

Request for Decision

Intersection of Notre Dame Avenue and Kathleen Street - Pedestrian Safety

Presented To:	Operations Committee
Presented:	Monday, Dec 03, 2012
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Type:	Managers' Reports

Recommendation

That no changes be made to the existing traffic signal control at this time, and;

That staff continue to monitor pedestrian safety at the intersection of Notre Dame Avenue and Kathleen Street to determine if improvements are required, and;

That staff continue to research new ways to enhance pedestrian safety within the city, all in accordance with the report from the General Manager of Infrastructure Services dated November 21, 2012.

Finance Implications

There are no financial implications with the status quo.

The following reflects the financial impact for implementation of each option: Option 1 - \$30,000 Option 2 - \$45,000 Option 3 - \$10,000

Background

At the Operation Committee meeting held on July 9, 2012, it was requested that staff investigate alternatives to improve pedestrian safety at the intersection of Notre Dame Avenue and Kathleen Street.

The main concern raised was that the left turning vehicles do not always yield for pedestrians when they are crossing Notre Dame Avenue as required by the Highway Traffic Act.

Notre Dame Avenue and Kathleen Street

The Notre Dame Avenue and Kathleen Street intersection is located in the area of the City known as the Flour Mill (see Exhibit 'A'). In this area, Notre Dame Avenue is constructed with three (3) through lanes in each direction with northbound and southbound left turn lanes. This section of Notre Dame Avenue is designated as a primary arterial roadway that carries an Annual Average Daily Traffic (AADT) volume of 28,000 and has a posted speed limit of 50 km/h.

Signed By

Report Prepared By

Dave Kivi
Co-ordinator of Transportation & Traffic
Engineering Services
Digitally Signed Nov 22, 12

Division Review

David Shelsted, MBA, P.Eng.
Director of Roads & Transportation
Services
Digitally Signed Nov 22, 12

Recommended by the Department

Tony Cecutti, P.Eng., FEC
General Manager of Infrastructure
Services
Digitally Signed Nov 22, 12

Recommended by the C.A.O.

Doug Nadorozny
Chief Administrative Officer
Digitally Signed Nov 23, 12

Kathleen Street is designated as a collector road that carries an AADT of 5,500 and has a posted speed limit of 50 km/h. Kathleen Street intersects with Notre Dame Avenue at approximately 90 degrees and forms a four legged intersection with the entrance to the grocery store parking lot on the east side of the intersection. The grocery store approach is very wide and undefined due to the layout of the parking lot and close proximity of the building.

Collision History

A review of the City's collision data from 2009 to 2011 (inclusive) revealed that there were a total of twenty-five (25) reported collisions, which occurred in the vicinity of the intersection. During the three (3) year period, two (2) of the collisions involved pedestrians. The first involved a pedestrian crossing with the right-of-way, being struck by a northbound to westbound left turning vehicle. It should be noted that an advance left turn phase is provided for this movement. The second involved a motorized wheelchair crossing Notre Dame Avenue that was struck by a southbound right turning vehicle in the northwest corner of the intersection. The collision report indicates that the driver failed to yield the right-of-way to the pedestrian.

Completed Intersection Improvements

The following are some of the pedestrian safety improvements that have already been implemented at the intersection within the last few years:

- The pedestrian crossing times at the intersection were increased based on a slower than normal walking speed to account for the needs of seniors and special needs persons. This provides more time for pedestrians to complete their crossing.
- In 2008, as part of the reconstruction of Notre Dame Avenue, pedestrian push buttons and poles were installed closer to the crosswalk so that they would be more visible and easier for pedestrians to access.
- In 2010 the City painted zebra striped pedestrian crosswalks at the intersection to enhance the visibility of the crosswalks.
- In 2011 pedestrian count-down signals were installed at the intersection to improve pedestrian safety.

Pedestrian Right-of-Way

At the majority of traffic signals in the City, pedestrians cross the road with a walk display at the same time and direction as vehicles receive a green ball display. East and westbound traffic at the subject intersection currently operate in this manner.

In accordance with the Highway Traffic Act, at a traffic signal *“every pedestrian who lawfully enters a roadway in order to cross may continue to cross as quickly as reasonably possible despite a change in the indication he or she is facing, and for the purpose of crossing, has the right-of-way over vehicles”*. Therefore, vehicles turning right or left on a green ball must yield to pedestrians lawfully in the crosswalk.

At some signalized intersections, the City has installed various types of special left turn phases to improve the operation and safety of left turn movements. The decision whether to provide a left turn phase and the type to use, is based on a number of factors which include: the volume of left turns, volume of opposing

traffic, collision history, signal timing, number of left turn lanes and intersection geometry. While the introduction of a special left turn phase can reduce the number of conflicts between pedestrians and left turning traffic, they increase delay to pedestrians and all other movements of traffic and therefore should only be installed when warranted.

Existing Conditions

The traffic signals at the intersection of Notre Dame Avenue and Kathleen Street are coordinated with the signals at Leslie Street, King Street and Wilma Street to improve traffic flow and reduce delay and the number of stops. It should be noted that any increase to the signal cycle length at the subject intersection will result in the need to increase the cycle length at the other signalized intersections to maintain coordination. This will adversely impact the adjacent intersections by increasing the delay to minor street traffic and pedestrians waiting to cross Notre Dame Avenue. The existing cycle length for the Notre Dame Avenue system is 100 seconds.

Currently, the traffic signals at the subject intersection have an advance left turn arrow for northbound traffic on Notre Dame Avenue only. As previously described, pedestrians crossing Notre Dame Avenue will receive a walk display at the same time as east and westbound vehicles on Kathleen Street get a green ball. Left and right turning traffic must yield to pedestrians in the crosswalk. The existing level of service (LOS) for traffic on Notre Dame Avenue is 'B' with delays of sixteen (16) seconds. Traffic on Kathleen Street and the grocery store entrance are LOS 'C' with delays of about twenty-two (22) seconds.

The advantages for the existing mode of operation include the following:

- Maximize capacity.
- Minimize the overall intersection delay.
- Can operate at a lower cycle length compared to the other modes.

The disadvantage of this type of operation is the increased number of conflicts between left turning vehicles and opposing vehicle and pedestrian traffic.

Option #1 - Protected and Permissive Left Turn Operation

Under this scenario, eastbound and westbound left turning vehicles are first given a protected interval (green arrow) during which they may turn with opposing traffic stopped. The associated through and right turning vehicles are also allowed to proceed during the protected left turn phase if there are no opposing left turning vehicles.

Pedestrians are prohibited from crossing the path of the left turning vehicles during the protected left turn movement. After the protected movement terminates, the opposing traffic is released with a normal green ball display. Left turning vehicles are still permitted to turn; however, they must yield to any opposing vehicle traffic and pedestrians in the crosswalk. An example of an intersection with this type of phasing is Elm Street at Elgin Street, where northbound and southbound traffic on Elgin Street have protected and permissive left turn phases.

The advantages of this type of operation include:

- Increased left turn capacity.
- Provision for efficient left turn movement operation, often without causing a significant increase in delay to other movements.
- Reduction in angle and side-swipe types of collisions that involve left turning vehicles.

The disadvantages for this mode of operation include:

- Increased overall delay at the intersection.
- Need to increase the cycle length which will increase delay at adjacent intersections.
- Requirement to provide exclusive left turn lanes.
- Permissive phase still results in conflicts between left turning vehicles and pedestrians as well as opposing vehicle traffic.

Our analysis indicates that implementing protected and permissive left turn phasing for eastbound and westbound traffic on Kathleen Street will result in the need to increase the cycle length from 100 to 110 seconds. The level of service for traffic on Notre Dame will go from 'B' to 'C' in the afternoon peak hour with delays of 24 seconds.

The estimated cost to implement this option is \$30,000. This mode of operation will also require work on private property which will include eliminating some parking spaces and adding pavement markings for a left turn lane. Staff will need to negotiate with the property owner and enter an agreement to undertake the work on their property.

Option #2 - Fully Protected Left Turn Operation

Under this scenario, east and west left turn movements are provided their own traffic signal heads and operate as opposing simultaneous protected left turn phases. During this phase, traffic can only make a left turn and no other conflicting vehicle or pedestrian traffic is allowed to enter the intersection. After the simultaneous protected left turn phase has terminated, the right-of-way is transferred to straight through and right turning traffic on Kathleen Street and the grocery store driveway. During this movement, pedestrians who have actuated the pedestrian pushbutton are allowed to cross Notre Dame Avenue. An example of an intersection with this type of phasing is Paris Street at Brady Street where eastbound and westbound traffic on Brady Street have simultaneous fully protected left turn phases.

The advantages of this type of operation include:

- Increased left turn capacity.
- Conflicts eliminated between left turning traffic and opposing vehicles, and pedestrians.

The disadvantages for this mode of operation include:

- Increased delay to all movements of vehicles and pedestrian traffic.
- An exclusive left turn lane is required.
- Increase in the signal cycle length.
- Requires the construction of a median island on the east side of the intersection.

Our analysis indicates that by implementing fully protected left turn phasing, the signal cycle length will need to be increased from 100 seconds to 120 seconds. This will increase delay and reduce level of service for southbound traffic on Notre Dame Avenue from 'B' to 'C'. Delay on Kathleen Street will also significantly increase from 22 seconds to 44 seconds and the level of service will drop to 'D'.

The estimated cost to implement this option is also more expensive at \$45,000. In addition to upgrading the traffic signals, construction will also be required on the east side of the intersection to construct a median island. The island will encroach onto private property and require significant changes to the grocery store parking lot. The estimated cost does not include construction of the island or any work on private property.

Option #3 - Split Phasing

Under this scenario, the eastbound and westbound movements are allowed to proceed through the intersection during their own phase while all other conflicting traffic movements have red displays. This movement consists of green left arrow displays and green ball displays. Split phase timing allows pedestrian crossing movements to be completely free from conflicts with left turning vehicles. After the green intervals are terminated, the eastbound or westbound traffic will receive a clearance interval prior to the right-of-way being transferred to Notre Dame Avenue. This phasing is typically less efficient than other types of left-turn phasing. It usually increases the cycle length and/or reduces the green time available for the intersecting road. Due to the drawbacks of this mode of operation, it is generally only used at intersections with unusual lane geometry. An example of an intersection with this type of phasing is Lasalle Boulevard at Notre Dame Avenue which has split phases for eastbound and westbound traffic.

The advantages of this type of operation include:

- Traffic movements are totally separate.
- Conflict eliminated between pedestrians and left turning vehicles.
- Improved safety for intersections where the crash history indicates an unusually high number of sideswipe or head-on collision in the middle of the intersection involving left turning vehicles.

The disadvantages for this mode of operation include:

- Less efficient than other types of left turn phasing.
- Requires longer cycle length.
- Increased delay for vehicles and pedestrians.
- Usually inefficient particularly in low flow conditions.

The analysis shows that implementing split phasing for the eastbound and westbound movements on Kathleen Street will require that the cycle length be increased from 100 seconds to 125 seconds. As previously stated, the cycle lengths for the other signals along Notre Dame Avenue will also need to be increased to 125 seconds.

Split phasing will greatly increase the average delay for vehicle and pedestrian traffic on Notre Dame Avenue to 40 seconds and reduce the level of service from 'B' to 'D'. Delay for through traffic on Kathleen Street is also increased with this option.

The estimated cost to implement split phasing is approximately \$10,000. While modifications to the private parking lot on the east side of the intersection is recommended with this option, it is not a requirement.

Recommendations

The changes in Option #1 will not provide a definitive solution to the current safety concerns. While some of the left turning vehicles will proceed during the protected phase, frequent conflicts will still occur between left turning vehicles and pedestrians during the permissive phase.

Both Options #2 and #3 will separate the left turning traffic from conflicting with the pedestrians and provide a solution to the current safety concerns. However, they will significantly increase overall intersection delays and result in longer queue lengths on Notre Dame Avenue. The increased cycle length will create similar problems at Leslie Street, King Street and Wilma Street intersections.

These options will require significant upgrading to the current traffic signal plant. Some construction and alterations to the parking lot on private property will also be required on the east side of the intersection. Discussions and agreement with the property owner will need to occur prior to any changes taking place.

A review of the collision data revealed that neither of the two (2) pedestrian collisions at this intersection would have been preventable with the implementation of any of the three (3) options.

Based on the above information, staff recommends that no changes be made to the existing traffic signal control at this time. Staff will continue to monitor pedestrian safety at the intersection to determine if improvements are required. Also, staff will continue to research new ways to enhance pedestrian safety within the city.