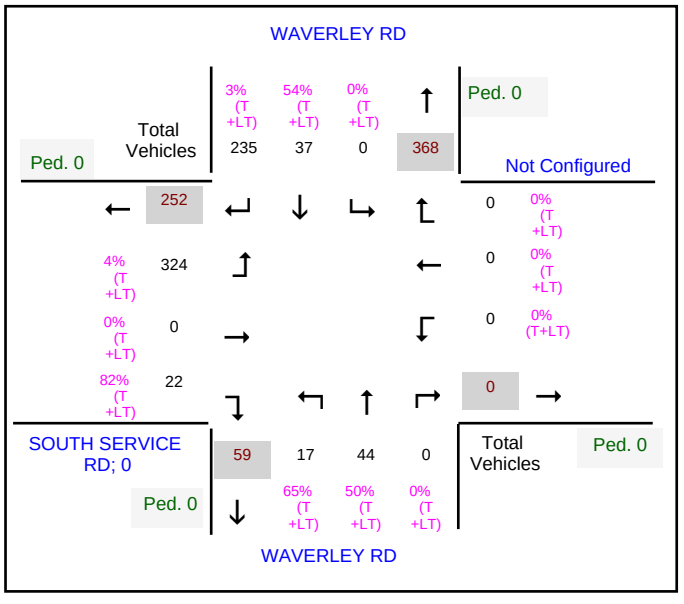
Total Count — Number of hours: 8



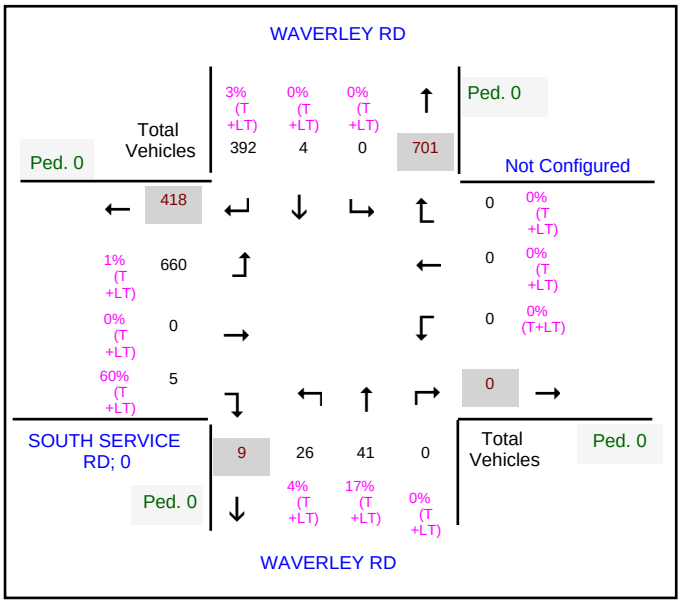
AM Peak Hour Report — Start Time: 07:15



Midday Peak Hour Report — Start Time: 12:15



PM Peak Hour Report — Start Time: 16:15



Ontario

Ministry of Transportation

TVIS II - Traffic Volume Information System

Turning Movement 15 Minute Report

Description: HWY 401 - SERVICE RD/WAVERLEY RD
Region: CENTRAL | **Survey Type:** TM – Interchange | **Hwy:** 401
Start Date: 21-Nov-2018 (Wed) | **I/C Side:** S | **LHRS:** 47577
End Date: 21-Nov-2018 (Wed) | **Int. Type:** T - W | **Offset:** 0.100
Schedule Summary: TUES-THURS, 07:00-09:00, 11:00-14:00, 15:00-18:00

	Major Road Approaches																				Minor Road Approaches																				
	North WAVERLEY RD										South WAVERLEY RD										West SOUTH SERVICE RD: Ramp(s): 0										Not Configured										
Start Time	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Heavy Trucks			Ped	Total Veh.
	←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		
Period 1																																										
07:00	0	8	66	0	0	0	0	4	1	0	0	0	0	0	0	0	2	5	0	0	43	0	2	1	0	0	1	0	1	0											134
07:15	0	6	75	0	0	3	0	4	1	0	1	0	0	0	0	0	0	5	0	0	70	0	4	1	0	0	3	0	1	0											174
07:30	0	26	86	0	0	1	0	5	3	0	0	2	0	0	2	0	0	6	0	0	65	0	7	4	0	1	3	0	0	0											211
07:45	0	16	92	0	0	0	0	1	4	0	0	1	0	0	1	0	0	4	0	0	78	0	7	2	0	1	0	0	2	0											209
08:00	0	5	83	0	0	2	0	3	3	0	4	6	0	0	0	0	3	2	0	0	86	0	2	3	0	0	2	0	1	0											205
08:15	0	4	59	0	1	2	0	5	2	0	0	1	0	0	2	0	0	3	0	0	65	0	3	4	0	0	0	0	7	0											158
08:30	0	5	51	0	0	2	0	8	1	0	1	1	0	1	2	0	0	3	0	0	78	0	1	4	0	2	1	0	2	0											163
08:45	0	0	48	0	0	0	0	3	3	0	1	1	0	0	1	0	1	5	0	0	71	0	1	2	0	1	4	0	3	0											145
Period 2																																									
11:00	0	1	33	0	1	2	0	9	0	0	0	4	0	0	0	0	3	12	0	0	81	0	0	3	0	1	1	0	1	0											152
11:15	0	1	45	0	0	2	0	1	5	0	1	2	0	0	2	0	4	3	0	0	85	0	4	3	0	1	2	0	2	0											163
11:30	0	1	44	0	0	1	0	7	1	0	1	3	0	0	3	0	3	5	0	0	79	0	0	4	0	0	1	0	2	0											155
11:45	0	3	44	0	2	3	0	2	3	0	2	5	0	0	1	0	6	5	0	0	73	0	1	3	0	1	0	0	4	0											158
12:00	0	5	53	0	1	2	0	5	1	0	1	7	0	1	2	0	1	5	0	0	78	0	0	1	0	0	1	0	3	0											167
12:15	0	5	53	0	1	0	0	6	0	0	1	7	0	0	2	0	0	4	0	0	75	0	1	5	0	1	1	0	2	0											164
12:30	0	2	53	0	1	3	0	6	1	0	2	2	0	1	0	0	3	6	0	0	79	0	1	2	0	2	2	0	3	0											169
12:45	0	3	58	0	0	0	0	5	0	0	1	6	0	0	0	0	3	4	0	0	84	0	1	0	0	0	0	0	4	0											169
13:00	0	7	65	0	0	1	0	1	1	0	2	7	0	0	1	0	4	5	0	0	73	0	1	1	0	1	2	0	5	0											177
13:15	0	1	49	0	0	2	0	3	1	0	0	1	0	0	2	0	2	6	0	0	70	0	2	3	0	0	1	0	5	0											148
13:30	0	4	44	0	0	2	0	5	0	0	1	1	0	0	1	0	3	5	0	0	83	0	2	1	0	1	0	0	3	0											156
13:45	0	3	54	0	1	0	0	6	1	0	0	2	0	0	1	0	2	5	0	0	86	0	2	0	0	0	4	0	2	0											169
Period 3																																									
15:00	0	0	80	0	1	1	0	0	0	0	3	3	0	0	0	0	5	2	0	0	140	0	1	1	0	1	2	0	2	0											242
15:15	0	5	58	0	1	1	0	4	2	0	0	6	0	0	1	0	3	4	0	0	158	0	1	1	0	1	3	0	1	0											250

Ontario

Ministry of Transportation

TVIS II - Traffic Volume Information System

Turning Movement 15 Minute Report

Description: HWY 401 - SERVICE RD/WAVERLEY RD
Region: CENTRAL **Survey Type:** TM – Interchange **Hwy:** 401
Start Date: 21-Nov-2018 (Wed) **I/C Side:** S **LHRS:** 47577
End Date: 21-Nov-2018 (Wed) **Int. Type:** T - W **Offset:** 0.100
Schedule Summary: TUES-THURS, 07:00-09:00, 11:00-14:00, 15:00-18:00

	Major Road Approaches																				Minor Road Approaches																				
	North WAVERLEY RD										South WAVERLEY RD										West SOUTH SERVICE RD: Ramp(s): 0										Not Configured										
Start Time	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Long Trucks			Ped	Cars			Trucks			Heavy Trucks			Ped	Total Veh.
	←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		←	↑	→	←	↑	→	←	↑	→		
15:30	0	1	64	0	1	3	0	3	3	0	3	4	0	0	0	0	4	1	0	0	168	0	0	1	0	0	4	0	0	0											**260**
15:45	0	1	79	0	0	0	0	0	2	0	1	3	0	0	0	0	2	4	0	0	171	0	2	1	0	1	0	0	2	0											**269**
16:00	0	0	91	0	0	2	0	3	5	0	4	6	0	0	0	0	0	1	0	0	162	0	0	2	0	0	2	0	0	0											**278**
16:15	0	0	105	0	0	3	0	0	2	0	1	4	0	0	1	0	0	3	0	0	166	0	0	0	0	0	1	0	0	0											**286**
16:30	0	1	105	0	0	0	0	0	3	0	14	14	0	0	1	0	0	1	0	0	149	0	1	1	0	0	1	0	1	0											**292**
16:45	0	1	82	0	0	0	0	0	0	0	7	9	0	0	1	0	1	0	0	0	168	0	0	0	0	0	1	0	0	0											**270**
17:00	0	2	90	0	0	1	0	0	1	0	3	7	0	0	0	0	0	0	0	0	172	0	1	1	0	1	0	0	1	0											**280**
17:15	0	0	85	0	0	0	0	0	1	0	4	4	0	0	1	0	1	0	0	0	179	0	0	1	0	0	0	0	0	0											**276**
17:30	0	1	91	0	0	2	0	0	1	0	0	2	0	0	0	0	1	0	0	0	167	0	2	0	0	0	1	0	1	0											**269**
17:45	0	4	67	0	0	0	0	0	1	0	0	3	0	0	0	0	0	0	0	0	171	0	1	0	0	0	0	0	1	0											**248**

Ontario

Ministry of Transportation

TVIS II - Traffic Volume information System

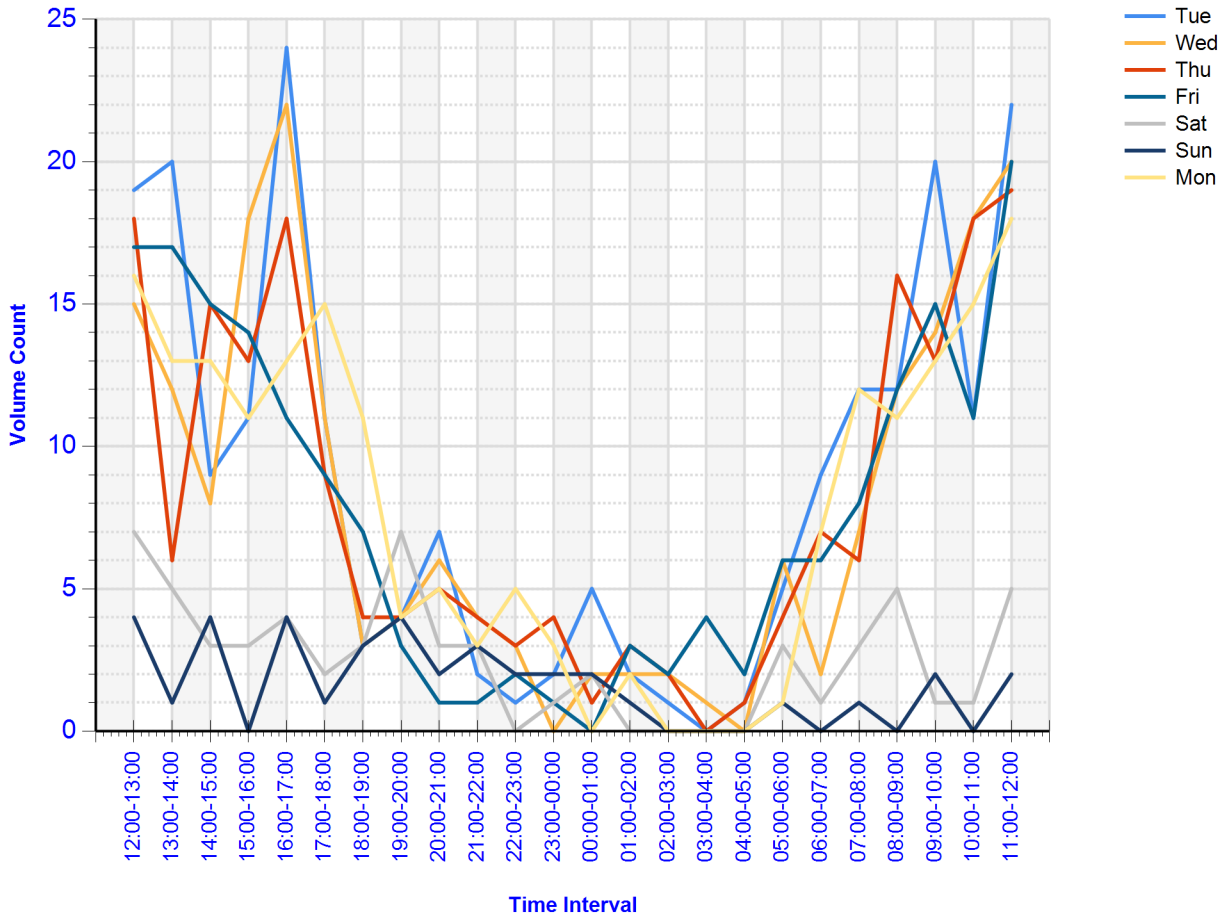
Ramp Weekly Volume Summary

Hwy: 401 **Between:** WAVERLEY RD IC-431-NEWCASTLE
TS: 332 **and:** HOLT RD IC-428-NEWCASTLE
Regn: CENTRAL **Pattern:** CR **PDCS:** 37
LHRS: 47577 **Offset:** 0 **Locn:** WAVERLEY RD IC-431-NEWCASTLE
Ramp: 16 **Lanes:** 1 **Speed:** **Dates:** 24-May-2016 to 31-May-2016

	Tue		Wed		Thu		Fri		Sat		Sun		Mon		Tue	
H. Interval	05/24		05/25	Pk.	05/26	Pk.	05/27	Pk.	05/28	Pk.	05/29	Pk.	05/30	Pk.	05/31	Pk.
00:00-01:00			2		1		0		2		2		0		5	
01:00-02:00			2		3		3		0		1		2		2	
02:00-03:00			2		2		2		0		0		0		1	
03:00-04:00			1		0		4		0		0		0		0	
04:00-05:00			0		1		2		0		0		0		1	
05:00-06:00			6		4		6		3		1	◄	1		5	
06:00-07:00			2		7		6		1		0		7		9	
07:00-08:00			7		6		8		3		1		12	◄	12	◄
08:00-09:00			12	◄	16	◄	12	◄	5	◄	0		11		12	
09:00-10:00			14		13		15		1		2		13		20	
10:00-11:00			18		18		11		1		0		15		11	
11:00-12:00			20	◄	19	◄	20	◄	5		2		18	◄	22	◄
AM Total			**86**		**90**		**89**		**21**		**9**		**79**		**100**	
12:00-13:00	19		15		18		17		7	◄	4	◄	16			
13:00-14:00	20	◄	12		6		17		5		1		13			
14:00-15:00	9		8		15		15		3		4		13			
15:00-16:00	11		18		13		14	◄	3		0		11			
16:00-17:00	24	◄	22	◄	18	◄	11		4		4	◄	13			
17:00-18:00	11		11		9		9		2		1		15	◄		
18:00-19:00	3		3		4		7		3		3		11			
19:00-20:00	4		4		4		3		7	◄	4		4			
20:00-21:00	7		6		5		1		3		2		5			
21:00-22:00	2		4		4		1		3		3		3			
22:00-23:00	1		3		3		2		0		2		5			
23:00-00:00	2		0		4		1		1		2		3			
PM Total	**113**		**106**		**103**		**98**		**41**		**30**		**112**			
24h. Total	**113**		**192**		**193**		**187**		**62**		**39**		**191**		**100**	
Noon - Noon	**199**		**196**		**192**		**119**		**50**		**109**		**212**			

ADT	AWD
154	200

Weekly Volume Summary - Combined



Ontario

Ministry of Transportation

TVIS II - Traffic Volume information System

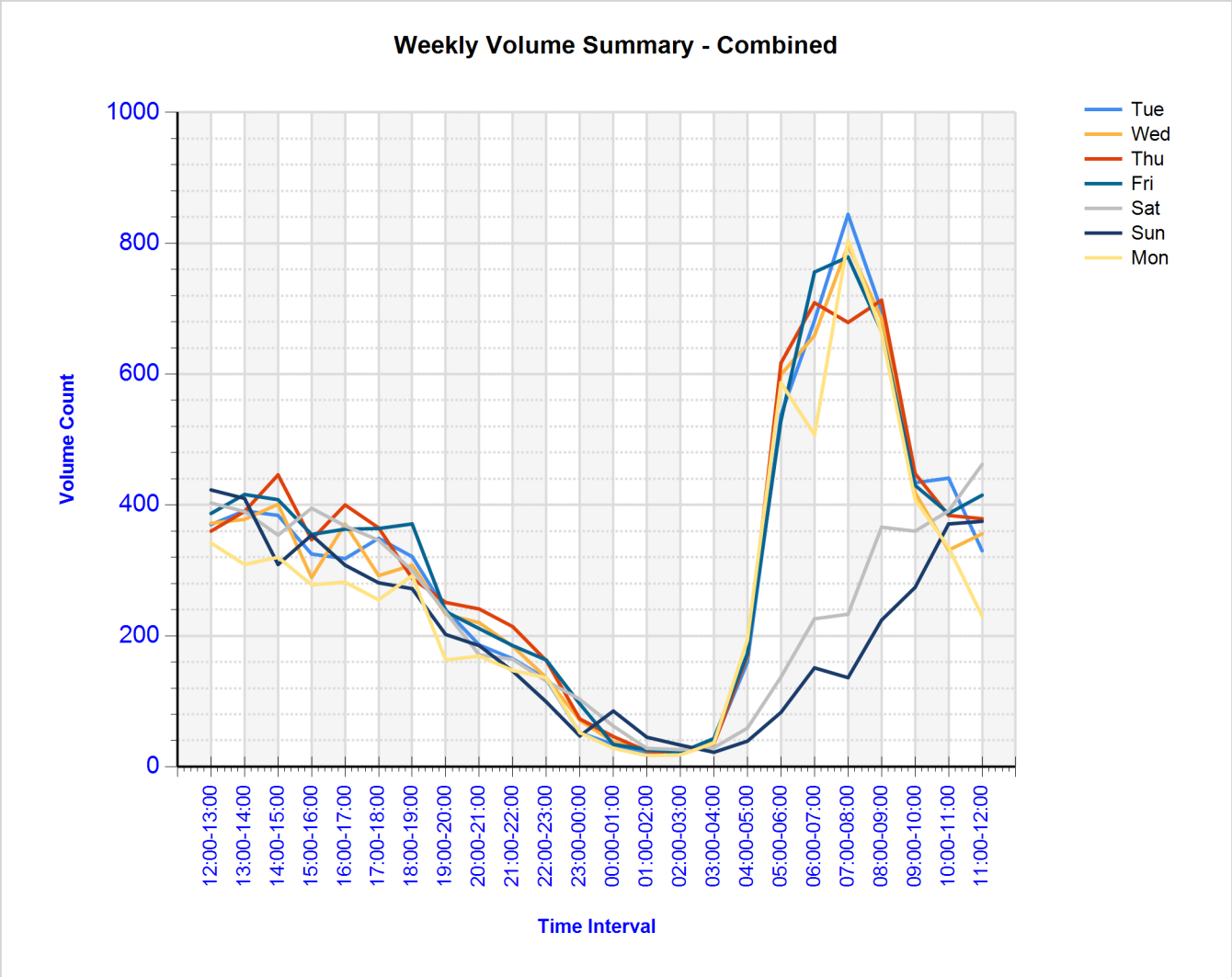
Ramp Weekly Volume Summary

Hwy: 401 **Between:** WAVERLEY RD IC-431-NEWCASTLE
TS: 332 **and:** HOLT RD IC-428-NEWCASTLE
Regn: CENTRAL **Pattern:** CR **PDCS:** 37
LHRS: 47577 **Offset:** 0 **Locn:** WAVERLEY RD IC-431-NEWCASTLE
Ramp: 36 **Lanes:** 1 **Speed:** **Dates:** 24-May-2016 to 31-May-2016

	Tue		Wed		Thu		Fri		Sat		Sun		Mon		Tue	
H. Interval	05/24		05/25	Pk.	05/26	Pk.	05/27	Pk.	05/28	Pk.	05/29	Pk.	05/30	Pk.	05/31	Pk.
00:00-01:00			38		46		34		62		85		28		34	
01:00-02:00			25		24		26		28		45		17		19	
02:00-03:00			20		19		22		26		33		18		19	
03:00-04:00			41		35		43		29		22		36		37	
04:00-05:00			169		170		173		59		39		194		160	
05:00-06:00			599		617		529		137		83		587		538	
06:00-07:00			659		709		756		226		151		507		682	
07:00-08:00			797	◄	679		779	◄	233		136		805	◄	844	◄
08:00-09:00			685		713	◄	665		366	◄	224	◄	664		697	
09:00-10:00			419		448		430		360		274		408		434	
10:00-11:00			331		384		387		391		371		335		441	
11:00-12:00			356		379		415		462	◄	375		230		330	◄
AM Total			**4139**		**4223**		**4259**		**2379**		**1838**		**3829**		**4235**	
12:00-13:00	370		372		360		387		403		423	◄	342	◄		
13:00-14:00	391	◄	378	◄	390	◄	416	◄	390		410		309			
14:00-15:00	384		401		446		408		354		309		320			
15:00-16:00	325		289		347		355		395	◄	354	◄	278			
16:00-17:00	318		371	◄	400	◄	363		368		308		282			
17:00-18:00	349	◄	292		365		364		346		281		255			
18:00-19:00	321		308		288		371	◄	300		272		292	◄		
19:00-20:00	240		233		251		237		236		202		163			
20:00-21:00	186		220		241		211		171		185		169			
21:00-22:00	165		184		214		185		164		146		147			
22:00-23:00	134		136		162		163		131		99		136			
23:00-00:00	52		71		73		96		103		47		52			
PM Total	**3235**		**3255**		**3537**		**3556**		**3361**		**3036**		**2745**			
24h. Total	**3235**		**7394**		**7760**		**7815**		**5740**		**4874**		**6574**		**4235**	

Noon - Noon	7374	7478	7796	5935	5199	6865	6980

ADT	AWD
6804	7407



Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Project #19375 - AECOM

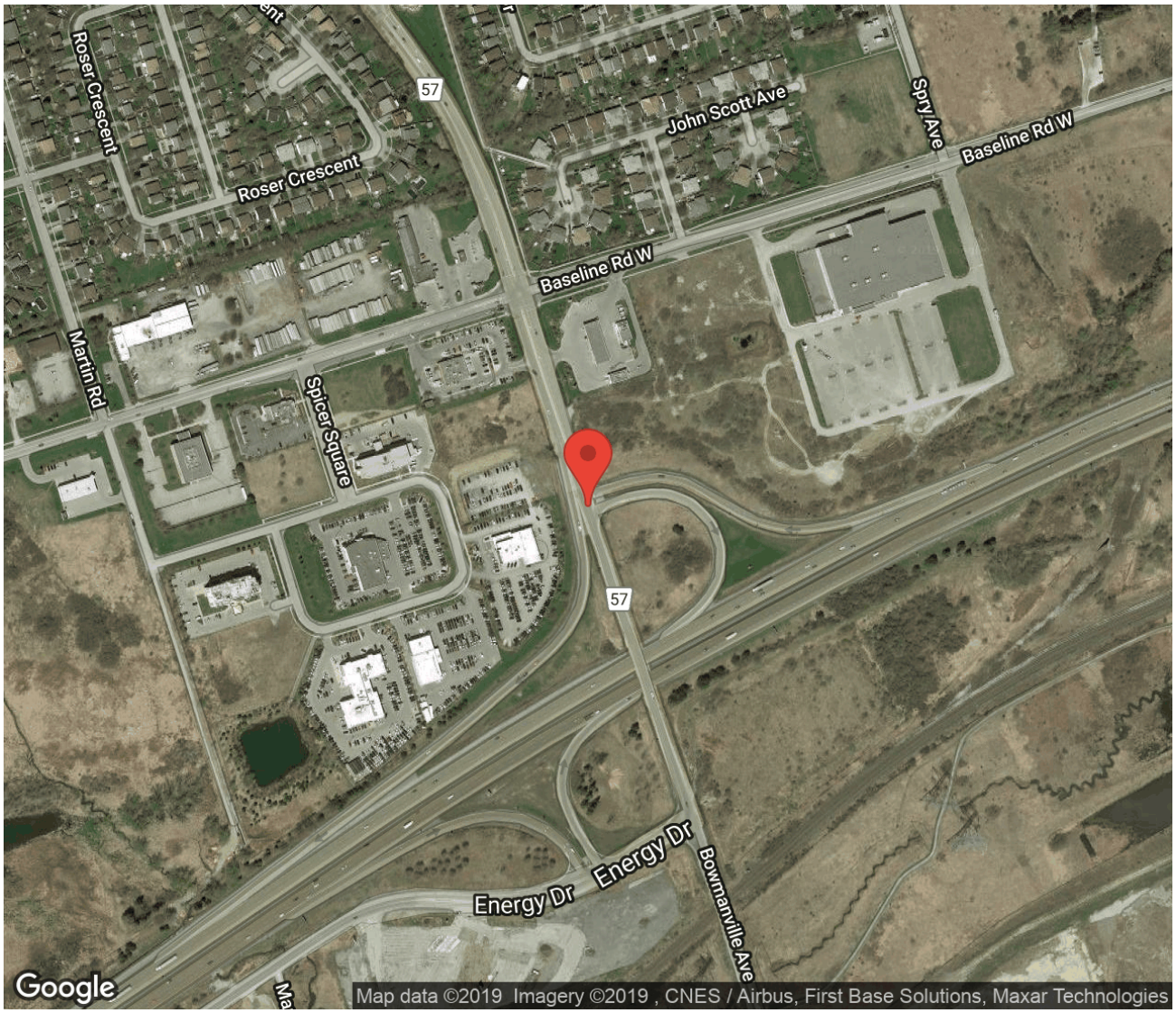
Intersection Count Report

Intersection:	Bowmanville Ave & Hwy 401 North Ramp Terminal
Municipality:	Bowmanville
Count Date:	Nov 19, 2019
Site Code:	1937500001
Count Categories:	Cars, Medium Trucks, Heavy Trucks, Pedestrians
Count Period:	07:00-09:00, 10:00-12:00
Weather:	Clear

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Map

Intersection:	Bowmanville Ave & Hwy 401 North Ramp Terminal
Municipality:	Bowmanville
Count Date:	Nov 19, 2019



Traffic Count Summary

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Intersection:	Bowmanville Ave & Hwy 401 North Ramp Terminal
Municipality:	Bowmanville
Count Date:	Nov 19, 2019

Bowmanville Ave - Traffic Summary

	North Approach Totals						South Approach Totals					
	Includes Cars, Medium Trucks, Heavy Trucks						Includes Cars, Medium Trucks, Heavy Trucks					
Hour	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds
07:00 - 08:00	0	339	767	0	1106	0	0	342	15	0	357	0
08:00 - 09:00	0	276	692	0	968	0	0	344	14	0	358	0
BREAK												
10:00 - 11:00	0	183	334	0	517	0	0	345	28	0	373	0
11:00 - 12:00	0	256	322	1	579	0	0	444	28	0	472	0
GRAND TOTAL	**0**	**1054**	**2115**	**1**	**3170**	**0**	**0**	**1475**	**85**	**0**	**1560**	**0**

Traffic Count Summary

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Intersection:	Bowmanville Ave & Hwy 401 North Ramp Terminal
Municipality:	Bowmanville
Count Date:	Nov 19, 2019

Hwy 401 North Ramp Terminal - Traffic Summary

Hour	East Approach Totals – Includes Cars, Medium Trucks, Heavy Trucks						West Approach Totals – Includes Cars, Medium Trucks, Heavy Trucks					
	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds
07:00 - 08:00	42	0	202	0	244	0	0	0	0	0	0	0
08:00 - 09:00	15	0	217	0	232	0	0	0	0	0	0	0
BREAK												
10:00 - 11:00	7	1	129	0	137	0	0	0	0	0	0	0
11:00 - 12:00	15	0	145	0	160	0	0	0	0	0	0	0
GRAND TOTAL	**79**	**1**	**693**	**0**	**773**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Bowmanville Ave & Hwy 401 North Ramp Terminal
Municipality: Bowmanville
Count Date: Nov 19, 2019

North Approach - Bowmanville Ave

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
07:00	0	38	141	0	179	0	10	0	0	10	0	12	20	0	32	0
07:15	0	60	150	0	210	0	19	0	0	19	0	16	33	0	49	0
07:30	0	60	185	0	245	0	17	1	0	18	0	17	34	0	51	0
07:45	0	68	174	0	242	0	10	1	0	11	0	12	28	0	40	0
08:00	0	35	178	0	213	0	12	0	0	12	0	18	27	0	45	0
08:15	0	50	187	0	237	0	10	1	0	11	0	16	25	0	41	0
08:30	0	40	139	0	179	0	15	3	0	18	0	17	21	0	38	0
08:45	0	37	89	0	126	0	12	1	0	13	0	14	21	0	35	0
SUBTOTAL	0	388	1243	0	1631	0	105	7	0	112	0	122	209	0	331	0

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Bowmanville Ave & Hwy 401 North Ramp Terminal
Municipality: Bowmanville
Count Date: Nov 19, 2019

North Approach - Bowmanville Ave

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
10:00	0	34	65	0	99	0	11	2	0	13	0	11	10	0	21	0
10:15	0	26	68	0	94	0	5	2	0	7	0	5	15	0	20	0
10:30	0	28	75	0	103	0	8	3	0	11	0	6	17	0	23	0
10:45	0	26	62	0	88	0	11	2	0	13	0	12	13	0	25	0
11:00	0	35	63	0	98	0	11	2	0	13	0	11	9	0	20	0
11:15	0	40	69	0	109	0	7	5	0	12	0	7	15	0	22	0
11:30	0	45	74	1	120	0	10	2	0	12	0	13	18	0	31	0
11:45	0	48	53	0	101	0	16	5	0	21	0	13	7	0	20	0
SUBTOTAL	0	282	529	1	812	0	79	23	0	102	0	78	104	0	182	0
GRAND TOTAL	**0**	**670**	**1772**	**1**	**2443**	**0**	**184**	**30**	**0**	**214**	**0**	**200**	**313**	**0**	**513**	**0**

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Bowmanville Ave & Hwy 401 North Ramp Terminal
Municipality: Bowmanville
Count Date: Nov 19, 2019

South Approach - Bowmanville Ave

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
07:00	0	31	0	0	31	0	12	0	0	12	0	13	0	0	13	0
07:15	0	55	0	0	55	0	23	0	0	23	0	25	4	0	29	0
07:30	0	51	1	0	52	0	16	0	0	16	0	17	2	0	19	0
07:45	0	62	4	0	66	0	15	0	0	15	0	22	4	0	26	0
08:00	0	61	0	0	61	0	18	0	0	18	0	24	2	0	26	0
08:15	0	55	0	0	55	0	10	0	0	10	0	8	5	0	13	0
08:30	0	55	0	0	55	0	7	0	0	7	0	12	2	0	14	0
08:45	0	66	1	0	67	0	15	0	0	15	0	13	4	0	17	0
SUBTOTAL	0	436	6	0	442	0	116	0	0	116	0	134	23	0	157	0

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Bowmanville Ave & Hwy 401 North Ramp Terminal
Municipality: Bowmanville
Count Date: Nov 19, 2019

South Approach - Bowmanville Ave

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
10:00	0	52	4	0	56	0	15	2	0	17	0	15	5	0	20	0
10:15	0	49	4	0	53	0	10	1	0	11	0	14	3	0	17	0
10:30	0	48	1	0	49	0	23	0	0	23	0	20	4	0	24	0
10:45	0	74	1	0	75	0	14	0	0	14	0	11	3	0	14	0
11:00	0	70	2	0	72	0	10	0	0	10	0	15	4	0	19	0
11:15	0	65	0	0	65	0	18	1	0	19	0	18	7	0	25	0
11:30	0	67	1	0	68	0	19	0	0	19	0	23	4	0	27	0
11:45	0	92	4	0	96	0	23	0	0	23	0	24	5	0	29	0
SUBTOTAL	0	517	17	0	534	0	132	4	0	136	0	140	35	0	175	0
GRAND TOTAL	**0**	**953**	**23**	**0**	**976**	**0**	**248**	**4**	**0**	**252**	**0**	**274**	**58**	**0**	**332**	**0**

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Bowmanville Ave & Hwy 401 North Ramp Terminal
Municipality: Bowmanville
Count Date: Nov 19, 2019

East Approach - Hwy 401 North Ramp Terminal

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↷	Total	↰	↑	↱	↷	Total	↰	↑	↱	↷	Total	
07:00	6	0	27	0	33	0	0	0	0	0	4	0	6	0	10	0
07:15	2	0	30	0	32	0	0	1	0	1	3	0	8	0	11	0
07:30	19	0	50	0	69	0	0	0	0	0	6	0	16	0	22	0
07:45	2	0	53	0	55	0	0	0	0	0	0	0	11	0	11	0
08:00	4	0	50	0	54	0	0	0	0	0	1	0	11	0	12	0
08:15	0	0	49	0	49	0	0	0	0	0	5	0	11	0	16	0
08:30	0	0	45	0	45	0	0	1	0	1	1	0	5	0	6	0
08:45	2	0	35	0	37	0	0	0	0	0	2	0	10	0	12	0
SUBTOTAL	35	0	339	0	374	0	0	2	0	2	22	0	78	0	100	0

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Bowmanville Ave & Hwy 401 North Ramp Terminal
Municipality: Bowmanville
Count Date: Nov 19, 2019

East Approach - Hwy 401 North Ramp Terminal

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
10:00	1	0	18	0	19	0	0	0	0	0	1	0	9	0	10	0
10:15	1	1	23	0	25	0	0	0	0	0	2	0	10	0	12	0
10:30	0	0	26	0	26	0	0	0	0	0	1	0	7	0	8	0
10:45	0	0	22	0	22	0	0	0	0	0	1	0	14	0	15	0
11:00	1	0	26	0	27	0	0	0	0	0	5	0	4	0	9	0
11:15	0	0	25	0	25	0	0	0	0	0	2	0	7	0	9	0
11:30	1	0	44	0	45	0	0	0	0	0	1	0	6	0	7	0
11:45	3	0	28	0	31	0	0	0	0	0	2	0	5	0	7	0
SUBTOTAL	7	1	212	0	220	0	0	0	0	0	15	0	62	0	77	0
GRAND TOTAL	**42**	**1**	**551**	**0**	**594**	**0**	**0**	**2**	**0**	**2**	**37**	**0**	**140**	**0**	**177**	**0**

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Bowmanville Ave & Hwy 401 North Ramp Terminal
Municipality: Bowmanville
Count Date: Nov 19, 2019

West Approach - Hwy 401 WB On-Ramp

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
					Total					Total					Total	
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Bowmanville Ave & Hwy 401 North Ramp Terminal
Municipality: Bowmanville
Count Date: Nov 19, 2019

West Approach - Hwy 401 WB On-Ramp

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GRAND TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Peak Hour Diagram

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Specified Period		One Hour Peak	
From:	07:00:00	From:	07:30:00
To:	09:00:00	To:	08:30:00

Intersection: Bowmanville Ave & Hwy 401 North Ramp Terminal
Site ID: 1937500001
Count Date: Nov 19, 2019
Weather conditions:

**** Unsignalized Intersection ****
Major Road: Bowmanville Ave runs N/S

North Approach

	Out	In	Total
Cars	937	431	1368
MT	52	59	111
HT	177	120	297
	1166	**610**	**1776**

Bowmanville Ave

HT	114	63	0	0
MT	3	49	0	0
Cars	724	213	0	0
Totals	**841**	**325**	**0**	**0**

East Approach

	Out	In	Total
Cars	227	5	232
MT	0	0	0
HT	61	13	74
	288	**18**	**306**

Hwy 401 WB On-Ramp

HT	MT	Cars	Totals

Peds: 0 (N)
Peds: 0 (W)
Peds: 0 (E)
Peds: 0 (S)

Hwy 401 North Ramp Terminal

	Totals	Cars	MT	HT
	0	0	0	0
	251	202	0	49
	0	0	0	0
	37	25	0	12

West Approach

	Out	In	Total
Cars	0	724	724
MT	0	3	3
HT	0	114	114
	0	**841**	**841**

Bowmanville Ave

Totals	**0**	**359**	**18**	**0**
Cars	0	229	5	0
MT	0	59	0	0
HT	0	71	13	0

South Approach

	Out	In	Total
Cars	234	238	472
MT	59	49	108
HT	84	75	159
	377	**362**	**739**

Cars - Cars MT - Medium Trucks HT - Heavy Trucks

Comments

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Peak Hour Summary

Intersection: Bowmanville Ave & Hwy 401 North Ramp Terminal
Count Date: Nov 19, 2019
Period: 07:00 - 09:00

Peak Hour Data (07:30 - 08:30)

Start Time	North Approach Bowmanville Ave						South Approach Bowmanville Ave						East Approach Hwy 401 North Ramp Terminal						West Approach Hwy 401 WB On-Ramp						Total Vehicles
					Peds	Total					Peds	Total					Peds	Total					Peds	Total	
07:30	0	94	220	0	0	314	0	84	3	0	0	87	25	0	66	0	0	91					0	0	492
07:45	0	90	203	0	0	293	0	99	8	0	0	107	2	0	64	0	0	66					0	0	466
08:00	0	65	205	0	0	270	0	103	2	0	0	105	5	0	61	0	0	66					0	0	441
08:15	0	76	213	0	0	289	0	73	5	0	0	78	5	0	60	0	0	65					0	0	432
Grand Total	**0**	**325**	**841**	**0**	**0**	**1166**	**0**	**359**	**18**	**0**	**0**	**377**	**37**	**0**	**251**	**0**	**0**	**288**					**0**	**0**	**1831**
Approach %	0	27.9	72.1	0		-	0	95.2	4.8	0		-	12.8	0	87.2	0		-						-	
Totals %	0	17.7	45.9	0		63.7	0	19.6	1	0		20.6	2	0	13.7	0		15.7						0	
PHF	**0**	**0.86**	**0.96**	**0**		**0.93**	**0**	**0.87**	**0.56**	**0**		**0.88**	**0.37**	**0**	**0.95**	**0**		**0.79**						**0**	**0.93**
Cars	0	213	724	0		937	0	229	5	0		234	25	0	202	0		227						0	1398
% Cars	0	65.5	86.1	0		80.4	0	63.8	27.8	0		62.1	67.6	0	80.5	0		78.8						0	76.4
Medium Trucks	0	49	3	0		52	0	59	0	0		59	0	0	0	0		0						0	111
% Medium Trucks	0	15.1	0.4	0		4.5	0	16.4	0	0		15.6	0	0	0	0		0						0	6.1
Heavy Trucks	0	63	114	0		177	0	71	13	0		84	12	0	49	0		61						0	322
% Heavy Trucks	0	19.4	13.6	0		15.2	0	19.8	72.2	0		22.3	32.4	0	19.5	0		21.2						0	17.6
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	

Peak Hour Diagram

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Specified Period		One Hour Peak	
From:	10:00:00	From:	11:00:00
To:	12:00:00	To:	12:00:00

Intersection: Bowmanville Ave & Hwy 401 North Ramp Terminal
Site ID: 1937500001
Count Date: Nov 19, 2019
Weather conditions:

**** Unsignalized Intersection ****
Major Road: Bowmanville Ave runs N/S

North Approach

	Out	In	Total
Cars	428	418	846
MT	58	70	128
HT	93	102	195
	579	**590**	**1169**

Bowmanville Ave

HT	49	44	0	0
MT	14	44	0	0
Cars	259	168	0	1
Totals	**322**	**256**	**0**	**1**

East Approach

	Out	In	Total
Cars	128	7	135
MT	0	1	1
HT	32	20	52
	160	**28**	**188**

Hwy 401 WB On-Ramp

HT	MT	Cars	Totals

Peds: 0 (N) | Peds: 0 (W) | Peds: 0 (E) | Peds: 0 (S)

Hwy 401 North Ramp Terminal

	Totals	Cars	MT	HT
	0	0	0	0
	145	123	0	22
	0	0	0	0
	15	5	0	10

West Approach

	Out	In	Total
Cars	0	259	259
MT	0	14	14
HT	0	49	49
	0	**322**	**322**

Bowmanville Ave

Totals	**0**	**444**	**28**	**0**
Cars	0	294	7	0
MT	0	70	1	0
HT	0	80	20	0

South Approach

	Out	In	Total
Cars	301	173	474
MT	71	44	115
HT	100	54	154
	472	**271**	**743**

Cars - Cars MT - Medium Trucks HT - Heavy Trucks

Comments

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Peak Hour Summary

Intersection: Bowmanville Ave & Hwy 401 North Ramp Terminal
Count Date: Nov 19, 2019
Period: 10:00 - 12:00

Peak Hour Data (11:00 - 12:00)

Start Time	North Approach Bowmanville Ave						South Approach Bowmanville Ave						East Approach Hwy 401 North Ramp Terminal						West Approach Hwy 401 WB On-Ramp						Total Vehicles
	↰	↑	↱	↩	Peds	Total	↰	↑	↱	↩	Peds	Total	↰	↑	↱	↩	Peds	Total	↰	↑	↱	↩	Peds	Total	
11:00	0	57	74	0	0	131	0	95	6	0	0	101	6	0	30	0	0	36					0	0	268
11:15	0	54	89	0	0	143	0	101	8	0	0	109	2	0	32	0	0	34					0	0	286
11:30	0	68	94	1	0	163	0	109	5	0	0	114	2	0	50	0	0	52					0	0	329
11:45	0	77	65	0	0	142	0	139	9	0	0	148	5	0	33	0	0	38					0	0	328
Grand Total	**0**	**256**	**322**	**1**	**0**	**579**	**0**	**444**	**28**	**0**	**0**	**472**	**15**	**0**	**145**	**0**	**0**	**160**					**0**	**0**	**1211**
Approach %	0	44.2	55.6	0.2		-	0	94.1	5.9	0		-	9.4	0	90.6	0		-						-	
Totals %	0	21.1	26.6	0.1		47.8	0	36.7	2.3	0		39	1.2	0	12	0		13.2						0	
PHF	**0**	**0.83**	**0.86**	**0.25**		**0.89**	**0**	**0.8**	**0.78**	**0**		**0.8**	**0.63**	**0**	**0.73**	**0**		**0.77**						**0**	**0.92**
Cars	0	168	259	1		428	0	294	7	0		301	5	0	123	0		128						0	857
% Cars	0	65.6	80.4	100		73.9	0	66.2	25	0		63.8	33.3	0	84.8	0		80						0	70.8
Medium Trucks	0	44	14	0		58	0	70	1	0		71	0	0	0	0		0						0	129
% Medium Trucks	0	17.2	4.3	0		10	0	15.8	3.6	0		15	0	0	0	0		0						0	10.7
Heavy Trucks	0	44	49	0		93	0	80	20	0		100	10	0	22	0		32						0	225
% Heavy Trucks	0	17.2	15.2	0		16.1	0	18	71.4	0		21.2	66.7	0	15.2	0		20						0	18.6
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Project #19375 - AECOM

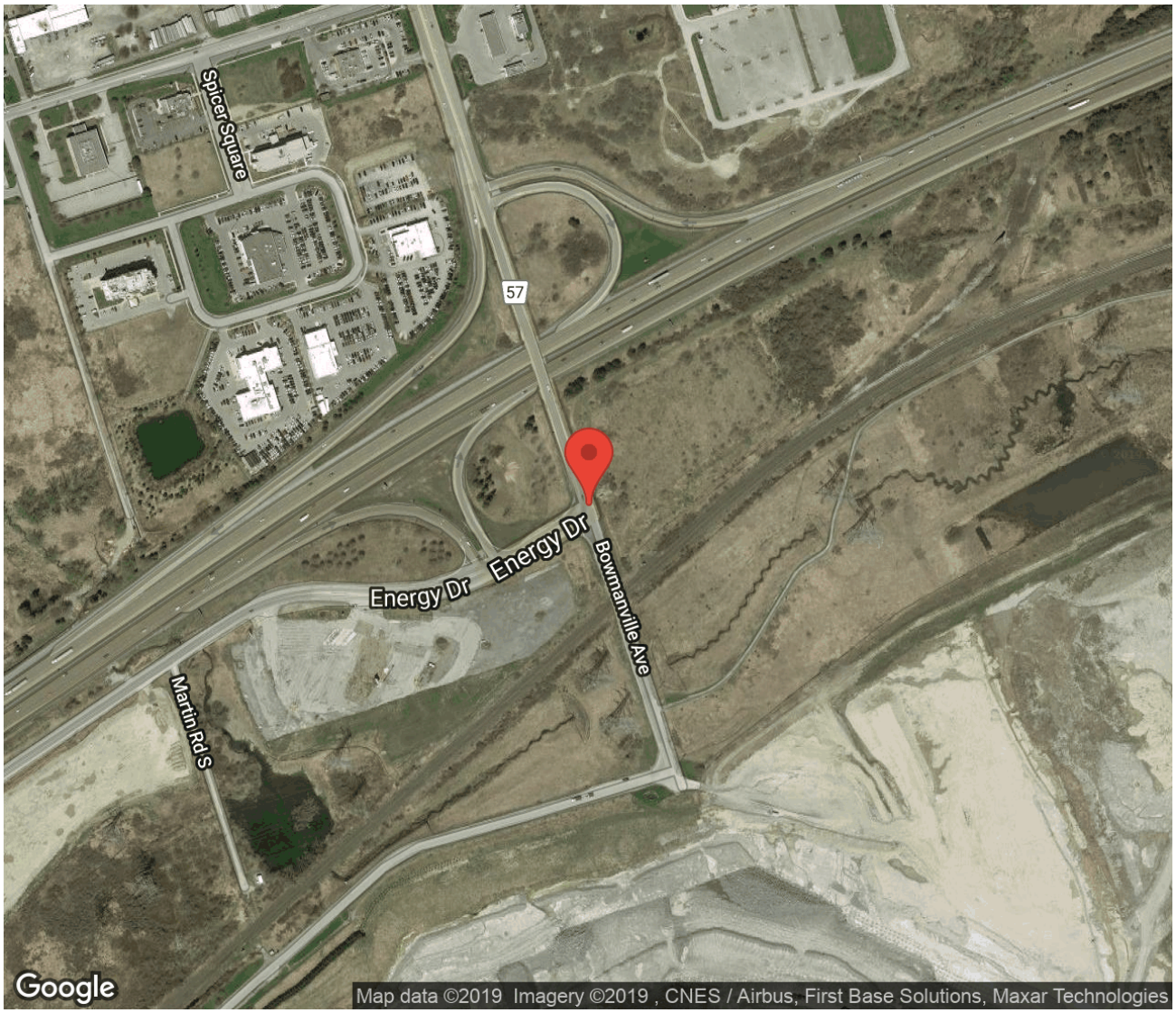
Intersection Count Report

Intersection:	Bowmanville Ave & Energy Dr
Municipality:	Bowmanville
Count Date:	Nov 19, 2019
Site Code:	1937500002
Count Categories:	Cars, Medium Trucks, Heavy Trucks, Pedestrians
Count Period:	07:00-09:00, 10:00-12:00
Weather:	Clear

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Map

Intersection:	Bowmanville Ave & Energy Dr
Municipality:	Bowmanville
Count Date:	Nov 19, 2019



Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Summary

Intersection: Bowmanville Ave & Energy Dr
Municipality: Bowmanville
Count Date: Nov 19, 2019

Bowmanville Ave - Traffic Summary

	North Approach Totals						South Approach Totals					
	Includes Cars, Medium Trucks, Heavy Trucks						Includes Cars, Medium Trucks, Heavy Trucks					
Hour	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds
07:00 - 08:00	0	96	285	0	381	0	8	44	0	0	52	0
08:00 - 09:00	0	61	230	0	291	0	13	48	0	0	61	0
BREAK												
10:00 - 11:00	0	45	144	1	190	0	7	68	0	0	75	0
11:00 - 12:00	0	44	227	0	271	0	8	65	0	0	73	0
GRAND TOTAL	**0**	**246**	**886**	**1**	**1133**	**0**	**36**	**225**	**0**	**0**	**261**	**0**

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Summary

Intersection: Bowmanville Ave & Energy Dr
Municipality: Bowmanville
Count Date: Nov 19, 2019

Energy Dr - Traffic Summary

	East Approach Totals						West Approach Totals					
	Includes Cars, Medium Trucks, Heavy Trucks						Includes Cars, Medium Trucks, Heavy Trucks					
Hour	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds
07:00 - 08:00	0	0	0	0	0	0	313	0	29	0	342	0
08:00 - 09:00	0	0	0	0	0	0	310	0	19	0	329	0
BREAK												
10:00 - 11:00	0	0	0	0	0	0	304	0	20	2	326	0
11:00 - 12:00	0	0	0	0	0	0	407	0	19	0	426	0
GRAND TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**1334**	**0**	**87**	**2**	**1423**	**0**

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Bowmanville Ave & Energy Dr
Municipality: Bowmanville
Count Date: Nov 19, 2019

North Approach - Bowmanville Ave

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
07:00	0	3	41	0	44	0	3	7	0	10	0	10	6	0	16	0
07:15	0	9	53	0	62	0	4	15	0	19	0	11	8	0	19	0
07:30	0	24	55	0	79	0	9	8	0	17	0	9	14	0	23	0
07:45	0	9	61	0	70	0	2	8	0	10	0	3	9	0	12	0
08:00	0	3	36	0	39	0	0	12	0	12	0	17	2	0	19	0
08:15	0	2	48	0	50	0	1	9	0	10	0	14	7	0	21	0
08:30	0	2	38	0	40	0	1	14	0	15	0	5	13	0	18	0
08:45	0	5	34	0	39	0	1	11	0	12	0	10	6	0	16	0
SUBTOTAL	0	57	366	0	423	0	21	84	0	105	0	79	65	0	144	0

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Bowmanville Ave & Energy Dr
Municipality: Bowmanville
Count Date: Nov 19, 2019

North Approach - Bowmanville Ave

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↷	Total	↰	↑	↱	↷	Total	↰	↑	↱	↷	Total	
10:00	0	5	29	1	35	0	1	10	0	11	0	8	4	0	12	0
10:15	0	1	26	0	27	0	2	3	0	5	0	6	1	0	7	0
10:30	0	2	26	0	28	0	1	7	0	8	0	7	0	0	7	0
10:45	0	0	26	0	26	0	1	10	0	11	0	11	2	0	13	0
11:00	0	0	36	0	36	0	1	10	0	11	0	5	11	0	16	0
11:15	0	1	39	0	40	0	1	6	0	7	0	9	0	0	9	0
11:30	0	1	45	0	46	0	0	10	0	10	0	11	3	0	14	0
11:45	0	2	49	0	51	0	1	15	0	16	0	12	3	0	15	0
SUBTOTAL	0	12	276	1	289	0	8	71	0	79	0	69	24	0	93	0
GRAND TOTAL	**0**	**69**	**642**	**1**	**712**	**0**	**29**	**155**	**0**	**184**	**0**	**148**	**89**	**0**	**237**	**0**

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Bowmanville Ave & Energy Dr
Municipality: Bowmanville
Count Date: Nov 19, 2019

South Approach - Bowmanville Ave

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
07:00	1	1	0	0	2	1	0	0	0	1	2	0	0	0	2	0
07:15	0	1	0	0	1	0	0	0	0	0	1	21	0	0	22	0
07:30	0	1	0	0	1	0	1	0	0	1	1	1	0	0	2	0
07:45	0	1	0	0	1	0	2	0	0	2	2	15	0	0	17	0
08:00	2	2	0	0	4	3	3	0	0	6	1	12	0	0	13	0
08:15	0	1	0	0	1	0	1	0	0	1	0	9	0	0	9	0
08:30	1	0	0	0	1	0	0	0	0	0	3	5	0	0	8	0
08:45	0	0	0	0	0	0	0	0	0	0	3	15	0	0	18	0
SUBTOTAL	4	7	0	0	11	4	7	0	0	11	13	78	0	0	91	0

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Bowmanville Ave & Energy Dr
Municipality: Bowmanville
Count Date: Nov 19, 2019

South Approach - Bowmanville Ave

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
10:00	1	6	0	0	7	0	4	0	0	4	0	11	0	0	11	0
10:15	0	2	0	0	2	0	1	0	0	1	3	12	0	0	15	0
10:30	1	2	0	0	3	0	1	0	0	1	2	13	0	0	15	0
10:45	0	1	0	0	1	0	1	0	0	1	0	14	0	0	14	0
11:00	1	1	0	0	2	1	3	0	0	4	2	9	0	0	11	0
11:15	0	2	0	0	2	0	2	0	0	2	0	13	0	0	13	0
11:30	0	2	0	0	2	0	0	0	0	0	1	11	0	0	12	0
11:45	0	7	0	0	7	0	2	0	0	2	3	13	0	0	16	0
SUBTOTAL	3	23	0	0	26	1	14	0	0	15	11	96	0	0	107	0
GRAND TOTAL	7	30	0	0	37	5	21	0	0	26	24	174	0	0	198	0

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Bowmanville Ave & Energy Dr
Municipality: Bowmanville
Count Date: Nov 19, 2019

West Approach - Energy Dr

Start Time	Cars				Total	Medium Trucks				Total	Heavy Trucks				Total	Total Peds
07:00	30	0	3	0	33	12	0	0	0	12	13	0	4	0	17	0
07:15	54	0	5	0	59	23	0	1	0	24	8	0	1	0	9	0
07:30	51	0	3	0	54	15	0	0	0	15	18	0	1	0	19	0
07:45	65	0	6	0	71	13	0	2	0	15	11	0	3	0	14	0
08:00	59	0	2	0	61	15	0	0	0	15	14	0	1	0	15	0
08:15	54	0	3	0	57	9	0	1	0	10	4	0	5	0	9	0
08:30	55	0	1	0	56	7	0	0	0	7	9	0	2	0	11	0
08:45	67	0	2	0	69	15	0	0	0	15	2	0	2	0	4	0
SUBTOTAL	435	0	25	0	460	109	0	4	0	113	79	0	19	0	98	0

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Traffic Count Data

Intersection: Bowmanville Ave & Energy Dr
Municipality: Bowmanville
Count Date: Nov 19, 2019

West Approach - Energy Dr

Start Time	Cars					Medium Trucks					Heavy Trucks					Total Peds
	↰	↑	↱	↷	Total	↰	↑	↱	↷	Total	↰	↑	↱	↷	Total	
10:00	49	0	0	0	49	13	0	3	0	16	9	0	5	0	14	0
10:15	51	0	0	1	52	10	0	0	0	10	5	0	1	0	6	0
10:30	47	0	1	0	48	22	0	1	0	23	11	0	3	0	14	0
10:45	74	0	2	1	77	13	0	0	0	13	0	0	4	0	4	0
11:00	71	0	1	0	72	7	0	0	0	7	10	0	3	0	13	0
11:15	63	0	2	0	65	17	0	0	0	17	12	0	2	0	14	0
11:30	66	0	0	0	66	19	0	0	0	19	16	0	4	0	20	0
11:45	89	0	1	0	90	21	0	2	0	23	16	0	4	0	20	0
SUBTOTAL	510	0	7	2	519	122	0	6	0	128	79	0	26	0	105	0
GRAND TOTAL	945	0	32	2	979	231	0	10	0	241	158	0	45	0	203	0

Peak Hour Diagram

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Specified Period		One Hour Peak	
From:	07:00:00	From:	07:15:00
To:	09:00:00	To:	08:15:00

Intersection: Bowmanville Ave & Energy Dr
Site ID: 1937500002
Count Date: Nov 19, 2019

Weather conditions:

**** Unsignalized Intersection ****

Major Road: Energy Dr runs E/W

North Approach

	Out	In	Total
🚗	250	234	484
MT	58	72	130
HT	73	100	173
	381	**406**	**787**

Bowmanville Ave

HT	33	40	0
MT	43	15	0
🚗	205	45	0
Totals	**281**	**100**	**0**

Peds: 0

Energy Dr

HT	MT	🚗	Totals
0	0	0	**0**
51	66	229	**346**
6	3	16	**25**

Peds: 0

Peds: 0

Peds: 0

West Approach

	Out	In	Total
🚗	245	207	452
MT	69	46	115
HT	57	38	95
	371	**291**	**662**

Totals	**10**	**60**	**0**
🚗	2	5	0
MT	3	6	0
HT	5	49	0

Bowmanville Ave

South Approach

	Out	In	Total
🚗	7	61	68
MT	9	18	27
HT	54	46	100
	70	**125**	**195**

🚗 - Cars MT - Medium Trucks HT - Heavy Trucks

Comments

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Peak Hour Summary

Intersection: Bowmanville Ave & Energy Dr
Count Date: Nov 19, 2019
Period: 07:00 - 09:00

Peak Hour Data (07:15 - 08:15)

Start Time	North Approach Bowmanville Ave						South Approach Bowmanville Ave						East Approach						West Approach Energy Dr						Total Vehicles
					Peds	Total					Peds	Total					Peds	Total					Peds	Total	
07:15		24	76	0	0	100	1	22		0	0	23				0			85		7	0	0	92	215
07:30		42	77	0	0	119	1	3		0	0	4				0			84		4	0	0	88	211
07:45		14	78	0	0	92	2	18		0	0	20				0			89		11	0	0	100	212
08:00		20	50	0	0	70	6	17		0	0	23				0			88		3	0	0	91	184
Grand Total		**100**	**281**	**0**	**0**	**381**	**10**	**60**		**0**	**0**	**70**				**0**	**0**		**346**		**25**	**0**	**0**	**371**	**822**
Approach %		26.2	73.8	0		-	14.3	85.7		0		-						-	93.3		6.7	0		-	
Totals %		12.2	34.2	0		46.4	1.2	7.3		0		8.5						0	42.1		3	0		45.1	
PHF		**0.6**	**0.9**	**0**		**0.8**	**0.42**	**0.68**		**0**		**0.76**						**0**	**0.97**		**0.57**	**0**		**0.93**	**0.96**
Cars		45	205	0		250	2	5		0		7						0	229		16	0		245	502
% Cars		45	73	0		65.6	20	8.3		0		10						0	66.2		64	0		66	61.1
Medium Trucks		15	43	0		58	3	6		0		9						0	66		3	0		69	136
% Medium Trucks		15	15.3	0		15.2	30	10		0		12.9						0	19.1		12	0		18.6	16.5
Heavy Trucks		40	33	0		73	5	49		0		54						0	51		6	0		57	184
% Heavy Trucks		40	11.7	0		19.2	50	81.7		0		77.1						0	14.7		24	0		15.4	22.4
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	

Peak Hour Diagram

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Specified Period		One Hour Peak	
From:	10:00:00	From:	11:00:00
To:	12:00:00	To:	12:00:00

Intersection: Bowmanville Ave & Energy Dr
Site ID: 1937500002
Count Date: Nov 19, 2019

Weather conditions:

**** Unsignalized Intersection ****

Major Road: Energy Dr runs E/W

North Approach

	Out	In	Total
🚗	173	301	474
MT	44	71	115
HT	54	100	154
	271	**472**	**743**

Bowmanville Ave

HT	17	37	0
MT	41	3	0
🚗	169	4	0
Totals	**227**	**44**	**0**

Peds: 0

Energy Dr

HT	MT	🚗	Totals
0	0	0	**0**
54	64	289	**407**
13	2	4	**19**

Peds: 0

Peds: 0

Peds: 0

West Approach

	Out	In	Total
🚗	293	170	463
MT	66	42	108
HT	67	23	90
	426	**235**	**661**

Totals	**8**	**65**	**0**
🚗	1	12	0
MT	1	7	0
HT	6	46	0

Bowmanville Ave

South Approach

	Out	In	Total
🚗	13	8	21
MT	8	5	13
HT	52	50	102
	73	**63**	**136**

🚗 - Cars MT - Medium Trucks HT - Heavy Trucks

Comments

Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTS

Peak Hour Summary

Intersection: Bowmanville Ave & Energy Dr
Count Date: Nov 19, 2019
Period: 10:00 - 12:00

Peak Hour Data (11:00 - 12:00)

Start Time	North Approach Bowmanville Ave						South Approach Bowmanville Ave						East Approach						West Approach Energy Dr						Total Vehicles
					Peds	Total					Peds	Total					Peds	Total					Peds	Total	
11:00		6	57	0	0	63	4	13		0	0	17				0			88		4	0	0	92	172
11:15		11	45	0	0	56	0	17		0	0	17				0			92		4	0	0	96	169
11:30		12	58	0	0	70	1	13		0	0	14				0			101		4	0	0	105	189
11:45		15	67	0	0	82	3	22		0	0	25				0			126		7	0	0	133	240
Grand Total		**44**	**227**	**0**	**0**	**271**	**8**	**65**		**0**	**0**	**73**				**0**	**0**		**407**		**19**	**0**	**0**	**426**	**770**
Approach %		16.2	83.8	0		-	11	89		0		-					-		95.5		4.5	0		-	
Totals %		5.7	29.5	0		35.2	1	8.4		0		9.5					0		52.9		2.5	0		55.3	
PHF		**0.73**	**0.85**	**0**		**0.83**	**0.5**	**0.74**		**0**		**0.73**					**0**		**0.81**		**0.68**	**0**		**0.8**	**0.8**
Cars		4	169	0		173	1	12		0		13					0		289		4	0		293	479
% Cars		9.1	74.4	0		63.8	12.5	18.5		0		17.8					0		71		21.1	0		68.8	62.2
Medium Trucks		3	41	0		44	1	7		0		8					0		64		2	0		66	118
% Medium Trucks		6.8	18.1	0		16.2	12.5	10.8		0		11					0		15.7		10.5	0		15.5	15.3
Heavy Trucks		37	17	0		54	6	46		0		52					0		54		13	0		67	173
% Heavy Trucks		84.1	7.5	0		19.9	75	70.8		0		71.2					0		13.3		68.4	0		15.7	22.5
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	

Merkoulovitch, Ilia

To: Merkoulovitch, Ilia
Subject: RE: Traffic Impact Study

From: Schmied, Sarah
Sent: September 18, 2019 8:18 AM
To: Sher, Ilya <ilya.sher@aecom.com>
Subject: RE: Traffic Impact Study

Good morning Ilya,

I posed your questions to the client and they provided the responses below in red. Please let me know if this information is sufficient for you to develop a scope of work and fee. Regarding question #2, please also advise if a count of trucks would be required.

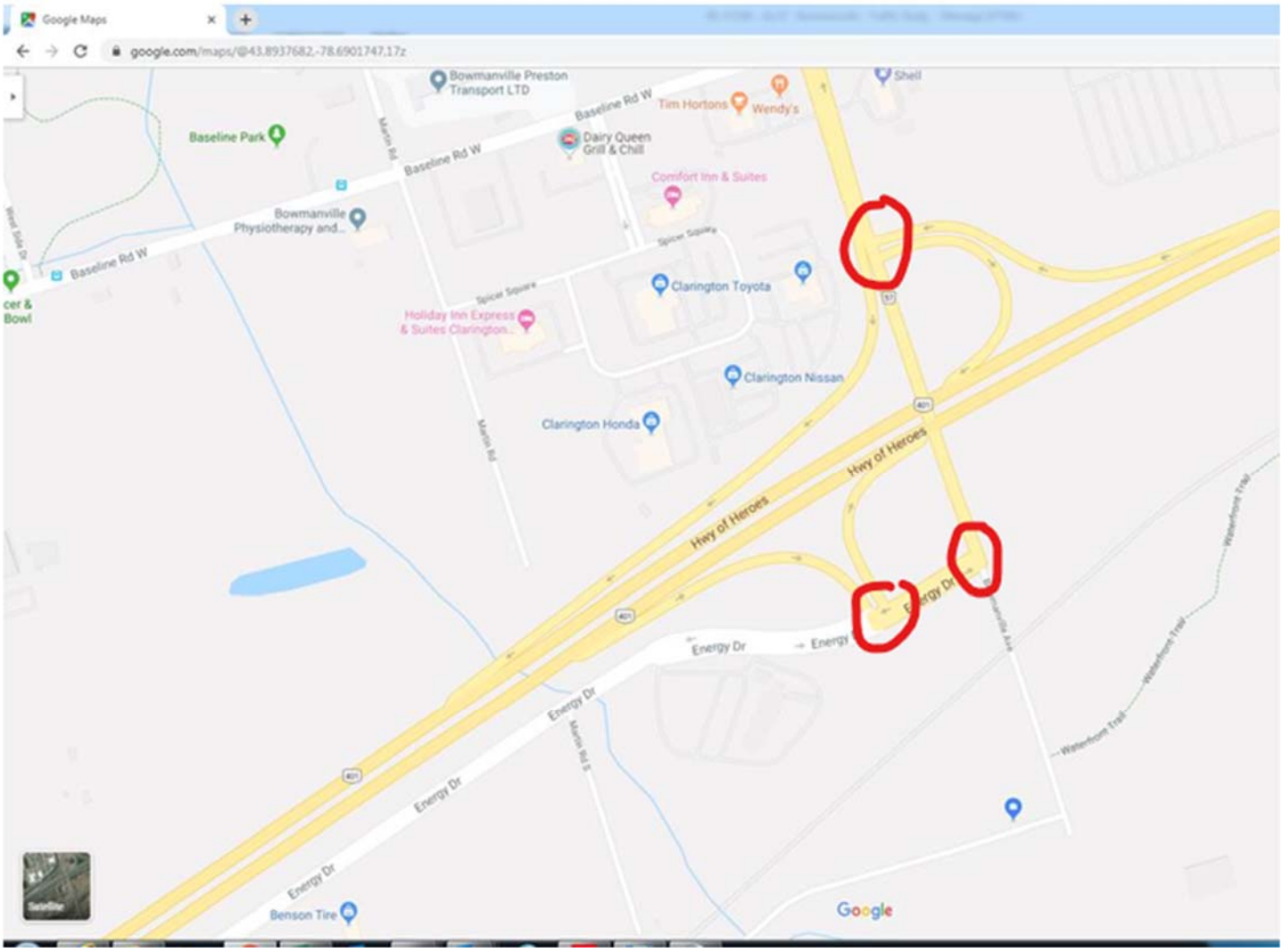
I also looked into our contracts and it seems that AECOM/Golder have a MSA. I'm just confirming with our legal team if that would be considered a suitable contract for this scope of work and will try to get back to you as soon as possible. I assume that this would just be a desktop study, and that a site visit would not be required?

Feel free to let me know if you have any further questions.

Thank you,

-Sarah

1. Operational characteristics of the site (hours of operation, busiest time-frames)
   The site operates 24/7. We truck from 4 am to 8 pm Monday to Friday but for modelling and flexibility purposes we assume it happens at any time. If there might be some potential problems/restrictions with the operation time please let me know.
2. Truck distribution if known (including types of trucks)
   The types of trucks we have coming into the site are dump trucks, life bottom trailers, stone slingers, tankers. We don't have a count of trucks. Do we need one? Inside the site we also have big loaders for quarry operation, but those stay onsite.
3. Will the increased use of ALCFs result in additional staff traffic?
   No
4. Which intersections you would like assessed?
   The most relevant intersections would be the auxiliary road from the 401 to energy drive, energy drive and Bowmanville avenue, and Bowmanville avenue to the auxiliary road to the 401. See circles in red. These are the way the trucks will get in and outside the site. The trucks will drive inside the site, away from the site fence line.
5. Please confirm that the increase from 5 truck to 20 trucks is "per day" and not "per hour"
   Normally it will be 20 trucks per day (400 tonnes per day / 20 tonnes per truck = 20 trucks per day). There will be some days when we will need to receive more trucks to put material into storage, up to **35 trucks per day** (400 tonnes per day * 7 days consumption per week / 20 tonnes per truck * 4 days per week delivery in a short week = 35 trucks per day). Having a conversation with production they will also want to have storage material for a long weekend, so that's 3 days' worth of material, 400 tonnes * 3 = 1200 tonnes storage system.


Google Maps
google.com/maps/@43.8937682,-78.6901747,17z
Bowmanville Preston Transport LTD
Baseline Rd W
Tim Hortons
Wendy's
Shell
Baseline Park
Dairy Queen Grill & Chill
Comfort Inn & Suites
Bowmanville Physiotherapy and...
Spicer Square
Clarington Toyota
Holiday Inn Express & Suites Clarington...
Clarington Nissan
Clarington Honda
Martin Rd
Hwy of Heroes
401
Energy Dr
Waterfront Trail
Benson Tire
Google

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Work Safe, Home Safe

Appendix B

Synchro Reports

Intersection	
Int Delay, s/veh	14.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	99	325	331	17	0	320
Future Vol, veh/h	99	325	331	17	0	320
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	3	3	8	71	0	9
Mvmt Flow	111	365	372	19	0	360

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	742	382	0	0	-	-
Stage 1	382	-	-	-	-	-
Stage 2	360	-	-	-	-	-
Critical Hdwy	6.43	6.23	-	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	-	-	-	-
Pot Cap-1 Maneuver	382	663	-	-	0	-
Stage 1	688	-	-	-	0	-
Stage 2	704	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	382	663	-	-	-	-
Mov Cap-2 Maneuver	382	-	-	-	-	-
Stage 1	688	-	-	-	-	-
Stage 2	704	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	36.4	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	566	-
HCM Lane V/C Ratio	-	-	0.842	-
HCM Control Delay (s)	-	-	36.4	-
HCM Lane LOS	-	-	E	-
HCM 95th %tile Q(veh)	-	-	8.9	-

Intersection	
Int Delay, s/veh	6.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	318	26	8	30	66	353
Future Vol, veh/h	318	26	8	30	66	353
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	1050	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	6	23	38	67	20	5
Mvmt Flow	335	27	8	32	69	372

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	303	255	441	0	-	0
Stage 1	255	-	-	-	-	-
Stage 2	48	-	-	-	-	-
Critical Hdwy	6.46	6.43	4.48	-	-	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.507	2.542	-	-	-
Pot Cap-1 Maneuver	680	735	952	-	-	-
Stage 1	778	-	-	-	-	-
Stage 2	964	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	675	735	952	-	-	-
Mov Cap-2 Maneuver	675	-	-	-	-	-
Stage 1	772	-	-	-	-	-
Stage 2	964	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.1	1.9	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	952	-	675	735	-	-
HCM Lane V/C Ratio	0.009	-	0.496	0.037	-	-
HCM Control Delay (s)	8.8	-	15.5	10.1	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0	-	2.8	0.1	-	-

Intersection	
Int Delay, s/veh	6.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	3	35	143	218	309	3
Future Vol, veh/h	3	35	143	218	309	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	17	3	8	6	0
Mvmt Flow	3	37	151	229	325	3

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	380	0	-	0	291	266
Stage 1	-	-	-	-	266	-
Stage 2	-	-	-	-	25	-
Critical Hdwy	4.1	-	-	-	6.69	6.2
Critical Hdwy Stg 1	-	-	-	-	5.49	-
Critical Hdwy Stg 2	-	-	-	-	5.89	-
Follow-up Hdwy	2.2	-	-	-	3.557	3.3
Pot Cap-1 Maneuver	1190	-	-	-	678	778
Stage 1	-	-	-	-	767	-
Stage 2	-	-	-	-	984	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1190	-	-	-	676	778
Mov Cap-2 Maneuver	-	-	-	-	676	-
Stage 1	-	-	-	-	765	-
Stage 2	-	-	-	-	984	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	15.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1190	-	-	-	676	778
HCM Lane V/C Ratio	0.003	-	-	-	0.481	0.004
HCM Control Delay (s)	8	0	-	-	15.2	9.6
HCM Lane LOS	A	A	-	-	C	A
HCM 95th %tile Q(veh)	0	-	-	-	2.6	0

Intersection	
Int Delay, s/veh	6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	272	702	18	0	390
Future Vol, veh/h	6	272	702	18	0	390
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	0	1	2	6	0	3
Mvmt Flow	6	278	716	18	0	398

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1123	725	0	0	-	-
Stage 1	725	-	-	-	-	-
Stage 2	398	-	-	-	-	-
Critical Hdwy	6.4	6.21	-	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.309	-	-	-	-
Pot Cap-1 Maneuver	230	427	-	-	0	-
Stage 1	483	-	-	-	0	-
Stage 2	683	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	230	427	-	-	-	-
Mov Cap-2 Maneuver	230	-	-	-	-	-
Stage 1	483	-	-	-	-	-
Stage 2	683	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	29.8	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	419	-
HCM Lane V/C Ratio	-	-	0.677	-
HCM Control Delay (s)	-	-	29.8	-
HCM Lane LOS	-	-	D	-
HCM 95th %tile Q(veh)	-	-	4.9	-

Intersection	
Int Delay, s/veh	37.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	665	7	26	55	4	392
Future Vol, veh/h	665	7	26	55	4	392
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	1050	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	1	57	4	13	0	3
Mvmt Flow	679	7	27	56	4	400

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	314	204	404	0	-	0
Stage 1	204	-	-	-	-	-
Stage 2	110	-	-	-	-	-
Critical Hdwy	6.41	6.77	4.14	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.813	2.236	-	-	-
Pot Cap-1 Maneuver	681	715	1144	-	-	-
Stage 1	833	-	-	-	-	-
Stage 2	917	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 665	715	1144	-	-	-
Mov Cap-2 Maneuver	~ 665	-	-	-	-	-
Stage 1	813	-	-	-	-	-
Stage 2	917	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	64.5	2.6	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1144	-	665	715	-	-
HCM Lane V/C Ratio	0.023	-	1.02	0.01	-	-
HCM Control Delay (s)	8.2	-	65.1	10.1	-	-
HCM Lane LOS	A	-	F	B	-	-
HCM 95th %tile Q(veh)	0.1	-	16.8	0	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	15.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	171	56	362	501	5
Future Vol, veh/h	16	171	56	362	501	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	0	1	4	3	2	0
Mvmt Flow	16	176	58	373	516	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	431	0	-	0	365	245
Stage 1	-	-	-	-	245	-
Stage 2	-	-	-	-	120	-
Critical Hdwy	4.1	-	-	-	6.63	6.2
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	2.2	-	-	-	3.519	3.3
Pot Cap-1 Maneuver	1139	-	-	-	621	799
Stage 1	-	-	-	-	795	-
Stage 2	-	-	-	-	893	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1139	-	-	-	611	799
Mov Cap-2 Maneuver	-	-	-	-	611	-
Stage 1	-	-	-	-	782	-
Stage 2	-	-	-	-	893	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	34.6
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1139	-	-	-	611	799
HCM Lane V/C Ratio	0.014	-	-	-	0.845	0.006
HCM Control Delay (s)	8.2	0.1	-	-	34.8	9.5
HCM Lane LOS	A	A	-	-	D	A
HCM 95th %tile Q(veh)	0	-	-	-	9.2	0

Intersection	
Int Delay, s/veh	20.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	106	348	354	19	0	342
Future Vol, veh/h	106	348	354	19	0	342
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	3	3	8	68	0	9
Mvmt Flow	119	391	398	21	0	384

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	793	409	0	0	-	-
Stage 1	409	-	-	-	-	-
Stage 2	384	-	-	-	-	-
Critical Hdwy	6.43	6.23	-	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	-	-	-	-
Pot Cap-1 Maneuver	356	640	-	-	0	-
Stage 1	668	-	-	-	0	-
Stage 2	686	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	356	640	-	-	-	-
Mov Cap-2 Maneuver	356	-	-	-	-	-
Stage 1	668	-	-	-	-	-
Stage 2	686	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	53.9	0	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	540	-
HCM Lane V/C Ratio	-	-	0.945	-
HCM Control Delay (s)	-	-	53.9	-
HCM Lane LOS	-	-	F	-
HCM 95th %tile Q(veh)	-	-	12.1	-

Intersection	
Int Delay, s/veh	7.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	340	27	8	33	70	378
Future Vol, veh/h	340	27	8	33	70	378
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	1050	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	6	22	38	67	20	5
Mvmt Flow	358	28	8	35	74	398

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	324	273	472	0	-	0
Stage 1	273	-	-	-	-	-
Stage 2	51	-	-	-	-	-
Critical Hdwy	6.46	6.42	4.48	-	-	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.498	2.542	-	-	-
Pot Cap-1 Maneuver	662	720	926	-	-	-
Stage 1	764	-	-	-	-	-
Stage 2	961	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	656	720	926	-	-	-
Mov Cap-2 Maneuver	656	-	-	-	-	-
Stage 1	757	-	-	-	-	-
Stage 2	961	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.4	1.7	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	926	-	656	720	-	-
HCM Lane V/C Ratio	0.009	-	0.546	0.039	-	-
HCM Control Delay (s)	8.9	-	16.9	10.2	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0	-	3.3	0.1	-	-

Intersection	
Int Delay, s/veh	7.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	3	37	152	234	330	3
Future Vol, veh/h	3	37	152	234	330	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	16	3	8	6	0
Mvmt Flow	3	39	160	246	347	3

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	406	0	-	0	309	283
Stage 1	-	-	-	-	283	-
Stage 2	-	-	-	-	26	-
Critical Hdwy	4.1	-	-	-	6.69	6.2
Critical Hdwy Stg 1	-	-	-	-	5.49	-
Critical Hdwy Stg 2	-	-	-	-	5.89	-
Follow-up Hdwy	2.2	-	-	-	3.557	3.3
Pot Cap-1 Maneuver	1164	-	-	-	661	761
Stage 1	-	-	-	-	754	-
Stage 2	-	-	-	-	982	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1164	-	-	-	659	761
Mov Cap-2 Maneuver	-	-	-	-	659	-
Stage 1	-	-	-	-	752	-
Stage 2	-	-	-	-	982	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	16.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1164	-	-	-	659	761
HCM Lane V/C Ratio	0.003	-	-	-	0.527	0.004
HCM Control Delay (s)	8.1	0	-	-	16.4	9.8
HCM Lane LOS	A	A	-	-	C	A
HCM 95th %tile Q(veh)	0	-	-	-	3.1	0

Intersection	
Int Delay, s/veh	7.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	291	751	19	0	418
Future Vol, veh/h	6	291	751	19	0	418
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	0	1	2	5	0	3
Mvmt Flow	6	297	766	19	0	427

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1203	776	0	0	-	-
Stage 1	776	-	-	-	-	-
Stage 2	427	-	-	-	-	-
Critical Hdwy	6.4	6.21	-	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.309	-	-	-	-
Pot Cap-1 Maneuver	206	399	-	-	0	-
Stage 1	457	-	-	-	0	-
Stage 2	662	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	206	399	-	-	-	-
Mov Cap-2 Maneuver	206	-	-	-	-	-
Stage 1	457	-	-	-	-	-
Stage 2	662	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	39.3	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	392	-
HCM Lane V/C Ratio	-	-	0.773	-
HCM Control Delay (s)	-	-	39.3	-
HCM Lane LOS	-	-	E	-
HCM 95th %tile Q(veh)	-	-	6.5	-

Intersection	
Int Delay, s/veh	57.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	711	7	28	59	4	420
Future Vol, veh/h	711	7	28	59	4	420
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	1050	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	1	57	4	12	0	3
Mvmt Flow	726	7	29	60	4	429

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	337	219	433	0	-	0
Stage 1	219	-	-	-	-	-
Stage 2	118	-	-	-	-	-
Critical Hdwy	6.41	6.77	4.14	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.813	2.236	-	-	-
Pot Cap-1 Maneuver	~ 661	701	1116	-	-	-
Stage 1	820	-	-	-	-	-
Stage 2	910	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 644	701	1116	-	-	-
Mov Cap-2 Maneuver	~ 644	-	-	-	-	-
Stage 1	799	-	-	-	-	-
Stage 2	910	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	98.5	2.7	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1116	-	644	701	-	-
HCM Lane V/C Ratio	0.026	-	1.127	0.01	-	-
HCM Control Delay (s)	8.3	-	99.4	10.2	-	-
HCM Lane LOS	A	-	F	B	-	-
HCM 95th %tile Q(veh)	0.1	-	22.4	0	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	23

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	17	182	60	388	536	5
Future Vol, veh/h	17	182	60	388	536	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	0	1	3	3	2	0
Mvmt Flow	18	188	62	400	553	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	462	0	-	0	392	262
Stage 1	-	-	-	-	262	-
Stage 2	-	-	-	-	130	-
Critical Hdwy	4.1	-	-	-	6.63	6.2
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	2.2	-	-	-	3.519	3.3
Pot Cap-1 Maneuver	1110	-	-	-	598	782
Stage 1	-	-	-	-	781	-
Stage 2	-	-	-	-	883	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1110	-	-	-	587	782
Mov Cap-2 Maneuver	-	-	-	-	587	-
Stage 1	-	-	-	-	767	-
Stage 2	-	-	-	-	883	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	50.2
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1110	-	-	-	587	782
HCM Lane V/C Ratio	0.016	-	-	-	0.941	0.007
HCM Control Delay (s)	8.3	0.1	-	-	50.6	9.6
HCM Lane LOS	A	A	-	-	F	A
HCM 95th %tile Q(veh)	0	-	-	-	12.4	0

Intersection	
Int Delay, s/veh	24

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	113	348	354	19	0	342
Future Vol, veh/h	113	348	354	19	0	342
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	9	3	8	68	0	9
Mvmt Flow	127	391	398	21	0	384

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	793	409	0	0	-	-
Stage 1	409	-	-	-	-	-
Stage 2	384	-	-	-	-	-
Critical Hdwy	6.49	6.23	-	-	-	-
Critical Hdwy Stg 1	5.49	-	-	-	-	-
Critical Hdwy Stg 2	5.49	-	-	-	-	-
Follow-up Hdwy	3.581	3.327	-	-	-	-
Pot Cap-1 Maneuver	348	640	-	-	0	-
Stage 1	656	-	-	-	0	-
Stage 2	673	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	348	640	-	-	-	-
Mov Cap-2 Maneuver	348	-	-	-	-	-
Stage 1	656	-	-	-	-	-
Stage 2	673	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	61.1	0	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	531	-
HCM Lane V/C Ratio	-	-	0.975	-
HCM Control Delay (s)	-	-	61.1	-
HCM Lane LOS	-	-	F	-
HCM 95th %tile Q(veh)	-	-	13.1	-

Intersection	
Int Delay, s/veh	7.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	340	27	12	33	77	378
Future Vol, veh/h	340	27	12	33	77	378
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	1050	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	6	22	58	67	27	5
Mvmt Flow	358	28	13	35	81	398

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	341	280	479	0	-	0
Stage 1	280	-	-	-	-	-
Stage 2	61	-	-	-	-	-
Critical Hdwy	6.46	6.42	4.68	-	-	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.498	2.722	-	-	-
Pot Cap-1 Maneuver	647	713	846	-	-	-
Stage 1	758	-	-	-	-	-
Stage 2	952	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	637	713	846	-	-	-
Mov Cap-2 Maneuver	637	-	-	-	-	-
Stage 1	747	-	-	-	-	-
Stage 2	952	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.2	2.5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	846	-	637	713	-	-
HCM Lane V/C Ratio	0.015	-	0.562	0.04	-	-
HCM Control Delay (s)	9.3	-	17.7	10.3	-	-
HCM Lane LOS	A	-	C	B	-	-
HCM 95th %tile Q(veh)	0	-	3.5	0.1	-	-

Intersection	
Int Delay, s/veh	7.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	3	37	152	238	330	3
Future Vol, veh/h	3	37	152	238	330	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	16	3	9	6	0
Mvmt Flow	3	39	160	251	347	3

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	411	0	-	0	312	286
Stage 1	-	-	-	-	286	-
Stage 2	-	-	-	-	26	-
Critical Hdwy	4.1	-	-	-	6.69	6.2
Critical Hdwy Stg 1	-	-	-	-	5.49	-
Critical Hdwy Stg 2	-	-	-	-	5.89	-
Follow-up Hdwy	2.2	-	-	-	3.557	3.3
Pot Cap-1 Maneuver	1159	-	-	-	659	758
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	982	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1159	-	-	-	657	758
Mov Cap-2 Maneuver	-	-	-	-	657	-
Stage 1	-	-	-	-	749	-
Stage 2	-	-	-	-	982	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	16.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1159	-	-	-	657	758
HCM Lane V/C Ratio	0.003	-	-	-	0.529	0.004
HCM Control Delay (s)	8.1	0	-	-	16.5	9.8
HCM Lane LOS	A	A	-	-	C	A
HCM 95th %tile Q(veh)	0	-	-	-	3.1	0

Intersection	
Int Delay, s/veh	8.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	8	291	751	19	0	418
Future Vol, veh/h	8	291	751	19	0	418
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	24	1	2	5	0	3
Mvmt Flow	8	297	766	19	0	427

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1203	776	0	0	-	-
Stage 1	776	-	-	-	-	-
Stage 2	427	-	-	-	-	-
Critical Hdwy	6.64	6.21	-	-	-	-
Critical Hdwy Stg 1	5.64	-	-	-	-	-
Critical Hdwy Stg 2	5.64	-	-	-	-	-
Follow-up Hdwy	3.716	3.309	-	-	-	-
Pot Cap-1 Maneuver	184	399	-	-	0	-
Stage 1	417	-	-	-	0	-
Stage 2	614	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	184	399	-	-	-	-
Mov Cap-2 Maneuver	184	-	-	-	-	-
Stage 1	417	-	-	-	-	-
Stage 2	614	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	41.3	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBT
Capacity (veh/h)	-	-	387	-
HCM Lane V/C Ratio	-	-	0.788	-
HCM Control Delay (s)	-	-	41.3	-
HCM Lane LOS	-	-	E	-
HCM 95th %tile Q(veh)	-	-	6.7	-

Intersection	
Int Delay, s/veh	64.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	711	7	34	59	6	420
Future Vol, veh/h	711	7	34	59	6	420
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	1050	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	1	57	21	12	32	3
Mvmt Flow	726	7	35	60	6	429

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	351	221	435	0	-	0
Stage 1	221	-	-	-	-	-
Stage 2	130	-	-	-	-	-
Critical Hdwy	6.41	6.77	4.31	-	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.813	2.389	-	-	-
Pot Cap-1 Maneuver	~ 648	699	1031	-	-	-
Stage 1	818	-	-	-	-	-
Stage 2	898	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 626	699	1031	-	-	-
Mov Cap-2 Maneuver	~ 626	-	-	-	-	-
Stage 1	790	-	-	-	-	-
Stage 2	898	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	110.9	3.1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1031	-	626	699	-	-
HCM Lane V/C Ratio	0.034	-	1.159	0.01	-	-
HCM Control Delay (s)	8.6	-	111.9	10.2	-	-
HCM Lane LOS	A	-	F	B	-	-
HCM 95th %tile Q(veh)	0.1	-	23.8	0	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	23.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	17	182	60	394	536	5
Future Vol, veh/h	17	182	60	394	536	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	0	1	3	5	2	0
Mvmt Flow	18	188	62	406	553	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	468	0	-	0	395	265
Stage 1	-	-	-	-	265	-
Stage 2	-	-	-	-	130	-
Critical Hdwy	4.1	-	-	-	6.63	6.2
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	2.2	-	-	-	3.519	3.3
Pot Cap-1 Maneuver	1104	-	-	-	596	779
Stage 1	-	-	-	-	779	-
Stage 2	-	-	-	-	883	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1104	-	-	-	585	779
Mov Cap-2 Maneuver	-	-	-	-	585	-
Stage 1	-	-	-	-	765	-
Stage 2	-	-	-	-	883	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	50.9
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1104	-	-	-	585	779
HCM Lane V/C Ratio	0.016	-	-	-	0.945	0.007
HCM Control Delay (s)	8.3	0.1	-	-	51.3	9.7
HCM Lane LOS	A	A	-	-	F	A
HCM 95th %tile Q(veh)	0	-	-	-	12.5	0

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	358	28	8	35	472
v/c Ratio	0.53	0.05	0.03	0.07	0.50
Control Delay	17.6	5.4	9.6	9.6	4.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	17.6	5.4	9.6	9.6	4.3
Queue Length 50th (m)	29.1	0.0	0.5	2.0	4.4
Queue Length 95th (m)	50.6	3.9	2.4	6.1	18.7
Internal Link Dist (m)	80.4			124.5	290.2
Turn Bay Length (m)			105.0		
Base Capacity (vph)	674	541	233	527	942
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.53	0.05	0.03	0.07	0.50

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	340	27	8	33	70	378
Future Volume (veh/h)	340	27	8	33	70	378
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1557	1377	1138	1770	1900
Adj Flow Rate, veh/h	358	28	8	35	74	398
Adj No. of Lanes	1	1	1	1	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	6	22	38	67	20	20
Cap, veh/h	669	518	269	521	111	595
Arrive On Green	0.39	0.39	0.46	0.46	0.46	0.46
Sat Flow, veh/h	1707	1324	678	1138	242	1299
Grp Volume(v), veh/h	358	28	8	35	0	472
Grp Sat Flow(s),veh/h/ln	1707	1324	678	1138	0	1541
Q Serve(g_s), s	9.7	0.8	0.6	1.0	0.0	14.4
Cycle Q Clear(g_c), s	9.7	0.8	14.9	1.0	0.0	14.4
Prop In Lane	1.00	1.00	1.00			0.84
Lane Grp Cap(c), veh/h	669	518	269	521	0	706
V/C Ratio(X)	0.54	0.05	0.03	0.07	0.00	0.67
Avail Cap(c_a), veh/h	669	518	269	521	0	706
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.0	11.3	18.5	9.1	0.0	12.7
Incr Delay (d2), s/veh	3.1	0.2	0.2	0.2	0.0	5.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	0.3	0.1	0.4	0.0	7.0
LnGrp Delay(d),s/veh	17.1	11.5	18.7	9.3	0.0	17.7
LnGrp LOS	B	B	B	A		B
Approach Vol, veh/h	386			43	472	
Approach Delay, s/veh	16.7			11.1	17.7	
Approach LOS	B			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		32.0		28.0		32.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		27.5		23.5		27.5		
Max Q Clear Time (g_c+I1), s		16.9		11.7		16.4		
Green Ext Time (p_c), s		5.5		1.8		5.7		

Intersection Summary	
HCM 2010 Ctrl Delay	16.9
HCM 2010 LOS	B

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	726	7	29	60	433
v/c Ratio	0.74	0.01	0.19	0.11	0.55
Control Delay	16.5	4.1	19.0	15.7	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	16.5	4.1	19.0	15.7	5.0
Queue Length 50th (m)	55.1	0.0	2.3	4.7	0.3
Queue Length 95th (m)	93.5	1.4	8.0	11.7	17.0
Internal Link Dist (m)	80.4			124.5	290.2
Turn Bay Length (m)			105.0		
Base Capacity (vph)	978	566	154	528	794
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.74	0.01	0.19	0.11	0.55

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	711	7	28	59	4	420
Future Volume (veh/h)	711	7	28	59	4	420
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1210	1827	1696	1845	1900
Adj Flow Rate, veh/h	726	7	29	60	4	429
Adj No. of Lanes	1	1	1	1	1	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	1	57	4	12	0	0
Cap, veh/h	970	557	162	523	4	480
Arrive On Green	0.54	0.54	0.31	0.31	0.31	0.31
Sat Flow, veh/h	1792	1029	933	1696	15	1556
Grp Volume(v), veh/h	726	7	29	60	0	433
Grp Sat Flow(s),veh/h/ln	1792	1029	933	1696	0	1571
Q Serve(g_s), s	18.7	0.2	1.8	1.5	0.0	15.8
Cycle Q Clear(g_c), s	18.7	0.2	17.6	1.5	0.0	15.8
Prop In Lane	1.00	1.00	1.00			0.99
Lane Grp Cap(c), veh/h	970	557	162	523	0	484
V/C Ratio(X)	0.75	0.01	0.18	0.11	0.00	0.89
Avail Cap(c_a), veh/h	970	557	162	523	0	484
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.6	6.3	28.2	14.9	0.0	19.8
Incr Delay (d2), s/veh	5.3	0.0	2.4	0.4	0.0	21.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.5	0.1	0.6	0.8	0.0	9.6
LnGrp Delay(d),s/veh	15.9	6.4	30.6	15.3	0.0	41.4
LnGrp LOS	B	A	C	B		D
Approach Vol, veh/h	733			89	433	
Approach Delay, s/veh	15.8			20.3	41.4	
Approach LOS	B			C	D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		23.0		37.0		23.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		18.5		32.5		18.5		
Max Q Clear Time (g_c+I1), s		19.6		20.7		17.8		
Green Ext Time (p_c), s		0.0		4.0		0.4		

Intersection Summary	
HCM 2010 Ctrl Delay	24.9
HCM 2010 LOS	C

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	358	28	13	35	479
v/c Ratio	0.53	0.05	0.07	0.07	0.51
Control Delay	17.6	5.4	10.2	9.6	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	17.6	5.4	10.2	9.6	4.5
Queue Length 50th (m)	29.1	0.0	0.8	2.0	4.8
Queue Length 95th (m)	50.6	3.9	3.4	6.1	19.5
Internal Link Dist (m)	80.4			124.5	290.2
Turn Bay Length (m)			105.0		
Base Capacity (vph)	674	541	200	527	934
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.53	0.05	0.07	0.07	0.51

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	340	27	12	33	77	378
Future Volume (veh/h)	340	27	12	33	77	378
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1557	1203	1138	1748	1900
Adj Flow Rate, veh/h	358	28	13	35	81	398
Adj No. of Lanes	1	1	1	1	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	6	22	58	67	27	27
Cap, veh/h	669	518	244	521	118	580
Arrive On Green	0.39	0.39	0.46	0.46	0.46	0.46
Sat Flow, veh/h	1707	1324	589	1138	258	1266
Grp Volume(v), veh/h	358	28	13	35	0	479
Grp Sat Flow(s),veh/h/ln	1707	1324	589	1138	0	1524
Q Serve(g_s), s	9.7	0.8	1.1	1.0	0.0	14.9
Cycle Q Clear(g_c), s	9.7	0.8	16.0	1.0	0.0	14.9
Prop In Lane	1.00	1.00	1.00			0.83
Lane Grp Cap(c), veh/h	669	518	244	521	0	699
V/C Ratio(X)	0.54	0.05	0.05	0.07	0.00	0.69
Avail Cap(c_a), veh/h	669	518	244	521	0	699
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.0	11.3	19.1	9.1	0.0	12.8
Incr Delay (d2), s/veh	3.1	0.2	0.4	0.2	0.0	5.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	0.3	0.2	0.4	0.0	7.2
LnGrp Delay(d),s/veh	17.1	11.5	19.6	9.3	0.0	18.3
LnGrp LOS	B	B	B	A		B
Approach Vol, veh/h	386			48	479	
Approach Delay, s/veh	16.7			12.1	18.3	
Approach LOS	B			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		32.0		28.0		32.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		27.5		23.5		27.5		
Max Q Clear Time (g_c+I1), s		18.0		11.7		16.9		
Green Ext Time (p_c), s		5.2		1.8		5.7		

Intersection Summary	
HCM 2010 Ctrl Delay	17.3
HCM 2010 LOS	B

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	726	7	35	60	435
v/c Ratio	0.74	0.01	0.27	0.11	0.55
Control Delay	16.5	4.1	22.1	15.7	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	16.5	4.1	22.1	15.7	5.1
Queue Length 50th (m)	55.1	0.0	2.9	4.7	0.5
Queue Length 95th (m)	93.5	1.4	9.7	11.7	17.3
Internal Link Dist (m)	80.4			124.5	290.2
Turn Bay Length (m)			105.0		
Base Capacity (vph)	978	566	131	528	793
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.74	0.01	0.27	0.11	0.55

Intersection Summary

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	711	7	34	59	6	420
Future Volume (veh/h)	711	7	34	59	6	420
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1210	1570	1696	1838	1900
Adj Flow Rate, veh/h	726	7	35	60	6	429
Adj No. of Lanes	1	1	1	1	1	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	1	57	21	12	32	32
Cap, veh/h	970	557	154	523	7	476
Arrive On Green	0.54	0.54	0.31	0.31	0.31	0.31
Sat Flow, veh/h	1792	1029	801	1696	22	1544
Grp Volume(v), veh/h	726	7	35	60	0	435
Grp Sat Flow(s),veh/h/ln	1792	1029	801	1696	0	1565
Q Serve(g_s), s	18.7	0.2	2.5	1.5	0.0	16.0
Cycle Q Clear(g_c), s	18.7	0.2	18.5	1.5	0.0	16.0
Prop In Lane	1.00	1.00	1.00			0.99
Lane Grp Cap(c), veh/h	970	557	154	523	0	483
V/C Ratio(X)	0.75	0.01	0.23	0.11	0.00	0.90
Avail Cap(c_a), veh/h	970	557	154	523	0	483
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.6	6.3	28.8	14.9	0.0	19.9
Incr Delay (d2), s/veh	5.3	0.0	3.4	0.4	0.0	22.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.5	0.1	0.7	0.8	0.0	9.9
LnGrp Delay(d),s/veh	15.9	6.4	32.2	15.3	0.0	42.5
LnGrp LOS	B	A	C	B		D
Approach Vol, veh/h	733			95	435	
Approach Delay, s/veh	15.8			21.5	42.5	
Approach LOS	B			C	D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		23.0		37.0		23.0		
Change Period (Y+Rc), s		4.5		4.5		4.5		
Max Green Setting (Gmax), s		18.5		32.5		18.5		
Max Q Clear Time (g_c+I1), s		20.5		20.7		18.0		
Green Ext Time (p_c), s		0.0		4.0		0.3		

Intersection Summary	
HCM 2010 Ctrl Delay	25.4
HCM 2010 LOS	C

Appendix C

Signal Warrant Outputs

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: Energy Drive/Bowmanville Avenue - 2024 BG Count Date: 2018

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☑	☐
	B	Crossing Volume	100	%		
2. Delay to Cross Traffic	A	Main Road	58	%	☐	☑
	B	Crossing Road	100	%		
3. Combination	A	Justificaton 1	100	%	☐	☑
	B	Justification 2	58	%		
4. 4-Hr Volume			90	%	☐	☑
5. Collision Experience			0	%	☐	☑
6. Pedestrians	A	Volume	Justification not met		☐	☑
	B	Delay	Justification not met			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: Energy Drive/Bowmanville Avenue - 2024 FT Count Date: 2018

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☑	☐
	B	Crossing Volume	100	%		
2. Delay to Cross Traffic	A	Main Road	60	%	☐	☑
	B	Crossing Road	100	%		
3. Combination	A	Justificaton 1	100	%	☐	☑
	B	Justification 2	60	%		
4. 4-Hr Volume			87	%	☐	☑
5. Collision Experience			0	%	☐	☑
6. Pedestrians	A	Volume	Justification not met		☐	☑
	B	Delay	Justification not met			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: Bowmanville Avenue/Highway 401 NRT - 2024 BG Count Date: 2018

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☐	☑
	B	Crossing Volume	93	%		
2. Delay to Cross Traffic	A	Main Road	98	%	☐	☑
	B	Crossing Road	38	%		
3. Combination	A	Justificaton 1	93	%	☐	☑
	B	Justification 2	38	%		
4. 4-Hr Volume			100	%	☑	☐
5. Collision Experience			0	%	☐	☑
6. Pedestrians	A	Volume	Justification not met		☐	☑
	B	Delay	Justification not met			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: Bowmanville Avenue/Highway 401 NRT - 2024 FT Count Date: 2018

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☐	☑
	B	Crossing Volume	93	%		
2. Delay to Cross Traffic	A	Main Road	98	%	☐	☑
	B	Crossing Road	41	%		
3. Combination	A	Justificaton 1	93	%	☐	☑
	B	Justification 2	41	%		
4. 4-Hr Volume			100	%	☑	☐
5. Collision Experience			0	%	☐	☑
6. Pedestrians	A	Volume	Justification not met		☐	☑
	B	Delay	Justification not met			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: Energy Drive/Highway 401 SRT - 2024 BG Count Date: 2018

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	98	%	☐	☑
	B	Crossing Volume	100	%		
2. Delay to Cross Traffic	A	Main Road	63	%	☐	☑
	B	Crossing Road	100	%		
3. Combination	A	Justificaton 1	98	%	☐	☑
	B	Justification 2	63	%		
4. 4-Hr Volume			92	%	☐	☑
5. Collision Experience			0	%	☐	☑
6. Pedestrians	A	Volume	Justification not met		☐	☑
	B	Delay	Justification not met			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: Energy Drive/Highway 401 SRT - 2024 FT Count Date: 2018

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	99	%	☐	☑
	B	Crossing Volume	100	%		
2. Delay to Cross Traffic	A	Main Road	63	%	☐	☑
	B	Crossing Road	100	%		
3. Combination	A	Justificaton 1	99	%	☐	☑
	B	Justification 2	63	%		
4. 4-Hr Volume			92	%	☐	☑
5. Collision Experience			0	%	☐	☑
6. Pedestrians	A	Volume	Justification not met		☐	☑
	B	Delay	Justification not met			