

February 2012

# Pedestrian Traffic Study Crossing Review

City of Greater Sudbury



## Final Report





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# **1. INTRODUCTION**

## **1.1 Project Objectives**

The City of Greater Sudbury has been responsive to the need to better accommodate the safety and security of pedestrians in the roadway environment. To this end, the City initiated a pedestrian crossing policy study and reviews of pedestrian safety and accommodation of “in-service roads”. This study is an assessment of specific pedestrian crossings in downtown Sudbury.

It is the objective of the study to assess the appropriateness of the existing forms of pedestrian crossings. It provides an inventory of existing conditions and identifies opportunities to improve pedestrian crossing safety. For the recommended measures, an implementation strategy is also identified.

It should be noted that this study commenced in 2006 with a draft report submitted to the City at that time. Since then, some of the recommendations identified in the draft report have been implemented. Other changes that have occurred at the study sites since 2006 have also been noted in this version of the report.

## **1.2 Study Context**

Pedestrian safety is related to the level of drivers and pedestrian awareness of potential conflicts, the level of pedestrian and driver understanding of who has the right of way where there is vehicle-pedestrian interaction, and the degree of care and disregard for safety. Efforts can be made to address each of these effects on pedestrian safety through public awareness and education. In addition, awareness and understanding of right of way can be enhanced through the design of road signs and pavement markings, and pedestrian infrastructure.

Road designs and use of traffic control measures can help maximize driver and pedestrian awareness of vehicle-pedestrian interaction, minimize distractions and obstructions, and improve understanding of which road user has the right of way. It is engineering practice to select designs that:

- Offer consistency in design approach in order to contribute to driver expectation that is appropriate for the road environment and potential hazards, and
- Are appropriate for the unique characteristics for each individual site.

The City developed draft pedestrian crossing policies in light of the benefits of improving driver and pedestrian awareness and understanding of right of way. The application of the policies cannot be applied in all instances. It is recognized that each site is unique. The sites under review have been identified as a result of configurations that are historical and may have resulted from a combination of land uses and roadway characteristics that are no longer desirable from a pedestrian safety and security perspective. In many situations, opportunities to change the fundamental nature of the pedestrian environment may not be feasible. However through this



study, efforts have been made to maximize driver and pedestrian awareness and understanding for each site.

### **1.3 Study Scope**

This report presents the findings of the pedestrian review for three specific crossing locations in the downtown area, identified below and indicated in **Exhibit 1**:

- Elm Street (west of Notre Dame Avenue between City Centre and Sudbury Transit Terminal)
- Ste. Anne Road (between Ignatius Street and Notre Dame Avenue), and
- Brady Street at Shaughnessy Street

A detailed review of collision history was beyond the scope of this study. However, the City did provide traffic and pedestrian volume and collision data. The study included field visits that included observations of driver and pedestrian behavior and documentation of traffic controls and traffic conditions.

The report provides a site description, a summary of road and traffic conditions, existing traffic control, an assessment of factors that affect pedestrian safety, and opportunities for pedestrian safety improvements. The report assesses the relative merits of safety improvement alternatives and identifies any improvements recommended for implementation.



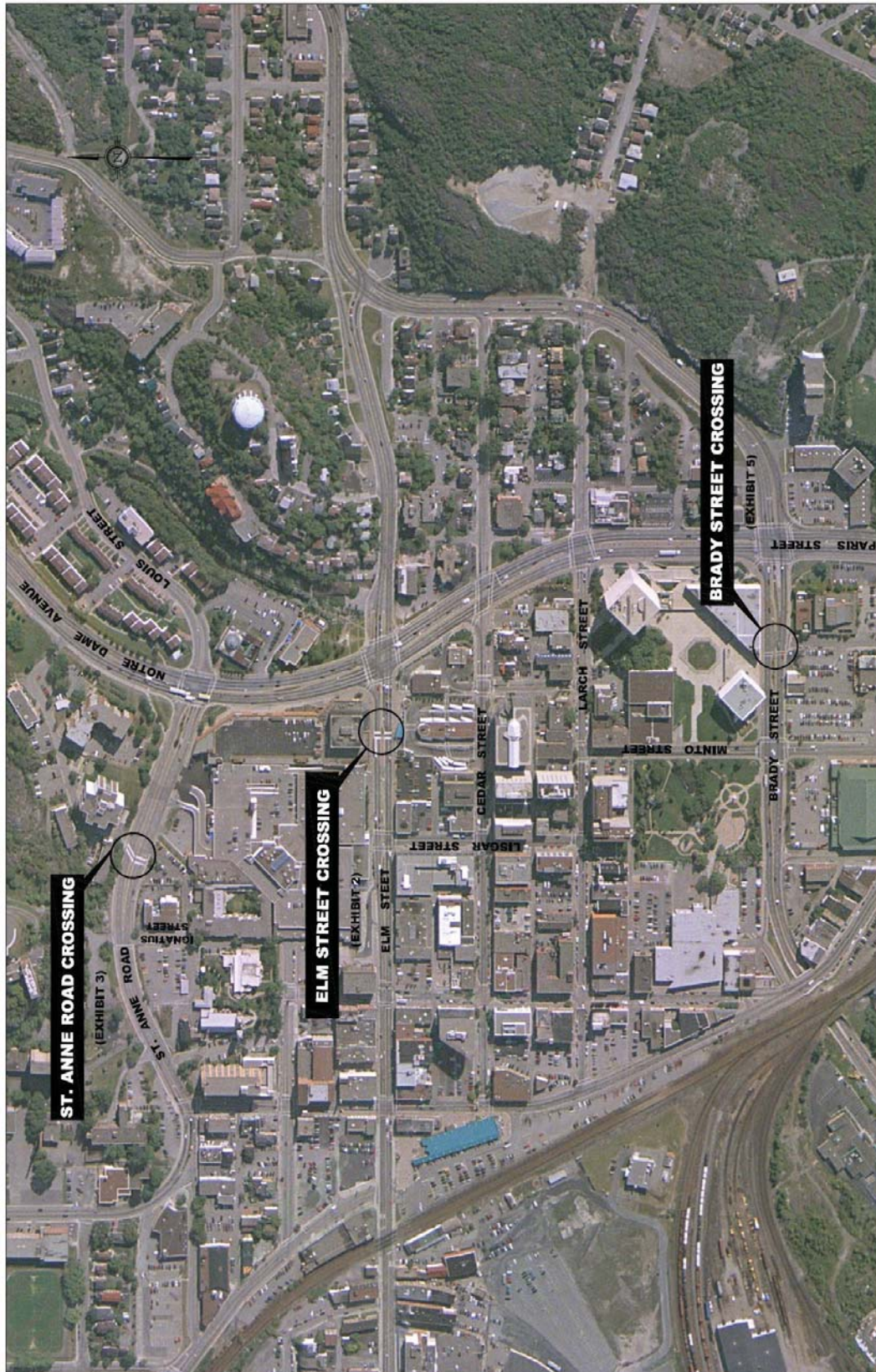


Exhibit 1: Site Locations





## 2. ELM STREET CROSSING



Exhibit 2: Elm Street Crossing

### 2.1 Site Description

The Elm Street crossing is an unprotected marked mid-block crossing located between two signalized intersections, Notre Dame Avenue – Paris Street approximately 50 metres to the east and Lisgar Street approximately 100 metres to the west. Elm Street is a 5-lane road with centre left turn lanes at the intersections. The posted speed on Elm Street is 50 km/h and carries a daily traffic volume of 16,000 vehicles. There are sidewalks along both sides on Elm Street with roadway illumination. Parking is prohibited within the vicinity of the crossing.

The surrounding land uses and buildings are illustrated in **Exhibit 2**. They include:

- Rainbow Value Centre (northwest corner of the Elm Street and Notre Dame Avenue – Paris Street intersection)
- Sudbury Transit Terminal (southwest quadrant of the Notre Dame Avenue and Elm Street intersection)
- Public parking lot located west of Sudbury Bus Terminal
- Commercial retail, offices and government buildings
- Residential and senior's home.



There are driveways within the proximity of the crossing:

- The Rainbow Value Centre driveway (35 metres west of the crossing)
- Public Parking lot driveway (35 metres west of the crossing), and
- Bus Terminal driveway (slight offset to the west of the crossing).

A raised median extends approximately 90 metres westerly from Notre Dame Avenue-Paris Street to the Mall entrance driveway with a 3-metre cut-out for the mid-block crossing. Fencing barrier is installed on portion of the median close to the Elm Street / Notre Dame Avenue – Paris Street intersection and the remaining portion has planters constructed. See **Exhibit 3**.



**Exhibit 3: Raised Median Extending from Elm Street / Notre Dame Avenue – Paris Street Intersection**

There are curb depressions at both ends of the crosswalk. The crosswalk lines are identified through zebra markings. The crossing is signed with "Seniors Crossing" warning signs. There are two signs facing each direction of traffic. There are also "Yield to Traffic" warning signs facing each curb side directed at pedestrians. See **Exhibit 3** and **Exhibit 4**.

The Elm Street / Notre Dame Avenue – Paris Street intersection is west of a vertical crest on Elm Street. The Elm Street / Notre Dame Avenue – Paris Street intersection has a channelized southbound right turn lane that is 'Yield' controlled.





**Exhibit 4: Elm Street Crossing**

## **2.2 Traffic Conditions**

There is considerable pedestrian activity at the Elm Street crossing. The Rainbow Value Centre and the Sudbury Transit Terminal are both major pedestrian generators and contributors. Significant pedestrian activity is also generated from the surrounding land uses, which includes commercial retail, government buildings, a residential area, and schools. In a peak period count conducted on October 18, 2005, 757 pedestrian crossings were observed from 11:45 am to 1:15 pm.

Crossing opportunities are created naturally by breaks in traffic flows created by signals upstream of the crossing. Courtesy gaps are also provided by drivers stopping at the crossing. As observed on site, drivers do slow down upon detection of pedestrians waiting at the curb side and especially during congested conditions when eastbound queues often extend past the crosswalk. The median is sometimes used as refuge by pedestrians.

There were 16 mid-block collisions recorded between Paris Street to Lisgar Street from January 1, 2008 to December 31, 2010 (an average of just over 5 collisions per year); one of which involved a pedestrian crossing from the bus depot to the mall.



In January of 2012, the City received another report of a pedestrian being hit at the Elm Street Crossing. The incident involved a pedestrian in a wheel chair. However, a police report and additional details were not known at the time this report was prepared.

## **2.3 Factors Affecting Pedestrian Safety**

Given that the Elm Street crossing is an unprotected crossing, there is an onus on pedestrians to ensure that there is an adequate gap in traffic sufficient for safe pedestrian crossing.

Notwithstanding pedestrian responsibilities drivers must exercise reasonable care to avoid a collision with pedestrians. We considered the factors that may affect the pedestrian's ability to make appropriate crossing decisions and / or the likelihood of drivers anticipating and avoiding pedestrians within the crosswalk including:

- Pedestrians' lack of familiarity with the rules of the road and the need to wait for an appropriate gap in traffic (anticipating that all vehicles will stop for pedestrians).
- Pedestrians unable to appropriately assess spacing and speeds of approaching vehicles and opportunities to cross.
- Pedestrians not seeing / anticipating vehicles making the southbound to westbound right turn at the Elm Street / Notre Dame Avenue – Paris Street intersection.
- Drivers making southbound right turn movements at the Elm Street / Notre Dame Avenue – Paris Street intersection who focus on merging with westbound traffic and are not aware of pedestrians in the crosswalk.
- Drivers who are westbound on Elm Street approaching Notre Dame Avenue – Paris Street who's awareness of the pedestrian crossing is limited by the vertical curve in the road and navigation through the signalized intersection.
- Inconsistent driver behaviour where a driver in one lane may yield to a pedestrian, while the vehicle in the adjacent lane may not yield creating a vehicle-pedestrian conflict.
- A driver who's view of pedestrians is obscured by vehicle queues that extend through the crosswalk.
- Outbound bus drivers that do not see / anticipate pedestrians crossing as they are exiting the transit terminal.

If the zebra crossings were not in place, it is anticipated that a large percentage of pedestrians would continue to cross Elm Street mid-block. As such, many of the above factors would continue to be an issue with an unmarked crossing. In addition, without the zebra crossing markings, pedestrian crossing activity may occur within a wider range of locations and drivers may be less aware of pedestrians crossing at any particular location.



## 2.4 **Opportunities for Improved Safety**

Consideration was given to a range of alternative crossing configurations and features. Alternatives considered included, but were not limited to:

- Traffic control signals or mid-block pedestrian signals
- Relocation of the marked crossing
- Signage and signal phasing modifications
- Removal of the marked crossing
- Grade separation, and
- No modifications.

Each option was assessed to determine positive and negative impacts on safety and potential for implementation.

### 2.4.1 **Traffic Control Signals**

The feasibility of traffic control signals or pedestrian signals were considered at both the existing crossing location and at a relocated crossing location 35 metres to the west, coordinated with the public parking lot driveway. Current pedestrian volumes would meet warrant thresholds for pedestrian signals, but the spacing requirements are not met. Under typical circumstances the introduction of a signal as a protected crossing:

- Simplifies the rules of the road for pedestrians, since the right-of-way at traffic signals is generally understood.
- Drivers are required to yield to pedestrians reducing the likelihood of inconsistent driver behaviour and the effect of vehicle queues through the crosswalk.

However, in either of the locations considered for traffic signals, the distance between a new traffic signals at the crossing and existing adjacent traffic signals would be well below the general practice for spacing of signals (215 metres). Furthermore the OTM Book 12 notes: “Motorists approaching a signal must be able to see the signal indications in sufficient time to react and to take any necessary actions”; and based on a posted speed limit of 50 km/h, the minimum distance from which signal must be clearly visible is 85 metres.

The spacing would be as low as 50 metres to 80 metres, which does not allow for decision stopping sight distance between signals and would not address:

- Pedestrians not seeing / anticipating vehicles making the southbound to westbound right turn at the Elm Street / Notre Dame Avenue – Paris Street intersection.
- Drivers making southbound right turn movements at the Elm Street / Notre Dame Avenue – Paris Street intersection who focus on merging with westbound traffic and are not aware of pedestrians in the crosswalk, and
- Drivers who are westbound on Elm Street approaching Notre Dame Avenue – Paris Street who’s awareness of the pedestrian crossing is limited by the vertical curve in the road and navigation through the first signalized intersection.

Furthermore, in these instances, pedestrians will likely cross with less care given that with a traffic signal or pedestrian signal, crossing pedestrians recognize that they have the right of way.





Very closely spaced signals can also result in driver confusion where drivers may focus on downstream signals rather than the signals at the next intersection. The alternative of programmable signal heads may or may not address this operational issue.

Overall there is a potential for increased exposure to vehicle-pedestrian conflicts.

### **2.4.2 Removal or Relocation of the Marked Crossing**

The option of removing or relocating the marked crossing was considered. Alternatives included a shift to the west side of the transit terminal driveway, and a shift to the east more in line with the Rainbow Value Centre doors.

It is anticipated that, with the removal of the crossing markings and signage, a large number of pedestrians will continue to cross mid-block at the gap in the median. As such, the crossing activity may be less focused within the block and drivers may be less prepared for the crossing activity. Fencing off the whole median is not preferred, as noted in the past staff report on the basis of legality – as pedestrians may still cross and travel along the fenced barrier, resulting in increased exposure time and gaps in the fence are still necessary to allow vehicles to turn.

A shift to the east of the marked crosswalk could result in a marginally more direct connection between Rainbow Value Centre and the Transit Terminal, but offers no tangible benefits. A shift to the east would reduce the distance available for westbound drivers to perceive and react to the pedestrian crossing and related activity following their navigation through the Notre Dame Avenue intersection. Pedestrians would also have less distance and time to judge acceptable gaps.

A shift of the marked crosswalk to the west would allow greater distance for westbound drivers to perceive and react to the pedestrian crossing and crossing activity. It would also remove the interaction and potential conflict between pedestrians in the crossing and buses exiting the transit terminal. However a shift of the crosswalk to the west is less convenient for pedestrian flows between the Rainbow Value Centre and the transit terminal (approximately an additional 40-50 metres). Pedestrians may tend to continue to cross at the most direct route, approximately at the existing crossing location, negating benefits of relocating the marked crossing.

### **2.4.3 Modifications to Signage and Signal Operation**

Existing signage provides clear direction to pedestrians that they do not have the right of way at the crossing and that they are to yield to vehicles. Eastbound and westbound approaching vehicles are made aware of the pedestrian crossing through signage at the crossing. However, vehicles turning from the Notre Dame Avenue – Paris Street intersection to westbound Elm Street have considerable workload.

Southbound right-turning (SBRT) vehicles were previously served by a SBRT channel, requiring them to first yield to pedestrians and find gap in pedestrian flows crossing the west leg of the intersection, then to find a gap in the westbound traffic flows, and navigate the turn immediately



prior to seeing and reacting to the pedestrian crossing. The SBRT channel has since been removed and SBRT movements are now under signal control.

#### **2.4.4 Grade Separation**

Grade separation was considered as an alternative crossing measure. Grade separation provides the highest form of protection for pedestrians as it allows the opportunity to completely separate pedestrian movements from vehicular movement. For pedestrians who use the grade separation, it eliminates confusion with the rules of the road and the need to search for vehicular gaps to cross.

A grade separated connection across Elm Street would require cooperation from the Rainbow Value Centre and the Transit department. The crossing would need a clearance of 5 metres, plus construction depth of the floor. Pedestrians would have to climb 1 ½ floors to reach the structure limiting accessibility and convenience. It is questionable whether many pedestrians would use the structure with or without the existing crossing in place.

The structure would involve a span of at least 20-25 metres long and would require an independent support on the Mall and transit terminal sides. Construction costs alone would be in the order of \$250,000 to \$500,000. While this option would be considered a long-term option, given the accessibility constraints it is questionable whether the benefits would meet the costs associated with a grade separation.

### **2.5 Conclusions and Recommendations**

It is concluded that the pedestrian demand of the current crossing is a function of existing land use (Rainbow Value Centre and the Transit terminal) and that there is no simple solution to change pedestrian desire-lines. The location of existing signals does not permit a protected (signalized) crossing with adequate sight distance.

It is recommended that the existing unprotected pedestrian crossing point be retained. The zebra markings offer greater benefit in terms of driver awareness of crossing pedestrians than any confusion it may represent in terms of pedestrian and driver right of way. Existing pedestrian signage, which addresses the need to alert pedestrians of the fact that they do not have the right of way and encourages caution, should also remain.

As previously noted, the City has removed the existing channelized southbound right-turn lane on Notre Dame Avenue at Elm Street. As such, southbound right-turning (SBRT) motorists now operate under signal-control and can either make a SBRT movement during a southbound green-phase (yielding to pedestrians crossing the west leg of the Notre Dame / Paris Street & Elm Street intersection) or after stopping at a southbound red phase and waiting for an acceptable gap in westbound traffic along Elm Street, to make their turn.



### 3. STE. ANNE ROAD CROSSING



**Exhibit 5: Ste. Anne Road Crossing**

The original scope of this study included an assessment of the formerly unprotected pedestrian crossing across Ste. Anne Road at 200 Ste. Anne Street, between Notre Dame Avenue and Ignatius Street. This crossing has since been converted into a signalized intersection on Ste. Anne Road at 200 Ste. Anne and the access to the Radisson Inn, as per the recommendation in this report. The following subsections provide a description of the former crossing and issues, which led to the recommendation to signalize the intersection.

#### 3.1 Site Description

The Ste. Anne Road crossing was an unprotected, mid-block crossing located just west of the Radisson Inn / 200 Ste. Anne (Apartment complex) driveways as shown in **Exhibit 5**. The crossing was located approximately 170 metres west of the Ste. Anne Road / Notre Dame Avenue signalized intersection and approximately 260 metres east of the Ste. Anne Road / Elgin Street signalized intersection.

It should also be noted that another marked, unprotected pedestrian crossing is provided across Ste. Anne Road, located immediately west of Ignatius Street.

Ste Anne Road is a 4-lane road from Elgin Street to Ignatius Street and is a 6-lane road from Ignatius Street to Notre Dame Avenue. The transition commences at the beginning of the horizontal curve at Ignatius Street with the introduction of a raised median (from Ignatius Street to Radisson Inn driveway) and centre left turn lane (from the Radisson Inn driveway to Notre





Dame Avenue). The centre left turn lane provides access to 200 St Anne Road (Apartment complex). In addition, an eastbound through lane is also introduced east of Ignatius Street.

Surrounding land use and buildings are illustrated in **Exhibit 5**. They include the following:

- Rainbow Value Centre (southwest corner of Ste. Anne Road / Notre Dame Avenue)
- Residential and senior's home
- Hotels (Radisson Inn)
- Schools.

The former crosswalk extended across the west leg of the Ste. Anne Road / Radisson Inn driveway intersection at the end of the median. Curb depressions were located at both ends of the crosswalk. The crosswalk lines were identified through zebra markings and signed with "Seniors Crossing" warning signs. There were two signs facing each direction of traffic, as well as "Yield to Traffic" warning signs facing each curb side. See **Exhibit 6**.

**Exhibit 6:** Former Ste. Anne Road Crossing Facing East

There was a painted, but unsigned crosswalk at the west leg of the Ste. Anne Road / Ignatius Street intersection approximately 45 metres west of the subject crossing at the crest of the vertical curve and at the starting portion of the horizontal curve. See Exhibit 7.



**Exhibit 6:** Former Ste. Anne Road Crossing Facing East



The posted speed on Ste. Anne Street is 50 km/h and carries a daily traffic of 7,100 vehicles. There are sidewalks along both sides on Ste. Anne Street with roadway illumination. Parking is prohibited within the vicinity of the crossing.

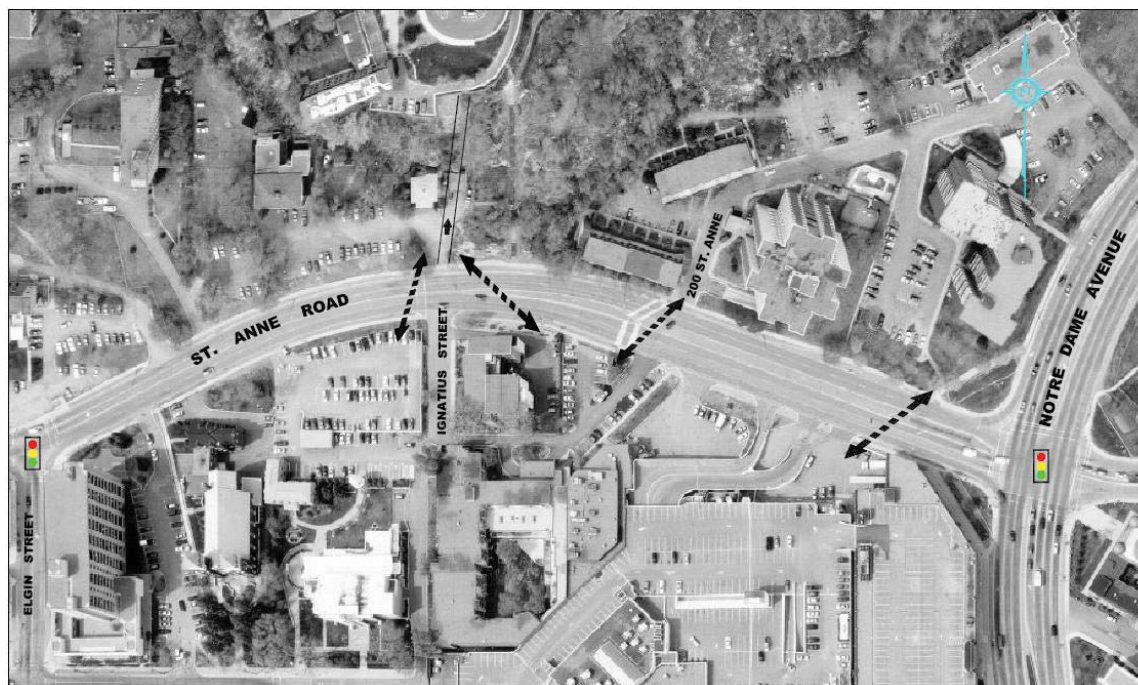
There are a number of driveways between the crosswalk and Notre Dame Avenue, connecting from the south side to the Rainbow Value Centre parking lot and loading area.



**Exhibit 7: Former Ste. Anne Road / Ignatius Street Crossing (West of Subject Crossing)**

### **3.2      Traffic Conditions**

The interaction between the residential area/schools to the north and the Elm Street downtown area to the south results in several pedestrian desire lines along Ste. Anne Road as illustrated in **Exhibit 8**.



### Exhibit 8: Pedestrian Desire Lines

Crossings at the subject crosswalk are generally to/from the 200 Ste. Anne Road (Apartment complex). The pedestrian activity at the crossing as indicated in a June 20, 2003 count shows a pedestrian volume of 55 during the peak hour from 3:15 p.m. to 4:15p.m.

Meanwhile, there is high frequency of mid-block pedestrian activities outside of the marked crosswalks and in particular, at the foothill of the staircase, east of Ignatius Street crossing, leading to the schools on the hilltop on the north side; and at the east end of Ste. Anne Road, where crossing at mid-block between the Seniors home and the Rainbow Value Centre were observed. The daily traffic volume of 7,084 vehicles at Ste. Anne Road is considered low.

There was only one collision reported during the period of January 1, 2008 to December 31, 2010 and it did not involve a pedestrian.

## 3.3 Factors Affecting Pedestrian Safety

Given that the Ste. Anne Road crossing was an unprotected crossing, there was an onus on pedestrians to ensure that there was an adequate gap in traffic, sufficient for safe pedestrian crossings. Notwithstanding pedestrian responsibilities, drivers must exercise reasonable care to avoid a collision with pedestrians. We considered the factors that may affect the pedestrians' ability to make appropriate crossing decisions and / or the likelihood of drivers anticipating and avoiding pedestrians within the crosswalk including:

- Pedestrians' lack of familiarity with the rules of the road and the need to wait for an appropriate gap in traffic (anticipating that all vehicles will stop for pedestrians)
- Pedestrians not seeing eastbound vehicles due to the vertical and horizontal curvature of Ste. Anne Road





- Drivers eastbound on Ste. Anne Road may not anticipate the crosswalk or be able to see pedestrians due to the horizontal curvature of Ste. Anne Road
- Visibility limitations at night
- Pedestrians unable to judge the adequacy of gaps in traffic for crossing, and
- The level of care taken by student pedestrians and the abilities of senior citizens crossing.

### **3.4 Opportunities for Improved Safety**

Consideration was given to a range of alternative crossing configurations and features. Alternatives considered included, but were not limited to:

- Traffic control signals
- Relocation of the marked crossing
- Realign staircase
- Removal of the marked crossing, and
- Modifications to signage.

Each option was assessed to determine positive and negative impacts on safety and potential for implementation.

#### **3.4.1 Traffic Control Signals**

The feasibility of traffic control signals or pedestrian signals were considered at both the existing crossing location and locations 70 to 90 metres to the west, coordinated with the Ignatius intersection and driveway. At either location, spacing to the closest intersection would be approximately 170 metres, which would allow adequate time for drivers to perceive and react to signal controls.

Vehicle and pedestrian volumes (expanded to 8 hours) based on the October 2005 traffic count did not meet warrant thresholds based on the OTM 12 Pedestrian Traffic Justification. The pedestrian and vehicle volumes are approximately 90% of the warrant threshold. However, taking into consideration the potential for the re-routing of pedestrians from the adjacent traffic signals and the potential for higher pedestrian demands under spring conditions, it is anticipated that under spring conditions, the need for signals can be justified at the existing marked crossing location.

It is anticipated that at this location the introduction of a signal as a protected crossing will:

- Simplify the rules of the road for pedestrians, since right of way at traffic signals is generally understood
- Help address visibility constraints given the geometry of the roadway
- Improve visibility at night, and
- Provide for greater protection for pedestrians at the signalized crossing (particularly for children and seniors).

It is noted that visibility of signal heads in the eastbound direction may be an issue that would need to be addressed in any signal design.



The operation of the existing accesses adjacent to the crossing would be influenced by the signals. Full traffic signals are preferred over intersection pedestrian signals as traffic signals will reduce the workload of drivers turning from the side street, given the sight distance of the eastbound vehicles due to the horizontal and vertical curvatures of Ste. Anne Road and would allow the incorporation of adjacent accesses.

### **3.4.2 Maintain or Relocate the Marked Crossing**

The option of maintaining or relocating the marked crossing was considered. In addition to the existing location, we considered shifting the crosswalk to the west coordinated with the Ignatius intersection and driveway 70 to 90 metres west of the existing crossing. At either location the crosswalk markings may lead some pedestrians to believe they have the right of way.

A shift of the crosswalk location to the west may reduce sightline constraints caused by the road curvature. However, this is seen as less convenient for most pedestrians, given the observed pedestrian flows.

### **3.4.3 Realign Staircase**

Much of the pedestrian activity on the existing staircase is related to schools situated to the north and northwest of the Ste Anne Road crossing. Students can access Ste Anne Road via a staircase situated approximately 60 metres west of the marked crossing. Consideration was given to realign the staircase, bringing it further east toward 200 Ste Anne Road to permit more direct access to the crossing for the students.

However, the staircase is built into a rock-face along the slope of the hill. Re-alignment of the staircase would require a significant amount of re-construction, including the need to “blast” the rock currently located along both sides of the staircase in order for it to be re-aligned. In addition, the area where the staircase would need to be realigned is located on private property where an existing residential townhouse complex is currently located. This limits the distance that the realigned staircase could be “shifted” to the east to a maximum of approximately 15 metres, without impacting the existing townhouse complex.

This minimal shift to the east would offer minimal benefit to pedestrians using the staircase, as it would still not lead them directly to the pedestrian crossing. It would also inconvenience pedestrians using the staircase that originate from or are destined to locations to the west of the staircase.

Given the amount of disruption and the high-costs associated with blasting the rock to accommodate the realigned staircase, and the minimal benefits it would offer to pedestrians using the staircase, it is not recommended that the staircase be realigned.

It is recommended that the staircase be maintained in its current position, and a sign be installed at the base of the staircase, with the directional arrow pointing to the crossing location at the signalized intersection to the east.



### **3.4.4 Remove the Marked Crossing**

With the removal of the crossing markings and signage it is anticipated that a large number of pedestrians will continue to cross mid-block. However the crossing activity may be less focused and drivers may be less prepared for the crossing activity.

### **3.4.5 Modifications to Signage**

Existing signage includes Pedestrian Ahead warning signs approaching and at the crossing. The signs at the crossing also include Seniors Crossing tab. There are also signs advising pedestrians that they do not have the right of way at the crossing and that they are to yield to vehicles. Modifications to the signage, such as supplemental signs or larger signs are not anticipated to have a significant impact on safety.

## **3.5 Conclusions and Recommendations**

It was concluded that the presence of seniors and students crossing at this unprotected marked crossing adjacent to a horizontal curve is not desirable. It was also noted that based on current counts that pedestrian and vehicle volumes approach OTM warrants for signals at the crossing and that warrants would likely be met during high volume (spring time) conditions. On this basis, it was recommended that traffic control signals be implemented in the vicinity of the existing crosswalk, coordinated with the adjacent driveways.

Prior to the finalization of this study, the Ste Anne Road crossing has since been converted into a signalized intersection on Ste. Anne Road at 200 Ste. Anne and the access to the Radisson Inn, as per the recommendation in this report. The previous crossing has since been removed.

As part of this study, it is also recommended that the existing unsignalized crossing at Ignatius Street, west of the Ste Anne Road crossing be removed along with the curb depressions since this crossing is in close proximity to the new signalized intersection at 200 Ste. Anne and does not serve any significant pedestrian generators.

Also, as previously recommended, the existing staircase should be retained with signs installed at the base of the staircase to direct pedestrians to the new signalized intersection to the east.



## 4. BRADY STREET CROSSING



Exhibit 9: Brady Street Crossing

### 4.1 Site Description

The Brady Street crossing is located on the west leg of the Brady Street / Shaughnessy Street intersection, at approximately 95 metres west of the Paris Street intersection and 90 metres east of Minto Street intersection. The crossing is on the west leg only since there is a centre left turn lane from Shaughnessy Street to Paris Street.

Brady Street is a 4-lane road with a posted speed limit of 50 km/h. Traffic is stop controlled from Shaughnessy Street, while the adjacent intersections are both signalized and coordinated. Sidewalks are constructed on both sides of the roadway. Streetlights are installed along the south side only. The crossing is painted with crosswalk line, but unsigned. The median on the west leg acts as refuge-island within the crosswalk. There are curb depressions at both ends of the crosswalk and at the median. “Pedestrian ahead” warning signs are also placed along Brady Street on the east and west approaches to the crossing.

There is a public parking lot on the southwest corner of Brady Street and Shaughnessy Street. Parking is prohibited along both sides of Brady Street. Surrounding land use and buildings are illustrated in **Exhibit 9**. They include:

- City Hall (north side on Brady Street)
- Sudbury Theatre Centre (south of Brady Street)
- Commercial retail and restaurants (south of Brady Street), and
- Residential land uses.





## **4.2      Traffic Conditions**

Brady Street currently carries 15,900 vehicles in daily traffic volume. Peak hour condition occurs during the weekday PM peak hour from 4:00 p.m. to 5:00 p.m. Queuing extends past the crosswalk from adjacent intersections during peak hours.

The pedestrian volume at this location is moderate to high during peak times (morning, midday and evening peak hours). There were 217 pedestrian crossings recorded during the weekday afternoon peak. Drivers tend not to yield (or give courtesy gaps) to pedestrians waiting to cross the road at the unprotected crossing.

Pedestrian desire lines are mainly between the parking lots and restaurants located along Shaughnessy Street and two destinations on the north side of Brady Street. One destination is the entrance to City Hall, located on the northwest corner of Brady and Paris Streets; east of the existing crossing. The other destination is the Police Station, located on the northeast corner of Brady and Minto Streets east of the existing crossing. Site observations showed that during peak hours, pedestrians tend to use the crosswalk to cross Brady Street. However, during other off-peak times, many pedestrians were observed crossing Brady Street at various locations between Paris and Minto Streets, with many pedestrians not using the crosswalk.

There were 12 collisions recorded between January 1, 2008 and December 31, 2010 (an average of 4 collisions per year) within the vicinity of Shaughnessy Street; one of which involved a pedestrian. That collision took place at a point 20 meters west of Shaughnessy Street.

## **4.3      Factors Affecting Pedestrian Safety**

Given that the Brady Street crossing is an unprotected crossing, there is an onus on pedestrians to ensure that there is an adequate gap in traffic sufficient for safe pedestrian crossing. Notwithstanding pedestrian responsibilities, drivers must exercise reasonable care to avoid a collision with pedestrians. We considered the factors that may affect the pedestrian's ability to make appropriate crossing decisions and / or the likelihood of drivers anticipating and avoiding pedestrians within the crosswalk including:

- Pedestrians' lack of familiarity with the rules of the road and the need to wait for an appropriate gap in traffic (anticipating that all vehicles will stop for pedestrians)
- Pedestrians unable to appropriately assess spacing and speeds of approaching vehicles and opportunities to cross
- Lack of driver awareness of the pedestrian crossing given limited signage and use of standard crosswalk markings
- Inconsistent driver behaviour where a driver in one lane may yield to a pedestrian, while the vehicle in the adjacent lane may not yield creating a vehicle-pedestrian conflict
- A driver who's view of pedestrians are obscured by vehicle queues that extend through the crosswalk
- Pedestrian visibility and illumination at night, and
- Turning traffic from Shaughnessy Street.



It was also observed that when approaching the crossing from the west, it is difficult to see the crossing pavement markings due to a slight vertical curve or “dip” in the road that obscures the crosswalk.

## **4.4 Opportunities for Improved Safety**

### **4.4.1 Traffic Control Signals or IPS**

The feasibility of traffic control signals or pedestrian signals were considered at the existing crossing location. The vehicle and pedestrian volumes based on the most recent traffic count meet warrant thresholds based on the OTM 12 Pedestrian Traffic Justification. Under typical circumstances the introduction of a signal as a protected crossing will:

- Simplify the rules of the road for pedestrians, since right of way at traffic signals is generally understood
- Improve visibility at night, and
- Provide for greater protection for pedestrians at the signalized crossing (particularly for children and seniors).

However, the spacing to the adjacent intersections is less than 100 metres, which will not satisfy OTM Book 12 minimum spacing requirements of 215 metres spacing between signals. Closely spaced signals can result in driver confusion where drivers may focus on downstream signals rather than the signals at the next intersection. As a result, signals are not recommended at this location.

### **4.4.2 Maintain or Enhance the Marked Crossing**

The option of maintaining the marked crossing or enhancing the crossing with zebra markings was considered. Either form of crosswalk markings may lead some pedestrians to believe they have the right of way. They may also result in increased frequency of drivers providing courtesy gaps leading to conflicts where a driver in an adjacent lane may not yield to crossing pedestrians.

### **4.4.3 Median Enhancements**

Enhancement to the existing median along Brady Street was considered in an effort to limit the amount of “jay-walking” across the street and to force pedestrians crossing the street to use the existing Brady Street crossing. Median enhancements could include the addition of added landscaping/ planting or a fence along the median to limit the potential for pedestrians to cross at various locations between Paris and Minto Streets’.

Discussions with City staff indicated that pedestrians crossing at various locations along a roadway was a significant problem at the Elm Street crossing, until a fence and raised median, approximately 1.5m high, with landscaping (plants) was installed along the centre of the roadway, with the only remaining “gap” across Elm Street at the pedestrian crossing location.



A similar treatment could be considered along Brady Street to “channel” crossing pedestrians to the crossing location and/or to the two adjacent signalized intersections east and west of the subject crossing.

#### **4.4.4 Remove the Marked Crossing**

Brady Street is a major corridor connecting with the Kingsway, accommodating long distance travel. Other than at the crossing, pedestrian activity in the east end of the corridor is moderate and driver awareness of pedestrian activity may be low. Volumes are above the threshold associated with the removal of unprotected crosswalk markings as indicated in the USDOT publication Pedestrian Facilities Users Guide.

However, with the removal of the crossing markings it is anticipated that a large number of pedestrians will continue to cross mid-block. Further, there is a need to heighten driver awareness of the potential for pedestrians in the area. This is best accomplished by consolidating the pedestrian movements to a single location. A crossing similar to that implemented on Elm Street is therefore recommended.

#### **4.4.5 Modifications to Signage**

Existing signage does not include Pedestrian Ahead warning signs approaching and at the crossing. There are also no signs advising pedestrians that they do not have the right of way at the crossing and that they are to yield to vehicles. The provision of signage directing pedestrians to yield to vehicles and use caution would help address the understanding of the right of way.

### **4.5 Conclusions and Recommendations**

Considering the high pedestrian volumes that cross Brady Street throughout the day, and the strong pedestrian desire line between the numerous pedestrian generators along Shaughnessy Street and City Hall and the Police station, it is recommended that the existing unprotected mid-block crossing be maintained and enhanced to accommodate this desire line. Recommended crossing enhancements to the mid block crossing include the application of Zebra style pavement markings similar to those used along Elm Street, as well as the addition of “Yield to Traffic” signs at both ends of the crossing.

In order to eliminate jay-walking at random locations across Brady Street, it is recommended that median enhancements be installed along Brady Street to discourage jay-walking and consolidate pedestrians to the enhanced pedestrian crossing. Median enhancements can include the installation of a fence and / or planters similar to the median enhancements applied along Elm Street at the Elm Street crossing.

To ensure pedestrians use the side of the intersection with the crosswalk, no markings should be shown on the east side of the Brady Street and Shaughnessy Street intersections. Further, Ra-9A signs requiring pedestrians to “Cross Other Side” should be posted across this leg of the intersection. It is also recommended that these “Cross Other Side” signs be regularly enforced.





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