SUBJECT: Operational Improvements for James Street and John Street (PW08141) - (City Wide)

RECOMMENDATION:

(a) That improvements to traffic signal timing, signal operations and roadway pavement markings on James Street and John Street be undertaken in 2008 and 2009, with the introduction of actuated operation at designated minor intersections in 2009 in the amount of $60,000 be charged to the Traffic Signal Modernization Capital Account 4030914010;

(b) That the Postmaster General of Canada, the federal Minister of Transport, Infrastructure and Communities and the Member of Parliament for Hamilton Centre be advised of the effect on traffic flow of Canada Post vehicles in the west curb of James Street South during the afternoon rush hour and request that formal direction be given that would prohibit Canada Post vehicles from stopping, parking or loading on James Street South during periods when traffic flow would be impacted, particularly weekdays from 4:00 p.m. to 6:00 p.m.;

(c) That staff continue to review and implement as applicable, subject to planning for rapid transit, longer-term direct and indirect measures which might reduce traffic congestion on James and John Streets, which may include construction, transportation demand management, information systems or public information programs.
EXECUTIVE SUMMARY:

The purpose of this report is to respond to the Public Works Committee request about improving traffic flow on James Street and John Street.

The Downtown Transportation Master Plan (DTMP) contains recommendations for the conversion of a number of streets from one-way to two-way operation. During recent Committee discussions about the five-year review of the DTMP, concerns were expressed about the proposed conversion to two-way operation of York Boulevard/Wilson Street, in the context of the operation of James Street and John Street, which had previously been converted to two-way operation.

The five-year review, which supported the initial DTMP recommendation to convert York Boulevard, was approved. However, capital funding for the York project is still to be approved as part of the 2009 budget process and Public Works Committee directed staff to undertake a review of the operation of James and John and to report back as to what improvements might be made. This was in the context of background to the capital budget decision.

A combination staff and consultant review of James/John was undertaken. It determined that overall traffic volumes in the corridor had not changed just shifted from one street to the other. Additional delays in the range of one to three minutes are continuing to be encountered, especially during peak hours of traffic flow. The conversion of James and John Streets to two-way imposed some basic constraints which are inherent to two-way operation in terms of lane reductions and traffic signal timing which cannot be totally compensated for. However, some minor improvements in the areas of traffic signal timing and operations, pavement marking and one particular legislative/policy issue can be implemented in the short-term, and these are recommended for 2008/9. There are several medium- to long-term options which might also offer additional improvements and these should be investigated.

BACKGROUND:

The information in this report affects drivers and pedestrians from across Hamilton although James Street and John Street are located within Ward 2.

The Downtown Transportation Master Plan (DTMP) was completed in 2001. It contained many recommendations for improved and altered transportation in the downtown core, with emphasis on converting a number of one-way streets to two-way operation. The attached plan shows the proposed conversions.
With regard to the impacts of the changes, the DTMP stated the following:

“Traffic Flow - The overall effect of the project will be slower moving motor vehicle traffic but with more direct, less circuitous routing and improved way-finding for drivers, and shorter trips. More direct access will be provided to all businesses on new two-way streets.

Parking manoeuvres, left turns onto side streets and less optimum signal timing progressions will create more stoppages in traffic than at present. As a result, traffic will generally move slower resulting in more congestion.”

The report predicted traffic delays for the year 2021 by noting that:

“Average travel times for through trips (i.e. trips on the major east-west and north-south arterials) would increase by about 1.5 minutes.”
The first streets to be considered for conversion were James Street and John Street. The conversion took place in two steps, with the area north of King/Main completed in October, 2002 and the remaining portion south to the base of the Escarpment completed in November, 2005.

Under the requirements for an Environmental Assessment, projects not completed within a five year time frame must be revisited. The review of the recommendations of the Downtown Transportation Plan was completed and presented to Public Works Committee on August 7, 2008. One of the primary recommendations in the report is to proceed with the conversion to two-way operation of York Boulevard/Wilson Street from Bay Street to Wellington/Victoria. Committee discussion about this conversion referenced the quality of the traffic flow on James and John, particularly the portions of those streets south of King and Main. Staff was directed to review the operation of these two roadways to determine if improvements could be made and report back.

In order to respond to the request, staff, with the assistance of an external consultant, reviewed the quality of the current operation, brainstormed a wide range of alternatives with representatives of a number of departments and sections, and assessed the potential of each in improving the operation of James Street and John Street. This report summarizes the findings and should provide input as to expectations for the proposed conversion of York Boulevard.

**ANALYSIS/RATIONALE:**

**Basic Impacts of Conversion from One-way to Two-way**

The primary reasons stated for converting one-way to two-way include provision of a pedestrian-friendly, walkable environment, the creation of an environment which would encourage business development, improved circulation and “the slowing of traffic”.

There are two primary factors which dictate the quality of traffic flow when a street is converted from one-way to two-way. These are the spacing of the traffic signals (distance between signalized intersections) and the need to provide separate traffic lanes for left turns.

In a one-way street system, the spacing of traffic signals has little effect on the ability of the system to move traffic. In a two-way system, there is an optimum spacing which must be maintained so that smooth flow can occur in both directions. For James/John, depending on which signal pattern is in use, this distance is between 470 and 610 metres. Hamilton’s downtown core, with signalization based historically on one-way operation, has much closer spacing, so “perfect” two-way flow is mathematically not possible. The closer the signals are, the worse the impact.

Prior to conversion, James Street and John Street south of King/Main were both four lane one-way arterials. Thus, south of King/Main there were eight total lanes available within the corridor for rush-hour traffic. Once the conversion took place, in order to accommodate safe and expeditious flow of traffic, left turn lanes had to be provided on both streets at a number of locations. The end result was that both James and John became streets with three moving lanes and the remaining lane dedicated to providing for various turning movements. Thus, the net condition is an immediate 25% reduction in the ability of the corridor to carry traffic. This impact is primarily felt at rush hours when
the largest traffic volumes are present. Left turn restrictions could be used, but these would negate the intent of improved circulation.

Traffic Volumes

A review of traffic volumes was carried out by the five-year review of the DTMP to determine the extent of traffic diverting from the corridor, which had been anticipated as a possible side effect of two-way conversion. Exhibit 2 and Exhibit 3 show peak hour volumes on James and John Street North and James and John Street South before and after two-way conversion. Peak hour is taken as the highest of the AM or PM peak hour volume in the most recent year, and compared to the same period in the previous year. Where a new movement was created, the volume comparison includes the total traffic carried on James Street and John Street as stacked bars in the charts.

Exhibit 2: Traffic Volume Comparison on James Street North and John Street North between Barton and Cannon (Peak Hour)
Exhibit 3: Traffic Volume Comparison on James Street South and John Street South at Hunter (Peak Hour)

The above exhibits indicate that while traffic volumes have decreased in the original directions on James Street and John Street, the volume decrease appears to simply transferred to the new lanes available. That is, the pre-conversion volumes appear to still be travelling within the James/John corridor, although now on a reduced number of through lanes.

Current Travel Conditions

While travel time studies were conducted for the update to the DTMP, to respond to Committee on this question, it was felt that new and more comprehensive data was required.

James Street and John Street were studied on weekdays in the late summer/fall of 2008 during the following time periods:
- 7:00 am to 9:00 am
- 11:30 am to 1:30 pm
- 4:00 pm to 6:00 pm
- 9:00 pm to 10:30 pm (used as the “free-flow” condition, which represents a situation with little or no congestion, and is close to the optimum travel pattern)

A number of trips, acting as an “average” vehicle, were performed in each direction, to ensure statistical validity.

James Street was studied between Strachan Street East and Gateview Drive and John Street was studied from Strachan Street East and Concession Street.

The following table describes the travel times and delays for various time periods and directions.
Table 1: Average Travel Time Comparison

<table>
<thead>
<tr>
<th>Direction of Travel</th>
<th>Free Flow (FF) (m:s)</th>
<th>AM Peak (Diff. from FF) (m:s)</th>
<th>Mid-Day (Diff. from FF) (m:s)</th>
<th>PM Peak (Diff. from FF) (m:s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>James NB</td>
<td>5:28</td>
<td>8:02</td>
<td>6:25</td>
<td>8:30</td>
</tr>
<tr>
<td></td>
<td>2:34</td>
<td>2:57</td>
<td></td>
<td>3:02</td>
</tr>
<tr>
<td>James SB</td>
<td>4:10*</td>
<td>5:21</td>
<td>7:17</td>
<td>7:57 (See note)</td>
</tr>
<tr>
<td></td>
<td>1:21</td>
<td>3:07</td>
<td></td>
<td>3:47</td>
</tr>
<tr>
<td>John NB</td>
<td>4:45*</td>
<td>7:22</td>
<td>5:12</td>
<td>7:50</td>
</tr>
<tr>
<td></td>
<td>2:37</td>
<td>0:27</td>
<td></td>
<td>3:05</td>
</tr>
<tr>
<td>John SB</td>
<td>5:25</td>
<td>6:47</td>
<td>5:46</td>
<td>7:32</td>
</tr>
<tr>
<td></td>
<td>1:22</td>
<td>1:21</td>
<td></td>
<td>2:07</td>
</tr>
</tbody>
</table>

Note: None of the p.m. peak travel studies encountered a parked Canada Post vehicle, which would have increased delay for this time and direction.

The John Street northbound and James Street southbound free-flow conditions (marked with a *) can be assumed to be similar to travel that would have been prior to the conversion.

The magnitude of the extra delay in rush hour for the major directions is in the range of one minute and twenty seconds to three minutes and fifty seconds. On a percentage basis, the additional delay is an increase of from 32% to 90%. These delays are longer than predicted by the original DTMP report, for which there may be two reasons. First, there was an expectation that the slower speed and added congestion of the two-way conversion would cause a diversion of traffic away from the downtown streets, but the data above shows that diversion has not occurred. Second, while the consultant used a sophisticated, micro-level model, it is still not possible to capture all of the effects, such as illegal parking, or vehicle breakdowns, which cause congestion. When a street system such as James/John is operating close to, or over, its maximum ability to carry traffic, it becomes very sensitive to minor effects such as this.

It can be seen that the “new” directions of travel created (northbound James, southbound John) are typically between 30 seconds and one minute slower to travel than the parallel street with the original movement in the same direction.

Three specific areas of congestion were noted in the travel time study as affecting through travel. Northbound James Mountain Road at St. Joseph’s Drive now has long waits in the both peak periods, due to the new traffic signal at St. Joseph’s and James required because of the crossing left turn movement. Northbound John Street at King Street now has to wait for opposing southbound through traffic and the queue backs up south of Main Street on occasion. Northbound John Street at Main Street used to have a dedicated right turn lane and a shared right turn lane. It now has to operate with only a shared lane, backing up traffic to Hunter Street at certain times. As well, while not impacting on through travel that was surveyed, southbound right turns from James Street to King Street experience queuing and delays.

The other factor noted was the quality of the traffic flow. The preferred outcome of two-way conversion would be slow, but steady, traffic flow. In reality, however, the flow is
very uneven, characterized by many stops and starts. The introduction of additional stops and idling causes poorer air quality and increased noise.

Expressed as speeds, the information is as follows:

### Table 2: Average Speed Comparison

<table>
<thead>
<tr>
<th>Direction of Travel</th>
<th>Free Flow (FF) (km / h)</th>
<th>AM Peak (Diff. from FF) (km / h)</th>
<th>Mid-Day (Diff. from FF) (km / h)</th>
<th>PM Peak (Diff. from FF) (km / h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>James NB</td>
<td>24.03</td>
<td>16.49 (-7.54)</td>
<td>21.78 (-2.25)</td>
<td>16.40 (-7.63)</td>
</tr>
<tr>
<td>James SB</td>
<td>30.82</td>
<td>23.15 (-7.67)</td>
<td>18.84 (-11.98)</td>
<td>16.62 (-14.20)</td>
</tr>
<tr>
<td>John NB</td>
<td>26.46</td>
<td>17.39 (-9.07)</td>
<td>24.37 (-2.09)</td>
<td>17.76 (-8.70)</td>
</tr>
<tr>
<td>John SB</td>
<td>23.61</td>
<td>18.24 (-5.37)</td>
<td>22.39 (-1.22)</td>
<td>16.93 (-6.68)</td>
</tr>
</tbody>
</table>

### Impact on Transit

The impacts on transit operations are similar to those on overall traffic flow, since the transit vehicles share the traffic lanes.

Prior to the second phase of James/John conversion, the right-hand curb lane James Street and John Street essentially functioned as a bus lane. Given the bus volumes operating in the corridor, it provided good service as many motorists chose to only enter the curb lanes to prepare for right turns. The reduction in corridor capacity resulting from the conversions, not accompanied by a reduction in overall traffic volumes, has resulted in rush hour delays to transit. From a transit passenger perspective, increases in on-bus travel times can have a negative impact on transit usage. Slower transit routes do not support City-wide Transportation Master Plan goals to encourage a shift from the private auto towards alternative modes, such as transit. Improving transit travel times on major arterials that link major activity centres can make a positive contribution in helping to convert car drivers into transit passengers.

Post-conversion, HSR did not realign routes to travel two-way on either James or John, since the new lane provided could not accommodate bus stops without blocking through traffic. Given that travel time on the "new" directions of travel is up to 1 minute slower, remaining status quo with the route alignments was probably a good strategy.

The proposed shift in location of the transit centre will move vehicles away from the congestion point at southbound James at King, but will introduce many more exiting bus movements from the Hunter Street terminal onto John Street, creating additional congestion at that location. The northbound left turn from John Street to King Street will remain as a congestion point for HSR in the new configuration, as a result of northbound left-turning traffic having to yield to southbound through traffic, although minor signal timing changes will improve conditions slightly.
Proposed Improvements

A technical team that included staff from a wide range of City departments and sections, along with the consultant, participated in a brainstorming session. The possible solutions were divided into those that could be implemented immediately and those which needed further investigation or were longer-term due to financial, property or other constraints. The entire list of items considered along with comments about applicability is included in Report PW08141 as Appendix A.

The short-term recommended improvements are as follows:

Signal Timing Changes

As part of the City’s on-going project to retime traffic signals across the City, the signal timing plans for the James/John corridors were reviewed using a computer simulation and optimization tool. As noted above, it is not possible to provide smooth two-way flow, given the spacing of the traffic signals. However, some fine-tuning is possible. On an overall basis, timing of traffic signals is designed to minimize the total or overall delay to all users in the system. By doing so, this also reduces the emission of air pollutants and greenhouse gases. This is important because researchers have already noted that our arterial roadways are the locations with the heaviest concentrations of air pollutants, and it is desirable in the interest of creating a pedestrian friendly environment to minimize air pollution in the James/John corridor. The roadways, under the two-way configuration, now have two lanes in the previous direction and one lane in the new, opposing direction. In addition, the two lane direction tends to be more heavily utilized as the “new” direction is intended to serve more of a local destination and convenience function rather than a through movement function. Therefore, the timing of the traffic signals tends to favour the previous or heavier movement. The revised signal timings will continue to favour the direction with the heaviest volume and movement of traffic.

Table 3 shows the expected improvements in travel times with the improved timings:

<table>
<thead>
<tr>
<th>Direction of Travel</th>
<th>Current AM Peak Travel Time (Predicted Improvement) (m:s)</th>
<th>Current PM Peak Travel Time (Predicted Improvement) (m:s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>James NB</td>
<td>8:02 0:60</td>
<td>8:30 0:30</td>
</tr>
<tr>
<td>James SB</td>
<td>5:21 -</td>
<td>7:57 -</td>
</tr>
<tr>
<td>John NB</td>
<td>7:22 0:05</td>
<td>7:50 0:30</td>
</tr>
<tr>
<td>John SB</td>
<td>6:47 0:10</td>
<td>7:32 0:15</td>
</tr>
</tbody>
</table>

The revised timings offer some improvement, but can only somewhat compensate for the two-way conversion. The revised signal timings will be prepared and installed before the end of the year.
Implement Actuated Control

The traffic signals presently all operate on a series of fixed patterns, without regard for vehicular or pedestrian traffic volumes. This is fine for peak hours as the volumes are consistent, heavy and predictable, day-to-day. However, at periods of the day when traffic is light, avoiding a signal change or minimizing the time the signal is not supplying green to the main street can have a positive effect. Minor intersections (James at Rebecca, James at Bold, James at Young and John at Young) have been identified for conversion to actuated operation, where the signals are called for by sensors in the road or by pushbutton for the pedestrians. These will be implemented as part of the City’s Traffic Signal Modernization program in 2009, subject to capital budget approval of the funding.

Revise Pavement Markings

There are two locations, northbound James at Hunter and northbound John at Cannon, where a driver who is not paying attention to signing, may be trapped in a continuous lane which changes to a mandatory left turn lane. Pavement marking changes will be implemented to help to smooth out flows in these areas.

Council Resolution re: Parking of Canada Post Vehicles

Observations on James Street South, by Hamilton Municipal Parking staff have identified that Canada Post vehicles are undertaking loading activities on the west side of James between Young and Duke during the afternoon peak period. This has been an ongoing problem for some time, and earlier this year, the presence of these postal vehicles was almost every afternoon and in some cases, they were observed loading twice during the peak period. The combination of the Canada Post vehicles, left turns into Young Street and a transit stop, creates a bottleneck that can back up southbound James Street for several blocks as it effectively reduces the number of southbound traffic lanes by one. Canada Post vehicles are exempt from all City parking and stopping regulations. Previous informal contact with Canada Post has had no impact on the frequency of deliveries at this location. Since it is unclear if the current situation is permanent, it is recommended that Canada Post be formally requested by Council to have their vehicles obey all existing traffic and parking regulations at this location and specifically to permanently alter their scheduling of deliveries to occur outside of the afternoon peak traffic period.

Longer-Term Investigations and Actions

On a longer-term basis, revisions to the northbound right turn at James Mountain Road and St. Joseph’s Drive hold promise for possibly relieving congestion at this location, but the City does not have sufficient property. As well, the use of traffic information systems, particularly to address the James Mountain Road at St. Joseph's queue problem, might be considered if reconstruction is not possible. These options will be investigated.

Future Impacts

The implementation of the proposed rapid transit route in this corridor has the possibility of having an additional, profound effect on traffic flow in the corridor. The aggressive implementation of Transportation Demand Management (TDM), as identified in the Hamilton Transportation Master Plan may help to reduce the use of single occupant motor vehicles in the short-term.
Conclusion

It is not possible to compensate for most of the traffic effects caused by two-way conversion, as the roadways simply have less overall ability to carry traffic. However, some changes are possible to improve operations, and it is recommended that these changes to traffic signal operation and pavement markings be made. In addition, staff should be directed to consider longer-term approaches, subject to the decisions on rapid transit for this corridor, which may totally change the status of James/John.

**ALTERNATIVES FOR CONSIDERATION:**

Of the thirty-one alternatives considered by the staff/consultant team, only thirteen are put forward as appropriate for implementation or further review. The other alternatives could be considered, but generally these are contrary to the basic philosophy of the two-way conversion, in that they would restrict pedestrian movements or reduce the freedom of circulation that was identified in the underlying principles related to the approved two-way conversion plan.

**FINANCIAL/STAFFING/LEGAL IMPLICATIONS:**

The short-term changes noted above can be undertaken by existing City staff. The basic signal and pavement marking changes can be undertaken using current or planned operating and capital budgets. The addition of actuated control (estimated at $60,000) would be funded from the Annual Traffic Signal Modernization capital account for 2009. Sufficient funds would exist in the capital account as presently submitted, to complete this work in 2009, assuming the capital budget is approved as submitted.

The medium-term and long-term alternatives will require additional staff time, and possibly consultant assistance to review.

**POLICIES AFFECTING PROPOSAL:**

The City’s Strategic Plan supports Vision 2020 under the Goal of being A Great Place To Live. Optimizing the operation of James Street and John Street is in line with Vision 2020.

The Public Works Strategic Plan goal of being a leader in greening and stewardship supports the recommendations of this report.

While not policies per se, the DTMP and the five-year review of the plan identifies the basic philosophy which guides the operation of James and John Streets and other potential two-way street conversions.

**RELEVANT CONSULTATION:**

Public Works: Capital Planning and Implementation, Transit Planning and Economic Development: Parking and By-law Services Corporate Services: Finance and Administration
CITY STRATEGIC COMMITMENT:

By evaluating the “Triple Bottom Line”, (community, environment, economic implications) we can make choices that create value across all three bottom lines, moving us closer to our vision for a sustainable community, and Provincial interests.

**Community Well-Being is enhanced.** ☑ Yes ☐ No
Improving traffic flow would increase the ease of access to the James/John area and improve transit flow.

**Environmental Well-Being is enhanced.** ☑ Yes ☐ No
Better traffic flow means less greenhouse gas and air pollution production.

**Economic Well-Being is enhanced.** ☑ Yes ☐ No
Better traffic flow means lower fuel costs for the users of the James/John corridor. It also might assist businesses in the area.

**Does the option you are recommending create value across all three bottom lines?**
☑ Yes ☐ No

**Do the options you are recommending make Hamilton a City of choice for high performance public servants?**
☐ Yes ☑ No
OPERATIONAL IMPROVEMENTS FOR JAMES STREET AND JOHN STREET

The staff and consultant team considered a wide range of possible changes in the categories of operational improvements, policy opportunities, geometric improvements, and corridor opportunities. Thirty-one alternatives were originally considered. Some were investigated and deemed contrary to the spirit of two-way conversion, such as removing parking or restricting turn movements. Others were found to add to congestion or do nothing to relieve it, such as adding scramble phases. Finally there was a group that was found to be unreasonably expensive or restricted by regulations, availability of land, etc.

Following is a list of actions with regard to the operation of the John Street and James Street corridors in downtown Hamilton which appear to have potential for a positive effect, although the medium- and long-term alternatives will need further review.

1.1 Short Term Recommendations

1.1.1 Signal Timing Changes

As part of the City’s on-going project to retimte traffic signals across the City, the signal timing plans for the James/John corridors were reviewed using a computer simulation and optimization tool. The roadways, under the two-way configuration, now have two lanes in the previous direction and one lane in the new, opposing direction. The signal timings will be fine-tuned but will continue to favour the direction with the heaviest volume and movement of traffic, for environmental and efficiency reasons. As shown in Table 3, this will provide a minor improvement, but will not eliminate the delays currently being experienced.

1.1.2 Add Traffic-Responsive Control to Minor Signals

In conjunction with signal timing changes, implement semi-actuated operation at intersections with low side street and pedestrian volumes. The recommended intersections are: James at Rebecca, James at Bold, James at Young and John at Young.

1.1.3 Council Resolution re: Parking of Canada Post Vehicles

City staff should prepare a report to City Council recommending that Canada Post be requested to have their vehicles obey all existing traffic and parking regulations and, specifically to alter their delivery times such that postal vehicles are not loading/unloading on James Street South during the p.m. peak period.

1.1.4 City Activities during Peak Hours

Initiate the practice of prohibiting City Works activities (e.g. Garbage pick-up), except those required due to an emergency, from taking place in key lanes, similar to restrictions placed on private contractors. Staff will review operations to determine the impacts of this suggestion.

1.1.5 Truck Prohibition

Refer this suggestion to the City’s Truck Route Master Planning Study.
1.1.6 Pavement Marking Revisions
Determine whether pavement marking changes to help drivers to understand when travel lanes convert to mandatory left turn lanes are feasible. Minor changes may be possible for northbound James at Hunter and northbound John at Cannon.

1.2 Mid Term Recommendations
These changes are, at least partially, dependent on the decision regarding rapid transit in the James/John corridor. Introduction of rapid transit will require radical changes in traffic operations, making some of the changes redundant.

1.2.1 Widen James St. and St. Joseph’s Dr. to Add a Northbound Right Turn Lane
Determine if a double right turn could reduce congestion. Construct the northbound right turn lane after property is acquired. The required property appears to be under hospital ownership.

1.2.2 Review the Potential for Conversion of the Intersections of James Street at St. Joseph’s Drive and John Street at St. Joseph’s Drive to Roundabouts
Undertake a review of the need and feasibility of roundabouts after signal timing changes and the geometric change in 1.2.1 have been implemented.

1.2.3 Transportation Demand Management
Continue to pursue TDM measures in the Downtown area to reduce the number of single occupant passenger vehicles on roads in the study area.

1.2.4 Bus Stop Locations
Consider whether bus stops could be consolidated or relocated from near-side to far-side to provide and transit or traffic flow advantages.

1.2.5 Part-time Turn Restriction at John and Hunter
Consider whether a peak-hour left-turn turn prohibition at John and Hunter would be justified, in view of the reduced access to the GO Transit centre.

1.3 Long Term Recommendations

1.3.1 Traffic Responsive Control
Undertake a feasibility study for the implementation of a traffic responsive traffic control system in the Downtown area. This is a type of operation that can change one or many parameters of timing of individual signals and the network in almost immediate response to traffic flow changes. Such systems are complex and expensive, but have the potential to react to on-street conditions, rather than depend on predicted volumes. It would be necessary to undertake a study to compare the benefits versus the cost of implementing this expensive type of control.

1.3.2 Use of Monitored Corridors and Variable Message Signs
Consider implementing the use of Closed Circuit Television and/or variable message signs to advise motorists of delays, collisions, etc. in the downtown area. This work could be coordinated with the installation of a traffic responsive traffic control system in the Downtown area.