# School Crossing Guard Warrant Development and Application

May 2022

## Project Team Member List

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## 1.0 Background

WSP was retained by the Town of New Tecumseth to develop a School Crossing Guard warrant procedure. The main goal of this project is to collect data at the existing school crossing guard locations and develop a warrant methodology that is objective, traceable and can be implemented throughout the Town for the evaluation of future candidate school crossing guard locations. It is important to note that the intent of this study is not to identify existing crossing guard locations that do not meet warrants. The Town of New Tecumseth currently operates 22 existing school crossing guard locations and WSP understands there is a list of 12 potential school crossing guard locations that need to be evaluated to understand whether the locations meet the technical warrants.

## 2.0 Methodology to Develop an Exposure Index Warrant

The guiding principle of this study is the 2017 School Crossing Guard Guide (herein referred to as the 2017 SCGG) by the Ontario Traffic Council (OTC). WSP worked with OTC in 2016 to 2017 to develop the 2017 SCGG, which is an update from the previous version. In the 2017 SCGG, a warrant methodology known as the Exposure Index was developed for controlled crossings.

In the transportation industry, the Exposure Index warrant is commonly used in crossing assessments related to safety and impacts to road users. The Exposure Index is derived by multiplying the volumes of two modes of travel (i.e., number of trains multiplied with the number of cars) to arrive at a product. The product at various crossing locations are then compared quantitatively. In the case of a school crossing guard Exposure Index, the multiplication is between the number of conflicting vehicle movements and the number of student crossings.

The Exposure Index warrant is a two-part process: development and application. The development of the warrant is based on data collected at existing locations with a crossing guard in operation. The warrant is designed to create an 85$^{th}$ percentile threshold of the existing locations. It should be noted that this does not imply that 15% of the existing locations need to be adjusted, but rather forms a more conservative warrant. In addition, the development of an Exposure Index relies on having enough sample size from existing school crossing guard locations to develop a meaningful warrant. Generally speaking, a sample size of 10 for each crossing type is desired. In the context of the Town New Tecumseth, the 20 controlled locations where an Exposure Index can be applied is summarized as follows:

- 2 Signalized intersections;
- 2 Intersection pedestrian signals (IPS);
- 5 All-way stop controlled intersections; and
- 11 Minor-street stop controlled intersections.

Based on the sample size above, there is insufficient sample size for signalized, IPS and all-way stop locations to develop a Town of New Tecumseth-specific Exposure Index. In such cases, the 2017 SCGG notes that there is an opportunity to build an Exposure Index warrant on top of data collected for a comparable municipality. WSP had completed a similar warrant development exercise for the Town of Ajax in 2018 using the 2017 SCGG approach. Based on similarities in school settings between the

Town of Ajax and Town of New Tecumseth, the Town of New Tecumseth data points were added to those used to develop the Exposure Index graphs for the Town of Ajax. This process is described in more detail in the signalized, all-way stop, and minor-street stop warrant sections of this report. There are currently no IPS school crossing guard locations in the Town of Ajax and as a result there is no pool of Exposure Index data points for IPS locations to build off of. For future IPS location warrants, it is recommended that compliance of the IPS control be observed as the primary way of determining the need for a school crossing guard.

With the development of the Exposure Index warrant for signalized, all-way stop and minor-street stop crossings, the Town can then collect data at new candidate locations for school crossing guards and determine whether the locations meet the warrant. The Exposure Index warrant, along with the consideration of other factors will help in the decision-making process regarding the need for a school crossing guard.

For the two existing mid-block locations currently served by school crossing guards, the Exposure Index method does not apply because it does not account for the difficulty experienced by students looking for gaps in the roadway due to the absence of any form of clear right-of-way for pedestrians. For the uncontrolled locations where a school crossing guard is being considered (i.e., mid-block location) a separate warrant process called the Gap Study will need to be applied. There is no municipality-specific warrant for Gap Studies. Moreover, once a guard has been implemented at a mid-block location, a Gap Study can no longer be conducted since the availability of gaps is dictated by the school crossing guard.

## 3.0 Data Collection

Consistent with the principles of the 2017 SCGG, WSP staff initiated the data collection process by first conducting site visits at the existing school crossing guard locations in February 2020 (pre COVID-19) during the periods of guard operations. The initial site visit allowed WSP to better understand the site-specific context of each guard location, and how to better orient the video equipment. In addition, other factors that may have been considered in the implementation of school crossing guards were considered – for example sightline and road geometry greatly influence the ability for students to cross unassisted.

To collect the student and vehicular data required to develop an Exposure Index warrant, WSP retained Ontario Traffic Inc. (OTI) to install video cameras at all of the existing school crossing guard locations. The summary of the school crossing guard locations that were surveyed and the respective types of intersection control is shown in **Table 3.1**.

Town staff provided the list of guard operation schedules for each location. Even though there are some school crossing guards in operation during the lunch period, only the weekday morning and afternoon crossing periods were surveyed since these periods represent the busiest times when the vast majority of students are either arriving at or departing from school. The morning and afternoon guard operation periods are also documented in Table 3.1. The intersection IDs are based on a list of unique IDs from 1 to 22 and the table is organized by intersection types.

The videos of each school crossing guard location were recorded between November 2 and November 4, 2021 during typical school weekdays as confirmed with the Town. The purpose of excluding special event days or holidays is to record vehicular and student volumes that represent typical conditions. It is also important to note that data collection was delayed due to the impact of COVID-19 on in person learning and general traffic patterns. The data collection in early November was scheduled following the re-opening of schools with near full in-person attendance (greater than 95%), as confirmed by both school boards. The impact of COVID-19 on the collected data is considered negligible.

**Table 3.1 - Town of New Tecumseth School Crossing Guard Operation Summary**

| ID # | Intersection | Period of Guard Operation - AM | Period of Guard Operation - PM |
|---|---|---|---|
| **All-Way Stop** | | | |
| 2 | James A McCague Ave & Gray Ave | 8:15 - 9:30 | 3:15 - 4:30 |
| 10 | Centre St N & Lilly St E* | 7:45 - 8:35 | 2:30 - 3:15 |
| 11 | Dayfoot St & Danielle Gate | 8:00 - 9:15 | 2:50 - 4:35 |
| 22 | Church St N & Gray Ave** | 8:20 - 9:35 | 3:15 - 4:45 |
| 19 | Church St N & Hussey St | 8:20 - 9:35 | 3:15 - 4:30 |
| **Minor-Street Stop Controlled** | | | |
| 3 | Boyne St & John W Taylor Ave | 8:30 - 9:15 | 3:25 - 4:15 |
| 4 | Davidson Dr & John W Taylor Ave | 8:45 - 9:30 | 3:40 - 4:25 |
| 5 | Gordon Drive & John W Taylor Ave | 8:45 - 9:30 | 3:40 - 4:25 |
| 6 | Tecumseth St N & Main St W | 8:45 - 9:30 | 3:50 - 4:35 |
| 9 | Centre St N & Dale Dr | 8:45 - 9:30 | 3:30 - 4:15 |
| 12 | King St S & Beattie Ave | 8:20 - 9:35 | 3:15 - 4:15 |
| 15 | Keogh St & Mill St E | 8:00 - 9:00 | 3:00 - 4:15 |
| 16 | King St S & Mackenzie St | 8:20 - 9:35 | 3:15 - 4:15 |
| 17 | King St S & Tupper St W | 8:20 - 9:35 | 3:25 - 4:25 |
| 20 | Church St N & Oak St*** | 8:20 - 9:35 | 3:15 - 4:30 |
| 21 | Gray Ave & Oak St | 8:10 - 9:25 | 3:15 - 4:15 |
| **Signalized** | | | |
| 7 | Patterson St & Main St E | 8:45 - 9:30 | 3:35 - 4:20 |
| 18 | Church St N & Victoria St E | 8:40 - 9:25 | 3:45 - 4:45 |

*Centre St N & Lilly St E has an additional lunch crossing guard operation period from 12:30-1:15 PM
**Church St N and Gray Ave has an additional lunch crossing guard operation period from 1:20-2:10 PM
***Church St N and Oak St has an additional lunch crossing guard operation period from 1:20-2:10 PM

## 4.0 Data Interpretation

As per the 2017 SCGG, the school crossing guard locations need to be evaluated based on a common time interval. For example, a location may have a crossing guard deployed for an hour, while another location has a crossing guard deployed for half an hour. A common time interval is required so that the results from different locations can be compared using an “Apples to Apples” approach.

Based on WSP’s review of the schedule of guard operations and data processing of when school crossing guards were in operation, a common study interval of the peak 20 minutes was established. It is also worth noting that the Town of Ajax Exposure Index data points were also collected for the peak 20 minutes of school crossing guard operation. Therefore, there is consistency that would allow for “Apples to Apples” comparison between the two datasets.

WSP staff watched the videos for all 18 locations in Table 3.1 and recorded the student and vehicular volumes in 5 minute intervals. The 20 minute peak period at each location that had the highest product of conflicting vehicular movements and student crossings were then identified. In instances where the school crossing guard was observed serving multiple approaches of an intersection, both approaches were counted. The results of the busier of the two approaches were then used in the Exposure Index warrant development.

The data recorded at each school crossing location including the student and conflicting vehicle volume for the approach served by the crossing guard are documented in the following appendices:

- All-way stop controlled intersections - **Appendix A**;
- Minor-street stop controlled intersections - **Appendix B**;
- Signalized intersections - **Appendix C**

As noted earlier, since the sample size is limited in the Town of New Tecumseth, the Town of Ajax Exposure Index inputs have also been incorporated as shown in yellow tabs of Appendices A to C. The tabs that are shown in blue in the appendices represent the candidate locations that are to be evaluated in this study.

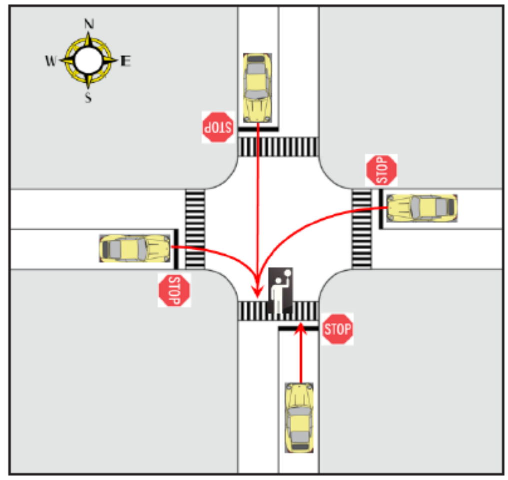
It should be noted that parents and adults were not included in the pedestrian volume count. Best efforts have been made in the data collection process to consider students as those in Junior Kindergarten (JK) to Grade 5 range (as per the 2017 SCGG). For example, the height of the pedestrian and whether they are wearing backpacks as well as the direction of travel were also considered. It would not be logical for example for a student to be walking away from the school in the morning peak hour. Any reference herein to students are based on this age group.

The vehicular volumes recorded in the data review are based on the conflicting vehicle definitions in the 2017 SCGG. This is an important distinction since not all the vehicular turning movements relate to the safety of student crossing. Excerpts from the 2017 SCGG on identifying conflicting vehicular movements are provided in the next page. For the purpose of the illustration, the school crossing guard is assumed to be serving one approach of the various crossing locations.

### 4.1 All-way stop controlled intersections

In the figure to the right, the conflicting vehicular movements for the pedestrian crossing **south leg** of the All-way stop controlled intersection are:

- All northbound movements
- Westbound left turns
- Eastbound right turns and
- Southbound through movements

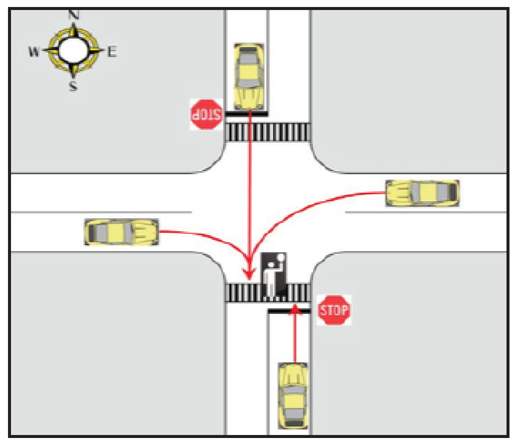



### 4.2 Minor-street stop controlled intersections

#### 4.2.1 Along Controlled leg

In the figure to the right, the conflicting vehicular movements for the pedestrian crossing **south leg** of the minor street at two-way stop controlled intersection are:

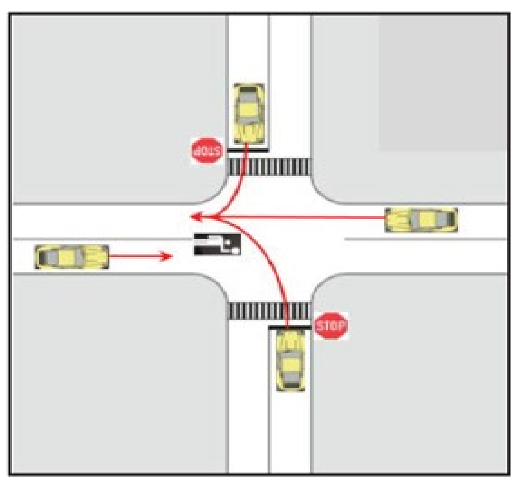
- All northbound movements
- Westbound left turns
- Eastbound right turns and
- Southbound through movements




#### 4.2.2 Along Uncontrolled leg

In the figure to the right, the conflicting vehicular movements for the pedestrian crossing **west leg** of the major street at two-way stop controlled intersection are:

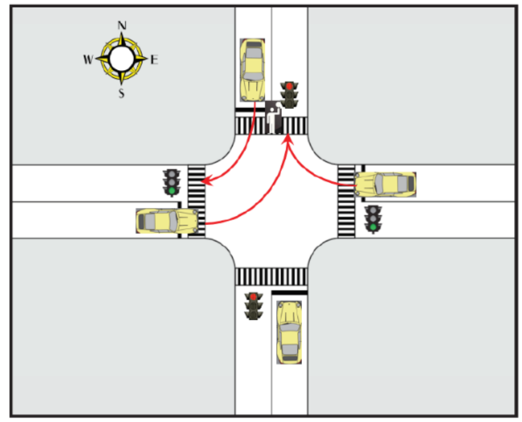
- All eastbound movements
- Southbound right turns
- Northbound left turns and
- Westbound through movements



### 4.3 Signalized intersections

In the figure to the right, the conflicting vehicular movements for the pedestrian crossing **north leg** of the signalized intersection during east-west green interval are:

- Southbound right turn on red
- Eastbound left turns during the permissive phase and
- Westbound right turns during the permissive phase



## 5.0 Data Summary

The resulting peak 20 minute product of the student crossing volume and the conflicting vehicle volume at each of the existing school crossing guard locations are summarized in **Table 5.1**.

**Table 5.1 - Town of New Tecumseth School Crossing Guard Summary (Peak 20 Minutes)**

| ID # | Intersection | # of Students Crossing | Conflicting Vehicular Volume | Product | Peak Time Interval Observed |
|---|---|---|---|---|---|
| **All-Way Stop** | | | | | |
| **2** | James A McCague Ave & Gray Ave | 52 | 42 | 2,184 | 15:20-15:40 |
| **10** | Centre St N & Lilly St E | 105 | 52 | 5,460 | 08:10-08:30 |
| **11** | Dayfoot St & Danielle Gate | 4 | 72 | 288 | 16:15-16:25 |
| **19** | Church St N & Hussey St | 26 | 122 | 3,172 | 15:45-16:05 |
| **22** | Church St N & Gray Ave | 58 | 56 | 3,248 | 15:30-15:50 |
| **Minor-Street Stop Controlled** | | | | | |
| **3** | Boyne St & John W Taylor Ave | 9 | 181 | 1,629 | 15:30-15:50 |
| **4** | Davidson Dr & John W Taylor Ave | 11 | 116 | 1,276 | 09:05-09:25 |
| **5** | Gordon Drive & John W Taylor Ave | 9 | 69 | 621 | 08:40-09:00 |
| **6** | Tecumseth St N & Main St W | 3 | 184 | 552 | 16:00-16:20 |
| **9** | Centre St N & Dale Dr | 16 | 57 | 912 | 15:50-16:10 |
| **12** | King St S & Beattie Ave | 57 | 240 | 13,680 | 15:15-15:35 |
| **15** | Keogh St & Mill St E | 58 | 176 | 10,208 | 15:15-15:35 |
| **16** | King St S & Mackenzie St | 7 | 227 | 1,589 | 15:40-16:00 |
| **17** | King St S & Tupper St W | 5 | 124 | 620 | 09:00-09:20 |
| **20** | Church St N & Oak St | 79 | 77 | 6,083 | 15:30-15:50 |
| **21** | Gray Ave & Oak St | 22 | 59 | 1,298 | 15:45-16:05 |
| **Signalized** | | | | | |
| **7** | Patterson St & Main St E | 10 | 26 | 260 | 09:05-09:25 |
| **18** | Church St N & Victoria St E | 13 | 31 | 403 | 15:45-16:05 |

- For the 5 all-way stop intersections that were reviewed, the number of students crossing during the critical 20-minute period ranged from 4 to 105, and the number of conflicting vehicles ranged from 42 to 122;

- For the 11 minor-street stop controlled intersections that were reviewed, the number of students crossing during the critical 20-minute period ranged from 3 to 79, and the number of conflicting vehicles ranged from 57 to 240; and

- For the 2 signalized intersections that were reviewed, the number of students crossing during the critical 20-minute period ranged from 10 to 13, and the number of conflicting vehicles ranged from 26 to 31.

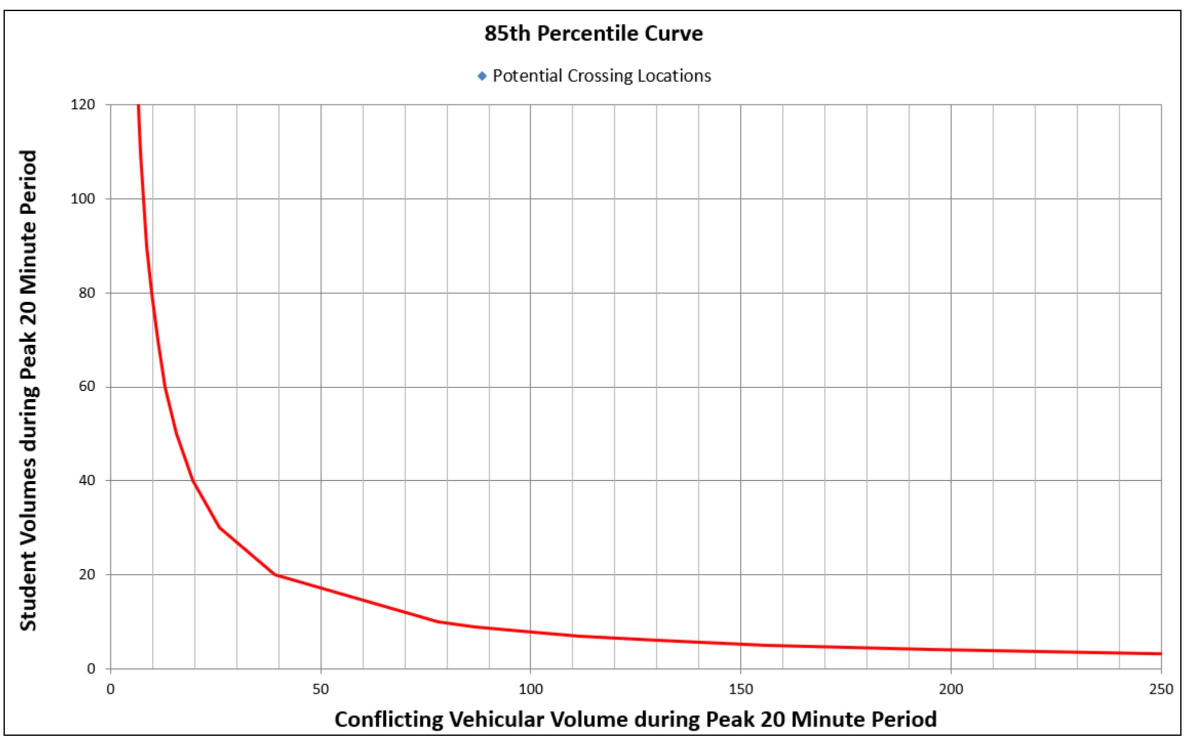
## 6.0 Warrant Graph Development

Based on the Exposure Index process described in Section 2, along with the data summary in Section 5, the Exposure Index graphs for each type of controlled crossing have been developed in the following sections. Future use of the respective graph for each type of intersection entails doing the survey at candidate locations and identifying the peak 20-minute period. The resulting vehicular volume and student crossing volume can then be plotted on the Exposure Index graphs that have been developed. If the intersection of the vehicular volume and the student crossing volume is above or on the red line of the Exposure Index graph, then that indicates the candidate approach/location meets the Exposure Index aspect of the warrant. If the intersection of the student and vehicular volumes is below the red line, then the Exposure Index Warrant is not met for the requested location. Please note the Exposure Index results need to be considered with the site visit and other factors as well, as noted in the 2017 SCGG.

## 6.1 All-way Stop Controlled Intersection Exposure Index Warrant

The Exposure Index graph for all-way stop controlled intersections is shown below in **Figure 6.1**. As mentioned earlier, the Exposure Index for all-way stop controlled intersections includes the 5 intersections in the Town of New Tecumseth detailed in Table 5.1, as well as 16 all-way stop controlled intersections from the Town of Ajax.

**Figure 6.1 – Exposure Index Graph – All-way Stop**



The inputs at the 21 all-way stop locations are summarized in **Table 6.1**. The average of the peak 20 minute products for the Town of Ajax locations is 3,761, while the average of the peak 20 minute products for the Town of New Tecumseth locations is 2,870. However, it is observed that existing Location 11 (Dayfoot St & Danielle Gate) yielded very low utilization from a student crossing perspective (4 students during the peak 20 period). If this location is excluded, then the average between the two Towns become very similar (3,761 product for the Town of Ajax and 3,516 for the Town of New Tecumseth). Therefore, the merge of the dataset is reasonable as per the 2017 SCGG.

**Table 6.1 – Summary of All-way Stop Exposure Index Inputs**

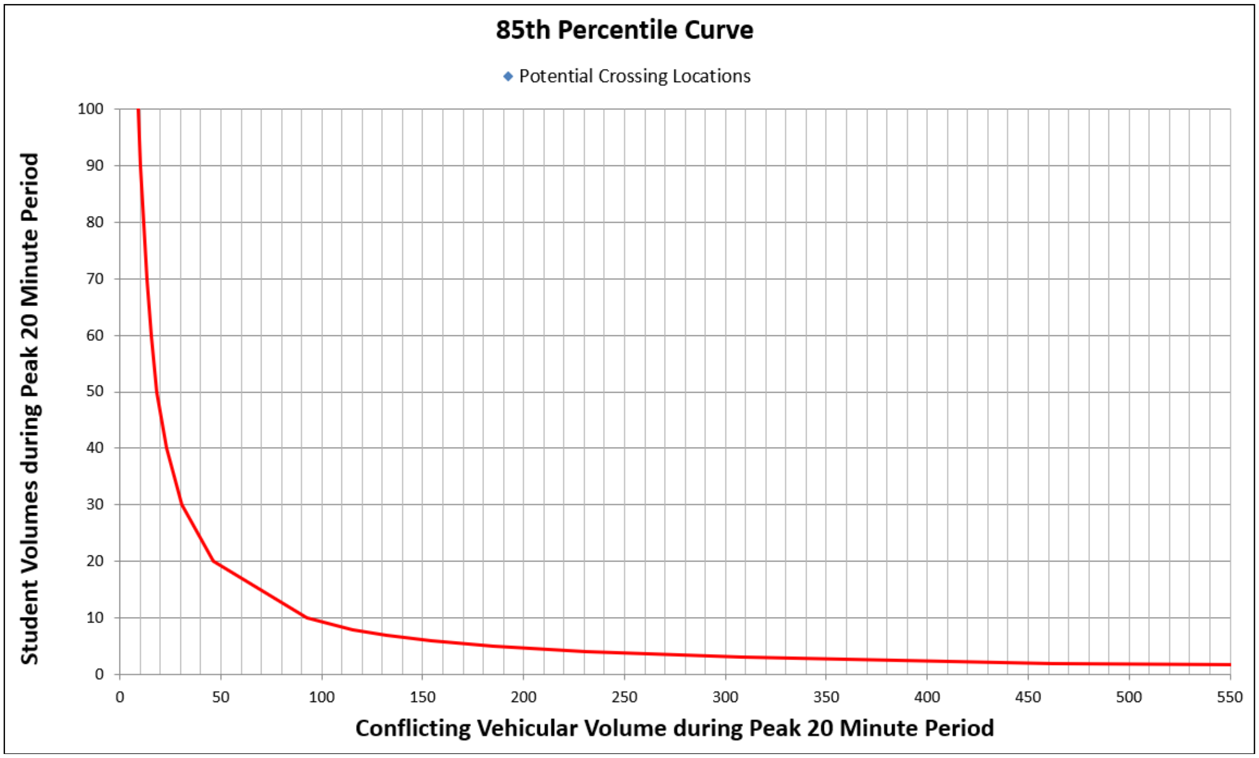
| Municipality | ID | Conflicting Vehicular Movements | Student Crossings (JK-5) | Product |
|---|---|---|---|---|
| Ajax | 9310 | 78 | 10 | 780 |
| Ajax | 10277 | 181 | 53 | 9593 |
| Ajax | 10700 | 102 | 24 | 2448 |
| Ajax | 10302 | 131 | 7 | 917 |
| Ajax | 9308 | 132 | 26 | 3432 |
| Ajax | 9357 | 67 | 11 | 737 |
| Ajax | 8704 | 204 | 16 | 3264 |
| Ajax | 11917 | 87 | 78 | 6786 |
| Ajax | 8928 | 136 | 19 | 2584 |
| Ajax | 8912 | 162 | 7 | 1134 |
| Ajax | 8943 | 127 | 29 | 3683 |
| Ajax | 8876 | 154 | 60 | 9240 |
| Ajax | 8730 | 153 | 74 | 11322 |
| Ajax | 8634 | 110 | 13 | 1430 |
| Ajax | 8403 | 151 | 17 | 2567 |
| Ajax | 8221 | 18 | 14 | 252 |
| New Tecumseth | 2 | 42 | 52 | 2184 |
| New Tecumseth | 10 | 52 | 105 | 5460 |
| New Tecumseth | 11 | 72 | 4 | 288 |
| New Tecumseth | 19 | 122 | 26 | 3172 |
| New Tecumseth | 22 | 56 | 58 | 3248 |

In addition to the Exposure Index development, the number of student crossings were reviewed from the perspective of identifying a potential minimum threshold. The 2017 SCGG notes that the minimum number of student crossings during the school peak period should be set at a threshold of 40 students but that a lower value may also be used at the discretion of each municipality. For example, a municipality can use a threshold of 30 students during its common peak period (i.e., 20 minutes). For the all-way stop locations in Table 6.1, the average number of students crossing during the peak 20 minute period is 33, while the minimum is 4. **A threshold of 30 students during the peak 20 minute period is recommended for the Town of New Tecumseth** as a screening mechanism for the warrant of all-way stop locations in addition to meeting the Exposure Index warrant. This prevents locations that have minimal student crossing demand from meeting the warrant due to higher vehicular volumes. This means that if a location meets the Exposure Index warrant but the minimum student threshold is not met, the location does not meet the overall warrant.

### 6.2 Minor-street Stop controlled Intersection Exposure Index Warrant

The Exposure Index graph for minor-street stop controlled intersections is shown below in **Figure 6.2**. As mentioned earlier, the Exposure Index for minor-street stop controlled intersections includes the 11 intersections in the Town of New Tecumseth detailed in Table 5.1, as well as 12 minor-street stop controlled intersections from the Town of Ajax.

**Figure 6.2 – Exposure Index Graph – Minor-Street Stop**




The inputs at the 23 minor-street stop locations are summarized in **Table 6.2**. For context, the average of the peak 20 minute products for the Town of Ajax locations is 3,914, while the average of the peak 20 minute products for the Town of New Tecumseth locations is 3,497. Given the similarity in the products and the desire for consistency, it is appropriate to merge the two data sets for the development of the minor-street stop Exposure Index.

**Table 6.2 – Summary of Minor-Street Stop Exposure Index Inputs**

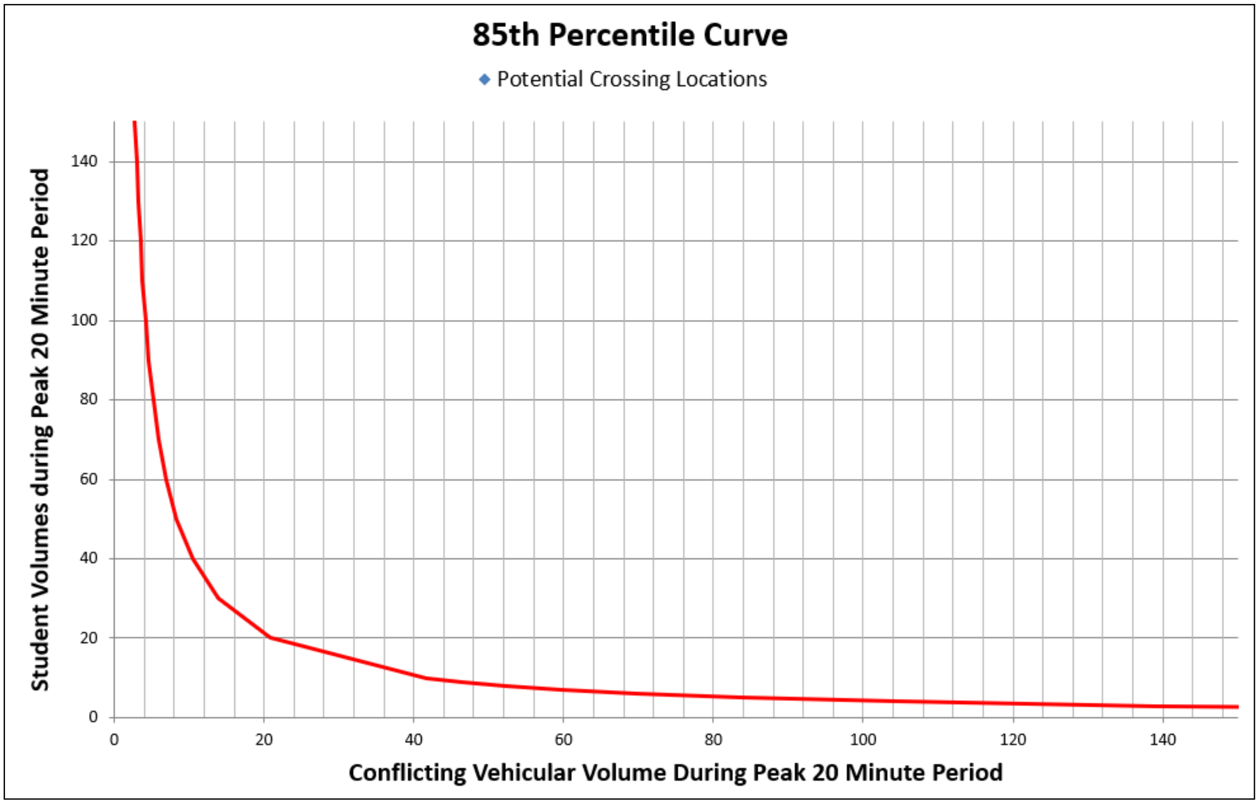
| Municipality | ID | Conflicting Vehicular Movements | Student Crossings (JK-5) | Product |
|---|---|---|---|---|
| Ajax | 8932 | 136 | 34 | 4,624 |
| Ajax | 11499 | 140 | 49 | 6,860 |
| Ajax | 8495 | 117 | 56 | 6,552 |
| Ajax | 10737 | 50 | 19 | 950 |
| Ajax | 9863 | 127 | 20 | 2,540 |
| Ajax | 10562 | 132 | 26 | 3,432 |
| Ajax | 8505 | 107 | 32 | 3,424 |
| Ajax | 8914 | 151 | 20 | 3,020 |
| Ajax | 8579 | 205 | 21 | 4,305 |
| Ajax | 8799 | 176 | 16 | 2,816 |
| Ajax | 8498 | 444 | 16 | 7,104 |
| Ajax | 8596 | 56 | 24 | 1,344 |
| New Tecumseth | 3 | 181 | 9 | 1,629 |
| New Tecumseth | 4 | 116 | 11 | 1,276 |
| New Tecumseth | 5 | 69 | 9 | 621 |
| New Tecumseth | 6 | 184 | 3 | 552 |
| New Tecumseth | 9 | 57 | 16 | 912 |
| New Tecumseth | 12 | 240 | 57 | 13,680 |
| New Tecumseth | 15 | 176 | 58 | 10,208 |
| New Tecumseth | 16 | 227 | 7 | 1,589 |
| New Tecumseth | 17 | 124 | 5 | 620 |
| New Tecumseth | 20 | 77 | 79 | 6,083 |
| New Tecumseth | 21 | 59 | 22 | 1,298 |

For the minor-street stop locations shown in Table 6.2, the average number of students crossing during the peak 20 minute period is 26, while the minimum is 3. **A threshold of 30 students during the peak 20 minute period is recommended for the Town of New Tecumseth** as a screening mechanism for the warrant of minor-street stop locations in addition to meeting the Exposure Index warrant. This prevents locations that have minimal student crossing demand from meeting the warrant due to higher vehicular volumes. This means that even if a location meets the Exposure Index warrant, but the minimum student threshold is not met, then the location does not meet the overall warrant.

### 6.3 Signalized Intersection Exposure Index Warrant

The Exposure Index graph for signalized intersections is shown below in **Figure 6.3**. As mentioned earlier, the Exposure Index for signalized intersections includes the 2 intersections in the Town of New Tecumseth detailed in Table 5.1, as well as 14 signalized intersections from the Town of Ajax.

**Figure 6.3 – Exposure Index Graph – Signalized**




The inputs at the 16 signalized locations are summarized in **Table 6.3**. For context, the average of the peak 20 minute products for the Town of Ajax locations is 3,249, while the average of the peak 20 minute products for the Town of New Tecumseth locations is 322. While this is a magnitude of order difference, the Town of New Tecumseth average is only based on two locations and in theory a higher overall threshold should be used since at signalized intersections, the pedestrian walking phase is usually clearly defined. For these reasons, the merge of the dataset is reasonable as per the 2017 SCGG.

**Table 6.3 – Summary of Signalized Exposure Index Inputs**

| Municipality | ID | Conflicting Vehicular Movements | Student Crossings (JK-5) | Product |
|---|---|---|---|---|
| Ajax | 12123 | 102 | 17 | 1,734 |
| Ajax | 9747 | 109 | 56 | 6,104 |
| Ajax | 9873 | 66 | 63 | 4,158 |
| Ajax | 10311 | 74 | 22 | 1,628 |
| Ajax | 9888 | 104 | 21 | 2,184 |
| Ajax | 9204 | 23 | 20 | 460 |
| Ajax | 9071 | 38 | 60 | 2,280 |
| Ajax | 9429 | 24 | 23 | 552 |
| Ajax | 8773 | 90 | 20 | 1,800 |
| Ajax | 8857 | 55 | 46 | 2,530 |
| Ajax | 8460 | 36 | 7 | 252 |
| Ajax | 12833 | 60 | 70 | 4,200 |
| Ajax | 12357 | 86 | 123 | 10,578 |
| Ajax | 12357 | 52 | 135 | 7,020 |
| New Tecumseth | 7 | 24 | 10 | 240 |
| New Tecumseth | 18 | 31 | 13 | 403 |

For the signalized locations shown in Table 6.3, the average number of students crossing during the peak 20 minute period is 44 students, while the minimum is 7. Given the level of student crossings in the Town of New Tecumseth (average of 12 student crossings), a **threshold of 30 students during the peak 20 minute period is recommended for the Town of New Tecumseth** as a screening mechanism for the warrant of signalized locations in addition to meeting the Exposure Index warrant. This prevents locations that have minimal student crossing demand from meeting the warrant due to higher vehicular volumes. This means that even if a location meets the Exposure Index warrant, but the minimum student threshold is not met, then the location does not meet the overall warrant.

## 7.0 School Crossing Guard Warrants at Other Types of Crossing

As noted earlier, the Town of New Tecumseth currently has 2 mid-block and 2 IPS school crossing guard locations. This section outlines the alternative warrant approaches for these two categories if the need arises in the future. It should also be noted that as part of the Gap Study warrant, the minimum number of student crossings may also be used as a consideration.

For uncontrolled crossing locations such as mid-blocks, students rely on gaps in traffic flow to judge when there is enough gap to cross the road. The Gap Study evaluates whether there is sufficient gaps in the roadway for students to cross safely based on the calculated safe gap time. A safe gap time is calculated based on the candidate school crossing guard location's road and boulevard width (average of the boulevards on both sides of the road) as well as the pattern in which students cross the road (i.e., in platoons of three or more). For instance, in the example below, the crossing distance would be measured as W (the width of the road) plus the average of the boulevard widths (1 and 2). This ensures a student does not need to stand at the edge of the curb/pavement to wait for a gap. If there is no boulevard on either sides, then it would just be the width of the pavement.


The input of the Gap Study warrant is the recorded gaps in traffic flow organized in 5 minute increments. The gaps recorded are then compared to the calculated safe gap time. If less than half of the 5 minute intervals surveyed had more than 4 safe gaps, then the Gap Study warrant is met. A Gap Study template has been developed and is provided in **Appendix D**. It is also important to note that once a school crossing guard has been deployed at a mid-block location, the crossing location is no longer uncontrolled when the guard is in operation. Therefore, a Gap Study cannot be conducted once the school crossing guard is in operation.

From a minimum student crossing perspective, a minimum threshold may be established as more locations are evaluated over time. As it stands, the two mid-block locations at 8th Ave & Ernest Cumberland Elementary School Driveway and Patterson St & Tecumseth Beeton Elementary School Driveway were observed to have a total of 92 and 45 student crossings, respectively during the peak 20 minute period. It should be noted however, that both of these mid-block locations are directly in front of the school and resulted in higher student volumes. To remain more conservative and consistent with the other locations in the Town, a **threshold of 30 students during the peak 20 minute period is recommended for the Town of New Tecumseth** as a screening mechanism for the warrant of mid-block locations.

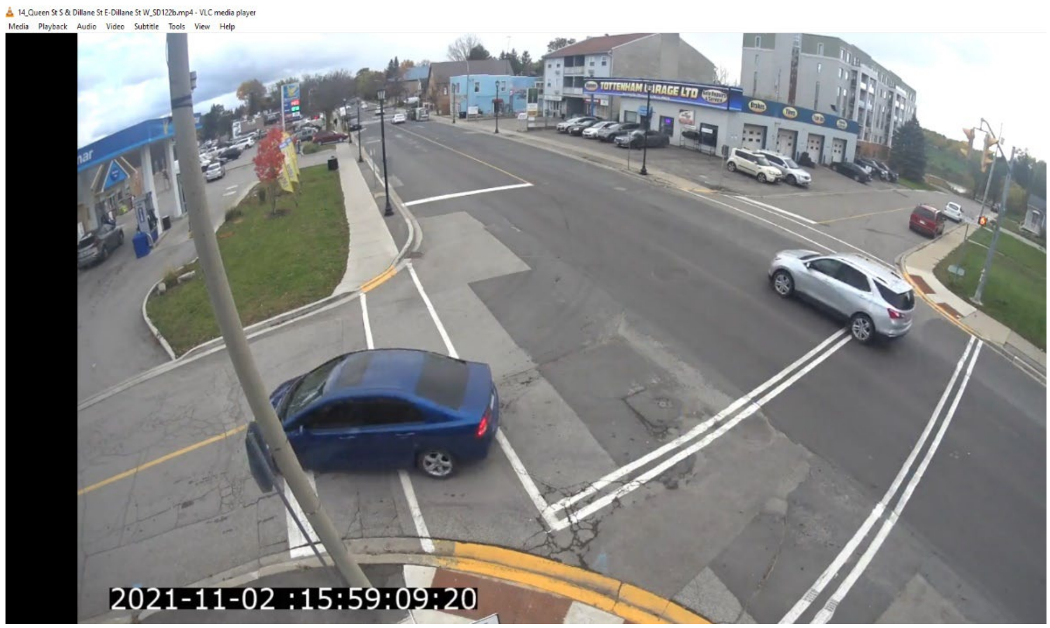
At the busiest mid-block location where 92 students were crossing in the peak 20 minute period, two issues were observed – particularly during the dismissal period. In the afternoon period, the school crossing guard is standing on the side away from the school, while students are crossing from the opposite approach. Based on best practices, the school crossing guard should be standing on the side/approach closer to the school in the dismissal period so that he/she can better communicate with students and also provide a better presence for them.


Students are also observed to frequently run diagonally across the crossing and in some instances cross the intersection on their skateboards. Once again, the school crossing guard and the school should communicate that students need to dismount and walk across the intersection and not run either since it makes it less predictable for motorists and the guard.

For intersection pedestrian signals (IPS), mid-block pedestrian signals (MPS) or pedestrian crossovers (PXO), there are presently not enough sample size in municipalities such as the Town to build a meaningful Exposure Index. Instead, the focus should be whether there is a compliance issue with the IPS, MPS or PXO. This is very important for the evaluation of these locations because the ability of students to cross is dependent on motorist compliance with the PXO and pedestrian signal control.

Examples of incompliance is when cars are observed to be not stopping even though the PXO has been activated or if the pedestrian signal shows red in the motorist approach. Similarly, if students are observed to be crossing at the mid-block PXO or signal without activating the controls or waiting for the control to be activated, then this is also a compliance issue to be recorded. Moreover, the presence of larger trucks or queuing from upstream intersections should be observed since they may block sightlines or be making larger turns at the crossing location.

Moreover, the turning movements should be reviewed to determine if there is a land use near the IPS or PXO that would result in motorists making an atypical turn. For example, at the location below, the blue car is observed to turn from Queen Street through the opposing lane because the motorist is trying to access the gas station driveway. This type of turning pattern may make it more challenging for students to cross the intersection.




From a minimum student crossing perspective, a minimum threshold may be established as more locations are evaluated over time. As it stands, the two IPS locations at Queen Street North/ O'Leary Ct and Queen Street South / Dillane Street East were observed to have a total of 37 and 11 student crossings, respectively during the peak 20 minute period. Given the average of 24 student crossings is similar to average number of crossings for minor-street stop controlled locations, a **threshold of 30 students during the peak 20 minute period is recommended for the Town of New Tecumseth** as a screening mechanism for the warrant of IPS and MPS locations. **The same minimum student threshold of 30 is recommended for PXOs as well given their similarity in function and purpose**.

## 8.0 Evaluation of Potential School Crossing Guard Locations

A total of 12 potential locations were provided by the Town for WSP to assess whether a school crossing guard is warranted. The 12 locations are outlined in **Table 8.1** by control type. The all-way stop and minor-street stop Exposure Index graphs developed in Section 6 have been applied. Based on the same approach of counting the number of student crossing and conflicting vehicular volumes, the peak 20 minute product was calculated in the Excel version of the Exposure Index.

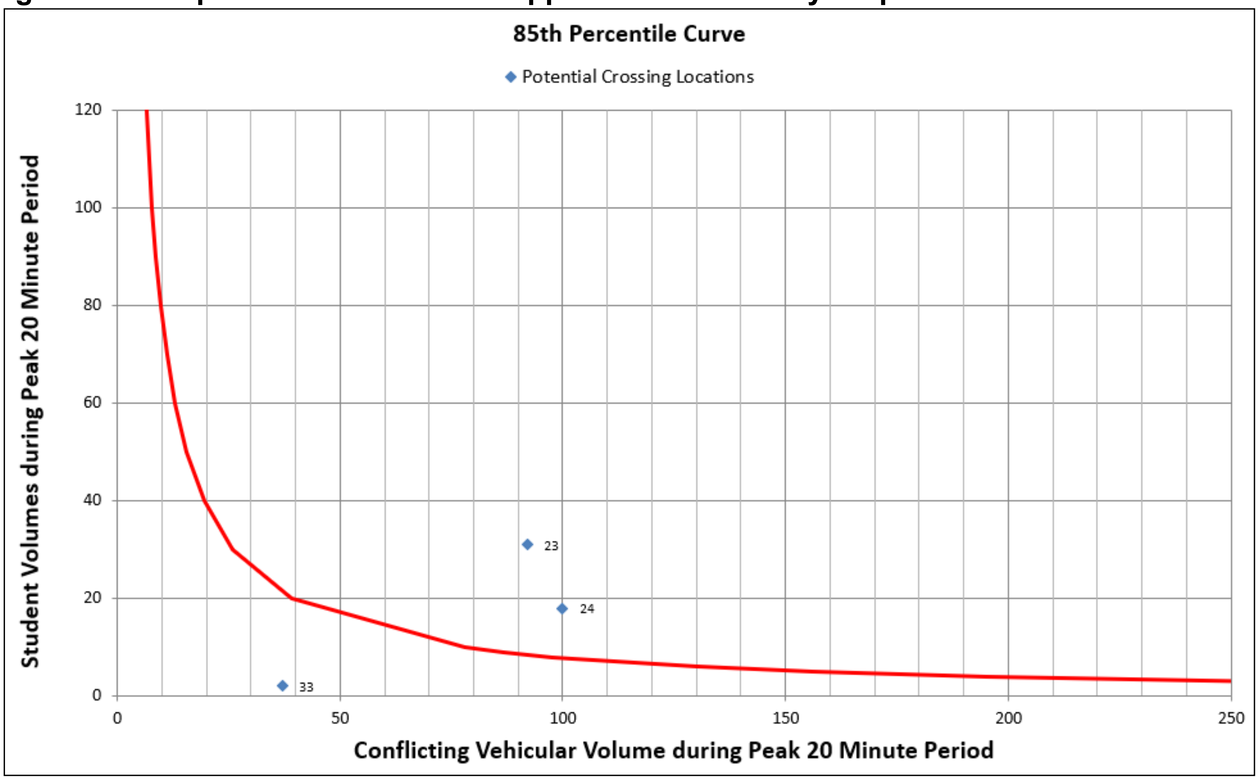
**Table 8.1 - Town of New Tecumseth Potential School Crossing Guard Operation Summary**

| ID # | Intersection | # of Students Crossing | Conflicting Vehicular Volume | Product | Peak 20 Minute Period Observed |
|---|---|---|---|---|---|
| **All-Way Stop** | | | | | |
| 23 | 8th Ave & Morrison Ave | 31 | 92 | 2,852 | 09:10-09:30 |
| 24 | Dillane St E & Rogers Rd | 18 | 100 | 1,800 | 08:40-09:00 |
| 33 | Stewart St W & Dayfoot St | 2 | 37 | 74 | 08:20-08:40 |
| **Minor-Street Stop** | | | | | |
| 12 | King St S & Beattie Ave | 8 | 27 | 216 | 3:20-3:40 |
| 25 | King Street S & Holt Drive | 6 | 182 | 1,092 | 15:50-16:10 |
| 26 | Queen Street S & Rogers Road | 3 | 237 | 711 | 15:55-16:15 |
| 27 | King St S & Anderson Rd | 7 | 157 | 1,099 | 08:35-08:55 |
| 28 | Ernest Cumberland South Driveway & 8th Avenue | 73 | 92 | 6,716 | 15:35-15:55 |
| 29 | James A McCague Ave & Dowling Road | 62 | 54 | 3,348 | 08:45-09:05 |
| 30 | 8th Ave & Tupper Blvd | 23 | 31 | 713 | 15:45-16:05 |
| 31 | Centre St N & Prospect St | 15 | 12 | 180 | 09:00-09:20 |
| 32 | Cedar St & Patterson St (10th Sideroad) | 4 | 96 | 384 | 09:00-09:20 |

### 8.1 All-way Stop Controlled Intersection Warrant

Using the aforementioned Exposure Index graph for all-way stop controlled intersections, only Location 33 does not meet the Exposure Index warrant product threshold of 780 as the location appears below the red line in **Figure 8.1**. However, as noted earlier, the minimum student threshold is also a recommended criterion for assessing the need for a school crossing guard. Based on the recommended threshold of 30 students, only **Location 23 (8th Avenue / Morrison Avenue)** meets both the minimum student threshold and Exposure Index warrants and is recommended for school crossing guard consideration.

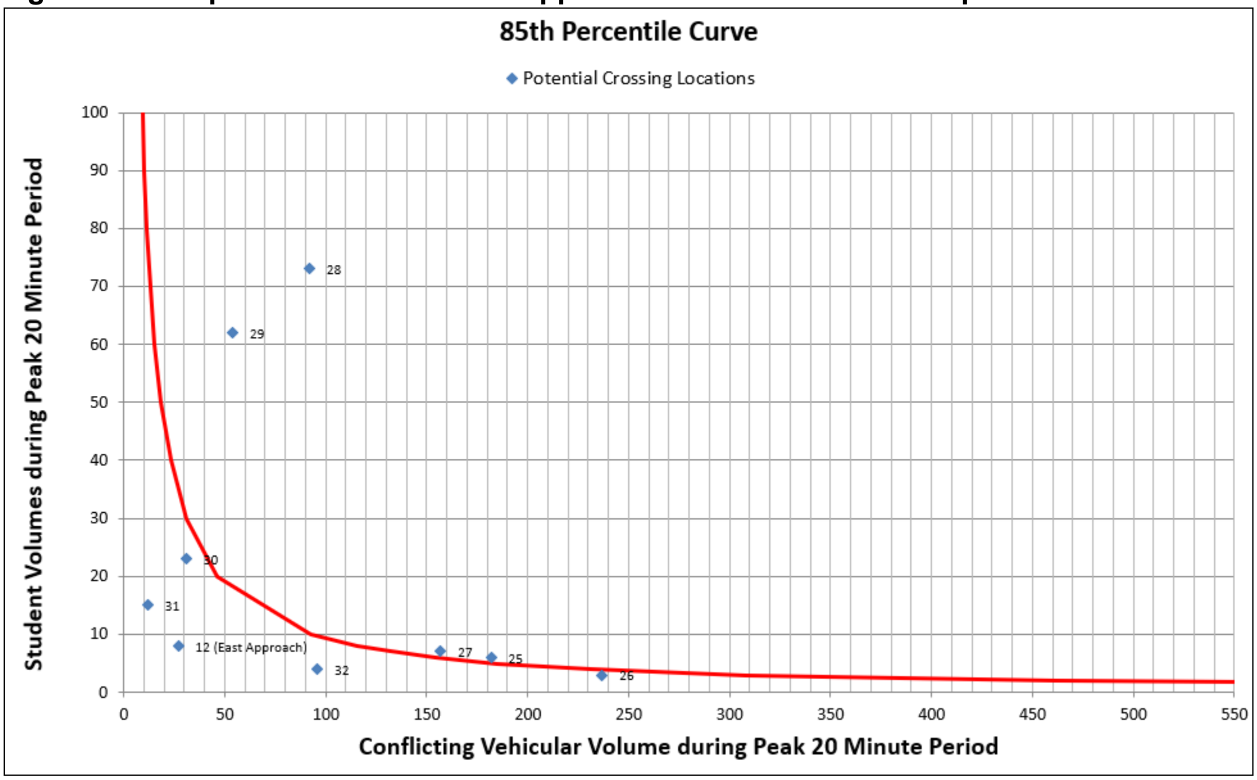
**Figure 8.1 – Exposure Index Warrant Application for All-way Stop Locations**



### 8.2 Minor-Street Stop Controlled Intersection Warrant

Using the aforementioned Exposure Index graph for minor-street stop controlled intersections, Locations 12, 26, 30, 31 and 32 do not meet the Exposure Index warrant product threshold of 923 as the location appears below the red line in **Figure 8.2**. However, as noted earlier, the minimum student threshold is also a recommended criterion for assessing the need for a school crossing guard. Based on the recommended threshold of 30 students, only **Locations 28 (Ernest Cumberland South Driveway & 8th Avenue)** and **29 (James A McCague Ave & Dowling Road)** meet both the minimum student threshold and Exposure Index warrants and are recommended for school crossing guard consideration.

**Figure 8.2 – Exposure Index Warrant Application for Minor-Street Stop Locations**



## 9.0 Prioritization of Guard Deployment

Should the Town determine it is necessary to install school crossings at each of the three locations that meet both the Exposure Index and minimum student volume warrant requirements, the following order of deployment is recommended. Rationale for the order of deployment is provided as well:

1) Minor-street stop Location 29 (James A McCague Ave & Dowling Road):
    a. 62 students crossing during the peak 20 minute period
    b. Exposure Index product of 3,348
    c. Both the west (stop controlled) and south (free flow) approaches meet the Exposure Index warrant.
    d. There is a school crossing guard serving the school approximately 190m to the north at James A. McCauge Avenue and Gray Avenue.
    e. This location is higher in priority than Location 28 because it allows the guard to serve multiple approaches and there is less overlap between the existing and potential new guards.
    f. Minor-street stop controlled crossings are harder for students to cross than all-way stop locations.

2) Minor-street stop Location 28 (Ernest Cumberland South Driveway & 8th Avenue):
    a. 73 students crossing during the peak 20 minute period
    b. Exposure Index product of 6,716
    c. It was observed from the videos that many students are dropped off or picked up in the surface parking lot east of the Ernest Cumberland South Driveway. These students are then crossing 8th Avenue at the minor-street stop intersection. This is an obvious desire line and it would be circuitous for students to have to walk south to the all-way stop intersection of 8th Avenue / Morison Avenue first then walk north again along the east side of 8th Avenue. Given the fact that students crossing 8th Avenue do not have the right-of-way, a school crossing guard would be a notable improvement from a safety perspective.

3) All-way stop Location 23 (8th Avenue / Morrison Avenue):
    a. 31 students crossing during the peak 20 minute period
    b. Exposure Index product of 2,852
    c. This location is only 60m south of the candidate Location 28, which would be crossing students at the minor-street stop controlled southerly school driveway. A school crossing guard at Location 23 would duplicate in function with a school crossing guard at Location 28 due to their close proximity. Therefore, a school crossing guard is not recommended at this all-way stop intersection.

## 10.0 Conclusion and Recommendations

The Town should consider the following actions as next steps:

- Monitor existing crossing guard locations every five years to refine the Exposure Index warrants. Subsequent surveys need to be completed during typical school periods to ensure “Apples to Apples” comparisons are achieved. More frequent monitoring can be considered where there has been a significant change in land use such as the construction of higher density residential uses, or substantial decline in student enrollment.

- Consider the recommended 30 student minimum threshold during the peak 20 minute period for all-way stop, minor-street stop, signalized, IPS, MPS, intersection and mid-block PXO locations;

- Apply the Exposure Index warrants for future locations for all-way stop, minor-street stop and signalized intersections;

- For IPS, MPS or PXO locations, review for compliance from motorists and students, as well as other factors such as presence of larger trucks or queuing trends;

- It was also observed at some existing locations that some of the school crossing guards were positioned at a less than ideal position. Consider reviewing the positioning of crossing guards at each location and during various periods. In general, the crossing guard should be positioned at the approach where students are starting to cross the intersection. In the morning, the guard should be on the side of the road opposite to the school, since that would be primarily where students would need assistance crossing. In the afternoon, when the elementary students are leaving, the guard should be on the same side as the school since students are leaving to cross the road. Additional guidance on the positioning of school crossing guards at various types of intersections are provided in Section 14.5 of the OTC 2017 School Crossing Guard Guide. There may be exceptions to this where the school crossing guard needs to be located at a particular approach in order to maximize their sightlines; and

- Out of the 12 candidate school crossing guard locations that were evaluated, the following locations meet both the recommended minimum student and Exposure Index thresholds and are recommended to be considered for implementation:

    - Minor-street stop Location 29 (James A McCague Ave & Dowling Road)
    - Minor-street stop Location 28 (8th Avenue / Ernest Cumberland south driveway)

  Even though minor-street stop Location 23 also meets both the Exposure Index and minimum student thresholds, it would overlap in functionality with Location 28, which is a more preferable location for a school crossing guard to be deployed.