TOWN OF CALEDON

Region of Peel
Working for you









EXECUTIVE SUMMARY FOR

THE BOLTON TRANSPORTATION MASTER PLAN STUDY

AUGUST 2015

MMM GROUP

D16-14-012

1.0 INTRODUCTION

Bolton is expected to experience significant population and employment growth in the near future, bringing economic benefits to the Community and the Town of Caledon. However, the anticipated development in Bolton and along the planned Highway 427 extension could also have major impacts on transportation facilities. A Transportation Master Plan (TMP) is an effective strategic tool to guide the development of transportation infrastructure and programs, thus helping to maintain the current high quality of life in downtown Bolton and the Community as a whole.

The TMP study followed a comprehensive and consultative transportation master planning process consistent with the Municipal Class Environment Assessment Act. It identifies transportation deficiencies and road network issues, while supporting municipal planning goals for the short, medium and long term.

Goals of the TMP study include:

- Supporting current and future municipal planning objectives by optimizing transportation capacity to accommodate planned growth in the study area, and to mitigate negative impacts from the perspective of transportation, environment, health and economy;
- Identifying opportunities for improved transit services (rail and bus) connecting Bolton to the area;
- Articulating a Bolton core transportation vision, identifying and assessing the current and future transportation needs and developing alternative solutions and recommendations;
- Catering for trucks servicing businesses in Bolton while reducing the impact of through truck traffic on the downtown core;
- Exploring and identifying opportunities to enhance pedestrian, parking and cycling infrastructure; and
- Proactively engaging stakeholders to identify collaborative transportation solutions that will result in a better quality of life.

As shown in Figure 1 overleaf, the TMP study area is bounded by:

- The Gore Road to the west;
- Caledon King Town Line/Albion Vaughan Road to the east;
- Old Church Road to the north; and
- Mayfield Road to the south.



Figure 1: TMP Study Area

For the purposes of network analysis, the assessment of goods movement characteristics, the review of transit services and other aspects of the study, a broader area was also considered. This encompassed the west part of Vaughan, the northeast part of Brampton, the Town of Caledon as far as Airport Road to the west, and the area to the north as far as Highway 9.

1.1 HOW THE TRANSPORTATION MASTER PLAN WAS DEVELOPED

The development of the Bolton TMP was a collaborative effort between the Town of Caledon, Region of Peel, MMM Group and the general public to identify existing transportation concerns and to envision a more sustainable, multi-modal future for the Community.

The Bolton TMP has been conducted in line with the Municipal Class Environmental Assessment (EA) process, which requires the following to be undertaken:

- Phase 1: Identification of a problem, deficiency or opportunity; and
- Phase 2: Identification of alternative solutions to address this by considering the existing environment and establishing the preferred solution.

Figure 2 shows the complete Environmental Assessment process. The phases covered by the TMP study are highlighted in red.

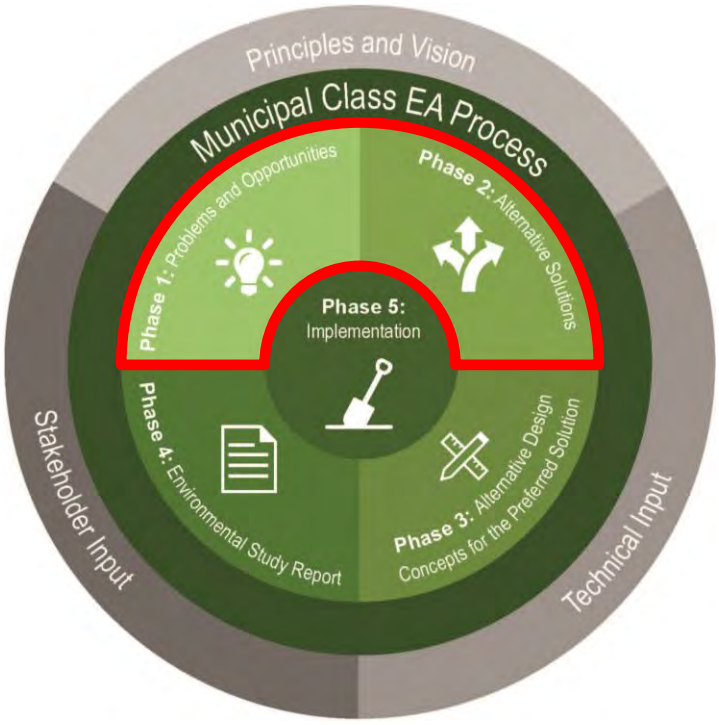


Figure 2: Environmental Assessment Process

1.2 THE PUBLIC AND STAKEHOLDER ENGAGEMENT PROCESS THE TRANSPORTATION MASTER PLAN WAS DEVELOPED

Public and stakeholder consultation and engagement are key components of a master planning project completed consistent with Phases 1 and 2 of the Municipal Class EA process. The process requires a minimum of two points of contact with members of the public and key stakeholders to review draft alternatives and to inform the identification of the preferred alternatives.

The public and stakeholder consultation and community process that was undertaken to inform the development of the Bolton TMP aimed to go beyond the Municipal Class EA requirements to involve residents, Town and Regional staff and stakeholders at key points in the study process and to provide them with a range of engagement alternatives e.g. online, in-person and at local community events.

At the beginning of the project, the consultant team worked with the Town of Caledon and the Region of Peel to prepare a communication and consultation strategy which was used as a guide for consultation timelines, objectives and key messages over the course of the project. The goal of the communication strategy was to identify key public, private, political, and technical groups that could provide the input needed to develop realistic and feasible solutions for the community of Bolton. Table 1 provides an overview of the **public agencies, businesses** and **interest groups, elected officials** and **members of the public** that were engaged over the course of the study.

Table 1 – Overview of Bolton TMP Stakeholder Contacts

Public Agencies	Businesses & Interest Groups	Elected Officials	Members of the Public
▶ Provincial Staff (MTO, MOECC, MMAH, etc.) ▶ Town and Regional Staff ▶ Staff from surrounding municipalities and Regions ▶ Metrolinx ▶ GO Transit	▶ Local / Regional Trail / Cycling Representatives ▶ Local Businesses ▶ Accessibility Committee ▶ BIA representation ▶ Transit Support groups	▶ Councilor representation from each of the Wards within the Town	▶ Youth & Seniors ▶ Working Professionals ▶ Multi-generational families ▶ Multi-lingual families ▶ Rural residents

Table 2 provides an overview of the consultation and engagement activities that were undertaken over the course of the project. All input received was documented and incorporated into the development of the master plan recommendations.

Table 2 – Overview of Consultation Activities

Consultation Method	Objective	Activities
Ongoing Consultation & Outreach	▶ To provide members of the public and stakeholders with ongoing and consistent communication and outreach regarding the study to ensure that they are up to date with study findings and are aware of the consultation and engagement opportunities as they arise.	▶ Study promotional Business Card ▶ Study Webpage ▶ Promotional Posters & Project Notices
In-person Outreach	▶ To provide members of the public and stakeholders (where applicable) with the opportunity to engage one-on-one with study team members, discuss, review and comment on study findings and engage with other members of the community at local community locations or events when at key study milestones.	▶ Public Information Centre #1 ▶ Booth at Bolton Farmer's Market ▶ Public Information Centre #2
Stakeholder Engagement	▶ To strategically engage different stakeholders groups to review key elements of the master plan and to address specific concerns or highlight potential solutions based on their local experience or ideas moving forward.	▶ Stakeholder Workshop #1 ▶ Stakeholder Workshop #2
Steering Committee Coordination	▶ To engage with members of the steering committee on an ongoing basis to ensure that they are involved in the development of study findings and solutions. Meetings will also be used to ensure that the team is on-track and that key issues, challenges or opportunities are highlighted and addressed.	▶ Steering Committee Meeting #1 ▶ Steering Committee Meeting #2 ▶ Steering Committee Meeting #3 ▶ Ongoing Communication



Consultation Method	Objective	Activities
Documenting the Findings	▶ To clearly document the input received and demonstrate how it has been incorporated into the study report and how they mold study findings and solutions.	▶ Interim Consultation Summary Report ▶ Final Consultation Summary Report
Reporting to Council	▶ To highlight study findings and key outcomes of the master plan to Regional and Town Councils to demonstrate how the plan will move forward and to gather support and buy-in from local politicians to facilitate implementation.	▶ Presentation to Regional and Town Councils at project completion

As the project progressed more interest was generated which yielded more involvement at the public and stakeholder events and thus more input on key master plan recommendations. A complete synopsis of the efforts made to engage the public and stakeholders, input received, as well as an analysis of survey results is provided as an appendix of the main TMP report.

1.3 PROBLEM AND OPPORTUNITY STATEMENT

Phase 1 of the Municipal Class EA process requires that the problem, deficiency or opportunity be identified. The issues and opportunities facing the Bolton community to the year 2031 and beyond from a transportation perspective include:

- Population Growth: the challenges associated with enabling increasing numbers of people, and goods that they consume, to get where they want to go in the most efficient way possible.
- Truck Traffic Into and Through Bolton: While the newly-built Emil Kolb Parkway will facilitate truck movement, the issue of trucks, especially through the historic downtown, is one of the most pressing transportation concerns. Truck traffic has positive economic impacts on the community, while at the same time negatively affecting the livability of the area due to the noise and congestion caused by large vehicles.
- Downtown Heritage Preservation: The historic downtown of Bolton dates back to the late nineteenth century and should be preserved and promoted as the centre of the community, creating an atmosphere that will attract businesses and residents to this area.
- Multi-modal Transportation Options: there are currently limited opportunities to travel comfortably in Bolton by other modes of transportation besides the personal automobile. With a vision toward a more sustainable and varied transportation future, non-auto modes such as transit, walking and cycling should be planned and enhanced in the coming years.



2.0 PLANNING CONTENT

Considerable planning work has been done in the Town of Caledon, Peel Region and other levels of government. The development of the Bolton TMP has been shaped by policies and plans presented in the documents identified in Table 3 – Overview of Consultation Activities

below. Descriptions of the most important plans and policies from the Federal, Provincial, Regional, Town and bordering jurisdiction levels are documented in Section 2 of the main TMP report, along with their relevance to the study.

Table 3 – Overview of Consultation Activities

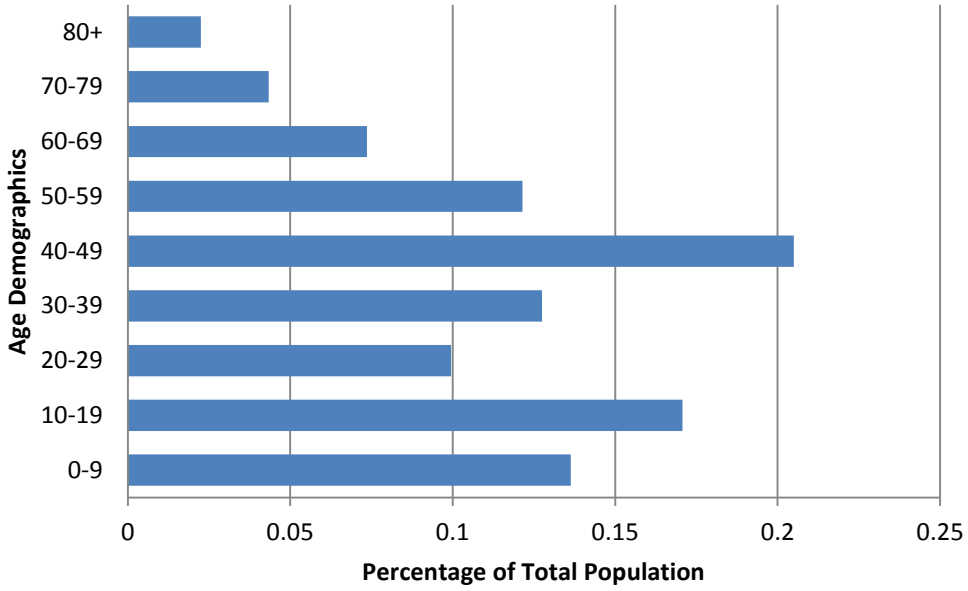
Federal	Provincial	Regional	Town	Neighboring Jurisdiction
National Vision for Urban Transit to 2020	Provincial Policy Statement (2014)	Peel Region Official Plan (2013)	Bolton Residential Expansion Study (BRES) 2012	King Township Transportation Master Plan (2015)
Federal Sustainable Development Act (2008)	Growth Plan for the Greater Golden Horseshoe (2013)	Strategic Goods Movement Network Study (2013)	Canadian Tire Distribution TIS (2012)	Brampton Transportation Master Plan Update (2015)
	Ministry of Transportation Cycling Strategy (2013)	Peel Region Long Range Transportation Plan (LRTP) Update (2012 Draft)	Bolton Commuter Rail Feasibility Study (2010)	County of Simcoe Transportation Master Plan (2014)
	Ontario Ministry of Transportation Transit Supportive Guidelines (2012)	Region of Peel Road Characterization Study (2011)	Caledon Transportation Needs Study Update (2009)	Highway 427 Industrial Secondary Plan - Area 47 (2014)
	GTA West Corridor Environmental Assessment (2012)	Peel Region Active Transportation Study (2011)		A New Path: Vaughan Transportation Master Plan (2012)
	The Big Move (2009)	Peel Region Transportation Demand Management (TDM) Plan (2008)		Health Background Study (2011) – Toronto Public Health / Peel Region
	Accessibility for Ontarians with Disabilities Act (2005)	Highway 50 / 427 Extension Area: Arterial Road Network Study (2007)		York Region Transportation Master Plan (2009)
	Greenbelt Plan (2005)			

3.0 ASSESSMENT OF EXISTING CONDITIONS CONTENT

The Census of Canada provides an insight into the socio-economic profiles of the Town of Caledon and the Community of Bolton, and traces their recent evolution. The following characteristics and trends were observed:

- Between 2001 and 2011, the population of the Town of Caledon almost doubled to 59,460. The population of the Community of Bolton nearly tripled to 23,174 over the same period.
- The median age of residents is 37 for Bolton and 40 for Caledon. As shown in Figure 3, the most populous age group in Bolton is 40-49. When combined with those under 20, this represents half of the Community, highlighting the significant presence of families in Bolton.
- Average household sizes are 3.1 and 3.3 persons in Caledon and Bolton, respectively, and have remained relatively stable over the last decade.
- In Bolton, average 2011 incomes were $45,828 for individuals and $104,708 for households. Though lower than the $50,911 individual and $119,258 household averages for Caledon in 2011, incomes in Bolton grew by around 14%, much faster than in Caledon, since 2006.
- Households in both Bolton and Caledon own an average of two cars each.

Figure 3: TMP Study Area



The 2011 Transportation Tomorrow Survey (TTS) recorded the following travel patterns:

- Of all morning peak period trips to or from Bolton, approximately 40% are internal, i.e. they both start and end in the Community.
- The main destination for Bolton-based commuters leaving the Community is the City of Toronto, followed by York Region and the Cities of Brampton and Mississauga.
- Morning trips destined for Bolton originate primarily in the adjacent municipalities of Caledon, Brampton and York Region.

These patterns are illustrated in Figure 4.



Figure 4: Trips From and To Bolton, Morning Peak Period

The TTS also indicates that, considering travel throughout the day, the overall proportion of auto driver trips starting or ending in Bolton decreased from 79% to 74% between 2001 and 2011. There was a corresponding increase in auto passengers over that period from 12% to around 15%, which suggests an increase in carpooling. Approximately 7% of trips were made by transit and 4% by bike or on foot in 2011.

Figures 5 - 8 show the modal splits of trips to and from Bolton in the morning and afternoon peak periods specifically.

Figure 5: AM Percentage Distribution of Primary Travel Modes Destined to Bolton, 2011

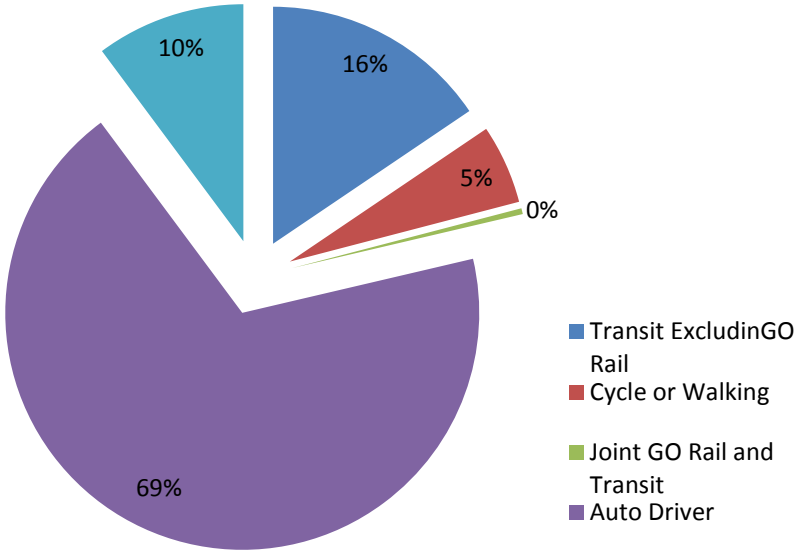


Figure 6: PM Percentage Distribution of Primary Travel Modes Destined to Bolton, 2011

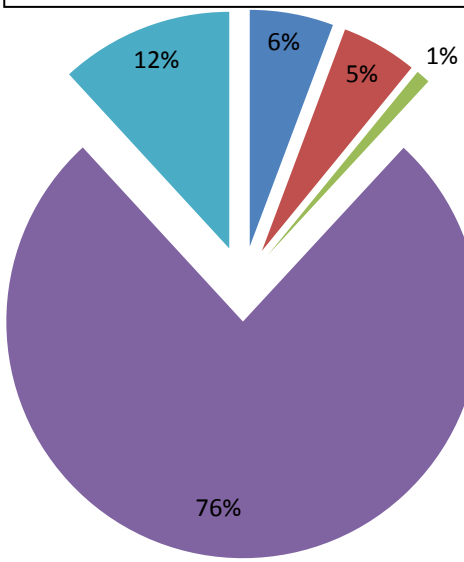


Figure 7: AM Percentage Distribution of Primary Travel Modes Destined to Bolton, 2011

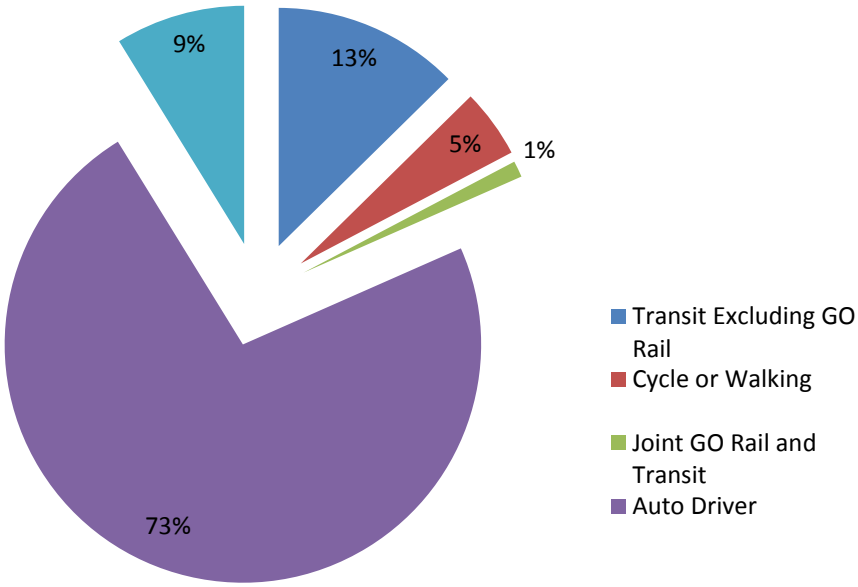
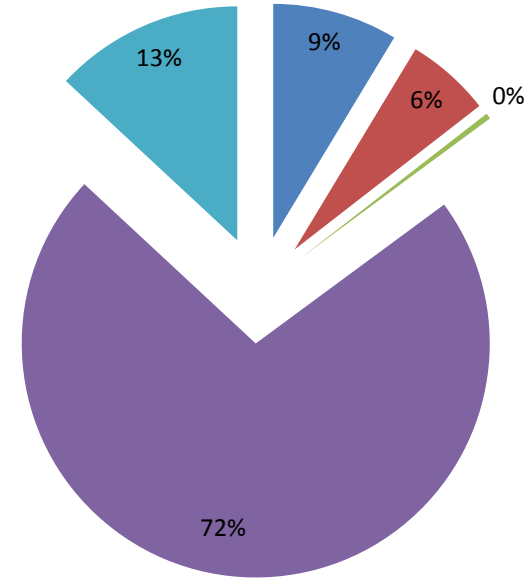


Figure 8: PM Percentage Distribution of Primary Travel Modes Destined to Bolton, 2011



As part of this study, Peel Region's 2007 Travel Forecasting Model (PFM) was reviewed, updated and used as a basis to determine the road improvements that are most appropriate for Bolton. The model improvements included updates to the seeding matrices, transportation analysis zones, the roadway network, and the model macros (used to run the model). Figure 9 is a model output in which the grey lines represent roadways in and around the study area, and the thickness of the red lines is proportional to the traffic volumes on those roads.

To analyze the current roadway network, a screenline analysis was used. A screenline is a group of count stations along a strategically placed imaginary line. Summing traffic data along this line gives the volume of traffic entering or leaving an area. This takes into account that, in a grid system, drivers may have parallel alternate routes.

In both the a.m. and p.m. peak hours, there are existing capacity concerns in the vicinity of:

- King Street; and
- Mayfield Road / Albion Vaughan Road.

The capacity concerns are southbound in the morning and northbound in the afternoon. The Gore Road has sufficient capacity to accommodate vehicles in both peak periods and directions.

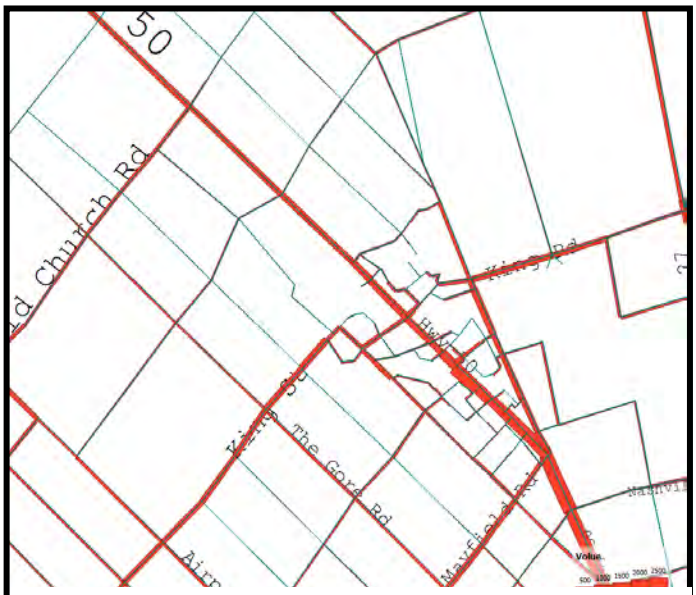


Figure 9: Existing Travel Flows

Intersection capacity analysis was undertaken for the following peak study hours: the weekday morning, midday and afternoon peak hours. Current intersection operation was found to be satisfactory in all but three locations, at which the following mitigating measures are proposed:

- Albion Vaughan Road intersection with King Road / King Street: an exclusive northbound right- turn lane should be provided to facilitate that movement in the afternoon; and
- Signal timings at the intersection of Mayfield Road and Albion Vaughan Road should be optimized to provide additional green time to the westbound left turn movement.

3.1 EXISTING ACTIVE TRANSPORTATION

Existing active transportation facilities in Bolton are:

- predominantly signed bike routes, hiking trails, footpaths and paved and unpaved multi-use trails;
- primarily located north of the railroad tracks in areas that are primarily residential; and
- Incomplete, particularly at barriers such as bridges over the railroad tracks.

Walking and cycling facilities are discussed in detail in a separate Active Transportation Strategy.

3.2 EXISTING TRANSIT

Currently, the only bus services to Bolton are operated by GO Transit and on weekdays only, along the routes shown in Figure 10:

- Route 38 travels along Highway 50, with 6 southbound buses from Bolton between 6 a.m. and the early afternoon, and 7 northbound buses from Malton GO station spread throughout the day. Connecting GO Rail and bus routes service Union Station in Toronto.
- Route 38A travels along Highways 27 and 401, with 2 southbound buses from Bolton in the morning and 2 northbound buses from York Mills in the afternoon. There are connecting services to and from downtown Toronto by train at Etobicoke North GO station and subway at Yorkdale.



Figure 10: GO Bus Routes through Bolton

4.0 TRUCKS

To evaluate the impact and effectiveness of the proposed restrictions, truck movements in the area were tracked between 6 a.m. and 8 p.m. on a weekday in August 2014. It was found that 86% of the existing northbound and southbound trucks along Queen Street are through trips that do not serve businesses on Queen Street. In the case of the eastbound and westbound trucks on King Street, the survey indicated that around 71% of the recorded truck movements were through trips.

As part of community considerations regarding downtown Bolton revitalization, it has been suggested that through truck movements be restricted in the downtown core. Only trucks making deliveries or collections at locations along the affected routes would be allowed to use them. Such restrictions have been considered in this TMP on Queen Street northbound and southbound between Emil Kolb Parkway and Healey Drive, as well as eastbound and westbound on King Street between Station Road and Albion Vaughan Road. The impact of truck restrictions was analyzed strictly from an intersection capacity perspective. To be conservative in the analysis, both the east/west and north/south restrictions were analyzed (if there is sufficient capacity on the roadways to divert both the north/south and east/west trucks then either of the two options can be accommodated individually). Through a detailed analysis of various routing alternatives, it was determined that the most likely alternative for the north/south trucks would be via Emil Kolb Parkway, Coleraine Drive, Mayfield Road. While the most likely alternative for the east/west trucks would be Coleraine Drive, Mayfield Road and Albion Vaughan Road and before returning to King Street. Figure 11shows the assumed detour routes.

Intersection capacity analysis indicates that the Queen Street restrictions may be implemented subject to the opening of Emil Kolb Parkway and the provision of modification of the traffic signals to facilitate the southbound left turn at the intersection of Mayfield Road and Coleraine Drive during the a.m. peak hour. It is recommended that the north/south truck restriction along Queen Street be implemented.

Currently restricting the east/west trucks on King Street through the downtown core would result in longer truck travel times due to the increased northbound delays and insufficient capacity at the intersection of King Street and Albion Vaughan Road. With an exception of the intersection of King Street and Albion Vaughan Road, all intersections along potential alternative routes will have sufficient capacity to accommodate additional truck volumes. The results of the capacity analysis suggest that strictly from the capacity perspective restricting the east/west truck movements along King Street through the downtown core should be considered in conjunction with the implementation of the exclusive northbound right turn lane at the intersection of King Street and Albion Vaughan Road.

Currently trucks are allowed on Queensgate Boulevard. In the event that trucks are restricted on King Street, it is recommended to restrict trucks on Queensgate Boulevard at the same time. It is likely that Queensgate Boulevard would become an attractive alternative which is not desirable considering this road runs through a residential area and has a school crossing. Moreover, if trucks are restricted on Queen Street between Emil Knob Parkway and Healey Road, that would create a scenario where the westbound trucks diverted from King Street would be allowed to utilize Queensgate Boulevard (via AlbionVaughan Road). In that case, once these trucks reach Highway 50, truck operators will have no other choice than to turn onto Highway 50 and violate the truck restrictions.



Figure 11: Truck Re-routing Patterns Associated with Queen Street and King Street Restrictions

5.0 TRANSPORTATION MASTER PLAN DEVELOPMENT

The Bolton TMP was developed by looking toward the year 2031 and assessing the effectiveness of various transportation alternatives in meeting the anticipated travel demand. First, population and employment projections were finalized and then multiple alternatives were devised and tested to gauge the performance of the transportation network. This iterative process led to the identification of a preferred alternative for the year 2031.

The population and employment projections used to forecast future transportation demands are shown in Table 4. These forecasts account for the population growth described in the Bolton Residential Expansion Study approved by Town Council in the fall of 2014, as well as future increases in employment in different parts of the Bolton community.

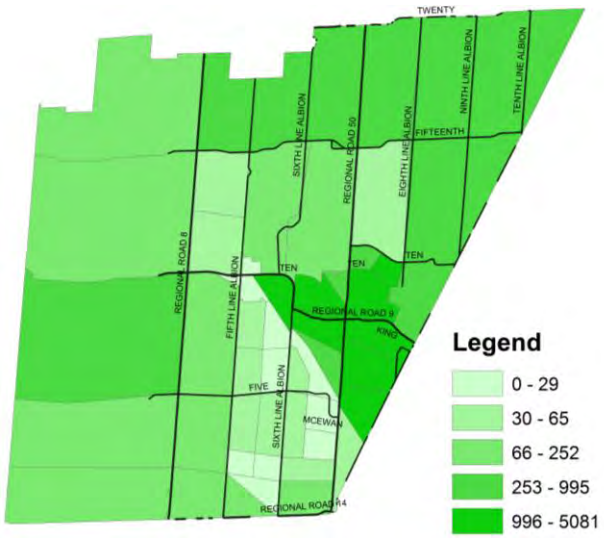
Table 4 – Forecast Population and Employment

Year	Population	Employment
2011	34,791	21,257
2021	35,699	27,032
2031	45,253	32,713

Note:*Includes the areas shown in Figures 12 and 13.

Figures 12 and 13 below show the 2011 population and employment distributions respectively. The majority of the existing population in Bolton is located between the rail corridor and Columbia Way, with the surrounding area having very low population as shown in Figure 12. Employment is also fairly concentrated with majority of the jobs located within either the downtown core area or the area surrounding Simpson Road (just south of the rail corridor), as indicated by Figure 13.

Figure 12: 2011 Population



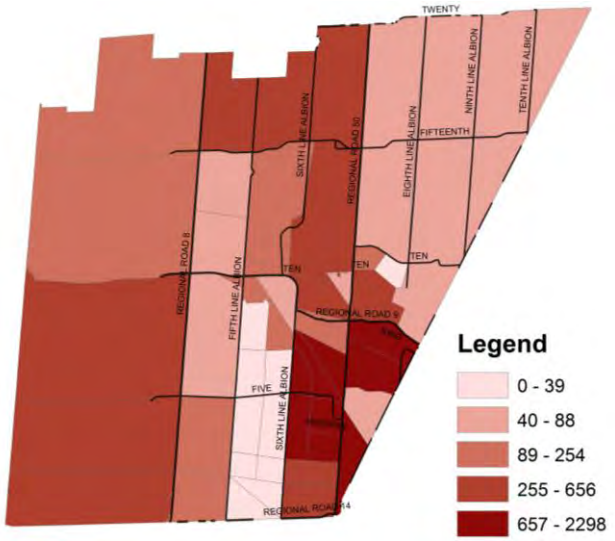


Figure 13: 2011 Employment

Key observations regarding the population and employment projections are that:

- Downtown Bolton is not projected to see significant increases in either employment or population;
- Balanced growth of population and employment is anticipated through the Community;
- The majority of the future population growth is expected in the area northeast of the King Street and The Gore Road intersection, whereas most of the employment growth will occur west of Coleraine Drive and north of Mayfield Road. The residential and employment areas are close enough to make active transportation a feasible option for commuters.

Phase 2 of the Municipal Class EA process for master plans requires the analysis of alternative future scenarios as part of the process to identify the preferred alternative. The alternatives were constructed sequentially, as illustrated in Table 5 below:

Table 5 – Development of TMP Alternatives

Alternative	Modelled Network
1 ("Do Nothing")	Existing network with no infrastructure improvements
2 ("Base Case")	= 1 + Planned and funded improvements in Town of Caledon and Region of Peel capital plans: • Emil Kolb Parkway construction; • Simpson Road extension; • Mayfield Road widening 2 to 4 lanes; • Highway 50 widening 5 to 7 lanes; and • Arterial Road A2 construction.

Alternative	Modelled Network
3	= 2 + • The location of the GTA West Highway was based on the input from the Town and Region. While the interchange was determined based on sensitivity analysis conducted; • Highway 427 extension to GTA West Highway with full interchange; • Albion Vaughan Road widening from two to four lanes from Mayfield Road to King Street; and • Queen Street narrowing from four to two lanes from Hickman Street to south of King Street in the downtown core.
4	= 3 + • King Street realignment; and • George Bolton Parkway extension east to Industrial Road.
5	= 4 + • East-west bypass from Queen Street to Caledon King Town Line Road.

The following observations were made from comparing the model outputs for the alternatives.

- The congestion levels predicted for Alternative 1 indicate that infrastructure improvements will be required by 2031 and that the "Do Nothing" scenario is not acceptable;
- The mobility in the system, in terms of the number of vehicles in the network and the distance they travel, is significantly higher in 2031 compared to existing conditions.
- Of the projects added into Alternative 3, the GTA West corridor has the greatest influence on the expected increase in mobility and decrease in congestion relative to Alternative 2.

5.1 MULTIPLE ACCUONT EVALUATION

Although the implications of future network improvements for the mobility and congestion experienced by auto drivers are important factors, it is also necessary to evaluate the alternatives considering other modes of transportation and the extent to which policy objectives are met. Therefore the selection of the preferred alternative was based on both the capacity analysis and the Multiple Account Evaluation.

A multiple account evaluation framework was developed and used to compare the five alternatives. Doing so provides a more complete picture of how each alternative could affect the multi-modal transportation network in Bolton. The accounts and questions being answered included:

- Active Transportation: Are walking and cycling improvements aligned with road improvements?
- Air Quality: What is the impact on CO_2 emissions?
- Congestion: What is the proportion of peak hour travel that occurs on congested roadways?
- Construction cost: How expensive will it be to implement the road improvements relative to others?
- Downtown Bolton: Will quality of life in the core be enhanced?



- Environment: Do the road construction and widening projects avoid woodland areas?
- Goods Movement: Are there improvements to Peel Region's Strategic Goods Movement Network?
- Transit: Would the road improvements facilitate transit service reliability by minimizing congestion delay to existing and potential commuter buses?

For each alternative, a score ranging from zero to 10 points was assigned for each account. The scores were then added up as shown in Table 6 below.

Table 6 – Development of TMP Alternatives

Alternative	Active Transportation	Air Quality	Congestion	Construction Cost	Downtown Vision	Environment Disruption	Goods Movement	Transit	Overall Score
1	0.0	10.0	0.0	10.0	0.0	10.0	0.0	0.0	30.0
2	9.4	8.8	4.9	6.4	0.0	6.0	2.3	3.0	40.7
3	10.0	0.1	9.7	5.7	10.0	5.8	6.4	6.0	53.6
4	10.0	0.6	9.8	2.5	10.0	4.8	8.4	8.0	**54.0**
5	10.0	0.0	10.0	0.0	10.0	0.0	10.0	10.0	50.0

5.2 SELECTION OF THE PREFERRED TMP ALTERNATIVE

The scores for each account were combined as shown in Table 6 and the overall score was determined. The analysis of the alternatives led to the selection of Alternative 4 (illustrated by opposite) as the preferred TMP alternative that would be best suited to accommodate future transportation demands to the year 2031. This reflects all of the most current information regarding planned future population and employment, Town, Regional and Provincial planning objectives, and public input.

Additional elements such as interchange locations on the planned GTA West Corridor, active transportation, transit and transportation demand management measures should also be incorporated into the preferred TMP alternative in order to create a multi-modal transportation plan for the future. These aspects are discussed in the following sensitivity analysis sections.



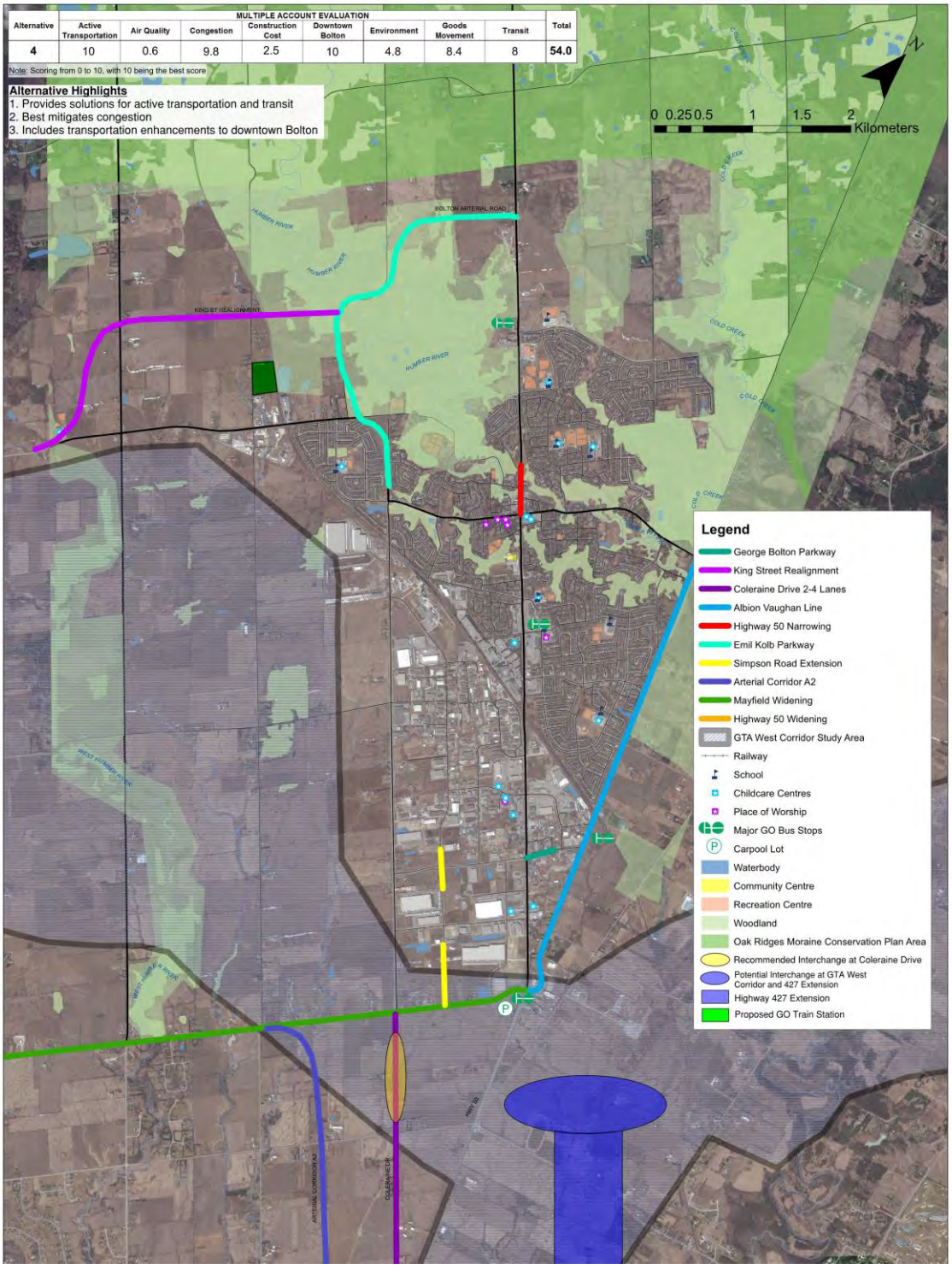


Figure 14: Preferred TMP Alternative 4

6.0 DOWNTOWN BOLTON SENSITIVITY ANALYSIS

As part of the Bolton downtown core revitalization, consideration has been given to narrowing Highway 50/Queen Street and modifying existing traffic signal locations in order to improve the pedestrian environment. A two-stage approach was used to determine the best cross-section option for Queen Street in the downtown core and the appropriate traffic control measures to institute with the preferred cross-section option. This approach was designed to determine the best option for transportation that would help to revitalize the downtown core.

The scenarios analyzed in Stage One – Cross-Section Analysis included:

- Scenario 1: Do Nothing – with the exception of prohibiting through trucks, Queen Street in the downtown core would be kept as-is. There would continue to be four travel lanes with on-street parking restrictions during the peak hours. The on-street parking stalls are not separated from the through lanes, allowing vehicles to travel in the parking lane if the space is not being utilized;
- Scenario 2: Two travel lanes (with bicycle sharrows) with all-day on-street parking on both sides of Queen Street; and
- Scenario 3: Two vehicle travel lanes, two bike lanes, and all-day on-street parking on the east side of Queen Street.

All three scenarios assumed that through trucks would be prohibited on Queen Street in the downtown core. Local deliveries would continue to be permitted.

The three Stage One scenarios were assessed using multiple account evaluation criteria, including:

- On-street parking: Which scenario provides the most on-street parking?;
- Pedestrian amenities: Which scenario creates the best environment for pedestrians?;
- Travel Time: Which scenario results in better travel times?;
- Cycling facilities: Which scenario provides the most appropriate cycling facilities?;
- Public realm (creating a "complete street"): Which scenario best utilizes the right-of-way to create a "complete street" for all road users?;
- Public input: Which scenario did the public prefer?;
- Noise: Which scenario would best mitigate transportation noise; and
- Cost: How does the cost of implementation compare with the other scenarios.

Based on the results of the multiple account evaluation, Scenario 3 scored the highest and is seen as the ultimate recommended solution for Queen Street in the downtown core. This scenario best embodies a complete street and will help Bolton create a destination for people in the downtown.



7.0 ADDITIONAL SENSITIVITY ANALYSIS

The GTA West Corridor will extend from Highway 400 (between Kirby Road and King-Vaughan Road) in the east to the Highway 401/407 ETR interchange area in the west, and will feature a 400-series highway, a transitway, and potential goods movement priority features. The new highway is expected to traverse either within or very near to the study area of the Bolton TMP and will play an important role in the local transportation network. The shaded hatch in **Figure 15** indicates the study area of the GTA West Highway corridor.



Figure 15: Assumed GTA West and 427 Extensions

7.1 ASSESSMENT OF OPTIMUM INTERCHANGE LOCATIONS

The TMP study also assessed whether it would be preferable to have a GTA West interchange on Mayfield Road east of Humber Station Road, on Coleraine Drive north of Countryside Drive, or at both locations, as illustrated in **Figure 16**.

The modelling results indicate that the Coleraine Drive interchange would provide higher mobility and lower congestion than the Mayfield Road interchange. It would also provide a direct access to Coleraine Drive (and the surrounding industrial lands) as well as Emil Kolb Parkway, which would particularly facilitate goods movement. Building both interchanges would not provide sufficient benefits over the single interchange at Coleraine Drive to justify the additional cost. There would also likely be challenging geometric constraints associated with the short separation between the interchanges.

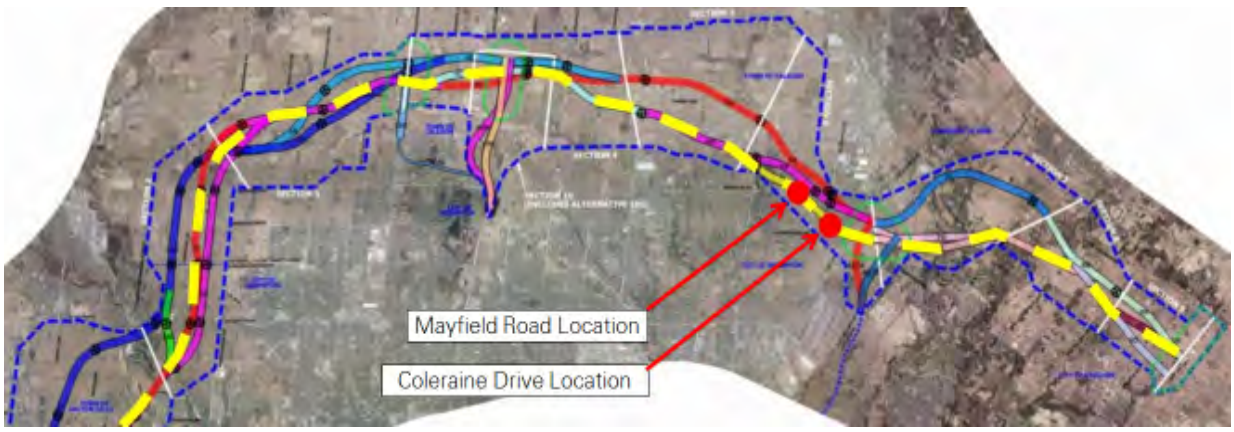


Figure 16: Potential Alignments for the GTA West Highway

7.2 SENSITIVITY TEST OF THE GTA WEST HIGHWAY

A sensitivity analysis was undertaken to determine what impacts might be experienced on roads in Bolton and the surrounding area if the GTA West Highway is not constructed by the year 2031.

Although more congestion is anticipated without the GTA West, the increase is not forecast to be sufficient to warrant improvements over and above those already identified in Alternative 4. There are two potential exceptions whose performance would need to be monitored if the GTA West Highway were not to be constructed by 2031:

- A section of Emil Kolb Parkway just north of King Street; and
- Highway 50/Queen Street between Mayfield Road and Major Mackenzie Drive (which is just south of the study area).

The GTA West Highway provides relief for the vehicles making long distance eastbound/westbound trips. Therefore the roadways that would be impacted the most by the deferral of the GTA West Highway are the ones that provide long distance east/west connections, such as Major Mackenzie Drive, Rutherford Road and Nashville Road, all of which are outside of the Community's jurisdiction and the TMP's study area.

7.3 ANALYSIS OF THE NEED FOR GRADE SEPARATED RAIL CROSSINGS

There is presently only one grade-separated rail crossing in Bolton: on Highway 50 at the CP rail line. However, the projected average daily traffic volumes at the existing level crossing locations on Albion Vaughan Road and Coleraine Drive will make them candidates for grade separation in the near future.

For the preferred road network, Alternative 4, grade separation is not warranted at the existing level crossing over King Street. The same applies to the location at which the railway would cross the proposed King Street realignment; however, the construction of this new road provides the opportunity to include a grade separation in the original design. This would enhance its functions of providing an east-west Bolton bypass and facilitating the development of the Bolton Residential Expansion area. The approach would also be more cost effective than a subsequent retrofit if this should later be deemed necessary on safety or operational grounds.

- It should be noted that if Alternative 3 were to be progressed, without the King Street realignment, the traffic volumes on King Street would warrant a grade separation at the existing level crossing there. However, the design and implementation of such a grade separation would be challenging due to constraints associated with existing adjacent land uses.



8.0 ACTIVE TRANSPORTATION

Every trip begins and ends with active transportation (AT) even if it is only walking to and from a car. Active transportation encompasses walking, cycling and other human powered modes of travel. More traditionally, active transportation was seen as a mode with a more recreational focus (e.g. fitness and fun); however, with the potential health, economic and environmental benefits that can be realized, people are now using active forms of transportation for day to day trips to and from work, school or primary destinations.

Promoting AT within the community of Bolton has the potential to accomplish short trips, provide recreational and touring access to surrounding communities and cultural destinations and is another mechanism to manage travel demand in Bolton. As the Bolton TMP evolved, it became apparent that an independent AT Strategy was required. The strategy was not intended to "reinvent the wheel" for the Town of Caledon and the Region of Peel but to build on what had already been proposed and implemented in the Region's Active Transportation Strategy (2011) and other planning and policy documents prepared and adopted by the Town of Caledon, the Toronto and Region Conservation Authority and surrounding municipalities.

The Bolton AT Strategy is intended to be a high-level planning document which outlines proposed improvements, programs, and initiatives for further investigation and consideration by the Town, Region and its partners. The strategy was founded on a number of key assumptions that were highlighted and confirmed through discussions with Town and Regional staff, members of the public and key stakeholders. The assumptions were used to shape the development of the AT network and the supportive policies and recommendations outlined in the strategy. They included:

- The Region's Active Transportation Strategy – Walk and Roll Peel – was adopted in 2012. The initial recommendations were investigated and updated as needed to reflect current conditions and emerging design principles.
- The Toronto and Region Conservation Authority (TRCA) is undertaking a master planning assignment on lands in the north-eastern area of Bolton. Future implementation of off-road trails will be determined by their master planning outcomes.
- Roads within the community of Bolton will be designed and developed based on the jurisdiction under which they fall. For example, the facilities identified on Regional roads will be designed and implemented by the Region.
- Maintenance of both on and off-road routes will need to be discussed in further detail and a common and consistent approach, where possible, will need to be applied for Region as well as Town Roads in addition to trails found under different jurisdictions.
- The newly-built Emil Kolb Parkway will help to alleviate traffic within the downtown core which will allow for more walking and cycling access and opportunities.
- Future transit connections and sites will require access by walking or by bicycle. Connections to these future planned sites as well as the design of amenities once at the site will be needed.
- Truck traffic is considered a significant barrier to walking and cycling within Bolton. The Town and Region will work together to move forward to restrict truck traffic along key Regional routes within the downtown core to alleviate traffic volumes and encourage walking and cycling.
- In some cases, the ultimate cycling facility identified may not be possible within the short-term. For these select locations, the study team had explored interim facilities which can be implemented in a shorter timeline due to costing, political or coordination constraints.



- The implementation of the strategy will need to be a collaborative and coordinated effort between the Town of Caledon, Region of Peel, Toronto and Region Conservation Authority, private land owners and other stakeholders within the community. It will require ongoing updates to Council and communication between those working on key initiatives.

The strategy focuses heavily on the development of the AT network for the community of Bolton. The network was developed using an eight (8) step iterative network development process. The process is illustrated in Figure 17 and a detailed summary of the steps and the results of the investigation undertaken are presented in the AT Strategy report.

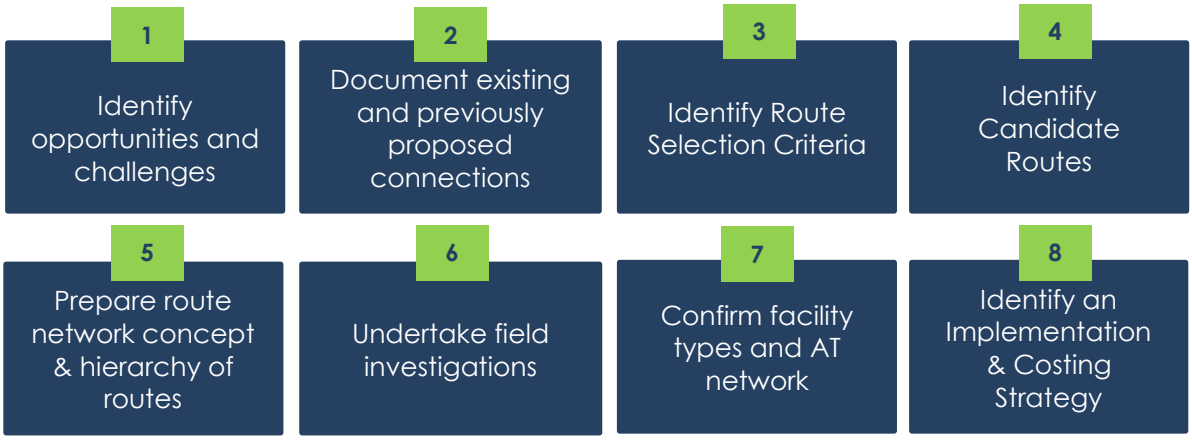


Figure 17 – Active Transportation Network Development Process

The process was founded on the principles outlined in Ontario Traffic Manual Book 18: Cycling Facilities. The project team applied step 1 of the facility selection tool to identify preferred facility types for the AT linkages / routes identified as part of the network.

The proposed AT network is illustrated in Figure 18. In addition to routes and facility types, the project team also identified network enhancements / intersection improvements to ensure that there were safe and comfortable connections and transitions between different the various facility types and at key conflict points in the network.

An implementable strategy not only identifies infrastructure improvements but also provides supportive recommendations, programs and policies. The AT Strategy includes 21 recommendations for consideration by the Town and the Region to facilitate the implementation of the AT network and to help achieve the community's AT vision and strategic objectives. Section 8 of the TMP report includes all 21 Active Transportation recommendations. The full Active Transportation Strategy is provided in Appendix A of the main report.

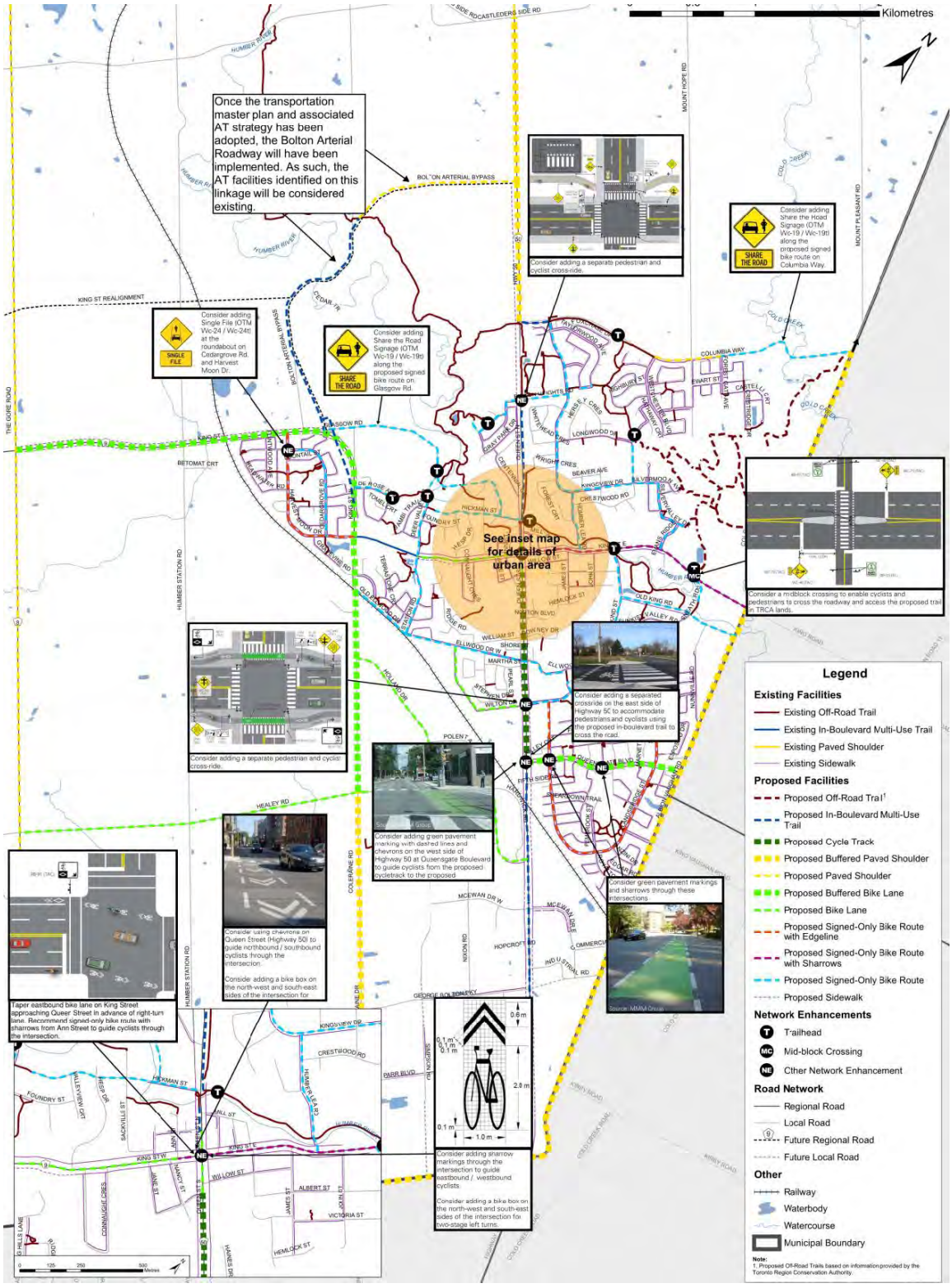


Figure 18: Proposed Active Transportation Facility Types & Network Enhancements

9.0 TRANSIT

Transit has the potential to serve an important role in the transportation network in and around Bolton.

The Bolton Commuter Rail Feasibility Study advocated for GO Rail service to Bolton and the Bolton Residential Expansion Study frames a location for the future GO Train Station, as illustrated in Figure 19. A GO Train Station at this location would help foster an environment for transit-oriented development in this new development expansion area. It also has the potential to significantly increase the proportion of trips to and from Bolton taken by transit.

In addition to the existing GO Bus service, the Town of Caledon is considering the introduction of local transit service between Bolton and its other main growth area, Mayfield West. While it is recognized that ridership will be low initially, a certain frequency of service during the periods that people want to travel will be necessary to make it attractive and maximize the potential for growth.

Service could be restricted to the a.m. and p.m. peak periods only, although if vehicles are to be purchased for a brand new local transit service, there may be value in utilizing them between the peaks also. A larger existing transit authority from a neighbouring municipality such as GO Transit or an amalgamated Regional authority would possess the economies of scale to make peak hour only service more cost effective.

Transit should be viewed as a utility that, like all such services, requires initial investment up front but will provide community benefits over the long run. The following actions should be considered:

- Working with the Town of Caledon and stakeholders in Mayfield West to develop a local transit plan that identifies the most convenient routes, periods of operation and frequency of service for potential riders. Sufficient funding should be secured to maximize the potential of this long-term investment.
- Liaison with GO Transit regarding increased frequency on existing routes and the potential for new and more direct services.
- Discussions on improving access from Bolton to transit hubs identified in the Metrolinx Big Move. Downtown Brampton, Vaughan Metropolitan Centre and Pearson Airport are nearby anchor hubs. Gateway hubs in the vicinity include Humber College, currently served by route 38A via York Region, where an expanded bus loop is now being constructed offering connectivity with the TTC and other operators.
- Encouraging Brampton Transit to extend service to Bolton via the northeastern portion of the City of Brampton as that area develops.
- Reviewing, in consultation with York Region Transit, the potential for extending or connecting to the peak hour YRT service 61 that runs between King, Nobleton and Schomberg.
- Engaging with studies that may arise regarding a potential Highway 427 transitway.
- Assessing, in collaboration with Brampton Transit, MiWay and Peel Region, the effectiveness of amalgamating the transit services into a regional authority that can leverage its scale to expand into Bolton and Caledon.



The potential to expand the catchment area of the transit network through improved active transportation facilities should also be evaluated.

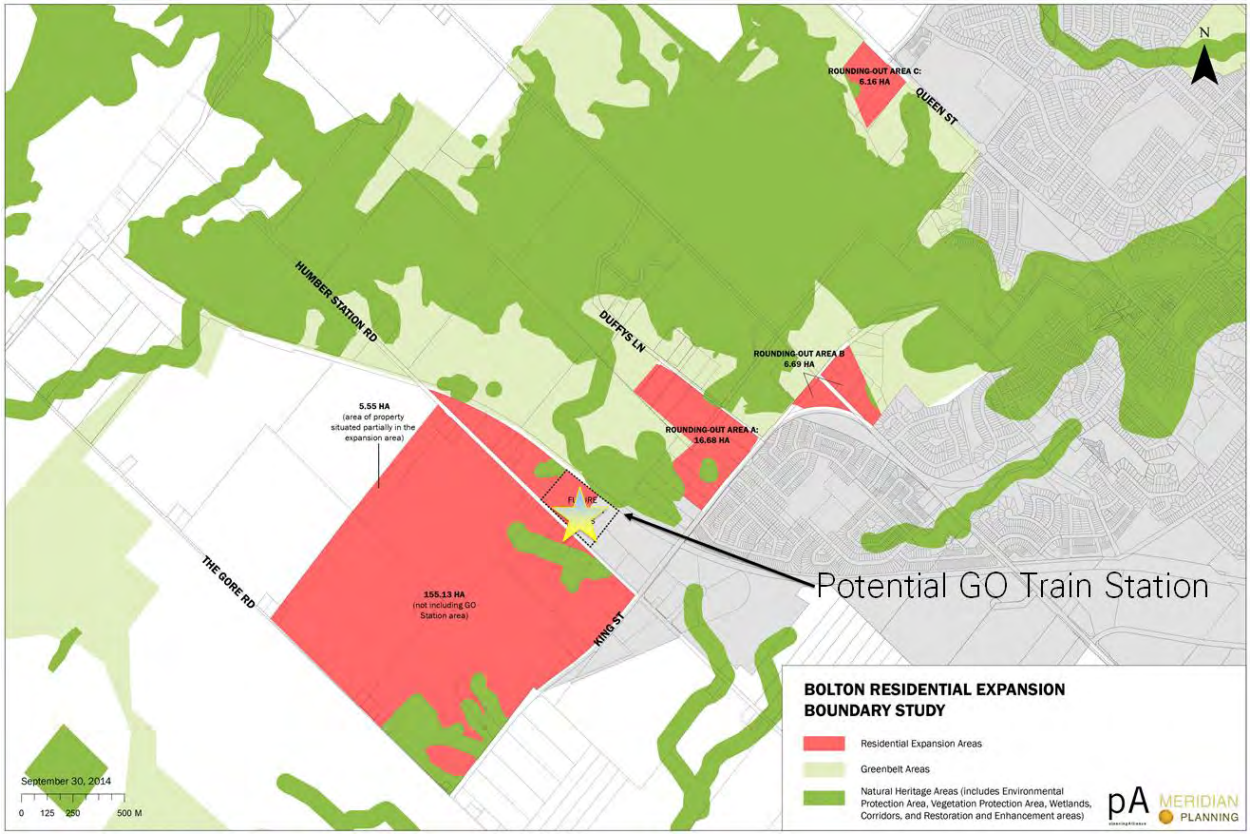


Figure 19: Possible Location of Future GO Train Stations in Bolton

10.0 OTHER TRANSPORTATION DEMAND MANAGEMENT MEASURES

There are a number of existing and potential Transportation Demand Management (TDM) measures and policies that the Community of Bolton can expand and introduce. These include reducing travel demand, redistributing the remaining demand in space and time, and minimizing the proportion of trips represented by single occupant vehicles. Two TDM strategies are already in place:

- Smart Commute, a Metrolinx program that works with GTA residents and businesses to explore walking, cycling, transit, carpooling and teleworking to ultimately reach its goal of easing gridlock while helping its users save time and money.
- 'Let Your Green Show', based around an online social media campaign promoting green living and encouraging residents throughout the Region of Peel to give their car a break and try more sustainable modes.

An upcoming TDM strategy involves the promotion of the Mayfield Road and Highway 50 Carpool Lot. This will encourage residents to park outside of downtown Bolton and take the GO Transit bus service instead.

More broadly, Caledon's 2015 Individualized Marketing Pilot for Sustainable Transportation aims to improve the Town's awareness of sustainable modes of transportation such as access to nearby public transportation, carpooling, and cycling. This project will facilitate changes in travel behavior by engaging with the public through surveys, followed by an evaluation phase to assess the impact of the project. Outcomes of the pilot will be:

- A project identity and brand;
- Newsletters, surveys and post cards;
- A transportation asset map of the community in and around Southfields Village;
- A Town devoted subpage on Caledon.ca;
- An online sustainable transportation store; and
- Community outreach and educational events.

There are several opportunities to enhance the existing and planned TDM program, by:

- Implementing active transportation and transit improvements, as described in Sections 8 and 9.
- Developing the partnership with Smart Commute to further facilitate carpooling by connecting commuters with similar origins and destinations, encouraging more Bolton businesses to join the Smart Commute network. Given the wide dispersal of potential riders compared to denser areas, expanding carpooling could be at least as effective as developing the local transit network.
- Continuing to collaborate with Peel Region in the implementation of their 2008 Transportation Demand Management Plan and Five Year TDM Plan (2014-2018).



11.0 DOWNTOWN BOLTON

Downtown Bolton is centred on the intersection of Queen Street (Highway 50) and King Street. The core has a number of commercial businesses including restaurants, banks, hair salons and specialty retail stores in addition to business offices and institutional uses. There also are residential units in the downtown: mostly multi-family dwellings with some single family dwellings at the periphery of the downtown area.

11.1 LAND USES AND ROAD NETWORKS

Although Queen Street and King Street are both major arterial roads, the existing traffic analysis indicates that the intersections along King Street through the downtown core operate at reasonable levels of service and delay, without any critical movements.

There are a number of available off-street parking areas accessible via Queen Street. Parking restrictions are in place on Queen Street prohibiting on-street parking on the west side (southbound direction) between 6 a.m. and 9 a.m., and on the east side (northbound direction) between 4 p.m. and 7 p.m. There are two off-street parking lots located in the vicinity off the King Street and Queen Street intersection, each parking lot is accessible by one of the two arterials.

11.2 A VISION FOR BOLTON

A common theme heard throughout the Bolton TMP, especially from the downtown business community, is a desire to reclaim the downtown for people and customers. There is an aspiration to shift the focus from moving cars and trucks through the downtown to bringing people to the core. The vision for downtown Bolton is to complete the street network, thus enabling all transportation modes and types of users to access the core.

Central to this vision is the enhancement of Queen Street to attract more people and make it more exciting for customers. It could be re-purposed with two vehicle travel lanes, bike lanes in both north and south directions and all day on-street parking on the east side for vehicles travelling in the northbound direction. The opening of Emil Kolb Parkway is expected to provide sufficient relief for the commuters to by-pass the downtown core. Existing sidewalks would be maintained and are recommended to be enhanced in line with other improvements to the downtown transportation network.

11.3 ALTERNATIVE TRUCK ROUTES AND ROUTE RESTRICTIONS

Trucks are currently allowed on Queen Street and King Street but truck turning movements between these two roads are prohibited at all times of the day. The newly-built Emil Kolb Parkway runs parallel to Queen Street as an alternative north/south connection. This new road also provides connections to east/west roads south of King Street. As discussed in Section 4, this TMP proposes to restrict truck movements through the downtown along Queen Street in the short term and possibly along King Street after provisions are made for trucks that would help facilitate this potential east-west restriction.



11.4 THE FUTURE OF DOWNTOWN BOLTON

The preferred TMP alternative is an agent for change in the downtown, helping to transition the downtown from a traffic conduit to a people-friendly place where customers and the general public want to be. The downtown streetscape has safety in mind and embodies the concept of "complete streets" in that Queen Street has been re-visioned as a street that provides transportation facilities for all modes of transportation and all types of transportation system users. The transformation of the downtown has been developed with interim and ultimate solutions. In the interim solution, all-day on-street parking is permitted with no time-of-day restrictions. Cyclists are accommodated using "super sharrows", which indicate that the cyclists should travel in the centre of the travel lane through this short portion of the downtown core. Bulb outs are used to decrease pedestrian crossing distances across Queen Street. A Queen Street midblock rendering is shown in Figure 20.



Figure 20: Interim Solution: Looking South on Queen Street Midblock North of King Street

At the intersection of Queen Street and King Street, cyclists would remain in the centre of the lane. South of King Street, cyclists would transition to a proposed cycle track. A rendering of a cyclist heading south and approaching the Queen Street at King Street intersection is shown in Figure 21.

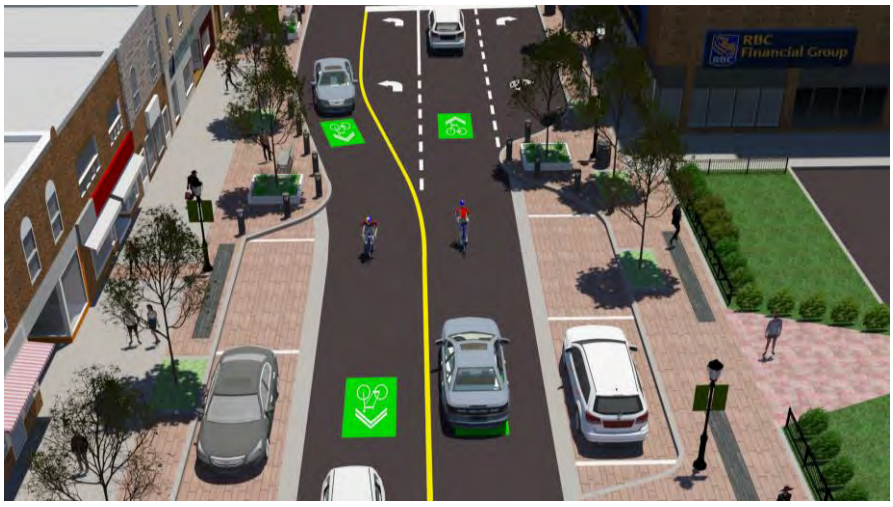


Figure 21: Interim Solution: Looking South on Queen Street Approaching Intersection with King Street

In the ultimate solution, all-day on-street parking is permitted northbound and bike lanes are provided northbound and southbound on Queen Street through the downtown core. A buffer has been provided between the northbound cycle lane and the northbound on-street parking in order to reduce the chance that cyclists might collide with people in parked cars opening their car doors. The midblock rendering of the ultimate solution is shown in Figure 22.



Figure 22: Interim Solution: Looking South on Queen Street Approaching Intersection with King Street

At the intersection of Queen Street and King Street in the ultimate solution, two-stage left-turn boxes are proposed for cyclists. On each corner of the intersection, left- turn boxes that are outside of the travel lane have been designated for cyclists to wait until the traffic signal turns green in the direction that they wish to travel. This proposed treatment is illustrated in Figure 23.

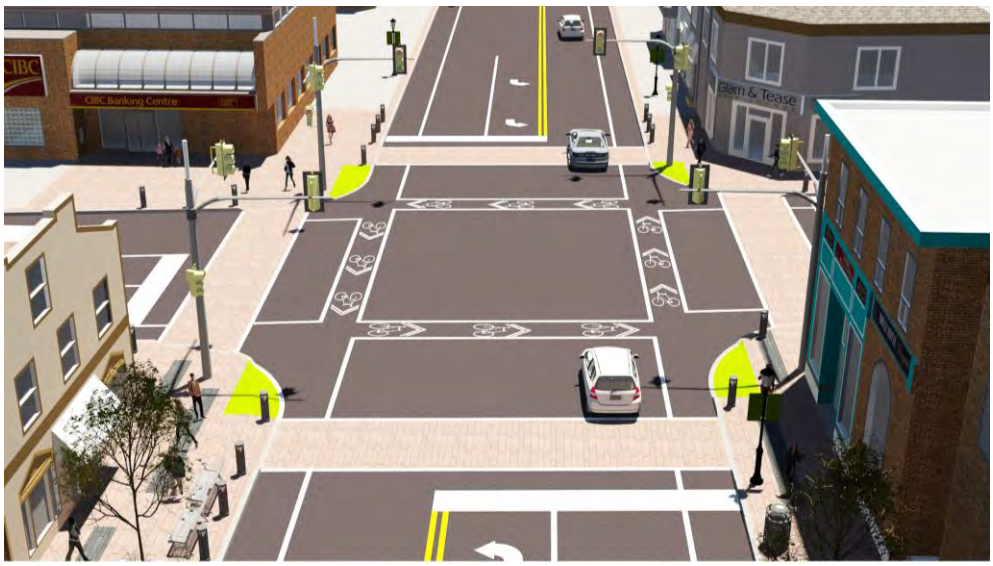


Figure 23: Interim Solution: Looking South on Queen Street Approaching Intersection with King Street

The interim and ultimate solutions for Queen Street in downtown Bolton are important to implement in order to re-vision downtown Bolton, reclaim the downtown for people and to embrace the concept of "complete streets" that provide for all transportation users and all modes. The benefits of implementing this vision are numerous, and include:

- Complete street design;
- Removal of truck through traffic on Queen Street (local deliveries only);
- All-day on-street parking;
- Facilities for cyclists;
- Opportunities for bicycle parking;
- Opportunities for enhanced pedestrian safety and amenities:
    - Bulb outs to reduce pedestrian crossing time;
    - Fewer travel lanes for pedestrians to cross;
    - Public seating
    - Streetscaping, street furniture and public art;
- Special materials such as brick paving to create a sense of place;
- Increase in the number of street trees that could be planted;
- Reduced vehicle speeds
- Potential for increased retail sales
- Reduction in streetwater runoff;
- Improved water quality in nearby waterways;
- Increase in resident, business and customer satisfaction; and
- Responsive to public input.

Vehicle traffic congestion would be expected to increase over existing conditions, however, Emil Kolb Parkway provides an alternative route for through traffic. Increased congestion also could lead to a decrease in prevailing speeds of motor vehicles. The multi-modal benefits to creating a sense of place through a complete street design on Queen Street in the downtown core are deemed to vastly outweigh any increases to vehicle travel times.



12.0 PHASING AND IMPLEMENTATION STRATEGY / SUMMARY OF RECOMMENDATIONS

The TMP includes a host of multi-modal recommendations. This chapter highlights short-term recommendations and includes tables and a map of recommended road improvements for the year 2021 and 2031.

12.1 SHORT TERM MULTI-MODAL RECOMMENDATIONS

Short term multi-modal recommendations are made for active transportation, transit, transportation demand management and truck movements. Greater detail for all of these improvements is found in the previous sections of this Executive Summary and in the complete TMP report.

12.1.1 Active Transportation

- Implement the short term recommendations as described in detail in the Active Transportation Strategy.

12.1.2 Transit

- Advocate for a GO Train Station to be constructed in the Bolton Residential Expansion area.
- Work with neighbouring jurisdictions and the Region of Peel to determine opportunities to expand transit service to Bolton.

12.1.3 Transportation Demand Management

- Start publicizing changes to truck routes and truck restrictions.
- Promote Emil Kolb Parkway as the best route to take for through movements of trucks as well as passenger cars.
- Expand carpooling opportunities.
- Support and promote existing and planned Regional TDM measures.

12.1.4 Truck Movements

- Upon the opening of Emil Kolb Parkway:
    - Restrict north-south truck movements on Queen Street.
    - Restrict east-west truck movements on King Street.
        - Construct additional road improvements and intersection improvements to help facilitate truck movements



12.1.5 Downtown Vision

- Implement all-day parking on Queen Street in the downtown core.
- Begin to re-purpose Queen Street in the downtown core in line with the Downtown Bolton Vision.

12.2 ROAD IMPROVEMENTS RECOMMENDED BY THE YEAR 2021

Road improvements recommended for implementation by the year 2021 are listed in **Table 7,** with their locations shown on a map in **Figure 24**.

Table 7: Road Improvements Recommended by the Year 2021

	Road	From	To	Type of Improvement
1	Emil Kolb Parkway	King Street	Highway 50	New Road Construction (0-2 lanes)
2	Queen Street (Highway 50)	South of King Street	Hickman Street	Narrowing (4-2 lanes)
3	Simpson Road	Mayfield Road	George Bolton Parkway	Extension (0-2 lanes)
4	Mayfield Road	Albion Vaughan Road	The Gore Road	Widening (2-4 lanes)
5	Coleraine Drive	Mayfield Road	Arterial Corridor A2	Widening (2-4 lanes)
6	Arterial Corridor A2	Mayfield Road	Highway 50	New Road Construction (0-6 lanes)

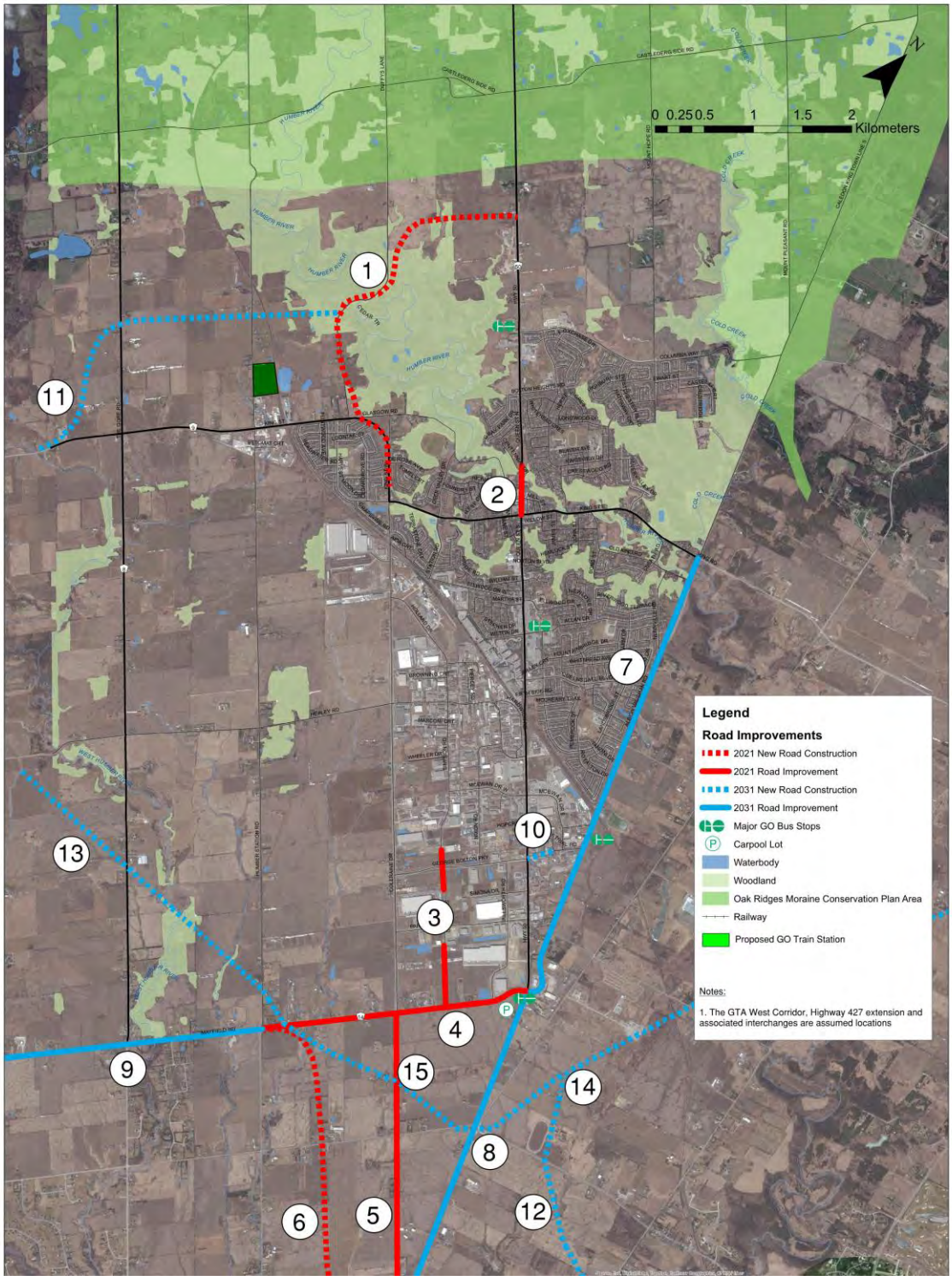


Figure 24: Recommended Road Improvements by Horizon Year

12.3 ROAD IMPROVEMENTS RECOMMENDED BY THE YEAR 2031

Road improvements recommended for the 2031 horizon year are listed in Table 8 and are shown on Figure 24.

Table 8: Road Improvements Recommended by the Year 2031

	Road	From	To	Type of Improvement
7	Albion Vaughan Road	Mayfield Road	King Street	Widening (2-4 lanes)
8	Highway 50	Mayfield Road	Castlemore Road	Widening (5-7 lanes)
9	Mayfield Road	Humber Station Road	Airport Road	Widening (4-6 Lanes)
10	George Bolton Parkway Extension	Highway 50	Industrial Road	Extension (0-2 lanes)
11	King Street Realignment	King Street	Emil Kolb Parkway	New Road Construction (0-2 lanes)
12	Highway 427	Highway 427 (Existing)	GTA West Corridor	New Road Construction
13	GTA West Corridor	--	--	New Road Construction
14	GTA West Corridor / Highway 427 Extension Interchange	--	--	New Road Construction
15	GTA West Corridor / Coleraine Drive Interchange	--	--	New Road Construction

TOWN OF CALEDON

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DRAFT REPORT FOR

THE BOLTON TRANSPORTATION MASTER PLAN STUDY

SEPTEMBER 2015

MMM GROUP

D16-14-012



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1.0 INTRODUCTION

1.1 WHY A TRANSPORTATION MASTER PLAN FOR BOLTON?

Bolton is a community in transition. It is expected to experience increased growth yielding elevated vehicle traffic congestion in the near future. Planned residential expansion in Bolton and the Highway 427 extension will both have major impacts on transportation facilities within the community's boundaries and surrounding areas. Building on the Caledon Area Transportation Needs Study Update (CATSU), completed in 2009, the Town has developed a Transportation Master Plan (TMP) specific to the community of Bolton that addresses:

- Existing and future developments;
- Provincial transportation corridor plans and land-use planning objectives;
- Impacts of other recent and ongoing Regional transportation-related studies;
- Studies related to multimodal transportation options and road character;
- Increasing demand from local residents and visitors for expanded transportation alternatives that preserve the cultural and natural significance of the community; and
- Impact of trucks travelling through the Bolton Downtown Core and alternative approaches to address this issue.

In March 2014, the Region of Peel and the Town of Caledon retained MMM Group Limited to prepare a long-term comprehensive transportation master plan for the community of Bolton. The TMP study reflects a master planning process that is consistent with Phases 1 and 2 of the Municipal Class Environmental Assessment process including public and stakeholder consultation at a minimum of two (2) key points in the project process.

The recommended policy and infrastructure improvements outlined in the TMP are intended to facilitate transportation planning, design and implementation changes within the community to improve quality of life, mobility, and community growth and preservation. The master plan identifies transportation deficiencies and road network issues as well as potential opportunities for improvement, while supporting municipal planning goals for the short, medium and long term.

1.1.1 Study Goals and Objectives

The development of Bolton's TMP was guided by a number of goals and objectives that were identified by the Region of Peel and the Town of Caledon through the Request for Proposal (RFP) as well as ongoing discussions with key staff and stakeholders. The goals of the master plan laid the foundation for the development of recommendations and strategies.

The transportation goals set out for the community of Bolton include:

- Support current and future municipal planning objectives by optimizing transportation capacity to accommodate planned growth in the study area, and mitigate negative impacts from the perspective of transportation, environment, health and economy;
- Identify opportunities for improved public transit services in the study area, which includes exploring ways to enhance GO Transit services (both bus & rail services), future 427 highway transit way and other local transit connections;
- Identify a Bolton core transportation vision, identifying and assessing the current and future transportation needs and developing alternative solutions and recommendations;
- Explore and identify opportunities to enhance pedestrian, parking and cycling infrastructure;
- Identify solutions to serve truck traffic travelling in the study area between the Town of Caledon and neighbouring municipalities, especially related to the nearby intermodal terminals, employment lands and the industrial areas; and
- Proactively engage the stakeholders to identify collaborative transportation solutions that will result in a better quality of life.

There are 12 objectives of the TMP that support the goals. Objectives include:

- Support current and future municipal planning objectives;
- Establish the arterial / collector road network;
- Coordinate and provide input to current transportation studies;
- Identify opportunities for improved public transit service;
- Identify alternative transportation options to the motorized vehicle;
- Explore traffic calming measures of key collector roadways;
- Address transportation deficiencies and network needs;
- Assess the GTA West transportation corridor and its impact;
- Explore medium and long-term timelines for transportation recommendations;
- Identify opportunities to improve pedestrian, parking and cycling infrastructure;
- Identify solutions to serve truck traffic; and
- Proactively engage with the public and local stakeholders.

1.1.2 The Project Study Area

The Bolton TMP study area is bounded by The Gore Road to the west, Caledon King Townline/Albion Vaughan Road to the east, Old Church Road to the north, and Mayfield Road to the south, as shown in **Figure 1**. Broadly, it encompasses the west part of Vaughan, the northeast part of Brampton, Airport Road to the west, and up to Highway 9 in the north for undertaking network analysis, goods movement characteristics, transit considerations and other broad aspects of the study.

By defining the geographic area that the project encompasses the study team was better able to define the scope and scale of the project and confirm the geographic limitations of master plan recommendations.

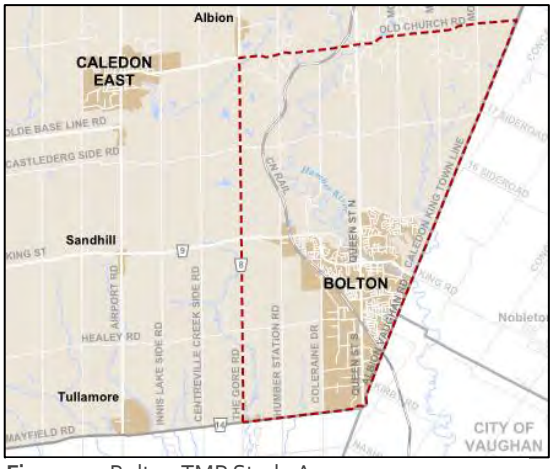


Figure 1 – Bolton TMP Study Area

1.2 HOW THE TRANSPORTATION MASTER PLAN WAS DEVELOPED

The development of the Bolton TMP was a collaborative effort between the Town of Caledon, Region of Peel, MMM Group, residents of the community, and local stakeholders and interest groups. Through their input, the project team was able to identify existing transportation concerns and recommended improvements to help achieve the vision of a more sustainable, multi-modal future. Special emphasis was placed on how transportation could help improve the Bolton downtown core.

The following sections provide an overview of the process and steps used to prepare the Bolton TMP. The process was guided by a Study Design and Project Schedule which was prepared and confirmed prior to project commencement.

1.2.1 The Bolton TMP Study Process

The Bolton TMP was completed using four (4) phases, and it is consistent with Phases 1 and 2 of the Municipal Class Environmental Assessment (EA) Process (see **section 1.2.2** for additional details about this process). The master plan was completed between March 2014 and July 2015 and was informed by extensive public and stakeholder consultation and input (see **section 1.2.3** for additional details about the process used) to engage these groups.

The project phases and the tasks associated with each are described in further detail below:

- Phase 1: Assessing Existing Conditions
  - Preparation of Detailed Engagement Strategy
  - Review and Documentation – Findings of Relevant Background Studies
  - Assessment of Current Transportation Network
  - Development of Transportation Modelling Approach
  - Determination of Population and Employment Projections/Scenarios for base year, 2021 and 2031
  - Prepare Materials and Facilitate Stakeholder Meetings
  - Prepare Materials and Facilitate Public Information Centre #1
- Phase 2: Transportation Master Plan Development
  - Forecasting of Future Transportation Demands – 2021 and 2031
  - Assessment of Future Network Deficiencies
  - Identification and Evaluation of Options to Fulfill Planning Objectives and Satisfy Future Travel Demand
  - Evaluation of Alternate Scenarios Based on Preliminary Criteria
  - Assessment of Ideal Interchange Locations (between the GTA West Transportation Corridor and Regional/Town Arterials)
  - Prepare Materials and Facilitate Stakeholder Meetings
  - Prepare Materials and Facilitate Public Information Centre #2
- Phase 3: Implementation Strategy – Recommendations
  - Recommendation of Transportation Networks for Horizon Years 2021 and 2031
  - Integration of Study Analysis and Findings to Produce an Optimum Arterial/Collector Network Plan and Associated Transportation Recommendations
- Phase 4: Complete the Report
  - Prepare Draft Transportation Master Plan Study



- Present Draft Plan to Municipal Staff
- Prepare Final Transportation Master Plan Study
- File Study with the Ministry of Environment and Climate Change

1.2.2 The Municipal Class Environmental Assessment Process

The Bolton TMP has been conducted under the requirements of the Municipal Class Environmental Assessment (EA) process. The Municipal Class EA (October 2000, amended in 2007 and 2011), provides a process in accordance with the EA Act for municipal infrastructure projects. Master plans, such as this TMP, are required to complete Phases 1 and 2 of the five phases of the Municipal Class EA process. These required phases include:

- Phase 1: Identify the problem (deficiency) or opportunity; and
- Phase 2: Identify alternative solutions to address the problem or opportunity by considering the existing environment and establishing the preferred solution.

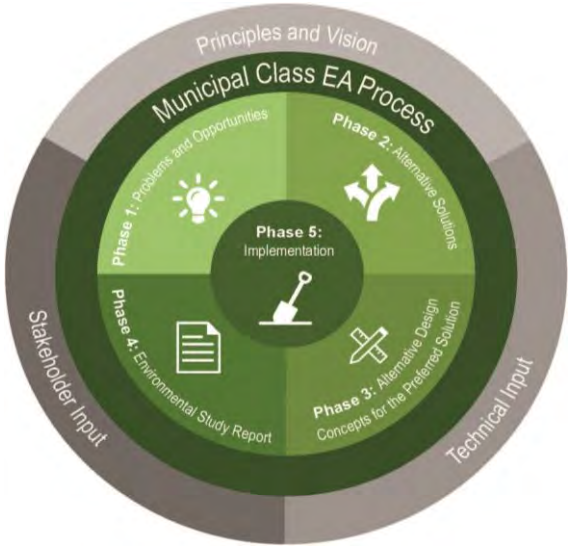


Figure 2 – Overview of the Municipal Class Environmental Assessment Process

Completion of Phases 1 and 2 of the Municipal Class EA process allows the Town of Caledon and Region of Peel to move on to Phase 3 (Assessment of Design Alternatives) for the projects encompassed by this report, which fall under Schedule 'C' of the Class EA Document. Further consultation will be required for any of these projects.

1.2.3 Consultation & the Project Process

A significant component of the Master Planning process, as identified in the Municipal Class Environmental Assessment Act, is public and stakeholder consultation and engagement. The development of the Bolton TMP was informed by a rigorous consultation and communication program. The program was developed prior to project commencement and was used to guide the project process to ensure that members of the public and key stakeholders were able to provide their input at key stages of project development.

1.2.3.1 The Consultation Requirements

To meet the requirements of Phases 1 and 2 of the Municipal Class Environmental Assessment Process, a minimum of two (2) points of contact with the public, stakeholders and government agencies should be achieved. Points of contact are defined as both in-person and on-line tools where information is presented to those in attendance, feedback and input is gathered and used to inform key project deliverables.

1.2.3.2 The Consultation Approach

The consultation and communication program was driven by the goal of "accessibility" and enhanced by the principle of "convenience where possible". As part of the consultation and communication program the project team identified the key target audiences that were to be engaged throughout the project process. The strategy also identified the consultation and engagement activities that would be used to engage each target audience. **Figure 3** illustrates the four (4) key target audiences that were identified and used to shape the consultation activities undertaken. It is important to note that in some cases, the individuals or groups may represent multiple target audiences.

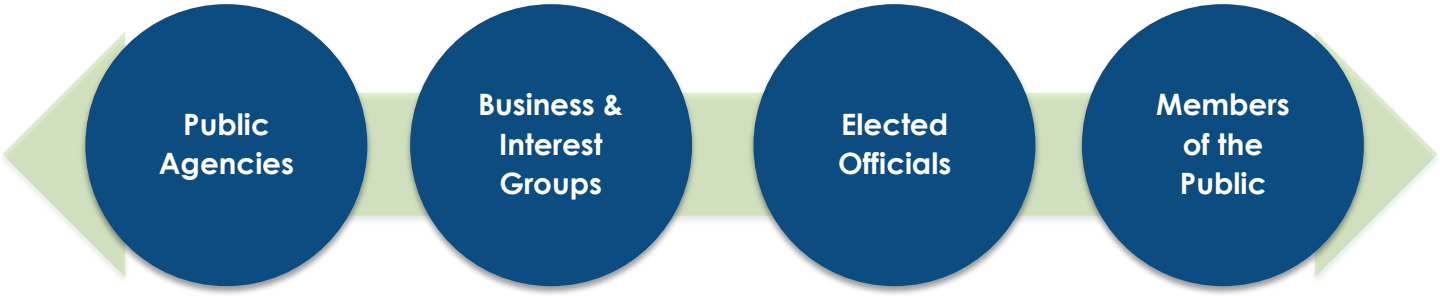


Figure 3 – Overview of the Key Target Audiences for the Bolton TMP

1.2.3.3 The Consultation Process

For the Bolton TMP, the project team endeavoured to go beyond the Municipal Class EA consultation requirements to continuously involve the public and stakeholders in the project process. The first formal point of contact was the Notification of Study Commencement which was posted on the Town's website and published in the local newspaper. The notice introduced the TMP, supplied project team contact information and provided an overview of the various opportunities for the public, stakeholders and government agencies to provide input. There were six types of public / stakeholder consultation activities that were undertaken to engage these groups. They included:

- Ongoing Consultation: Promotion and outreach tools and techniques that were developed with a consistent study brand to promote the study and to encourage people to get engaged at key points in the study process. Included in the ongoing consultation was an online questionnaire which gathered input from the public on current transportation habits and future wants and needs for the transportation system.
- In-person Public Outreach: Meetings and open houses that were used to engage members of the public and select stakeholders to present key study materials / recommendations and to gather their input to inform the development of future project deliverables.
- Stakeholder Engagement: Engagement tools including workshops and focus groups which were used to engage specific stakeholder groups to review key project deliverables and to inform the development of future project outputs.
- Steering Committee Coordination: To engage with members of the steering committee through focus group sessions and presentations to review and revise technical materials to form part of the master plan report.
- Documenting the Findings: The documentation of key public and stakeholder input to track the results gathered and to appropriately respond to inquiries and comments.
- Reporting to Council: To highlight key study findings and key outcomes of the master plan report to Council representatives.

Figure 4 illustrates the TMP study process and the occurrence of consultation / communication activities during this time.

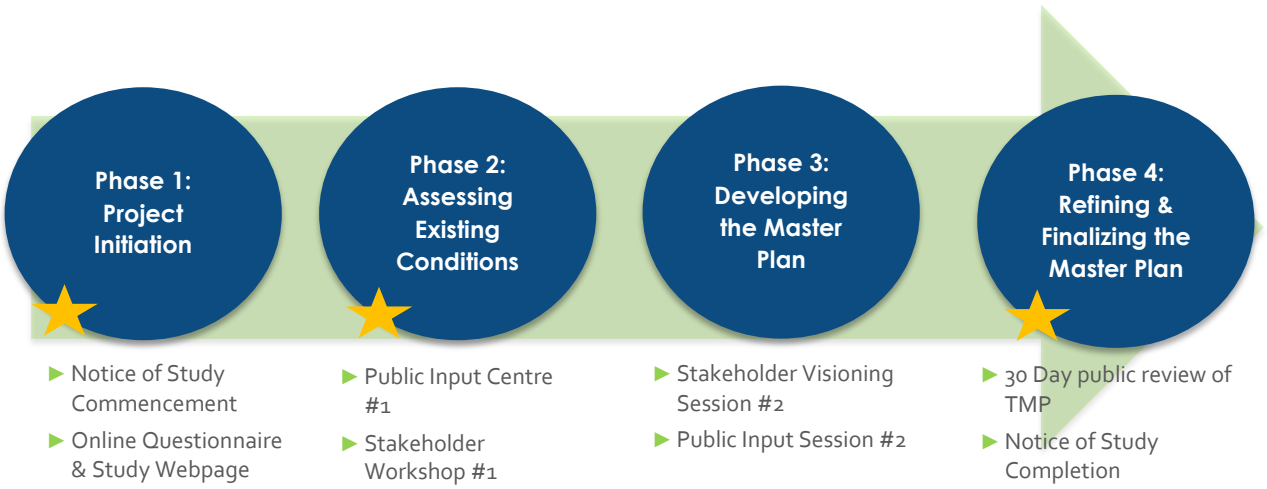


Figure 4 – Public / Stakeholder Consultation Process Overview

1.2.3.4 Public Input

The overwhelming message received through public input was the public's desire to reduce the impacts of trucks on the Bolton community through enforced truck restrictions, particularly through the downtown core. The public was adamant that through trucks should be restricted on Queen Street and King Street in the downtown core. Other key messages conveyed through the consultation process were the desire to see alternatives to the personal automobile, such as GO train service, expanded bus service and expanded active transportation facilities, and measures to improve the downtown, including on-street parking.

The input received from the public and stakeholder representatives, staff from the Region of Peel and the Town of Caledon and the Steering Committee was documented and summarized to highlight the key issues, concerns and opportunities that were addressed through the master plan. A complete synopsis of the efforts made to engage the public and stakeholders, input received, as well as an analysis of survey results is provided in **Technical Appendix A**.

1.3 PROBLEM AND OPPORTUNITY STATEMENT

As noted above, the Bolton TMP has been developed to address Phases 1 and 2 of the Municipal Class EA Process. Phase 1 requires that the problem / deficiency or opportunity be identified which is intended to be addressed through the policies, strategies and recommendations outlined in the report.

As part of Phase 1 of the Bolton TMP, the project team identified a problem statement for transportation within the community of Bolton. The problem statement was shaped by initial input provided by members of the public and stakeholders through the online questionnaire as well as discussions with staff from the Town and Region as well as members of the Steering Committee. The problem statement (below) reflects four (4) major themes related to transportation deficiencies and road network concerns in the Bolton area in the short and long-term to the year 2031 and beyond.

POPULATION GROWTH

The population of the community of Bolton is expected to grow from current levels of over 25,000 people to more than 45,000 people by the year 2031. This represents an almost doubling of the size of the existing population in Bolton. Increased population will bring new challenges to enable people and goods to get where they want to go by different travel modes.

TRUCK TRAFFIC INTO AND THROUGH BOLTON

There is significant truck traffic today on the main arterial roads in Bolton. The volume of truck traffic could increase in the future. While certain measures, such as Emil Kolb Parkway, are being constructed right now to help better facilitate truck movement, the issue of trucks, especially through the historic downtown, is one of the most pressing transportation issues. Truck traffic has positive economic impacts on the community while at the same time potentially decreases the livability of the area (due to the noise and congestion they can create). Truck movements need to be managed and balanced to maintain the high quality of life in Bolton.

DOWNTOWN HERITAGE PRESERVATION

The historic downtown of Bolton dates back to the late nineteenth century and is worth preserving and promoting as the centre of the community. While many factors affect the viability of this area as a commercial centre, traffic movements, particularly truck movements, need to be managed carefully in order to help create an atmosphere that will attract businesses and residents to this area.

MULTI-MODAL TRANSPORTATION OPTIONS

Besides the personal automobile, there are limited opportunities to travel comfortably in Bolton by other modes of transportation such as transit, walking or cycling. With a vision toward a more sustainable transportation future that provides a variety of choice in travel modes, alternatives to the automobile need to be planned for and enhanced in the coming years.

1.4 REPORT ORGANIZATION

The report is organized into 11 chapters that describe existing conditions and then the future multi-modal transportation network to meet forecast population and employment growth. The steps to arrive at the preferred transportation alternative are clearly defined. The vision and rationale for transforming Queen Street in the downtown core into a "complete street" that accommodates all modes of transportation is presented. The TMP concludes with the implementation strategy of next steps for programs and projects to make the TMP a reality.

The Bolton TMP report is supported by a number of technical appendices which are intended to be read in conjunction with the master plan report. Each technical appendix contains more detailed technical information that may be made available to the public for their review and consideration upon request to the Region of Peel or the Town of Caledon.



2.0 ASSESSMENT OF EXISTING CONDITIONS

2.1 BOLTON SOCIO-ECONOMIC PROFILE

The 2011 Census of Canada reported a population of 23,174 people in the Community of Bolton (boundaries as defined by Census Canada), which represents an increase of almost 2% since 2006. A figure of the current census area for the Community of Bolton is illustrated in **Figure 5.**

This growth coincides with the 4% town-wide growth experience in the Town of Caledon during the same time period. The Community of Bolton's population has been steadily increasing, in the ten year period between 2001 and 2011 it has nearly tripled in size, as shown in **Table 1**.

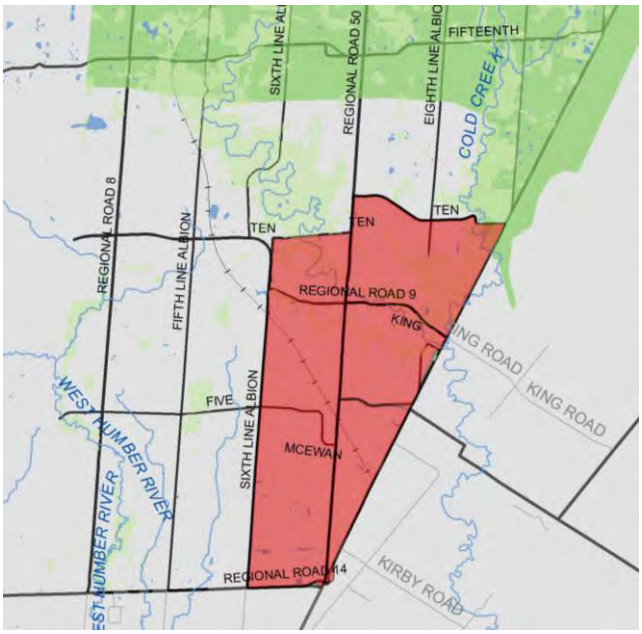


Figure 5 – Census Area for the Community of Bolton (Census Canada)

Table 1 – Town of Caledon and Community of Bolton Population Data, 2001- 2011

Year	Population	
	Town of Caledon	Community of Bolton
2011	59,460	23,174
2006	57,050	22,719
2001	32,961	9,408

Source: Canadian Census 2001-2011

The 2011 Census of Canada reported a median age of 37 for the Community of Bolton, which is lower than the Town of Caledon median age of 40 (see **Table 2)**. The Town of Caledon has reported an increase in age between 2001 and 2011 with the overall median age for the region increasing by 4 years over the decade. Within Bolton the most prominent age group is individuals aged 40-49, representing approximately 20% of the current population (see **Figure 6).**

This difference in age can be explained by the recent residential growth in Bolton that is attracting younger families when compared to the greater Town of Caledon. Being located in the southeast corner of the Town, Bolton is closest to Toronto and other job centres in the Greater Toronto Area.

Table 2 – Town of Caledon and Community of Bolton Median Age, 2001- 2011

Year	Age	
	Town of Caledon	Community of Bolton
2011	40	37
2006	40	N / A
2001	36	N / A

Source: Canadian Census 2001-2011

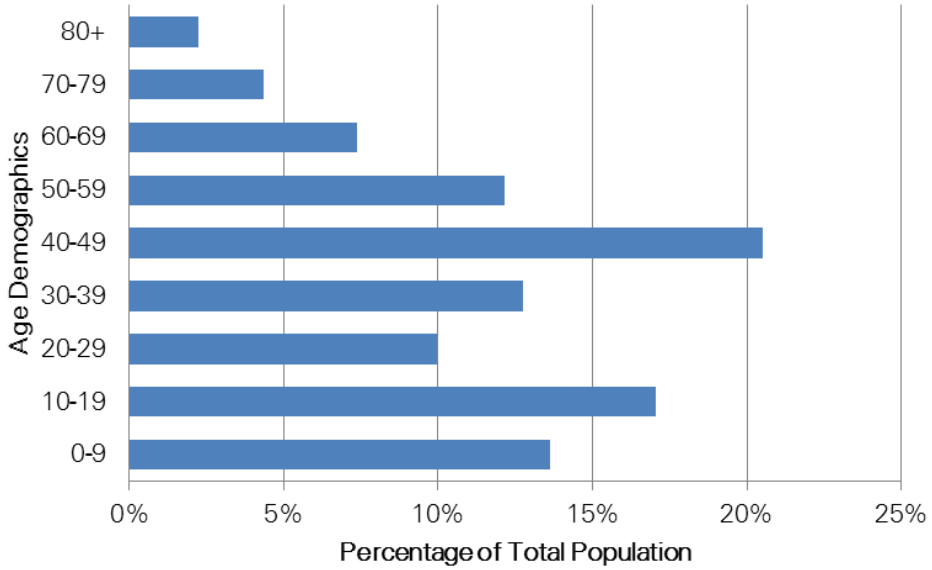


Figure 6 – Community of Bolton Demographics (Age), 2012

The 2011 Census of Canada reported an average household size of 3.1 and 3.3 persons in both the Town of Caledon and Community of Bolton, respectively. Since 2001, the average household size of the Community of Bolton has maintained static while the larger Town of Caledon has experienced a slight decreased in average household size, as shown in **Table 3.**

Table 3 – Town of Caledon and Community of Bolton Average Household Size, 2001-2011

Year	Average Household Size	
	Town of Caledon	Community of Bolton
2011	3.1	3.3
2006	3.2	3.3
2001	3.2	3.3

Source: Canadian Census 2001-2011
Note: Data shows the average number of persons per census family

The 2011 Census of Canada reported an average individual income of $45,828 in the Community of Bolton (see tabulated **Table 4**), which represents an increase of almost 13% since 2006. The 13% increase is more than eleven times the 1.45% increase experience in the Town of Caledon. When compared to the average individual income of Canada and Ontario, $40,650.00 and $42,264.00 respectfully, the Community of Bolton average income is 13% higher than the Canadian average and 8% greater than the Ontario average.

Table 4 – Town of Caledon and Community of Bolton Average Individual Income, 2001-2011

Year	Average Individual Income	
	Town of Caledon	Community of Bolton
2011	$50,911	$45,828
2006	$50,183	$40,627
2001	$44,819	$40,812

Source: Canadian Census 2001-2011

The 2011 Census of Canada reported an average household income of $104,708 for the Community of Bolton, a value slightly lower than the $119,258 household average for the Town of Caledon as shown in **Table 5.** This increase in household income represents an approximate increase of 15% from 2006 to 2011, significantly greater than an approximate 2% increase for the Town of Caledon.

Table 5 – Town of Caledon and Community of Bolton Average Household Income, 2001-2011

Year	Average Household Income	
	Town of Caledon	Community of Bolton
2011	$119,258	$104,708
2006	$117,386	$91,284
2001	$104,637	$93,332

Source: Canadian Census 2001-2011

2.2 EXISTING VEHCILE TRAFFIC CONDITIONS

Existing traffic conditions were observed and data was collected to analyze the performance of the existing road network in Bolton. Understanding the existing conditions will help identify areas for quick wins today and areas of focus for future improvements. The Transportation Tomorrow Survey (TTS) was used to gain an understanding of the mode distributions within the community of Bolton. Using the existing traffic volumes, screenline and intersection analyses were undertaken to gain an understanding of existing vehicle movements and traffic patterns in Bolton.

2.2.1 Existing Travel Behaviour

Data from the TTS was studied to determine travel behaviour in Bolton. Beginning in 1986, the TTS has been collecting data in southern Ontario coinciding with the Canadian Census regarding information on how members of household utilize the transportation system. At the time of this report, the most recent data available was for the year 2011. The TTS reported an approximate household car ownership of two cars per household in both the Community of Bolton and Town of Caledon as indicated in **Table 6.**

Table 6 – Town of Caledon and Community of Bolton Household Car Ownership, 2001-2011

Year	Car Ownership	
	Town of Caledon	Community of Bolton
2011	2	2
2006	2	2
2001	2	2

Source: Transportation Tomorrow Survey

The 2011 – 2001 TTS recorded an overall percentage increase in transit use in Bolton during the peak period of 6:00 a.m. – 9:00 a.m. Trips destined to Bolton are depicted in **Table 7** and shown graphically in **Figure 7** and **Figure 8.**

Table 7 – Transportation Mode - Trips Destined to Bolton

Time Period	Year	Transit Excluding GO Rail	Cycle or Walking	Joint GO Rail and Transit	Auto Driver	Auto Passenger
6:00 – 9:00 AM	2011	16%	5%	0%	69%	10%
	2006	13%	9%	0%	68%	10%
	2001	8%	4%	0%	80%	7%
3:30 – 5:30 PM	2011	6%	5%	1%	76%	12%
	2006	7%	6%	1%	75%	11%
	2001	10%	7%	1%	72%	10%
24 Hour	2011	7%	4%	0%	74%	15%
	2006	6%	5%	0%	75%	14%
	2001	5%	4%	0%	79%	12%

Source: Transportation Tomorrow Survey

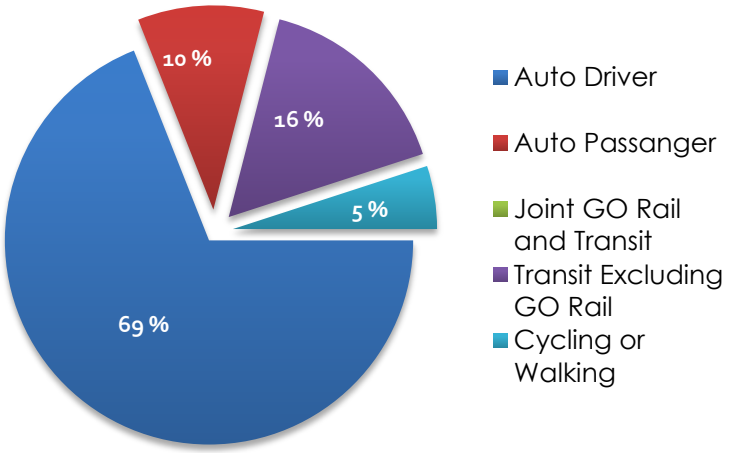


Figure 7 – AM Percentage Distribution of Primary Travel Modes Destined from Bolton, 2011

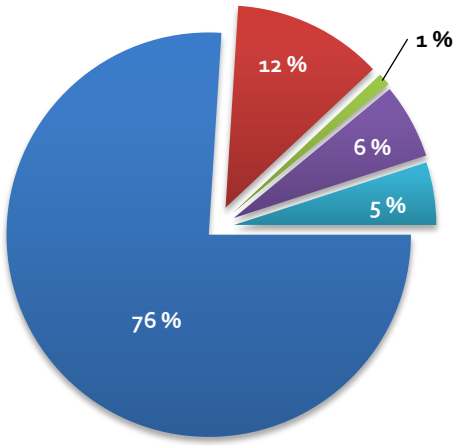


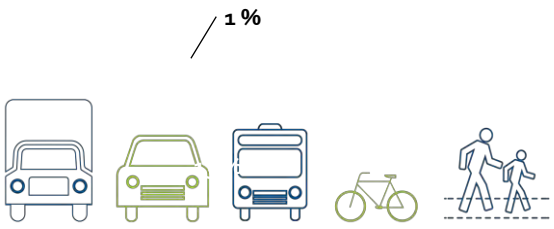
Figure 8 – PM Percentage Distribution of Primary Travel Modes Destined from Bolton, 2011

Based on the TTS data, the auto driver mode split for the a.m. peak period has significantly dropped from 80% in 2001 to 69% in 2011. The decrease in auto driver trips indicates that people are exploring and using alternative modes of transportation to reach their destinations. This drop in auto driver trips correlated with an increase in sustainable alternative transportation modes of carpooling and the utilization of transit between the decade's time of 2001 and 2011.

Trips from Bolton were recorded and analyzed in **Table 8**, for the a.m. peak period of 6:00 a.m. – 9:00 a.m., p.m. peak period of 3:30 p.m. – 6:30 p.m., and the 24 hour period. A marginal increase of transit was observed in the 24 hour data between the year 2006 and 2011. Moreover, active transportation modes of travel are more apparent during the a.m. peak period as opposed to the entire 24 hour day. The mode distribution for the a.m. and p.m. peak periods is also shown graphically in **Figure 9** and **Figure 10**.

Table 8 – Transportation Mode - Trips Originating from Bolton

Time Period	Year	Transit Excluding GO Rail	Cycle or Walking	Joint GO Rail and Transit	Auto Driver	Auto Passenger
6:00 – 9:00 a.m.	2011	13%	5%	1%	73%	9%
	2006	12%	7%	1%	72%	8%
	2001	12%	4%	1%	74%	9%
3:30 – 6:30 p.m.	2011	9%	6%	0%	72%	13%
	2006	10%	7%	0%	71%	13%
	2001	5%	5%	0%	79%	11%
24 Hours	2011	7%	4%	0%	74%	14%
	2006	6%	5%	0%	75%	14%
	2001	5%	3%	0%	79%	12%



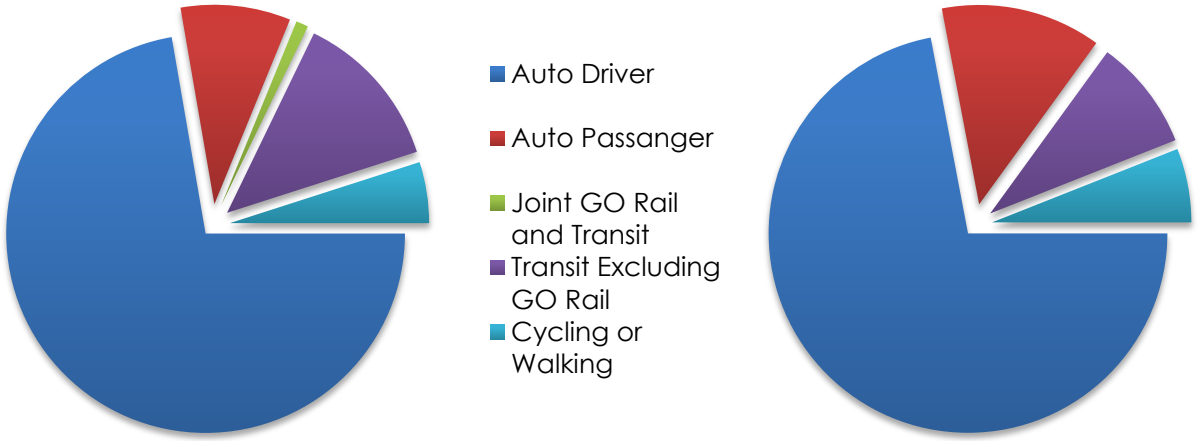


Figure 9 – AM Percentage Distribution of Primary Travel Modes Originating from Bolton, 2011

Figure 10 – PM Percentage Distribution of Primary Travel Modes Originating from Bolton, 2011

The TTS data revealed that approximately 40% of the morning peak period trips are internal to Bolton, i.e. the trips start and end in Bolton. As can be expected, the surrounding municipalities and regions (Toronto, Brampton and Mississauga, and the Region of York) are the major attractors and generators of trips originating from and destined to Bolton. The origin and destination trips to and from Bolton are shown in **Figure 11.**



Figure 11 – Trips From and To Bolton, Morning Peak Period

2.3 EXISTING POLICIES & PLANS

Considerable planning work has been done in the Town of Caledon, Region of Peel, and other levels of government to support a significant change in the approach to transportation planning, design and development. In order to understand the policies, recommendations and strategies that need to be developed for the TMP, one must understand the foundation from which they come from. The intent of the TMP was to build on the existing policies to highlight areas of support and possible areas of deficiency for future improvements. Relevant policies at the federal, provincial, regional and local level were reviewed. A summary of the plans and policies reviewed is presented in **Table 9**. A more detailed review and summary is presented in **Technical Appendix B**.

Table 9 – Overview of Planning Policies at all Levels of Government

Federal	Provincial	Regional	Town	Neighboring Jurisdiction
National Vision for Urban Transit to 2020	Provincial Policy Statement (2014)	Region of Peel Official Plan (2013)	Bolton Residential Expansion Study (BRES) 2012	King Township Transportation Master Plan (2015)
Federal Sustainable Development Act (2008)	Growth Plan for the Greater Golden Horseshoe (2013)	Strategic Goods Movement Network Study (2013)	Canadian Tire Distribution TIS (2012)	Brampton Transportation Master Plan Update (2015)
	Ministry of Transportation Cycling Strategy (2013)	Region of Peel Long Range Transportation Plan (LRTP) Update (2012 Draft)	Bolton Commuter Rail Feasibility Study (2010)	County of Simcoe Transportation Master Plan (2014)
	Ontario Ministry of Transportation Transit Supportive Guidelines (2012)	Region of Peel Road Characterization Study (2011)	Caledon Transportation Needs Study Update (2009)	Highway 427 Industrial Secondary Plan - Area 47 (2014)
	GTA West Corridor Environmental Assessment (2012)	Region of Peel Active Transportation Study (2011)		A New Path: Vaughan Transportation Master Plan (2012)
	The Big Move (2009)	Region of Peel Transportation Demand Management (TDM) Plan (2008)		Health Background Study (2011) – Toronto Public Health / Region of Peel
	Accessibility for Ontarians with Disabilities Act (2005)	Highway 50 / 427 Extension Area: Arterial Road Network Study (2007)		York Region Transportation Master Plan (2009)
	Greenbelt Plan (2005)			



2.4 EXISTING TRANSPORTATION ANALYSIS

In order to understand the improvements that need to be made to the transportation system, it is vital to have a strong understanding of the existing transportation facilities and how they function. The following sections provide an overview of the current transportation conditions in Bolton and how they were assessed through the TMP.

2.4.1 Roadway Network

The major roadways within Bolton are shown in **Figure 12.** The jurisdiction and classification of the roads are listed in **Table 10.**

Table 10 – Jurisdiction and Classification of the Roads in Bolton

Jurisdiction	Roadway	Classification
Region of Peel	Mayfield Road	High Capacity Arterial
Region of Peel	The Gore Road	Medium Capacity Arterial
Region of Peel	King Street	Medium Capacity Arterial
Region of Peel	Coleraine Drive (North of Mayfield Road)	Medium Capacity Arterial
Region of Peel	Old Church Road (W. of HWY 50)	Medium Capacity Arterial
Region of Peel	Queen Street/HWY 50	High Capacity Arterial
City of Vaughan	Albion Vaughan Road (South of King Street)	Medium Capacity Arterial
Town of Caledon/Township of King	Caledon King Townline (North of King Street)	Collector
Town of Caledon	Humber Station Road	Collector
Town of Caledon	Castlederg Side Road	Collector
Town of Caledon	Old Church Road (E. of HWY 50)	Collector
Town of Caledon	Healey Road	Collector
Town of Caledon	George Bolton Parkway	Collector
Town of Caledon	Queensgate Boulevard	Local

2.4.2 Forecasting Model Review and Update Roadway Network

A forecasting tool was used as a key component of the TMP to review and update the roadway network. The tool provides an indication of how factors such as population and employment growth and transportation investments will affect transportation system performance in the future.



Figure 12

Bolton Transportation Master Plan

Major Roadways:
Local, Collector, Major Arterial

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The Region of Peel's 2007 Travel Forecasting Model (PFM) was used as a basis to determine the transportation improvements that will best benefit Bolton. In reviewing the existing model, it was determined that updates to the model were needed to accurately reflect existing conditions. It is natural for a strategic model of this nature to include certain generalizations, which sometimes result in less than acceptable sub-area and/or corridor-wide performance.

The intent of the model review was not as much to critique the existing model, but to make it more sensitive to the study in question. This section identifies the list of improvements that were implemented in the original model.

These improvements were broadly divided into three parts:

- Seed Matrix: It was decided to replace all the "seed" matrices in the PFM with those generated from the 2011 TTS data. The original "seed" matrices in the model were based on 2001 TTS data;
- Zones: Improved the zone structure of the network by introducing additional Transportation Analysis Zones (TAZs). Through this review, large TAZs or those with relatively incompatible land uses were split into two or more zones to improve local assignments. The zones were divided along major corridors and distinctive land uses. The model was expanded from six (6) zones in Bolton to 48 zones. The original and the new zone boundaries are shown in **Figure 13**;
- Roadways: The PFM had a very basic roadway network within Bolton with only major arterial roadways. To improve trip assignment, a number of roadways were entered into the model, in addition to an update to the network characteristics. In total, an additional 90 lane kilometres were added within Bolton to the PFM. The capacity, number of lanes, volume delay functions (VDF), and centroid connector locations were refined. The newly added and modified links are shown in **Figure 14**; and
- Macro and Demand Updates: Improved the macros used to run the model, and key input matrices that are used to "seed" the trip distribution in the PFM. Factors were added to the calculated attractions and productions of specific zones within Bolton to converge the total trip making to 2011 TTS estimates, and to 2013 traffic count data. To improve key zone-to-zone linkages, factors were introduced at the trip distribution stage.

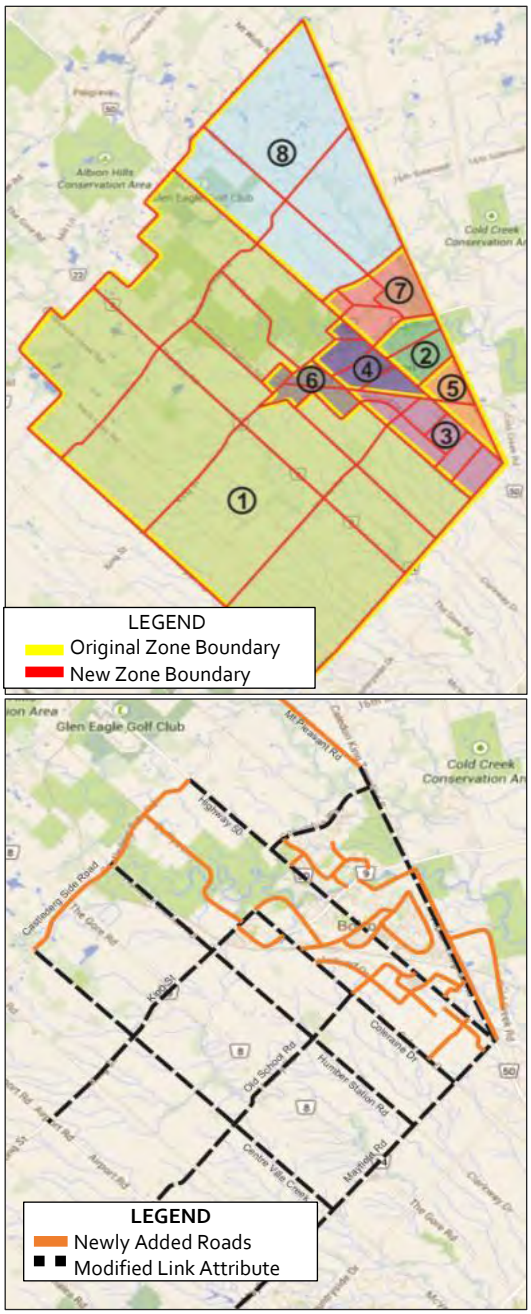


Figure 14 – Roadway Updates

The updates carried out to the PFM have resulted in a robust strategic forecasting tool. The supply-side (network) improvements carried out to the PFM were focused for the Bolton area, but the demand-side (trip generation, distribution, macros, and input matrices) improvements are applicable for the entire PFM and add significant value to the model and the Region of Peel. The updated PFM then was used to undertake future horizon year forecasts under different transportation

infrastructure conditions. The complete "Model Validation Technical Memorandum" is available in **Technical Appendix C**.

2.4.3 Model Assessment of Existing Conditions

Once the PFM was calibrated and validated, it was used to assess base (year 2011) conditions to help determine any current corridors that may be experiencing capacity concerns and to help establish a benchmark to compare alternatives of future conditions. The existing model travel flows and volume-to-capacity ratios are shown in **Figure 15** and **Figure 16.**

As shown in Figure 16, the majority of the roadways within Bolton operate at acceptable v/c ratios. There are a number of short sections that show congested or overcapacity conditions, which is primarily due to the location of the connectors in the model. Highway 50 / Queen Street and Albion Vaughan Road / Caledon King Townline experience longer sections of congestion in the southbound direction during the a.m. peak hour, similar patterns in the opposite, northbound, direction would be shown during the p.m. peak hour. These roads should be monitored and examined in more detail to determine intersection operations.

Metrics were extracted from the model to further analyze the existing conditions. The model metrics are readily available from the PFM and allow for an empirical analysis of the road network's performance. These metrics are taken from the PFM and will assist in assessing the performance of each alternative tested in Section 4. The metrics are explained in **Table 11**.



Figure 15 – Existing Travel Flows

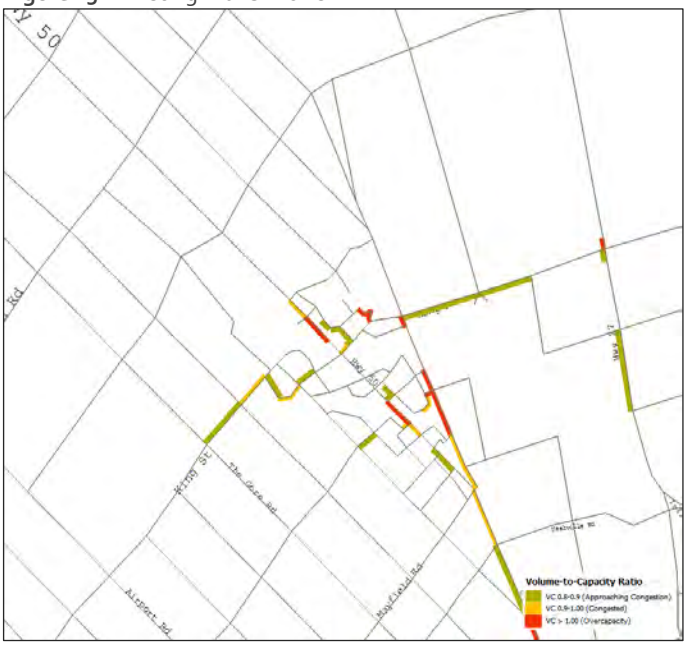


Figure 16 – Existing V/C Ratios

Table 11 – Metrics Explained

Metrics	Purpose	Goal	Key performance measures
Mobility	▶ Provide efficient travel ▶ Provide better connectivity between zones	▶ Improve mobility to ensure the availability of a high capacity and well-connected multi-modal network that will serve the growing areas	▶ Vehicle Kilometres Travelled (VKT) ▶ % of total VKT on congested links
Congestion	▶ Reducing time spent travelling	▶ Alleviate the build-up of systemic congestion through local improvements	▶ Vehicle Hours Travelled (VHT) ▶ % of total VHT on congested links ▶ Travel Time Index ▶ % of Congested Lane-Km
Economic Viability	▶ Provide an estimate of required improvement cost	▶ Reduce the cost of infrastructure improvements required	▶ Lane-kms per 1,000 people

The model evaluation accounts results for the present road network (2011), are tabulated in **Table 12**.

Table 12 – Model Evaluation of the Year 2011, Existing Conditions in Bolton

Evaluation Accounts	Metrics	2011 Results
General Infromation	Population	34,814
	Total Lane Kilometres (lane*km)	335
Mobility	Vehicle Kilometres Travelled (VKT)	72,968
	% of Total VKT on Congested Links (vc>0.9)	15%
Congestion	Vehicle Hours Travelled (VHT)	1,506
	% of Total VHT on Congested Links (vc>0.9)	24%
	Travel Time Index	1.17
	% of Congested Lane-Kilometres (vc>0.9)	4%
Economic Viability	Lane-kms per 1,000 people	9.6

Note: (1) Bolton area defined as shown in **Figure 5**.

The "vehicle lane kilometres travelled" indicates the total kilometres that are travelled by all vehicles within Bolton. The percent of total vehicle kilometres traveled on congested links indicates how congested the roadway network is. 15% indicates minor congested areas, which is confirmed by the v/c plot above. Vehicle hours travelled is the number of hours vehicles spend travelling on the roadways within Bolton.

The percent of total vehicle hours travelled on congested links indicated how long vehicles are driving on a congested link. The travel time index (TTI) indicates the ratio of model travel time to free flow travel time on all the links.

A TTI of 1.17 indicates that congested travel time in the system is expected to be only 17% higher than under free flow conditions. The annual delay cost of congestion calculates the economic cost of people stuck in



traffic. By themselves, the model metrics are difficult to interpret, therefore they are predominantly used in comparing various alternatives.

2.4.4 Existing Traffic Volumes

The existing traffic volumes for the a.m. and p.m. peak hours are shown in **Figure 17.** These volumes show directionality during both the a.m. and p.m. peak hours. During the a.m. peak hour, the majority of the traffic is headed southbound and eastbound towards employment centres in the Cities of Brampton, Mississauga and Toronto, and the Region of York. During the p.m. peak hour, the traffic pattern is reversed as people are commuting back home.

2.4.5 Existing Screenline Analysis

When doing capacity analysis of the roadway network, it is important to analyze not only the capacity of individual links and intersections but also the capacity of the network as a whole. By analyzing the capacities of specific links and intersections only, one might be tempted to start implementing improvements on a specific link (at significant costs) without considering whether the rest of the network has sufficient capacity to handle the traffic (which could be diverted from the over-congested links). To analyze the roadway network a screenline analysis is used.

A screenline is a group of count stations along a strategically placed imaginary line. Summing traffic data along this line will indicate the volume of traffic entering or leaving a particular area. Screenline analysis is used to show capacity, across multiple links, per direction of travel, and to determine if drivers have a feasible alternate to enter/exit a certain area. It is important to recognize that the screenline analysis is based on a theoretical lane capacity and the results do not necessarily reflect the actual traffic conditions. The analysis results primarily provide an indication where road widening or other measures to manage traffic volumes may be needed. The a.m. and p.m. peak hour screenline locations and their performance are shown in **Figure 18** and **Figure 19**, respectively. Not surprisingly, given the analysis of existing traffic volumes, there are capacity concerns southbound in the a.m. peak hour and northbound in the p.m. peak hour.

In the a.m. peak hour, there are capacity concerns southbound around:

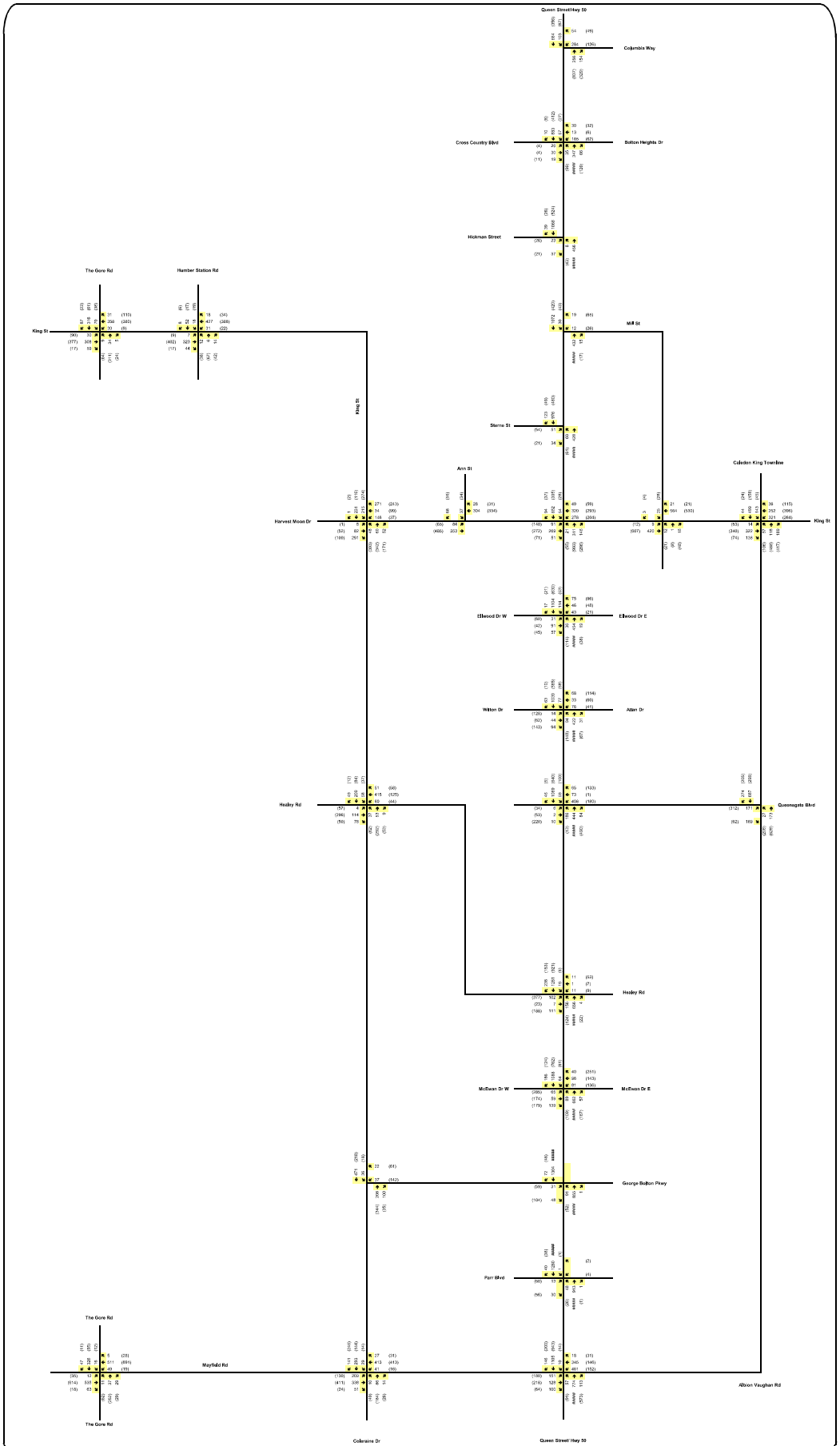
- Columbia Way;
- King Street; and
- Mayfield Road / Albion Vaughan Road.

The east/west screenline along The Gore Road has sufficient capacity to accommodate vehicles.

The screenline analysis of the p.m. peak hour generally exhibits the opposite trend of the a.m. peak hour, with capacity concerns on northbound screenlines at:

- Columbia Way;
- King Street; and
- Mayfield Road / Albion Vaughan Road.

The east/west screenline along The Gore Road has sufficient capacity to accommodate vehicles.



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XX AM Peak Hour Volumes
(XX) PM Peak Hour Volumes

FIGURE 17
Existing Conditions
Traffic Volumes

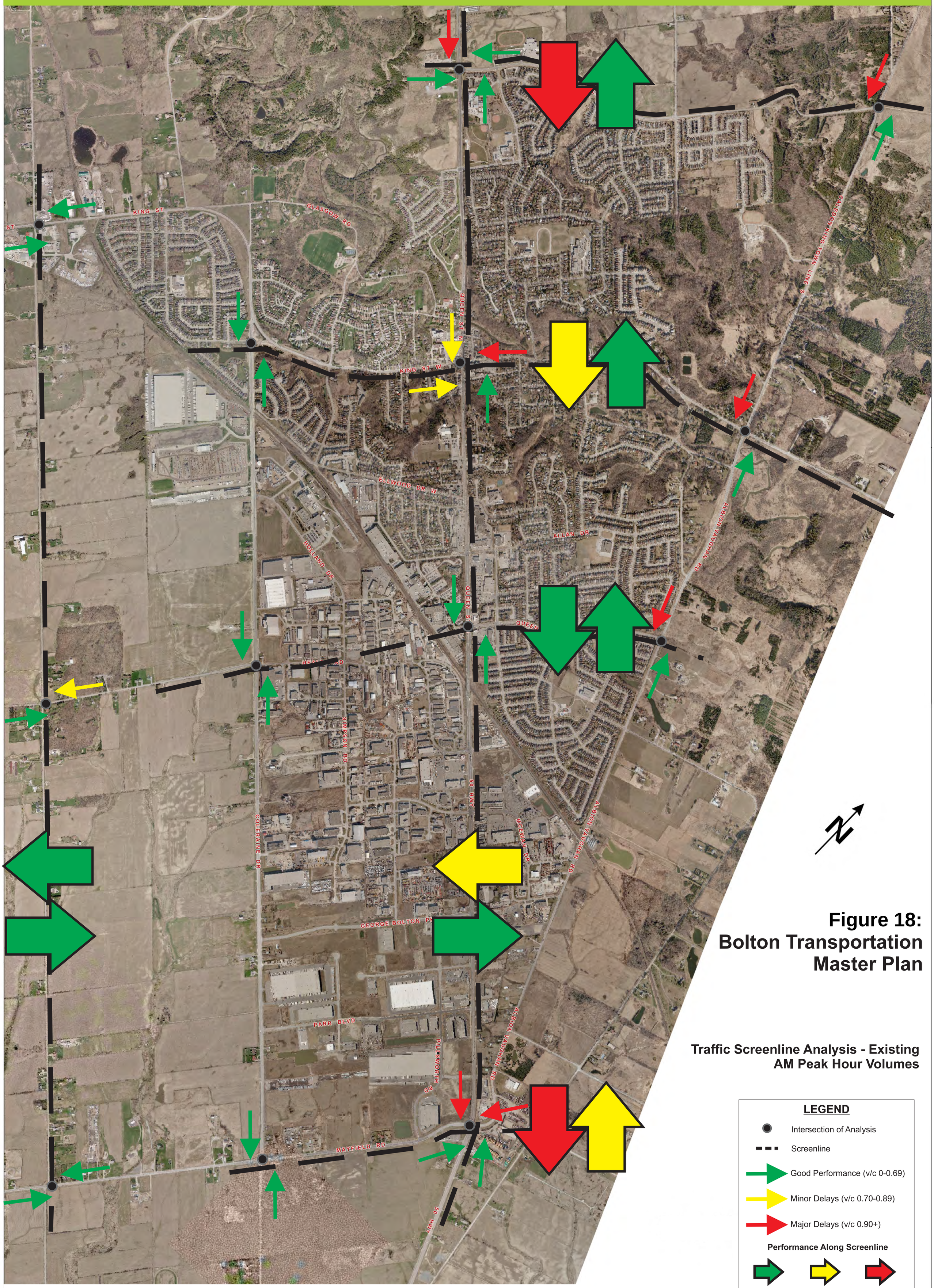

Figure 18: Bolton Transportation Master Plan

Traffic Screenline Analysis - Existing AM Peak Hour Volumes

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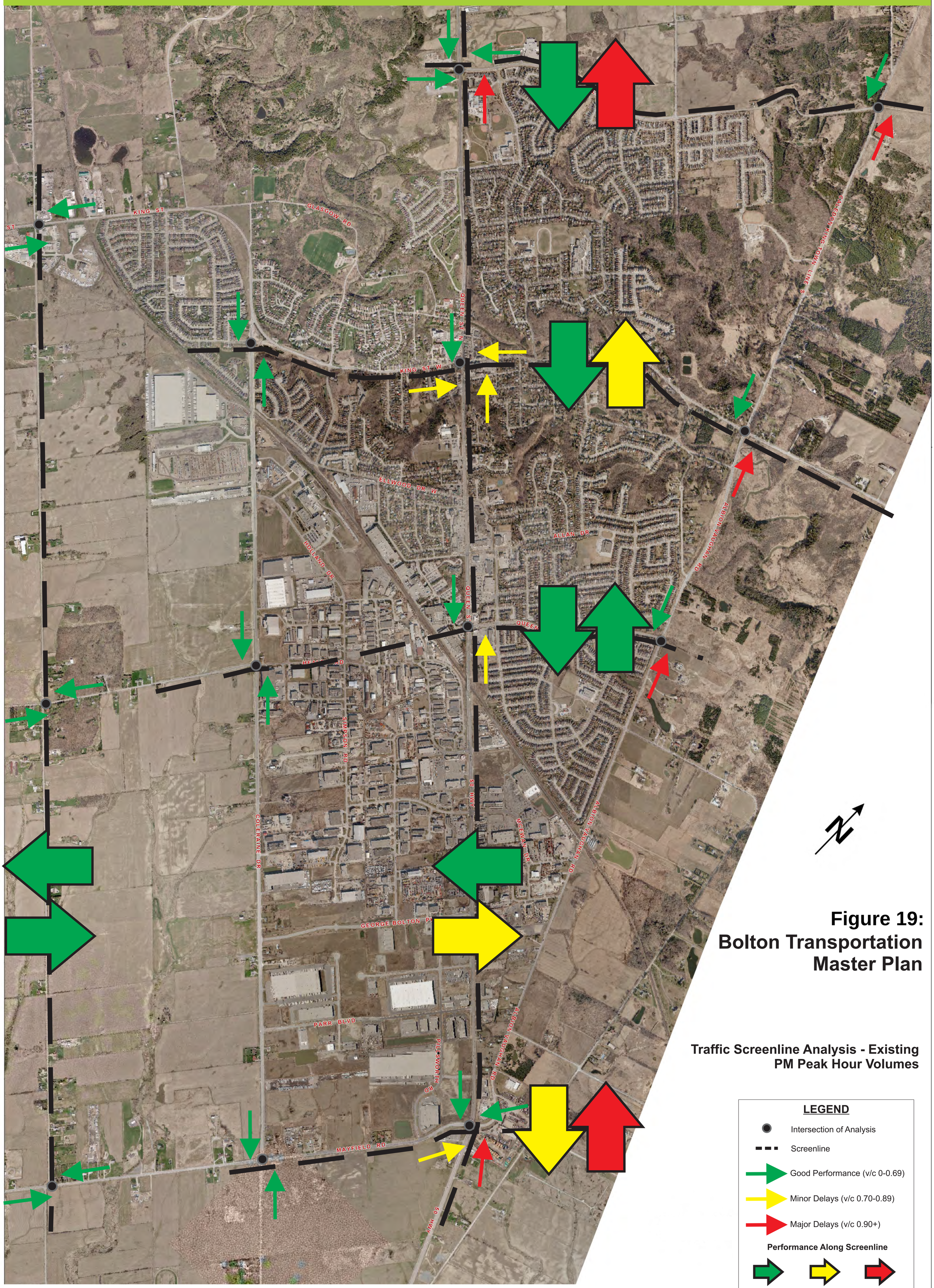

Figure 19: Bolton Transportation Master Plan

Traffic Screenline Analysis - Existing PM Peak Hour Volumes

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2.4.6 Existing Intersection Analysis

An intersection capacity analysis provides an indication of traffic operations based on the average delays at the intersection and calculations of volume to capacity (v/c) for individual movements. Level of Service (LOS) denoted by letters "A" through "D" represents satisfactory traffic operations. LOS denoted by letters "E" and "F" represent congested traffic operations. Turning movement counts, signal timing plans and intersection layouts were obtained to analyze the existing performance of 27 intersections. Capacity analyses were undertaken using the Synchro 8 traffic simulation software. This software incorporates the methodology outlined in the 2000 and 2010 editions of the *Highway Capacity Manual (HCM)*, published by the *Transportation Research Board (TRB)*. Intersection capacity analyses were conducted for the a.m. midday and p.m. peak hours. The midday peak hour scenario was analyzed to determine if any additional problems are exclusive to midday. The results of the analysis are shown in **Table 13**. Improvements were recommended at any intersections with excessive delays and/or movements above capacity.

Table 13 – Existing Intersection Analysis

Intersections	Control Type (Suggested Improvement)	WEEKDAY A.M.		WEEKDAY MIDDAY		WEEKDAY P.M.	
		LOS (Delay in seconds)	Critical Movements (v/c)	LOS (Delay in seconds)	Critical Movements (v/c)	LOS (Delay in seconds)	Critical Movements (v/c)
Hwy 50 & Mayfield Rd / Albion Vaughan Rd	Signalized	C (31)	WB-L (1.02)	B (17)	--	B (19)	--
	(Optimized timing AM Peak)	C (27)	--	--	--	--	--
Hwy 50 & George Bolton Pkwy	Signalized	A (3)	--	A (6)	--	A (7)	--
Coleraine Dr & Healey Rd	Signalized	B (18)	--	B (15)	--	B (16)	--
Hwy 50 & Queensgate Blvd	Signalized	C (23)	--	B (15)	--	C (26)	EB-TR (0.96)
Albion Vaughan Rd & Queensgate Blvd	Signalized	C (27)	SB-TR (0.93)	B (12)	--	B (19)	--
Albion Vaughan Rd / Caledon King Townline S & King St E	Signalized	C (31)	WB-L (0.96)	C (22)	--	D (46)*	WB-L (0.92) NB-TR (1.01)
	(Implement exclusive NB-R lane; P.P. WB-L in the a.m. period)	C (22)	--	C (22)	--	C (21)	--
Hwy 50 & King St W / King St E	Signalized	C (31)	--	C (27)	--	D (41)	--
Hwy 50 & Mill St	Signalized	A (2)	--	A (4)	--	A (5)	--



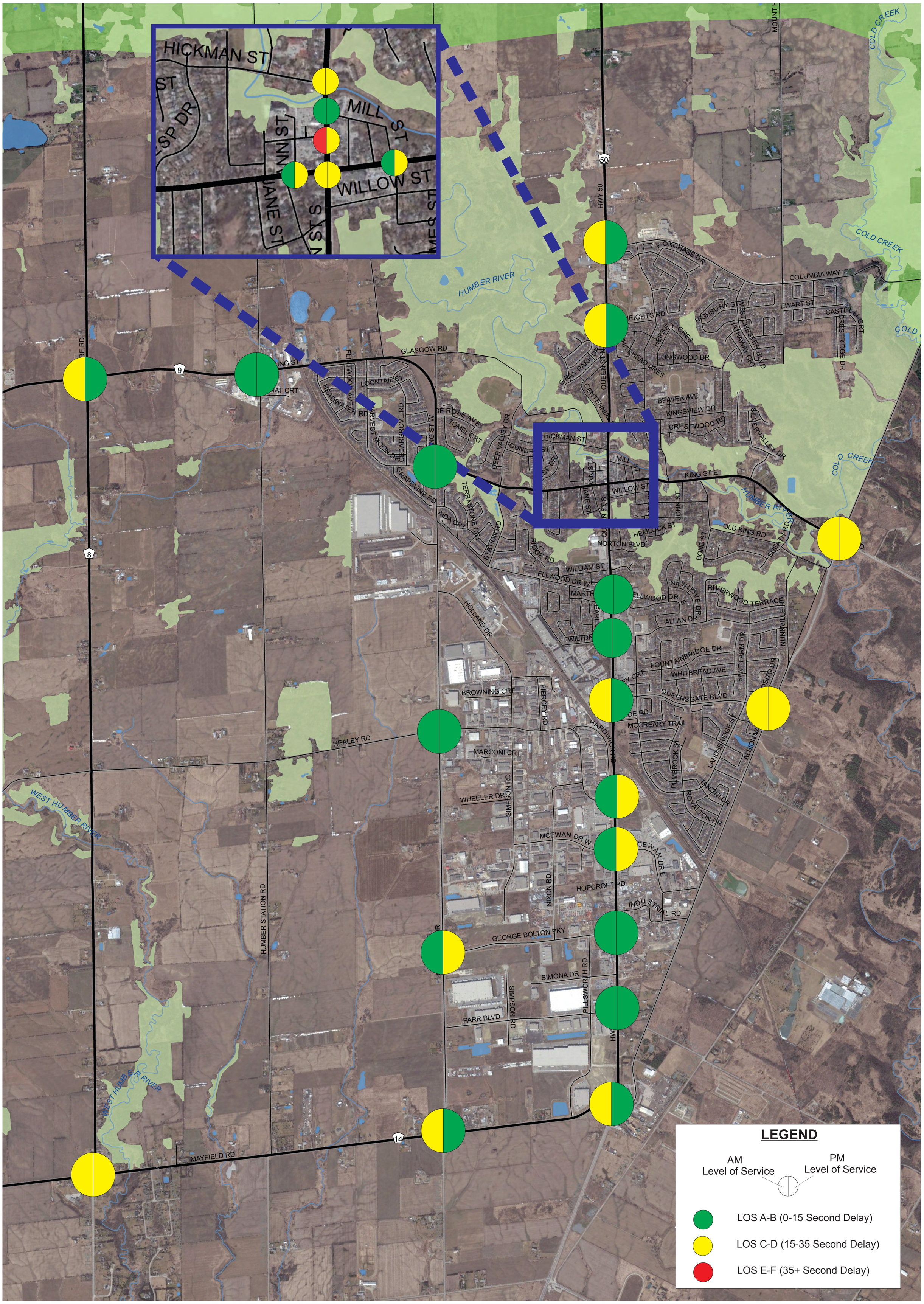
Intersections	Control Type (Suggested Improvement)	WEEKDAY A.M.		WEEKDAY MIDDAY		WEEKDAY P.M.	
		LOS (Delay in seconds)	Critical Movements (v/c)	LOS (Delay in seconds)	Critical Movements (v/c)	LOS (Delay in seconds)	Critical Movements (v/c)
Coleraine Dr & Harvest Moon Dr / King St W	Signalized	B (14)	--	B (10)	--	B (11)	--
Hwy 50 & Columbia Way	Signalized	C (22)	--	A (8)	--	B (13)	--
Humber Station Rd & King St W	Signalized	A (9)	--	A (8)	--	B (13)	--
Hwy 50 & Ellwood Dr W / Ellwood Dr E	Signalized	B (13)	--	B (11)	--	B (14)	--
Hwy 50 & Wilton Dr / Allan Dr	Signalized	B (19)	--	B (14)	--	B (17)	EB-LTR (0.97)
Hwy 50 & McEwan Dr W/ McEwan Dr E	Signalized	B (13)	--	C (22)	--	C (30)	EB-L (0.85)
Hwy 50 & Cross Country Blvd / Bolton Heights Dr	Signalized	C (21)	--	A (7)	--	A (7)	--
Hwy 50 & Parr Blvd	Signalized	A (3)	--	A (7)	--	B (11)	--
Coleraine Dr & Mayfield Rd	Signalized	C (26)	--	B (13)	--	B (17)	--
Hwy 50 & Healey Rd	Signalized	A (10)	--	B (16)	--	C (20)	EB-L (0.88)
The Gore Rd & King St W	Signalized	C (22)	--	B (13)	--	B (20)	--
The Gore Rd & Mayfield Rd	Signalized	C (26)	--	B (11)	--	C (25)	--
Hwy 50 & Old Church Rd	Signalized	B (12)	--	B (11)	--	B (18)	--
Coleraine Dr & George Bolton Pkwy	Unsignalized	WB-L: B(15)	--	WB-L: B(12)	--	WB-L: C(15)	--

Intersections	Control Type (Suggested Improvement)	WEEKDAY A.M.		WEEKDAY MIDDAY		WEEKDAY P.M.	
		LOS (Delay in seconds)	Critical Movements (v/c)	LOS (Delay in seconds)	Critical Movements (v/c)	LOS (Delay in seconds)	Critical Movements (v/c)
Hwy 50 & Hickman St	Unsignalized	EB-L: C(24)	--	EB-LR: B(13)	--	EB-LR: C(20)	--
David St / Mill St & King St E	Unsignalized	SB-LTR: B (14)	--	SB-LTR: B(11)	--	SB-LTR: C(17)	--
King St W & Ann St	Unsignalized	SB-LR: B(14)	--	SB-LR: B(11)	--	SB-LR: C(15)	--
Hwy 50 & Sterne St	Unsignalized	EB-LR: E(44)	EB-LR (0.49)	EB-LR: D(28)	--	EB-LR: C(17)	--

Note: * Long average NB-TR queues and delay.

Optimization of the traffic signal cycle lengths and green splits addressed the majority of the capacity issues at critical intersections. However, at the intersection of King Street and Albion Vaughan Road / Caledon King Townline, it is recommended that an exclusive northbound right turn lane be implemented. This is due to a high number of northbound through and right-turning vehicles during the p.m. peak hour, which result in long northbound queues and delays. There is a limited space available on the east side of Albion Vaughan Road, and the feasibility to accommodate the proposed northbound right turn lane will have to be determined based on a detailed engineering/feasibility study. It should be noted that the capacity analysis results for this intersection are based on the traffic counts conducted in 2015 which are significantly higher compared to all previous traffic counts. There has been a significant increase in the northbound and eastbound traffic volumes at this intersection compared to the previous traffic counts. The additional site visits were conducted and it was confirmed that the 2015 counts reflect the existing traffic conditions at this intersection. It is not clear if the significant increase in traffic volumes is due to new developments in the area or is due to temporary traffic diversion (e.g. due to a construction) from parallel/alternative routes in the area. However, the provision of the exclusive northbound right turn lane will significantly improve traffic operations at this intersection, and it is recommended to be implemented even if it is determined that the observed significant increase in the eastbound and northbound traffic volumes was temporary.

The updated level of service analysis of existing intersections is displayed in **Figure 20**. Based on the analysis, during the midday peak hour all intersections operate significantly better than during the a.m. or p.m. peak hours, with no critical movements at any intersection. Therefore, for the future scenarios only the a.m. and p.m. peak hours will be analyzed, which will capture the worst case scenarios.



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AM Level of Service / PM Level of Service

- LOS A-B (0-15 Second Delay)
- LOS C-D (15-35 Second Delay)
- LOS E-F (35+ Second Delay)

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Figure 20: Bolton Transportation Master Plan

Existing Traffic Operations

2.4.7 Existing Truck Movements

Trucks are an important part of the economy in Bolton but they also can prove challenging to accommodate while maintaining adequate mobility. An important part of this TMP is to consider truck volumes and ways to improve truck movements while at the same time preserving and enhancing the quality of life in Bolton, especially in the downtown core.

Based on the truck counts conducted in 2012 and 2013, while a significant portion of trucks enter Bolton from the south (peaking at 200 trucks in the a.m. peak hour) over half of these trucks are destined for points south of George Bolton Parkway. These include the larger warehouse developments in south Bolton. As a result, the volume of trucks travelling through the Bolton Core, from the south, is minimized. From the north of Bolton, approximately 30-50 trucks per hour can be expected during the peak periods, and the majority of these vehicles rely on travel through the Bolton Core to reach their destinations further south.

In terms of east-west travel through Bolton, Mayfield Road handles the majority of this traffic, with King Street through the Bolton Core being utilized by approximately 10-20 trucks in both directions during the peak hours.

Generally, the majority of truck volumes appear to be destined to and from the main industrial area south of Ellwood Drive between Highway 50 and Coleraine Drive. Providing an adequate network for trucks to travel to and from this major generator of truck traffic is an important component of the TMP and is supported by initiatives such as the recently constructed Emil Kolb Parkway.

2.4.7.1 Origin-Destination Truck Study

As part of the TMP, a 14 hour origin-destination (O-D) truck survey was conducted in August 2014 between the hours of 6:00 a.m. to 8:00 p.m. The purpose of the survey was to establish origin-destination patterns and to identify the proportion of trucks travelling on King Street and Highway 50 that would be affected by a potential prohibition of truck movements through the Bolton Core. The survey captured the first four letters or numbers of the license plate of trucks at 9 survey stations located on King Street, Highway 50 and Mayfield Road. A capture rate of 97% of all trucks passing through the stations was achieved. Point-to-point truck movements for north-south and east-west trips were obtained by matching the license plates of trucks passing through the stations. The survey results were also used to estimate the proportion of trucks that serve a local business need versus the number of trucks that are using King Street and Highway 50 for through trips. A summary of key findings from the O-D survey are listed below:

- In the eastbound direction, 38 trucks representing 20% of the total eastbound truck traffic travels along the entire section of King Road/Street between Highway 400 and Coleraine Drive. These long distance trips have the highest likelihood of having an alternate route should a truck restriction be implemented in the Bolton Core.
- Similarly, in the westbound direction, 26 trucks representing 23% of the westbound truck traffic are long distance trips that could potentially reroute.
- A review of eastbound and westbound trips through the Bolton Core indicates that 17 vehicles make local deliveries in the Core, while additional 20 vehicles likely use roadways such as Old Ellwood Drive and Wilton Drive to service industrial developments on these roads, before continuing onto Highway 50.
- In the northbound direction from Mayfield Road along Highway 50, the majority of vehicles (74% or 377 trucks) travel to and from the industrial area south of Healey Road. An additional 54 trucks, or 8%, enter the industrial area north of Healey Road, and 13% or 71 trucks travel through the Bolton Core past King Street. Truck restrictions in this direction would likely result in a re-routing of this traffic to Emil Kolb Parkway.

- A large number of southbound trucks travelling past Old Church Road do not pass King Street in the Bolton Core. These trucks may be destined for the James Dick Construction Ltd. site north of Columbia Way. 32% or 110 vehicles travel south of King Street, which would likely use Emil Kolb Parkway in the future if a truck restriction is in place in the Bolton Core.
- Of the northbound and southbound truck volumes, only 21 and 4 trucks respectively are estimated to be making local deliveries to the Bolton Core.
- The full explanation of the methodology and the results can be found in the "Bolton Transportation Master Plan O-D Truck Survey Results – Update" memo found in **Technical Appendix D.**

2.4.8 Existing Active Transportation Facilities

There are a number of existing active transportation (AT) facilities in Bolton, in the form of signed bike routes, hiking trails, footpaths and paved and unpaved multi-use trails. AT is defined as any form of human powered transportation and can include a number of different types of recreational and commuter modes.

For the purposes of the Bolton TMP, the project team focused on assessing the existing facilities that predominantly cater to pedestrians and cyclists. The existing active transportation facilities found within the community of Bolton were planned for and designed by the Region of Peel, the Town of Caledon and other key stakeholders including the Toronto and Region Conservation Authority (TRCA) and the Humber Valley Heritage Trail Association.

The majority of these facilities are located north of the railroad tracks in areas that are primarily residential and provide access within the community with a focus on recreational trips. The existing routes also provide connections to Regional trail systems which provide access to surrounding areas and beyond. The existing as well as previously proposed AT facilities are shown in **Figure 21** and are described in further detail in **Technical Appendix E.** AT route connectivity is limited within the southern areas of the community of Bolton with the exception of an extensive sidewalk system on both local and regional roads. A predominantly industrial and commercial area, there are almost no AT facilities located south of the railroad tracks. There are points of potential conflict between pedestrians, cyclists and motorists within this area due to the limited AT facilities that could be addressed by implementing new AT facilities. For example, the vehicular bridge on Highway 50 over the railroad tracks only has a sidewalk in the southbound direction, with no provision for pedestrians in the northbound direction or cyclists in either direction. Pedestrians and cyclists should be accommodated in both directions when the bridge is rebuilt

Also illustrated on this mapping are previously proposed active transportation routes identified in adopted master plans at the regional and local level including but not limited to the Region of Peel's Active Transportation Strategy (2012), the Town of Caledon's Trails Master Plan (2011) and the TRCA's master planning and infrastructure plans. Illustrating these previously proposed routes reinforces existing policy. The majority of the improvements are located on Regional Roads or green spaces not under the jurisdiction of the Town of Caledon or the Region of Peel.

Through this assessment the project team was able to identify the improvements that needed to be made through the Bolton AT Strategy to provide better connectivity and continuity between existing and previously proposed regional and local on and off-road AT routes. AT is discussed in detail in the accompanying Active Transportation Strategy (see **Technical Appendix E**).

Once the transportation master plan and associated AT strategy has been adopted, the Bolton Arterial Roadway will have been implemented. As such, the AT facilities identified on this linkage will be considered existing.

See inset map for details of urban area

0 0.5 1 2 Kilometres

Legend

Existing Facility Types
- Off-Road Trail[1]
- In-Boulevard Multi-Use Trail
- Existing Paved Shoulder
- Existing Sidewalk

Previously Proposed Facility Types
- Proposed Off-Road Trail[2]
- Proposed In-Boulevard Multi-Use Trail
- Proposed Paved Shoulder
- Proposed Bike Lane
- Proposed Sidewalk

Key Community Destinations
- Emergency Service
- Library
- Other Community Destination
- School
- Community Centre
- Recreation Centre
- Existing Park & Ride Lot
- Existing GO Bus Stop
- Future Planned GO Train Station

Road Network
- Regional Road
- Local Road
- Future Regional Road
- Future Local Road

Other
- Railway
- Oak Ridges Moraine Conservation Plan Area
- Woodland
- Waterbody
- Watercourse
- Municipal Boundary

Note:
1. Off-Road Trails include paved and unpaved multi-use paths, hiking trails, and unmarked dirt trails.
2. Proposed Off-Road Trails based on information provided by the Toronto Region Conservation Authority.

Figure 21: Existing & Previously Proposed Active Transportation Conditions

Bolton Transportation Master Plan

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2.4.9 Existing Transit Provision

GO Bus service is the only transit service currently operating in Bolton. There are two GO Bus routes, Route 38 servicing Malton and Route 38A servicing North York. The bus routes through Bolton are shown in **Figure 22** and are described in further detail below.

- Route 38: during the a.m. peak period (6:00 a.m. to 9:00 a.m.) 3 buses travel from Bolton Station (Bus Stop) to the Malton GO Station (Train and Bus Station). During the pm peak period (3:00 p.m. to 6:00 p.m.) 3 buses leave the Malton GO Station and service a number of stations within Bolton.
- Route 38A: during the a.m. peak period two buses travel from a number of stations within Bolton to Etobicoke North GO (Train and Bus Station), Yorkdale Bus Terminal and York Mills Bus Terminal. During the p.m. peak period two buses will depart from York Mills Bus Terminal (servicing the Yorkdale Bus Terminal and the Etobicoke North GO Station, amongst other) and travel to a number of stations within Bolton.

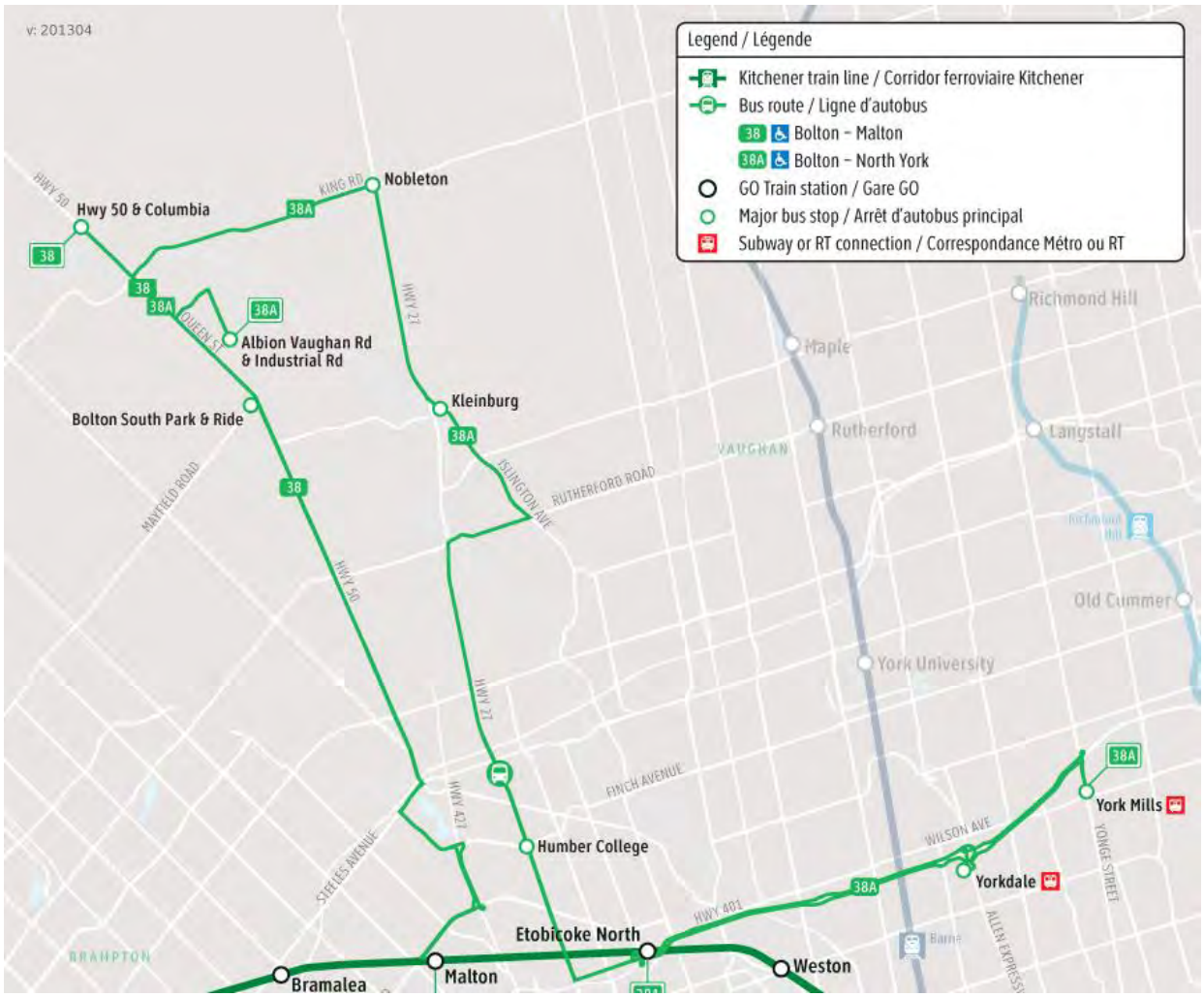

Figure 22 – GO Bus Routes through Bolton

The 2012 Metrolinx GO Bus Passenger Survey reported an average weekday ridership of 164 individuals for the 38A Bolton / North York Route. This study also found that 94% of the passengers surveyed participate in return trips. Moreover, out of those travelling on the Route 38A, over a quarter of participants walked or took local transit to GO stops, and displayed in **Figure 23**.

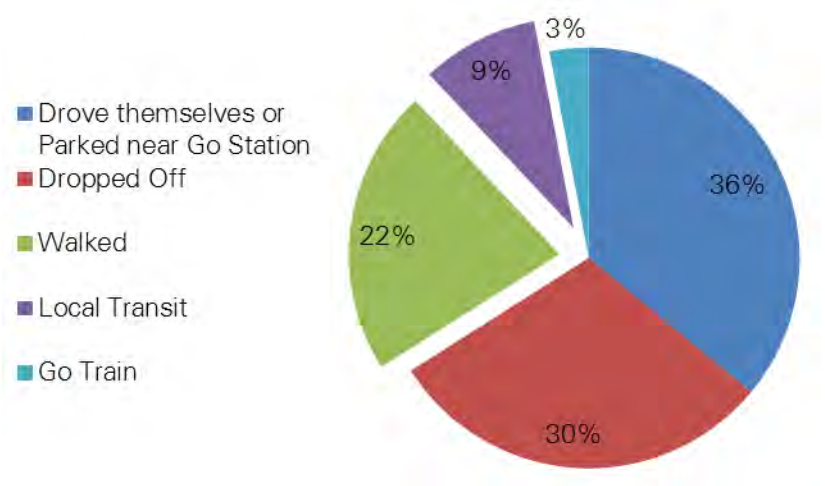

Figure 23 – Mode of Travel to GO Bus Stop



3.0 ANALYSIS OF TRUCK MOVEMENTS

As part of the downtown Bolton revitalization, it was suggested trucks be restricted from travelling through the downtown core. Local deliveries would still be allowed as per the Region's consolidated traffic by-law 15-2013. Three potential restrictions were suggested, which are listed below:

- Highway 50 / Queen Street restriction between the newly-built Emil Kolb Parkway and Healey Road;
- King Street restriction between Coleraine Drive and Albion Vaughan Road; and
- Both restrictions.

There are multiple factors that should be considered when evaluating impacts of implementing truck restrictions. However, from a feasibility perspective, it is imperative to determine if alternative routes have sufficient capacity to accommodate additional truck volumes and if any road/intersection improvements are needed. Hence, the capacity analysis was conducted for the four critical intersections located on the alternative routes. These four critical intersections were identified based on a review of existing traffic operations and the number of additional truck volumes to be added to the turning movements at these intersections. All other intersections located on alternative routes currently operate at very good levels of service, and additional truck volumes will be mostly added to the through movements. Hence, it is expected that additional truck volumes would have the minimal impacts on traffic operations of those intersections.

The third alternative, implementing both north-south and east-west restrictions, is the most conservative. If there is sufficient capacity on the roadways to divert both the north/south and east/west trucks, then either of the two options can be accommodated individually. The methodology, assumptions and the analysis are included in the remainder of this chapter.

3.1 PROJECTED VOLUMES

Based on the collaborative discussion with the Town and Region, the proposed truck restrictions were suggested to be implemented in the near future, therefore a 2016 horizon year was utilized in the analysis. To project the traffic volumes, the existing travel demand model was utilized. The percent change in the macro model results between the original existing scenario (roadway network as-is), and the modified existing scenario (with the opening of Emil Kolb Parkway and narrowing of Highway 50 through the downtown core) was obtained.

The percent change was then applied to the existing turning movement counts and the projected traffic volumes, after the narrowing of Highway 50 and the opening of Emil Kolb Parkway, were obtained. During the a.m. peak hour, the southbound volumes along Highway 50 decreased by approximately 20% while the northbound volumes decreased by approximately 2%-9%. Along King Street, the link volumes decreased by approximately 3%. With the exception of eastbound volumes, this portion saw an increase of 10% approaching Highway 50. The increase was due to more drivers opting to exit their neighbourhood onto King Street, opposed to Highway 50. The volumes along Coleraine Drive increased, which was expected due to the addition of Emil Kolb Parkway and the displacement of Highway 50 volumes. The volumes along Mayfield Road and Albion Vaughan Road stayed approximately the same.

For the p.m. peak hour volumes the percent change was applied to the opposite movements, to account for the change in directionality in the afternoon. The heavy vehicle percentages were also updated based on the new truck and traffic volumes.

3.2 TRUCK DIVERSION

The number of trucks diverted away from Highway 50 and King Street was based on the Truck O-D Survey. Based on the O-D survey, it was determined that approximately 86% of the existing trucks along Highway 50 and 71% of the trucks along King Street are through truck trips that would divert away from these roads in case that a truck restriction is implemented. This resulted in a diversion of 25 trucks per direction during the a.m. peak hour and approximately 18 trucks per direction during the p.m. hour from Highway 50. The trucks which were not diverted were assumed to be for local deliveries. Along King Street a diversion of six (6) eastbound trucks and 11 westbound trucks was assumed for the a.m. peak hour, while four (4) eastbound and six (6) westbound trucks were diverted during the p.m. peak hour. In addition to the diverted trucks added along Coleraine Drive and Mayfield Road, the projected truck trips to and from the Canadian Tire Distribution Centre that is proposed on the northwest corner of the Coleraine Drive and Healey Road intersection were added to the truck volumes, using the volumes from the Traffic Impact Study completed for the development.

The diverted trucks would have a number of alternate options to by-pass the downtown area; however, to be conservative, it was assumed that all the diverted trucks used the same route. This methodology results in a higher than expected number of heavy vehicles at the critical intersections on trucking routes within Bolton. Trucks diverted from King Street were assumed to use Coleraine Drive, Mayfield Road, and Albion Vaughan Road before returning to King Street. Trucks diverted from Highway 50 were assumed to use Emil Kolb Parkway, Coleraine Drive and Mayfield Road before returning to Highway 50. The assumed diversion paths, as well as other potential alternatives, are shown in **Figure 24** for east-west diversions and **Figure 25** for north-south diversions.

The geometric improvements at the intersections of Mayfield Road and Coleraine Drive, and Mayfield Road and Highway 50 are planned to occur in 2019. The focus of the assessment was to determine if even with these conservative assumptions, the truck prohibition on King Street could be implemented in 2016 before the planned improvements at these two intersections.

Figure 24: Assumed Truck Diversion Path (East - West)

King Street Route
Optional Route 1
Optional Route 2
Optional Route 3
Optional Route 4
Optional Route 5

0 300 600 900 1200
Meters

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Restriction Extends to the Bolton Arterial Roadway

BAR

KING ST

GLASGOW RD

COLUMBIA WAY

CALEDON KING TOWN LINE S

KING ST W

KING ST E

ELLWOOD DR W

ALLAN DR

ALBION VAUGHAN RD

QUEENSGATE BLVD

HOLLAND DR

HEALEY RD

SIMPSON RD

50 HWY

MCEWAN DR

GOREWAY DR

GEORGE BOLTON PKY

PARR BLVD

PILLSWORTH RD

MAYFIELD RD

COUNTRYSIDE DR

STOP

Queen Street Route

Optional Route 1

Optional Route 2

Optional Route 3

Optional Route 4

Optional Route 5

N

0 300 600 900 1200

Meters

Figure 25: Assumed Truck Diversion Path (North - South)

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3.3 ANALYSIS

The analysis was completed utilizing the assumptions above. Even though based on the results of the capacity analysis of the existing traffic conditions, an exclusive northbound right turn lane was recommended to be implemented at the intersection of King Street and Albion Vaughan Road, this improvement was not applied to the base case analysis below as it is not certain that this improvement will be in place by 2016. Hence, the omission was done to confirm if the intersection could handle the diverted trucks without the addition of the northbound right lane. **Table 14** summarized the results and the proposed improvements.

Table 14 – Capacity Analysis for Truck Diversions

Intersections	Control Type (Suggested Improvements)	WEEKDAY A.M.		WEEKDAY P.M.	
		LOS (Delay in seconds)	Critical Movements (v/c)	LOS (Delay in seconds)	Critical Movements (v/c)
King Street & Highway 50	Signalized	D (38)	--	D (37)	WB-TR (0.85)
King Street & Albion Vaughan Road	Signalized	C (31)	WB-L (0.95)	D (47)	WB-L (0.92) NB-TR (1.02)
	Signalized (implementation of exclusive NB-R lane, change cycle length)	C (22)	WB-L (0.89)	B (19)	--
Mayfield Road & Highway 50	Signalized	C (34)	WB-L (0.89)	B (19)	--
Mayfield Road & Coleraine Drive	Signalized	C (28)	--	B (18)	--
	Signalized (added SB-L prot+perm movement in the a.m. peak hour)	C (22)	--	--	--

Similar to the capacity analysis of the existing conditions, the intersection of King Street and Albion Vaughan Road approaches capacity during the a.m. peak hour and operates above capacity during the p.m. peak hour, without any improvements to the intersection. As suggested in the existing analysis, the exclusive northbound right turn lane should be implemented at this intersection. The intersection of Mayfield Road and Coleraine Drive operates within acceptable levels of service and v/c ratios. However, the southbound left turning movement experiences relatively high delays during the a.m. peak hour. Therefore, it is suggested that a protected/permissive phase be implemented for the southbound left turn movement during the a.m. peak hour. With the protected/permissive phase in place at the intersection of Mayfield Road and Coleraine Drive, the north/south truck movements through the downtown core can be restricted because the surrounding intersections should have sufficient capacity to handle the additional truck volumes. The truck restrictions along Highway 50 can be implemented immediately now that the Emil Kolb Parkway is constructed and open to traffic.

Currently restricting the east/west trucks on King Street through the downtown core would likely result in longer truck travel times due to the longer travelling distance, and the increased northbound delays and insufficient capacity at the intersection of King Street and Albion Vaughan Road. With an exception of the

intersection of King Street and Albion Vaughan Road, all intersections along potential alternative routes will have sufficient capacity to accommodate additional truck volumes. Truck restrictions can be implemented on King Street, however, efforts should be made to implement an exclusive northbound right turn lane at the intersection of King Street and Albion Vaughan Road in order to address the capacity concern at this intersection. It is important to recognize that there is a potential that the existing oversaturated conditions at the intersection of King Street and Albion Vaughan Road are due to a temporary increase in traffic volumes as discussed above in Section 2.4.6 Existing Intersection Analysis. Based on all previous traffic counts, this intersection would have sufficient capacity to accommodate the additional truck volumes. However, the construction of the exclusive northbound right turn lane is strongly recommended even if it is determined that the significant increase in the eastbound and northbound traffic volumes was temporary, as this improvement will significantly improve traffic operations at this intersection.

It is also important to note that more than 20% of the trucks travelling on King Street appear to be "longer-distance" trips with origins and destinations outside Bolton. These "longer-distance" through trips would be able to take advantage of a number of alternative regional travel routes if the truck restriction through the Bolton Core is implemented, and may be less impacted in comparison to "short-distance" truck trips that originate or stay within the Bolton's boundaries. This also means that the number of diverted trucks utilizing Albion Vaughan Road could be lower than assumed in the analysis.

The east-west restriction on King Street would directly respond to the public demands for truck restrictions through the downtown core. The restriction would remove truck from a residential neighbourhood with many residential properties that front on to King Street. It would help reclaim the downtown for people and reduce the emphasis on trucks.

Such a restriction would result in longer travel times for trucks and would be expected to result in increased vehicle emissions. Restricting trucks on King Street through the downtown core would reduce conflicts with trucks in this area, and potentially result in the improved safety. However, there still could be additional conflicts with trucks at other locations as trucks divert around the downtown to travel east or west. There would be increased truck traffic on Albion Vaughan Road. While residential properties do not typically front this road, there are several residential communities with backs to this road. These communities could be impacted by increased truck traffic.

Currently trucks are allowed on Queensgate Boulevard. In the event that trucks are restricted on King Street, it is recommended to restrict trucks on Queensgate Boulevard at the same time. It is likely that Queensgate Boulevard would become an attractive alternative for truck traffic, which is not desirable considering this road runs through a residential area and has a school crossing. Moreover, if trucks are restricted on Highway 50 between Emil Kolb Parkway and Healey Road, that would create a scenario where the westbound trucks diverted from King Street would be allowed to utilize Queensgate Boulevard (via Albion Vaughan Road). In that case, once these trucks reach Highway 50, truck operators will have no other choice than to turn onto Highway 50 and violate the truck restrictions.

4.0 TRANSPORTATION MASTER PLAN DEVELOPMENT

The TMP was developed by looking toward the year 2031 and analyzing transportation alternatives to meet travel demand. First, population and employment projections were finalized and then multiple alternatives were devised and tested to gauge the potential performance of the transportation network. This iterative process led to the identification of a preferred alternative for the year 2031.

4.1 POPULATION AND EMPLOYMENT

4.1.1 Existing Population, Employment, and Land Use Provision

Due to Bolton's projected growth into the surrounding area it was important to examine the population, employment and land uses outside of the area that Census Canada defines. In 2011, the Bolton area had a population of close to 35,000 residents. The majority of the existing population in Bolton is located between the rail corridor and Columbia Way, with the surrounding area having very low population, as shown in **Figure 26.** Employment is also fairly concentrated with the majority of the jobs located within either the downtown core area or surrounding Simpson Road (just south of the rail corridor), as is shown **Figure 27.** The total number of jobs in Bolton was just over 21,000 in 2011.

4.1.2 Projected Population

The population and employment projections used in the forecasting of future transportation demands are shown in **Table 15.** These forecasts account for future residential expansion as described in the Bolton Residential Expansion Study and as approved by Town Council in the fall of 2014 as well as future employment expansion in different parts of the Bolton community.

Table 15 – Forecasted Population and Employment Growth

Year	Population*	Employment*
2011	34,791	21,257
2021	35,699	27,032
2031	45,253	32,713

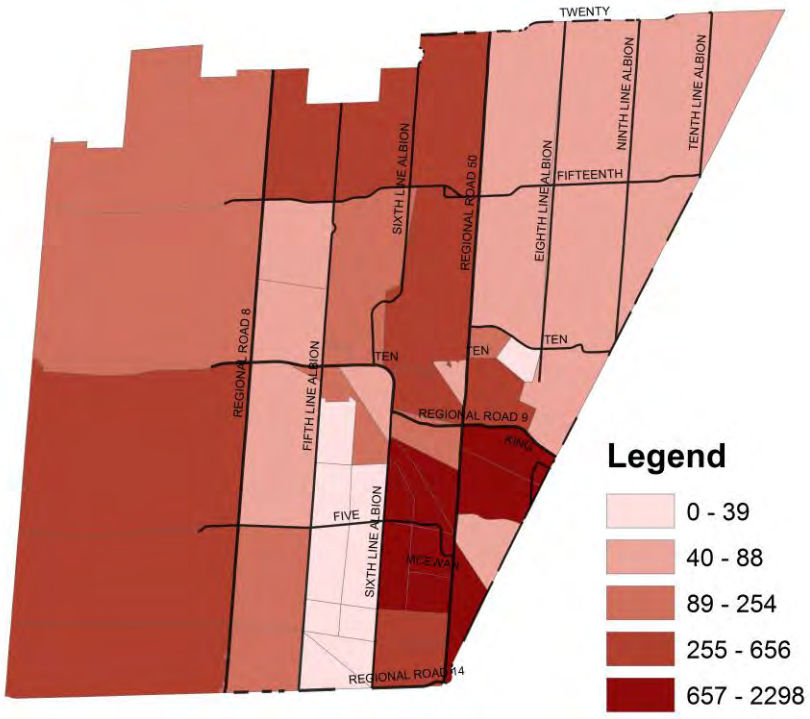

Figure 26 – Community of Bolton 2011 Employment

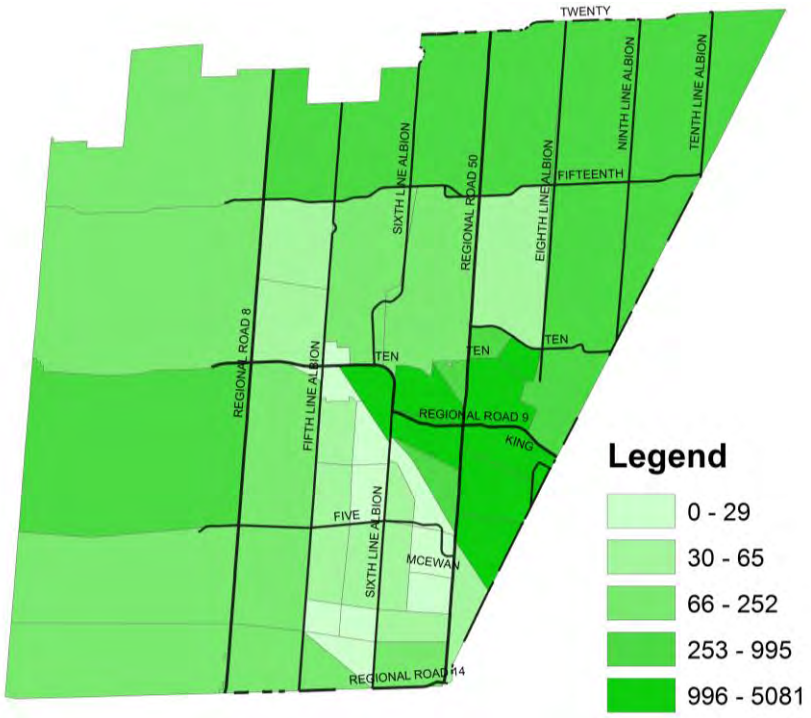

Figure 27 – Community of Bolton 2011 Population

Some key observations from the population and employment growth:

- The Bolton Downtown Core is not projected to see significant increases in either employment or population;
- There is a balanced growth between population and employment;
- Majority of the future population growth is located northeast of the King Street and The Gore Road intersection. While majority of the employment growth occurs west of Coleraine Drive and north of Mayfield Road. The residential and employment are close enough in proximity to allow people to use active transportation to go to work.

4.2 ALTERNATIVES GENERATION

Phase 2 of the Municipal Class EA process for master plans requires the analysis of alternative future scenarios as part of the process to identify the preferred alternative. Five overarching alternatives were generated for assessment.

ALTERNATIVE 1 – DO NOTHING ALTERNATIVE

The first alternative considered was the "Do Nothing" alternative. As its name suggests, this alternative did not include any improvements to the existing transportation network in Bolton. The population and employment would grow as forecasted, but no further transportation investment would be made. This alternative is tested as a way to build a case for new transportation projects. The analysis of this alternative will confirm whether or not the existing road network can accommodate forecast population and employment growth. If not, the analysis of this alternative will help identify road corridors in need of transportation solutions, be they construction of new roads and/or road widening to provide additional road capacity, or improved alternative modes of travel or other measures that would reduce travel demand. The road network for Alternative 1 is shown in **Figure 28**.

ALTERNATIVE 2 – BASE CASE ALTERNATIVE

The Base Case Alternative includes the transportation projects currently planned in the existing capital plans for the Town of Caledon, City of Brampton, Region of Peel, York Region and MTO. Testing this alternative with forecast population and employment will help confirm whether or not the projects currently planned and funded are sufficient to meet the needs of the forecast. The road network for Alternative 2 is shown in **Figure 29**.

ALTERNATIVE 3 – GTA WEST INTERCHANGE

Alternative 3 assessed the impact of the GTA West corridor on the travel patterns within Bolton. Alternative 3 included all of the projects in Alternative 2 in addition to the following:

- GTA West Highway;
- Highway 427 extension to GTA West Highway with full interchange;
- Bolton GO Rail station constructed and operational;
- Albion Vaughan Road widening from two to four lanes from Mayfield Road to King Street; and
- Queen Street narrowing from four to two lanes from Hickman Street to south of King Street in the downtown core (to support the downtown Bolton vision).

The GTA West corridor is still in its planning stages, therefore the location of the corridor needed to be assumed within the model. Based on the discussion with the Town and Region, a location for the GTA West corridor was selected and coded into the model.

The assumed location is shown in **Figure 30**. The location(s) of the potential interchanges also needed to be assumed. Based on the discussion with Town and Region staff three possible interchange options needed to be analyzed, these options are:

- Two interchanges: one on Coleraine Drive north of Countryside Drive, and one interchange on Mayfield Road east of Humber Station Road;
- Coleraine Drive Interchange only, located north of Countryside Drive; and
- Mayfield Road Interchange only, located east of Humber Station Road.

Based on the analysis described in **Section 6.1** of this report, it was determined that Coleraine Road interchange only was the optimum option. The Coleraine Road interchange was carried forward in analyzing Alternatives 4 and 5. The road network for Alternative 3 is shown in **Figure 30**.

ALTERNATIVE 4

Alternative 4 builds upon Alternative 3 and includes the following additional road projects:

- King Street realignment; and
- George Bolton Parkway extension east to Industrial Road.

The road network for Alternative 4 is shown in **Figure 31.**

ALTERNATIVE 5

The final alternative generated for the TMP included all the road projects in the previous alternatives in addition to one additional road project:

- East-West Bypass (extension of Emil Kolb Parkway) from Queen Street to Caledon King Townline.

The road network for Alternative 5 is shown in **Figure 32**.

4.3 ASSESSMENT OF THE ALTERNATIVES

Each of the five alternatives was tested in the PFM to help determine its performance.

4.3.1 Metrics Used in the Analysis of Alternatives

Each alternative was coded into the PFM. The same evaluation accounts and metrics used in the analysis of existing year 2011 conditions were obtained from the 2031 model. The results for the 2031 a.m. peak hour for each alternative are shown in **Table 16**.

4.3.2 Model Metric Observations

A number of observations can be made from comparing the metrics from the various alternatives.

MOBILITY:

- The mobility in the system, measured by using vehicle kilometres travelled (VKT), drastically increases (a range of approximately 60% to approximately 100%) in 2031 from the existing conditions;

Alternative	MULTIPLE ACCOUNT EVALUATION								Total
	Active Transportation	Air Quality	Congestion	Construction Cost	Downtown Bolton	Environment	Goods Movement	Transit	
1	0	10	0	10	0	10	0	0	**30**

Note: Scoring from 0 to 10, with 10 being the best score

Alternative Highlights

1. Does not provide transit or active transportation solutions
2. Does not address congestion
3. Does not address downtown Bolton

0 0.25 0.5 1 1.5 2 Kilometers

N

Legend

- Railway
- School
- Childcare Centres
- Place of Worship
- Major GO Bus Stops
- Carpool Lot
- Waterbody
- Community Centre
- Recreation Centre
- Woodland
- Oak Ridges Moraine Conservation Plan Area
- Proposed GO Train Station

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus

Figure 28: Bolton Transportation Master Plan

Roadway Options: Alternative 1: Do Nothing

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Alternative	MULTIPLE ACCOUNT EVALUATION								Total
	Active Transportation	Air Quality	Congestion	Construction Cost	Downtown Bolton	Environment	Goods Movement	Transit	
2	9.4	8.8	4.9	6.4	0	6	2.3	3	**40.7**

Note: Scoring from 0 to 10, with 10 being the best score

Alternative Highlights

1. Provides some solutions for congestion
2. Mitigates negative impacts on air quality
3. Does not address downtown Bolton

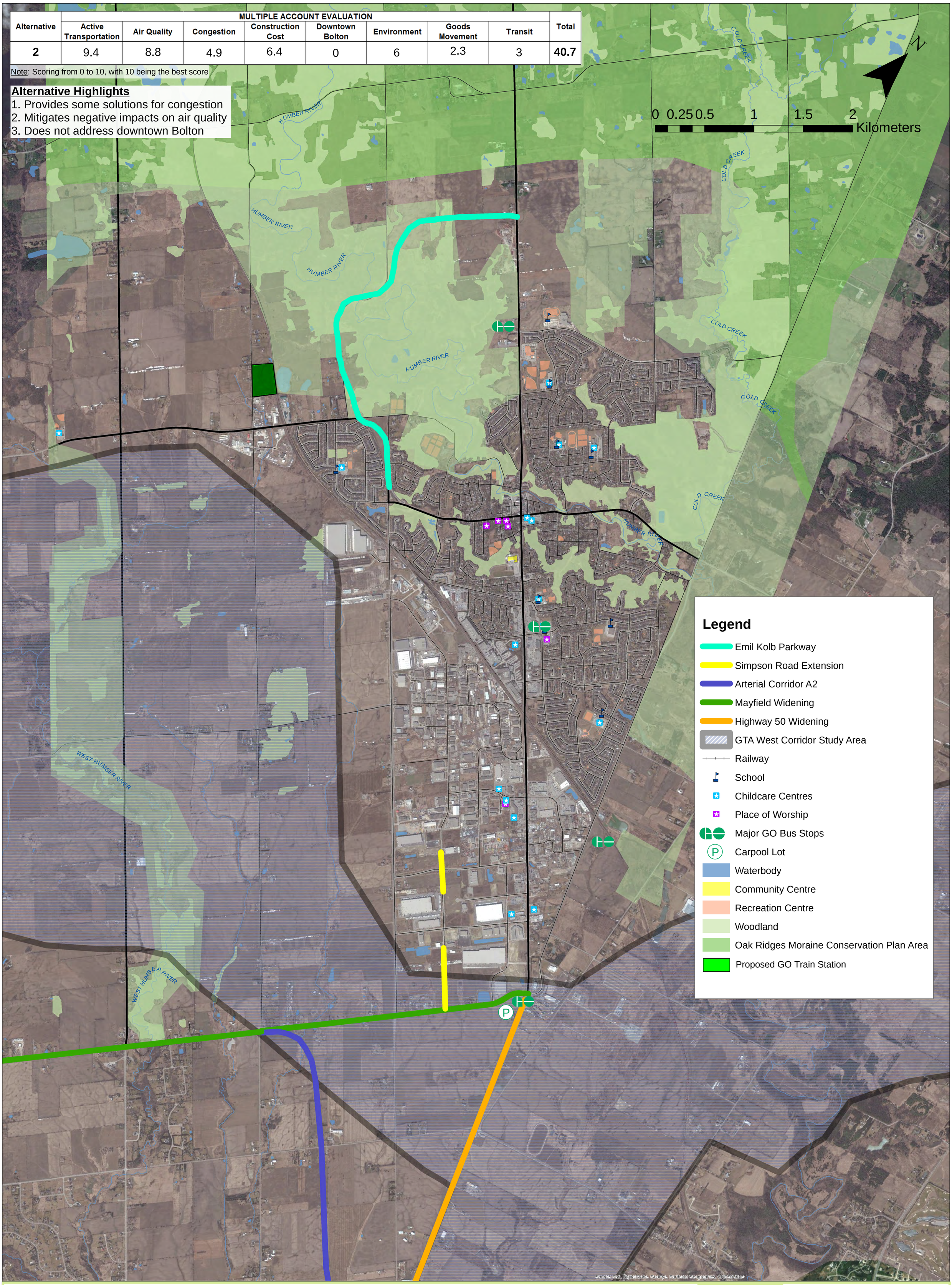

Figure 29:

Bolton Transportation Master Plan

Roadway Options:
Alternative 2: Base Case

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Alternative	MULTIPLE ACCOUNT EVALUATION								Total
	Active Transportation	Air Quality	Congestion	Construction Cost	Downtown Bolton	Environment	Goods Movement	Transit	
3	10	0.1	9.7	5.7	10	5.8	6.4	6	**53.6**

Note: Scoring from 0 to 10, with 10 being the best score

Alternative Highlights

1. Moderate construction costs
2. Scores lowest in air quality
3. Includes transportation enhancements to downtown Bolton

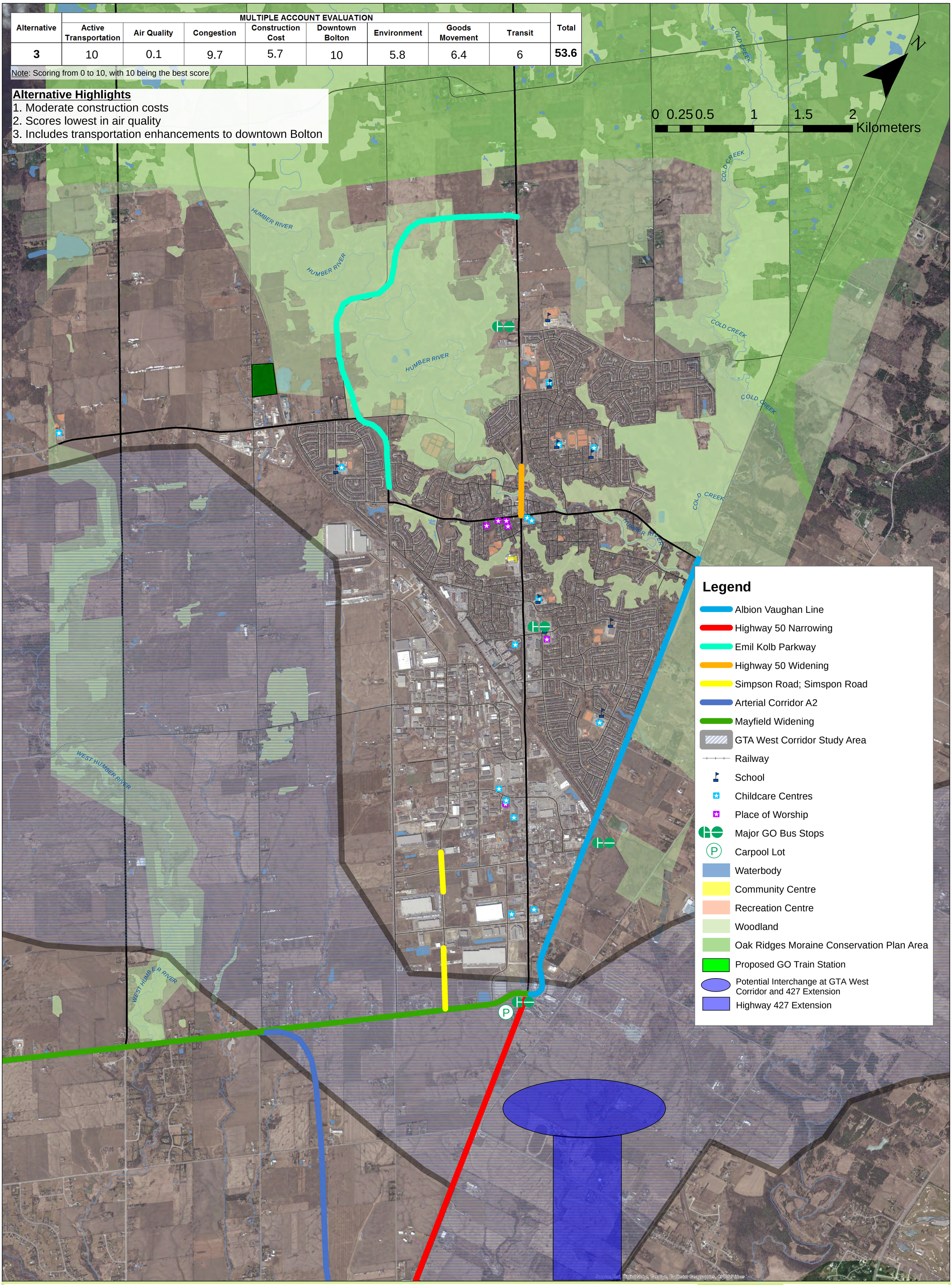

Figure 30:

Bolton Transportation Master Plan

Roadway Options:
Alternative 3

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Alternative	MULTIPLE ACCOUNT EVALUATION								Total
	Active Transportation	Air Quality	Congestion	Construction Cost	Downtown Bolton	Environment	Goods Movement	Transit	
4	10	0.6	9.8	2.5	10	4.8	8.4	8	**54.0**

Note: Scoring from 0 to 10, with 10 being the best score

Alternative Highlights

1. Provides solutions for active transportation and transit
2. Best mitigates congestion
3. Includes transportation enhancements to downtown Bolton

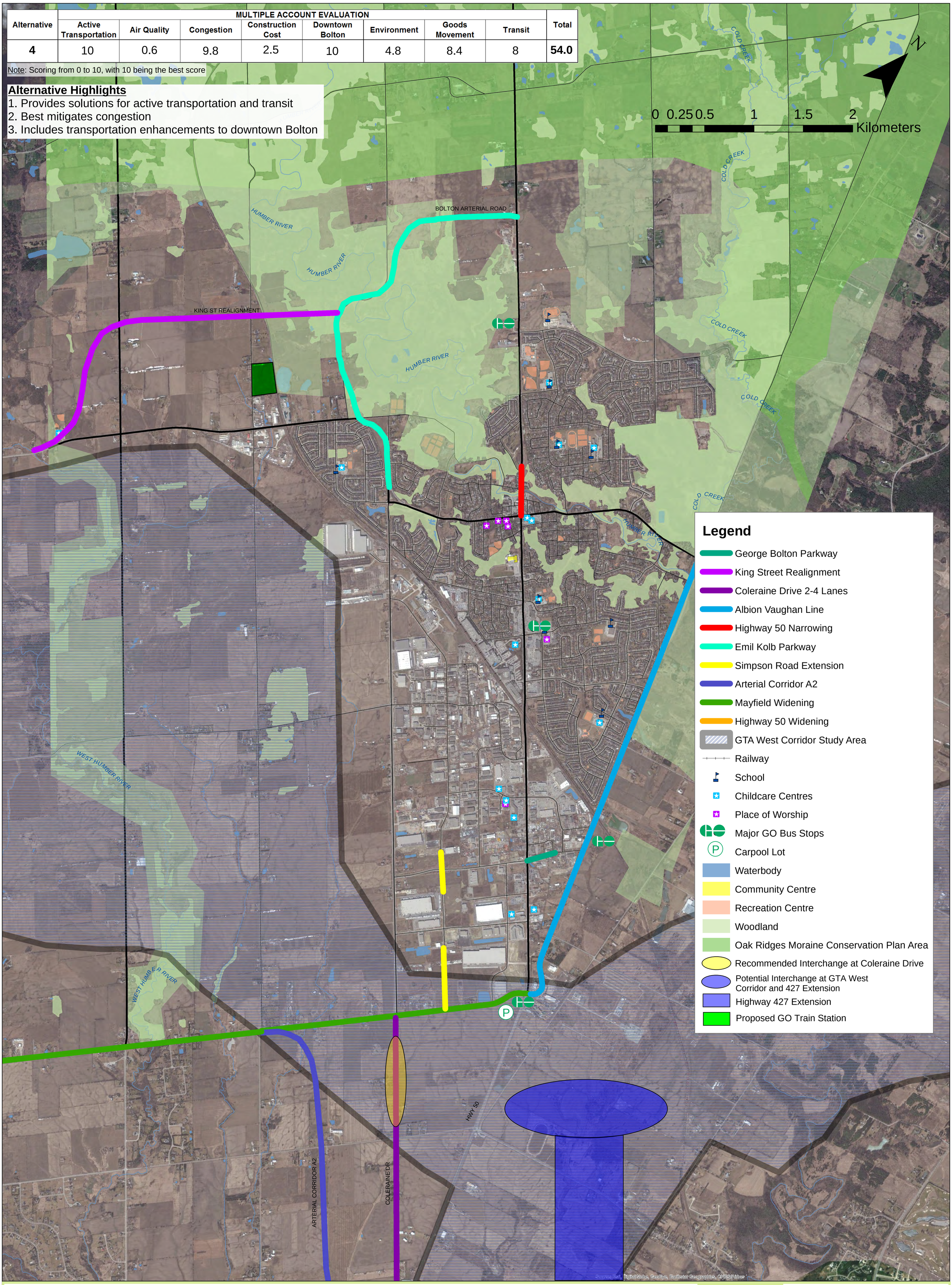

Figure 31:

Bolton Transportation Master Plan

Roadway Options:
Alternative 4

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Alternative	MULTIPLE ACCOUNT EVALUATION								Total
	Active Transportation	Air Quality	Congestion	Construction Cost	Downtown Bolton	Environment	Goods Movement	Transit	
5	10	0	10	0	10	0	10	10	**50**

Note: Scoring from 0 to 10, with 10 being the best score

Alternative Highlights

1. Best addresses goods movement
2. Highest construction cost
3. Includes transportation enhancements to downtown Bolton

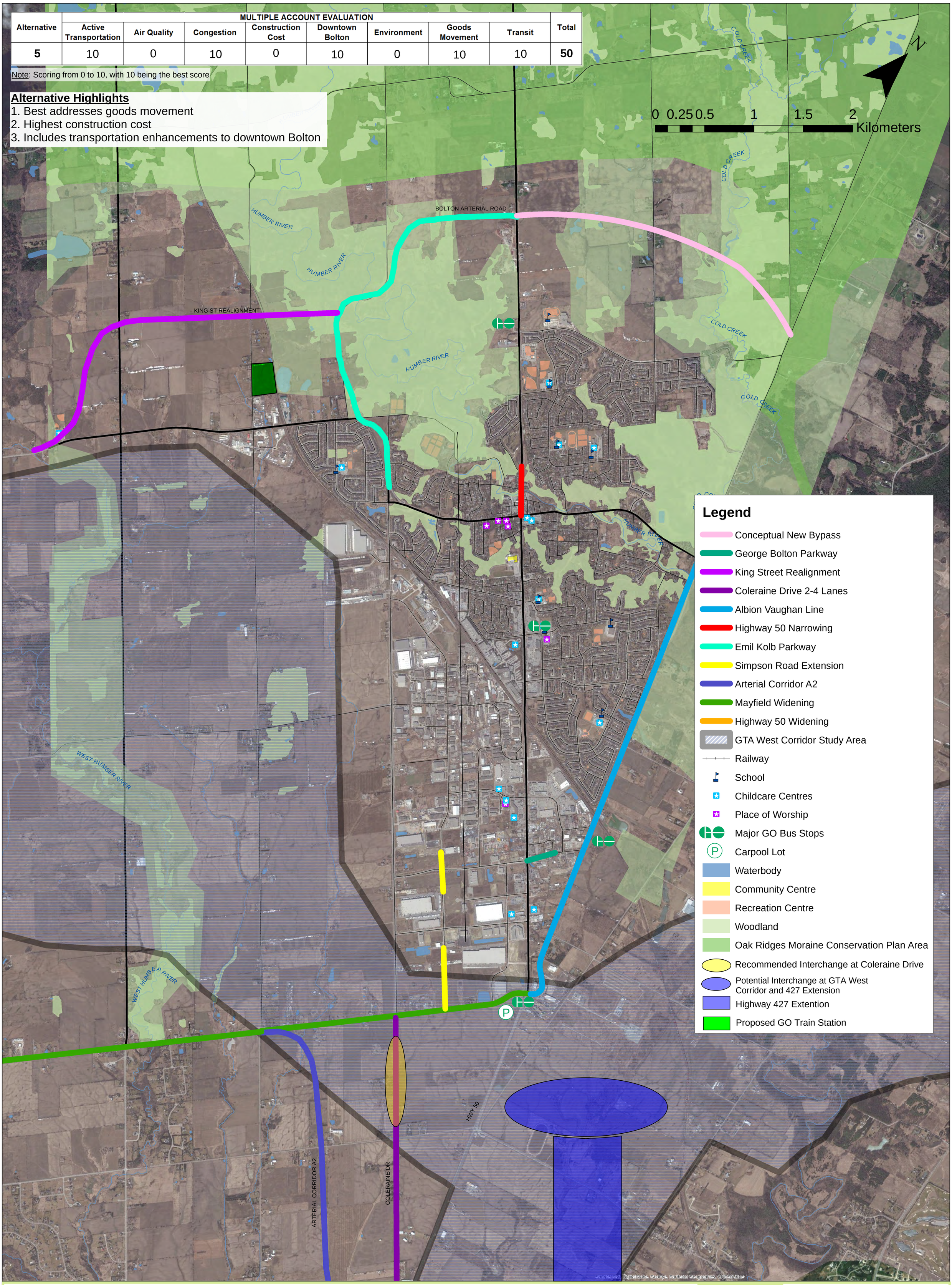

Figure 32:

Bolton Transportation Master Plan

Roadway Options:
Alternative 5

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- While the various planned road improvements suggested under Alternative 2, such as widening of Mayfield Road, building the A2 link, etc. result in an increase in mobility and a reduction in congestion (as can be seen by comparing Alternatives 1 and 2 metrics), the significant increase in VKT occurs due to the construction of the GTA West corridor (as can be seen by comparing Alternatives 2 and 3).
- The addition of improvements in Alternatives 4 and 5 (King Street re-alignment, East/West By-pass), result in some overall improvement to both mobility and congestion.

CONGESTION:

- The vehicle hours traveled (VHT) and the vehicles hours traveled in congestion (v/c ratio greater than 0.9), drastically increases between the existing conditions and Alternative 1 scenarios. This indicates that the existing roadway network is not capable of sustaining the future demand. The drastic increase in VHT is due to both a higher number of drivers, and higher congestion (resulting longer periods spent on over congested links);
- Both Alternatives 2 and 3 result in significant improvements (from the prior alternative) to the vehicle hours travelled and congested links. The drastic decrease in travel time is due to people spending less time on over-congested links. The Travel Time Index (TTI), which compares the free flow travel time to the model travel time, for Alternative 2 drops to 1.30 (indicating that congested travel time in the system is expected to be 30% higher than that measured under free flow conditions), while for Alternative 3 it drops further to 1.28.
- Similarly to the mobility results, Alternatives 4 and 5 results in a slight decrease in VHT and a decrease in hours travelled in congestion.

ECONOMIC VIABILITY:

- All the alternatives have less lane-km per 1000 people than the existing conditions. This is a positive result as it indicates that less roadway is being constructed to support the population growth.
- Alternatives 3 to 5 all fall within a similar range of lane-km per 1000 people, with the lane-km highest in Alternative 5.

Figure 33 shows the volume-to-capacity ratio improvements between Alternatives 1 – 5.

Table 16 – Evaluation of Alternatives

Evaluation Accounts	Metrics	Existing (2011)	Alternative (2031)				
			1	2	3	4	5
General Information	Bolton Population	34,814	45,253	45,253	45,253	45,253	45,253
	Total Lane Kilometres (lane*km) within Bolton	334.4	334.4	379.3	398.6	407.7	414.2
Mobility	Vehicle Kilometres Travelled (VKT)	72,721	127,035	130,285	140,880	140,393	140,925
	% of Total VKT on Congested Links (vc>0.9)	15%	43%	34%	23%	23%	23%
Congestion	Vehicle Hours Travelled (VHT)	1,500	3,904	3,380	3,200	3,134	3,155
	% of Total VHT on Congested Links (vc>0.9)	24%	62%	49%	36%	36%	35%

Evaluation Accounts	Metrics	Existing (2011)	Alternative (2031)				
			1	2	3	4	5
	Travel Time Index (TTI)	1.17	1.42	1.30	1.28	1.26	1.26
	% of Congested Lane-Kilometres (vc>0.9)	4%	19%	14%	10%	10%	9%
Economic Viability	Lane-kms per 1,000 people	9.6	7.4	8.4	8.8	9.0	9.2

4.3.3 Model Metric Observations

A multiple account evaluation framework was developed and used to compare the five alternatives. Doing so provides a more complete picture of how each alternative could affect the multi-modal transportation network in Bolton. The model metrics obtained above were used in calculating several accounts. The accounts and question being answered included:

- Active Transportation: Are active transportation improvements aligned with road improvements?
- Air Quality: How does the alternative rank, in tonnes of CO_2 emissions, based on peak hour vehicle kilometres travelled (VKT) and the percentage of peak hour vehicle kilometres travelled in congestion (VC ration greater than 0.9)?
- Congestion: How does the alternative rank in terms of vehicle hours travelled (VHT), VKT, and lane km in congestion?
- Construction Cost: How does the alternative rank in the cost to construct the road improvements?
- Downtown Bolton: Do the road improvements help to enhance the quality of life in downtown Bolton?
- Environment: Do the road improvements avoid woodland areas?
- Goods Movement: Do the road improvements align with the Region of Peel's Strategic Goods Movement Network?
- Transit: Would the road improvements facilitate better transit service so that potential commuter trains and buses would not be delayed in congestion and would be able to better adhere to reliable schedules?

The alternatives were scored on a scale from 0 to 10. For each account, the best performing alternative was assigned the score of 10 and the worst performing alternative was assigned the score of 0. The three remaining alternatives were then scaled relative to the performance compared to the best and worst. Detailed analysis of each account is provided in the subsections below.

4.3.3.1 Detailed Analysis of Active Transportation Account

Active transportation was analyzed based on the amount of active transportation improvements that could be aligned with new road improvements. The number of lane kilometres overlapping between road improvements and active transportation improvements was added in order to arrive at a benefit to active transportation.

Some road improvements, such as the GTA West Highway, do not have active transportation improvements associated with them. These road improvements do not add to the active transportation calculations. The results of the analysis are shown in **Table 17.**

Table 17 – Analysis of Active Transportation

Alternative	Score for Active Transportation
1	0.0
2	9.4
3	10.0
4	10.0
5	10.0

4.3.3.2 Detailed Analysis of Air Quality Account

The air quality account considers the peak hour vehicle kilometres traveled and the percentage of those hours that are spent in congestion, both obtained from the model metrics. Congestion is defined as a road link with a volume to capacity ratio of 0.90 or higher. Assumptions were made for the average fuel consumption in congested and uncongested conditions and the kilograms of carbon dioxide emitted per litre of gasoline consumed. The assumptions made are:

- Uncongested liters of gasoline per km = 8.38 (Avg. City & Hwy)
- Congested liters of gasoline per km = 10.09 (City)
- Estimate of kg CO_2 per liter gasoline = 2.4 (Assumption)

The analysis provided the total emissions of CO_2 in the peak hour. The results of the analysis are shown in **Table 18.**

Table 18 – Analysis of Air Quality Account

Alternative	AM Peak Hour VKT	% of Peak Hour VKT Congested	Total Emissions (tonnes CO2 per peak hour)	Score for Air Quality
1	127,035	43%	2,779	10.0
2	130,285	34%	2,802	8.8
3	140,880	23%	2,966	0.1
4	140,393	23%	2,956	0.6
5	140,925	23%	2,967	0.0

Alternatives 3, 4, and 5 have very similar results as both their VKTs and percent VKT in congestion are very similar. With more roadways in the system the congestion on the roadways decreases, allowing a higher number of vehicle kilometres travelled, which decreases the air quality and resulted in the three alternatives having very low scores. Conversely, Alternatives 1 and 2 had higher percent congested, which decreased the number of vehicle kilometres travelled. The reduction in VKTs was enough to offset the higher percentage of kilometres travelled in congestion.

4.3.3.3 Detailed Analysis of Congestion Account

The analysis of congestion takes into account three different variables. The three variables are vehicle kilometres in congestion, vehicle hours in congestion and congested lane kilometres. All three variables were obtained from the model metrics. Similar to before, congestion is defined as a road link with a volume to capacity ratio of 0.90 or higher.

The alternatives were ranked on a scale of 0 to 10 for each of the three metrics. The scores were then summed. The summed scores were then ranked on a scale from 0 to 10, with the highest score receiving a 10. The results of the ranking process are shown in **Table 19.**

Table 19 – Analysis of Congestion Account

Alternative	VKT in Congestion	VHT in Congestion	Lane km in Congestion	Score for Congestion
1	54,843	2,425	63.6	0.0
2	44,344	1,663	52.7	4.9
3	32,438	1,156	39.1	9.7
4	32,407	1,119	39.6	9.8
5	31,833	1,101	38.8	10.0

Alternatives 3, 4, and 5 had the lowest congestion levels across the three metrics measured, with Alternative 5 scoring the highest. Alternatives 1 and 2 exhibit much higher congestion levels due to a lack of investment in transportation infrastructure.

4.3.3.4 Detailed Analysis of Construction Cost Account

High-level construction costs suitable for planning purposes were calculated using the Town's development charges study and the number of lane kilometres for each improvement. Only Regional and Town roads were included in the construction cost estimates. Provincial highways, such as the GTA West Highway, were not included in this analysis as it is expected that the construction costs will be paid by others besides the Town or Region. The construction cost analysis is provided in **Table 20.**

Table 20 – Analysis of Construction Cost Account

Alternative	Score for Construction Cost
1	10.0
2	6.4
3	5.7
4	2.5
5	0.0

Alternative 1 scores the highest in this account with no construction costs, due to no transportation infrastructure improvements. Alternative 5 has the lowest score because it has the highest construction costs due to the most infrastructure improvements. The cost difference between Alternative 2 (without the GTA West corridor) and Alternative 3 (with the GTA West corridor) is minimal because it was assumed that the construction cost would be paid by other governing bodies.

4.3.3.5 Detailed Analysis of Downtown Bolton Account

Queen Street through downtown Bolton is proposed to be narrowed from four lanes to two lanes in Alternatives 3, 4 and 5. This narrowing is being done to help reclaim the downtown for people, and will also include the introduction of cycling facilities in the downtown core. The desired outcome of the Queen Street narrowing to two lanes is a reduction in the through traffic travelling through downtown Bolton. The alternatives were assessed as to whether or not they included this vision for the downtown core. The analysis of this account is summarized in **Table 21.**



Table 21 – Analysis of Downtown Bolton Account

Alternative	Score for Downtown Vision
1	0.0
2	0.0
3	10.0
4	10.0
5	10.0

Alternatives 3, 4, and 5 scored 10 as they include the downtown vision, while Alternatives 1 and 2 scored 0 as they do not include this downtown vision.

4.3.3.6 Detailed Analysis of Environment Account

The analysis of environmental impacts considered the length of road improvements that traverse woodlands or Oak Ridges Moraine Conservation Plan Areas. The analysis of all five alternatives for the environment account is summarized in **Table 22.**

Table 22 – Analysis of Environment Account

Alternative	Score for Environment Disruption
1	10.0
2	6.0
3	5.8
4	4.8
5	0.0

As Alternative 1 includes no road improvements, no new environmental areas are impacted by new road construction and this alternative scored 10. Alternative 5 includes the greatest amount of road construction and would have the greatest impact to environmental areas. Subsequently, Alternative 5 scored 0 for this account.

4.3.3.7 Detailed Analysis of Goods Movement Account

The goods movement account considers the percentage of the planned road improvements that overlap with the Region of Peel's Goods Movement Network. The greater the overlapping value, the higher the score. It is important to note, that the narrowing of Queen Street through downtown Bolton is assumed to be accompanied with the restriction of trucks through the Bolton core, which will have only a nominal impact on the truck movements. The goods movement account analysis is provided in **Table 23.**

Table 23 – Analysis of Goods Movement Account

Alternative	Score for Goods Movement
1	0.0
2	2.3
3	6.4
4	8.4
5	10.0

Even with the minimal potential negative impacts due to the truck restrictions through the downtown, Alternatives 3-5 have significantly higher scores than Alternatives 1 and 2. Due to the highest number of

additional links that are provided, allowing trucks easier manoeuverability, Alternative 5 was ranked the highest.

4.3.3.8 Detailed Analysis of Transit Account

The analysis of transit considers the percentage of the planned road improvements that help facilitate transit movement. The transit account analysis is provided in **Table 24.**

Table 24 – Analysis of Transit Account

Alternative	Score for Transit
1	0.0
2	3.0
3	6.0
4	8.0
5	10.0

Alternative 5 scored highest as it had the most routes available for possible transit service. Alternative 1 scored lowest as there were no additional road projects and no additional routes for transit to utilize.

4.4 SELECTION OF THE PREFERRED TMP ALTERNATIVE

The scores for each account were combined in **Table 25** and the overall highest score was determined. The analysis of the alternatives led to the selection of Alternative 4 as the preferred TMP alternative that would be best suited to accommodate future transportation demands to the year 2031. This alternative reflects all of the most current information regarding planned future population and employment, Town, Regional and Provincial planning objectives, and public input.

Additional aspects that make up the TMP Alternative, such as interchange locations on the planned GTA West Corridor, active transportation, transit and transportation demand management measures also need to be incorporated into the TMP Alternative in order to create a multi-modal transportation plan for the future. These aspects are discussed in the following sections.

Table 25 – Multiple Account Evaluation Summaries

Alternative	AT	Air Quality	Congestion	Construction Cost	Downtown Vision	Environmental Disruption	Goods Movement	Transit	Overall Score
1	0.0	10.0	0.0	10.0	0.0	10.0	0.0	0.0	30.0
2	9.4	8.8	4.9	6.4	0.0	6.0	2.3	3.0	40.7
3	10.0	0.1	9.7	5.7	10.0	5.8	6.4	6.0	53.6
4	10.0	0.6	9.8	2.5	10.0	4.8	8.4	8.0	54.0
5	10.0	0.0	10.0	0.0	10.0	0.0	10.0	10.0	50.0



5.0 INTERSECTION ANALYSIS OF THE PREFERRED ALTERNATIVE

5.1 METHODOLOGY FOR OBTAINING TURNING MOVEMENT COUNTS

Once the preferred alternative was selected, the link volumes were extracted from the 2031 a.m. model and converted into turning movement counts in order to conduct intersection analyses.

5.1.1 2031 A.M Peak Hour

For majority of the intersections in the a.m. peak hour, EMME's projected turning movements were utilized. The projected turning movements in EMME are not capacity constrained. Therefore, at a number of intersections, EMME showed significant turning movements that could not be accommodated. To resolve this problem, exclusive turning movement links with an adjusted capacity were provided and the traffic reassigned. This allowed for more realistic turning movements. Once the volumes were projected using EMME, the volumes were checked for reasonableness. The volumes were then balanced between intersections and input into Synchro. The a.m. peak hour volumes are shown in **Figure 34.**

5.1.2 2031 P.M Peak Hour

Due to the absence of a p.m. model, the methodology for projecting the p.m. peak hour volumes was different. To project the p.m. peak hour volumes, the a.m. peak hour growth rates (comparing the 2031 projections with the existing turning movements) were reversed, to the opposite movement, and applied to the existing p.m. peak hour turning movements. The process is illustrated in **Figure 35.**

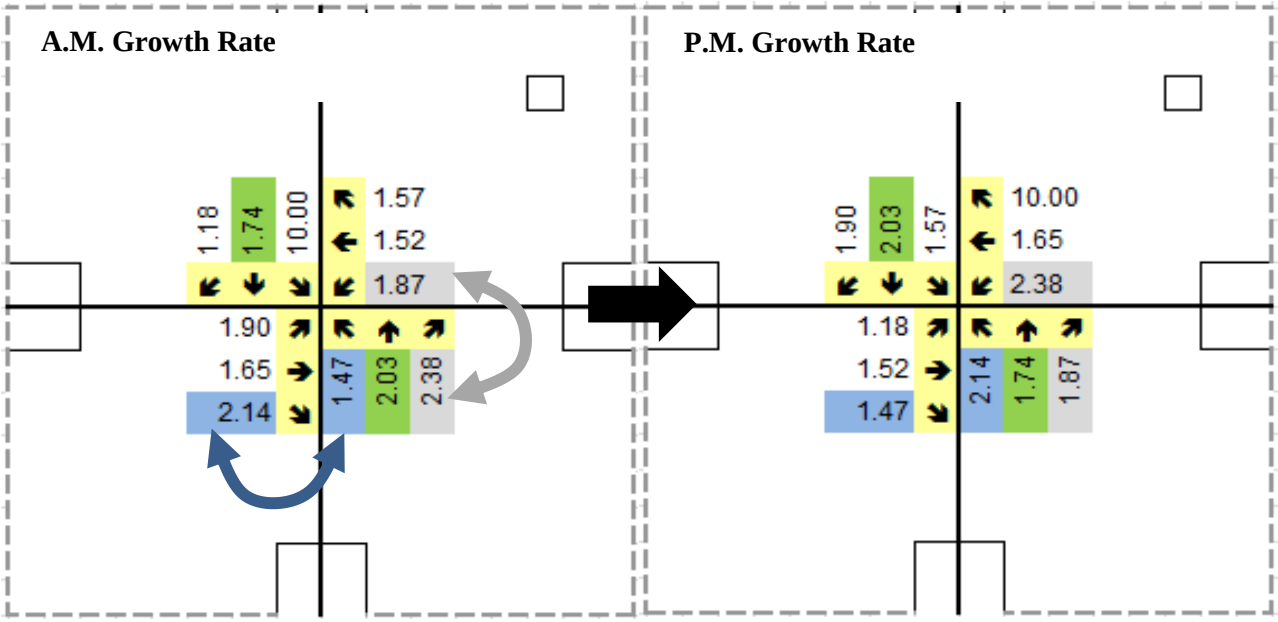

Figure 35 – Producing the P.M Growth Rates by Reversing the A.M Growth Rates

This methodology assumes that people use the same routes to and from work, school, etc. (in the evening drivers follow the same route as they did in the morning, just in the reverse direction). The volumes were then reviewed to check for reasonableness. The volumes were then balanced between intersections and populated into Synchro. The p.m. peak hour volumes are shown in **Figure 34.**

5.2 BOLTON DOWNTOWN SENSITIVITY ANALYSIS

A two-stage approach was used to determine the best cross-section option for Queen Street in the downtown core and the appropriate traffic control measures to institute with the preferred cross-section option. This approach was designed to determine the best option for transportation that would help to revitalize the downtown core. The scenarios analyzed in Stage One – Cross-Section Analysis included:

- Scenario 1: Do Nothing – with the exception of prohibiting through trucks, Queen Street in the downtown core would be kept as-is. There would continue to be four travel lanes with on-street parking restrictions during the peak hours. The on-street parking stalls are not separated from the through lanes, allowing vehicles to travel in the parking lane if the space is not being utilized;
- Scenario 2: Two travel lanes (with bicycle sharrows) with all-day on-street parking on both sides of Queen Street; and
- Scenario 3: Two vehicle travel lanes, two bike lanes, and all-day on-street parking on the east side of Queen Street.

Due to the right-of-way limitations, all day on-street parking can be provided only on one side of Queen Street in Scenario 3. A decision to implement all-day on-street parking on the east side of Queen Street was based on several factors. There are more stores fronting onto Queen Street on the east side than on the west side. An easily accessible off-street parking lot with a significant surplus capacity is located immediately west of Queen Street. Based on the Bolton Downtown Core Public Parking Study, dated January 2012, the on-street parking utilization is significantly higher on the east side than on the west side of Queen Street. Based on this study there are 17 available on-street parking spaces with the average and maximum utilization of 41% and 88%,

respectively. On the west side of Queen Street, there are 19 available on-street parking spaces with the average and maximum utilization of 26% and 53%, respectively. This data shows that even during the maximum parking demand, there are still at least nine (9) parking spaces available on the west side of Queen Street.

All three scenarios assumed that through trucks would be prohibited on Queen Street in the downtown core. Local deliveries would continue to be permitted.

5.2.1 Stage 1 Analysis

This stage determines the preferred optimum cross-sectional lane configuration that will be recommended for implementation on Queen Street through the downtown core. The three Stage One scenarios were assessed using multiple criteria, including:

- Transportation safety: Which scenario provides the most likely opportunity to reduce vehicle collisions?;
- On-street parking: Which scenario provides the most on-street parking?;
- Pedestrian amenities: Which scenario creates the best environment for pedestrians?;
- Travel Time: Which scenario results in better travel times?;
- Cycling facilities: Which scenario provides the most appropriate cycling facilities?;
- Public realm (creating a "complete street"): Which scenario best utilizes the right-of-way to create a "complete street" for all road users?;
- Public input: Which scenario did the public prefer?;
- Noise: Which scenario would best mitigate transportation noise; and
- Cost: How does the cost of implementation compare with the other scenarios.

For each criterion, a score of "10" was awarded to the scenario that best addressed the criterion. A score of "0" was awarded to the scenario that was least in line with the criterion. The remaining scenario was scored as a "5". At the end of the analysis, the scores were tallied in order to draw conclusions and arrive at a recommendation for the optimum cross section to proceed to stage two of the analysis.

5.2.1.1 Transportation Safety

Based on the collision history data, the section of Queen Street between Hickman Street and King Street experienced a very high number of vehicle collisions between 2008 and 2012. During this 5-year period, a total number of 195 vehicle collisions or 39 collisions per year were recorded. The breakdown of the vehicle collisions by location is provided below.

- Intersection of Queen Street and Hickman Street – 17 vehicles collisions;
- Between Hickman Street and Mill Street – 5 vehicle collisions;
- Intersection of Queen Street and Mill Street – 41 vehicle collisions;
- Between Mill Street and Sterne Street – 4 vehicle collisions;
- Intersection of Queen Street and Sterne Street – 12 vehicle collisions;
- Between Sterne Street and King Street – 13 vehicle collisions; and
- Intersection of Queen Street and King Street – 103 vehicle collisions

The narrowing of Queen Street will result in a reduction of through traffic volumes in the Bolton Core. It is also expected that the travel speeds will be reduced due to a slightly increased congestion and provision of cycling facilities on Queen Street. Hence, it is anticipated that the transportation safety will be improved in Scenario 2 and 3 compared to Scenario 1. Scenario 3 was awarded a "10" as this scenario provides increased safety for cyclists due to separate cycling lanes. Scenario 2 will also provide increased safety compared to Scenario 1,

resulting in an award of "5" for this criterion. Scenario 1 was awarded a "0" as it does not provide any safety improvements.

5.2.1.2 On-Street Parking

Residents and business owners have desired all-day on-street parking on both sides of Queen Street for many years. Currently, there are time-of-day restrictions that govern on-street parking, with parking in the curbside southbound lane prohibited in the morning commuter peak hours and parking in the curbside northbound lane prohibited in the evening commuter peak hours. Scenario 1 would keep this arrangement. Scenario 2 would allow for all-day parking on both sides of Queen Street, with no commuter peak hour restrictions. Scenario 3 would allow all-day parking on the northbound curbside lane with no restrictions. There would be no parking on the west side of Queen Street.

Scenario 2 was awarded a "10" as this scenario is the only one that provides all-day parking on both sides of Queen Street. Scenario 1 provides parking on both sides of the street, although with a time of day restriction, resulting in an award of "5" for this criterion. Scenario 3 was awarded a "5" as it provides all-day parking, although only on one side of Queen Street.

5.2.1.3 Pedestrian Amenities

Improving the pedestrian experience is one of the desired outcomes of the downtown Bolton visioning exercise. Each of the three scenarios was considered in terms of what could be done to make Queen Street more pedestrian friendly. Actions such as reducing crossing distance to cross Queen Street and adding space for street furniture and public art were considered.

Scenarios 2 and 3 were both scored a "10" as the reduction of travel lanes from four lanes to two lanes provides the opportunity to create bulb outs to shorten the pedestrian crossing distance across Queen Street. Instead of crossing four lanes, pedestrians would only be required to cross two lanes. The bulb outs also create new space for pedestrian furniture and public art. Scenario 1 maintains the existing conditions and offers limited opportunities to improve the pedestrian experience. Pedestrians would continue to be required to cross four lanes of traffic to cross Queen Street.

5.2.1.4 Travel Time

It is anticipated that narrowing of Queens Street and a corresponding increase in traffic control delays will result in longer travel times for drivers travelling through downtown Bolton. However, there are only three traffic signals located within this relatively short section of Queen Street with two travel lanes. Hence, traffic control delays are not expected to significantly affect travel times. Moreover, narrowing of Queen Street will result in lower volumes, lower traffic control delays and higher operating speeds along the sections Highway 50 north and south of the "two-lane" section. Therefore, it is likely that only short trips with both an origin and a destination located very close to downtown Bolton will experience slightly longer travel times, while longer trips (e.g. from north of Emil Kolb Parkway to south of Mayfield Road) are expected to have comparable travel times. Additionally, longer trips diverted to Emil Kolb Parkway will experience similar if not even shorter trips compared to the existing trips on Highway 50.

Scenario 1 is expected to maintain the most vehicle capacity and would be expected to best maintain travel times for shorter trips. Scenario 2 and Scenario 3 are expected to have lower travel speeds and slightly longer travel times. It is anticipated that due to the shared traffic operations (no separate bike lanes) Scenario 2 will have slightly higher travel times than Scenario 3.



It should be also recognized that a reduction in vehicle travel speed is not necessarily a negative impact. Reduced travel speeds can help create a more inviting environment for cyclists and pedestrians and can support the vision for downtown Bolton as a place to travel to and not only a place to travel through.

5.2.1.5 Cycling Facilities

Providing cycling facilities helps to complete the street and alerts all road users of the likely presence of cyclists and the place for cyclists to travel within the roadway. Dedicated cycling facilities may make cyclists feel more comfortable traveling in the downtown, potentially leading to an increase in the cycling mode split. The increase leads to a decrease in vehicle traffic and has the potential to improve the downtown core by reducing vehicle congestion.

Scenario 3 was ranked the highest as it provides dedicated bike lanes. Scenario 1 was ranked the lowest as it provides no cycling facility improvements. Scenario 2 was ranked in between because in this option sharrows are implemented in the centre of the lane. Cyclists and vehicles would travel single file on Queen Street through the downtown core. With the reduction of travel lanes in Scenarios 2 and 3, there is an added opportunity to increase the amount of bike parking in the downtown to encourage cyclists to visit the downtown while using their bikes.

5.2.1.6 Public Realm (Creating a Complete Street)

A criterion was included to consider which scenario best used the right-of-way to create a "complete street" that could be used by all modes of transportation and all transportation system users. Scenario 3 is seen as best embracing the concept of "complete streets" by providing facilities that can be used by pedestrians, cyclists and vehicles, be they passenger cars, local deliveries or transit vehicles.

The dedicated bike lanes give Scenario 3 the edge over the sharrows recommended in Scenario 2. With no provision for cyclists and no new provision for pedestrians, Scenario 1 received the lowest score.

5.2.1.7 Public Input

From the outset of the TMP, the public has been adamant about their desire to reclaim the downtown by removing trucks, re-instituting all-day parking and creating a people place. In all three scenarios, through trucks are assumed to be prohibited on Queen Street. Scenarios 2 and 3 were presented to the public and stakeholders at Public Information Centre #2. Both were warmly received, with more feedback in favour of Scenario 2 because it provides on-street parking all day on both sides of Queen Street and because there was some concern about the perceived low number of cyclists that would use the cycling lanes.

Scenario 2 was presented as an interim solution and Scenario 3 was presented as an ultimate solution at the Public Information Centre. If attitudes change about the amount of on-street parking needed or about the utility of dedicated bike lanes, the ultimate solution may be considered for implementation.

5.2.1.8 Noise

Transportation noise was cited by residents and business owners as a detriment in the downtown. With fewer travel lanes and lower speeds, transportation-related noise impacts would be expected to be reduced in Scenarios 2 and 3. More travel lanes and expected higher speeds in Scenario 1 result in a score of "0" for this scenario. All three scenarios assumed that through truck traffic is prohibited on Queen Street.

5.2.1.9 Cost

The financial cost of implementing each of the scenarios also was considered. With no new improvements, Scenario 1 would be expected to cost the least and scored a "10." All work would be done within the existing curbs and no road widening or utility relocation would be necessary. The reduction of lanes would provide the

opportunity to construct bulb outs to reduce pedestrian crossing distance and provide amenities such as street furniture and bike parking. While these improvements can be seen as positive, they would require additional financial cost. Scenario 3 will have slightly higher cost than Scenario 2 due to the cost of implementing the dedicated bike lanes, and therefore scored a "0". Scenario 2 scored a "5".

5.2.1.10 Summary of Analysis for Stage One

The scores for each criterion are tabulated and summed in **Table 26**. Scenario 3 scored the highest with a score of "65", slightly higher than Scenario 2 at a score of "60". Both Scenarios 2 and 3 scored well ahead of Scenario 1.

Table 26 – Summary of Stage One Analysis

Scenario	Safety	On-Street Parking	Pedestrian Amenities	Travel Time	Cycling Facilities	Public Realm (Creating a Complete Street)	Public Input	Noise	Cost	Total
1	0	5	0	10	0	0	0	0	10	25
2	5	10	10	0	5	5	10	10	5	60
3	10	5	10	5	10	10	5	10	0	65

Scenario 3 will be used in Stage Two of the analysis as this scenario scored the highest and is seen as the ultimate recommended solution for Queen Street in the downtown core. This scenario best embodies a complete street and will help Bolton create a destination for people in the downtown. However, it is important to recognize that Scenario 3 and Scenario 2 are very similar in terms of traffic operations, and that Scenario 3 traffic control plan recommended for downtown Bolton will be also appropriate for Scenario 2.

5.2.2 Stage 2 – Traffic Control Plan

Once the preferred scenario was determined, the preferred cross-section was utilized to determine the optimum traffic control plan through the downtown. The traffic control plan assessment was undertaken to address existing transportation concerns in the Bolton Core. The focus of the assessment was to provide recommendations regarding traffic control, including controlled pedestrian crossing locations and treatments, at the intersections of Highway 50 at Hickman Street, Highway 50 at Mill Street, and Highway 50 at Sterne Street. Currently a significant number of pedestrians jaywalk across Queen Street between King Street and Mill Street. It was observed that the majority of jaywalkers are pedestrians that are destined to and from small businesses along the east and west side of Queen Street.

The majority of pedestrian midblock crossings occur near a Tim Horton's store, and it is likely that convenience (choosing the shortest and fastest way) is a significant contributing factor. It was initially assumed that the high pedestrian crossing delays at the King Street and Mill Street signals contribute to the high number of existing jaywalkers. However, during the public consultation process, it was learned that the jaywalking issue is due to the fact that some pedestrians perceive the east-west crosswalks at the intersection of King Street and Queen Street to be very unsafe. It was indicated that this intersection experiences high traffic volumes and that motorists, and especially truck drivers making illegal left and right turning movements, do not yield to pedestrians crossing this intersection during green traffic signal indications. The review off the collision data shows that between 2008 and 2012 there were 103 vehicle collisions at the



intersection of Queen Street and King Street, and only four of these collisions involved pedestrians. Although the number of the pedestrian collisions is not high, it is likely that the very high number of vehicle collisions results in the public perception of this intersection as being very unsafe for pedestrians.

During the TMP process concerns were raised regarding the safety of vehicles ingress/egress from Hickman Street onto Queen Street. Due to high through traffic volumes on Queen Street and restricted sightlines, it is challenging to make the eastbound left turn movement from Hickam Street onto Queen Street. There have been several requests from the public to signalize the intersection of Queen Street and Hickman Street to address this issue. At the same time the existing traffic signal at the intersection of Queen Street and Mill Street is perceived to be lightly utilized by pedestrians and vehicles from Mill Street. Therefore, Region of Peel staff has considered an option of removing the traffic signal from Mill Street to Hickman Street.

Signalization of the intersection of Queen Street and Hickman Street will not only improve the safety of vehicles turning from Hickman Street onto Queen Street, but it is also a desirable alternative in terms of improved traffic operations due to the increased signalized intersection spacing. However, due to a very long and steep downgrade in the southbound direction, there is a concern that the frequency and severity of rear-end collisions will significantly increase after the signalization of this intersection. Advance warning beacons are installed on Highway 50 between Hickman St and Centennial Drive for the southbound direction to enhance safety at this intersection. This is a warning sign accompanied by flashing beacons that are actuated when there are vehicle(s) waiting to enter Queen Street from Hickman Street. Despite this measure, the collision history data show that between 2008 and 2012 there have been eight (8) rear-end vehicle collisions out of total 17 collisions. During the same time the intersection of Queen Street and Mill Street has experienced 21 rear-end vehicle collisions out of total 41 collisions. Given that both intersections experience very similar traffic volumes, this demonstrates that the installation of traffic signals at the intersection of Queen Street and Hickman Street will likely result in the increased number of the vehicle collisions.

With the narrowing of Queen Street to a two lane cross-section through the downtown core, it was suggested that the southbound direction between Hickman Street and Centennial Drive be narrowed from two lanes to one lane. The narrowing of Queen Street provides an opportunity to implement two-stage left turn gap operations at this intersection. On the south side of the intersection there is adequate space to provide an exclusive northbound left turn lane and a through lane. The exclusive northbound left turn lane would separate the left turning vehicles from the through vehicles, and minimize the potential for rear-end collisions. On the north side of the intersection there will be two northbound receiving lanes. A curb lane will accommodate the through vehicles from a single departing through lane on the south side of the intersection, while the inside lane will be available for the eastbound left turn vehicles from Hickman Street. When presented with a sufficient gap in the southbound though traffic, the eastbound left turn vehicles from Hickman Street will be able to safely turn onto this lane and then proceed northbound without conflicts with the northbound through vehicles. It is highly unlikely that the northbound through vehicles will use this inside receiving lane as there is no close downstream intersection with a significant left turn demand. However, this inside receiving lane can be hatched to indicate to the northbound through vehicles not to use this lane. Additionally, overhead regulatory lane designation signs could be implanted to indicate that there is a single northbound left turn lane on the northbound approach of this intersection. This two stage left-turn gap option is similar to existing operations at the intersection of QEW eastbound off-ramp and South Sheridan Way in the City of Mississauga where the heavy southbound left turn movements is provided with an additional receiving lane on the east side of this intersection.

The provision of the southbound right turn lane will minimize the potential for rear-end collisions in the southbound direction. This would require that a portion of the southbound section between Hickman Street and Centennial Drive not be narrowed, but instead be converted to an exclusive right turn lane. The exclusive

right turn lane would be used as a deceleration lane by drivers looking to make that turn. The drivers would be able to decelerate safely, away from the through vehicles and in turn minimizing the number of the rear-end collisions. The lane configuration alternatives for this intersection are illustrated in **Figure 36**.

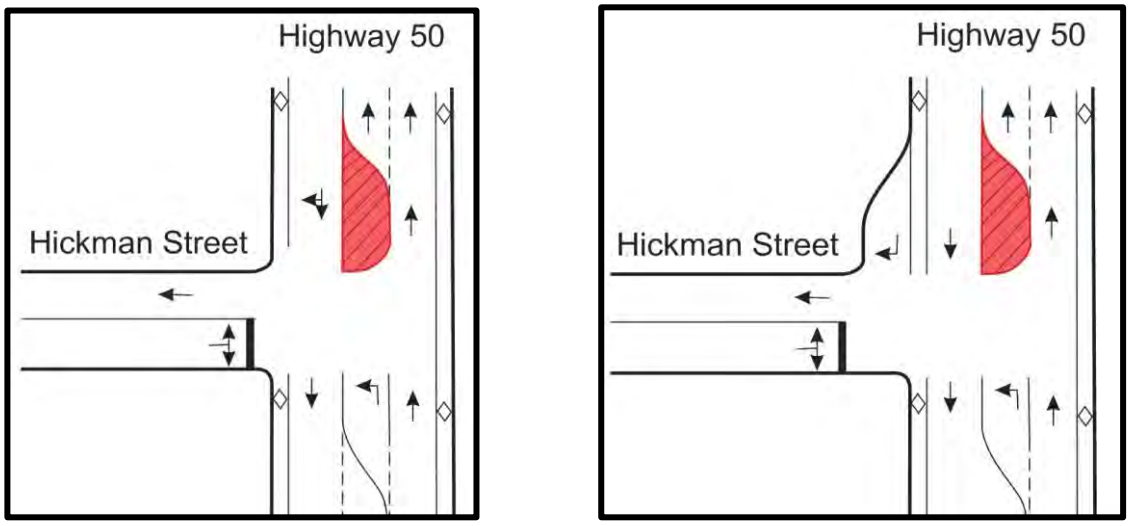

Figure 36 – Queen Street and Hickman Street Intersection – Two Stage Gap Acceptance Alternatives

To address existing transportation concerns six options were assessed In Stage Two – Traffic Control Plan :

- Option 1: No traffic control changes;
- Option 2: Maintain the traffic signal at Mill Street, install a pedestrian crossover (PXO) immediately south of Sterne Street;
- Option 3: Remove the existing traffic signal at Mill Street and install an intersection pedestrian signal (IPS) on the south side of the Sterne Street intersection;
- Option 4: Remove the existing traffic signal at Mill Street and signalize the intersection of Queen Street and Hickman Street;
- Option 5: Remove the existing traffic signal at Mill Street, signalize the intersection of Queen Street and Hickman Street, and install an IPS on the south side of the Sterne Street intersection; and,
- Option 6: Remove the signal at Mill Street, signalize the intersection of Queen Street and Hickman Street, and install a PXO at a proposed mid-block crossing (immediately south of Sterne Street).

The six options are illustrated in **Figure 37, Figure 38** and **Figure 39**.

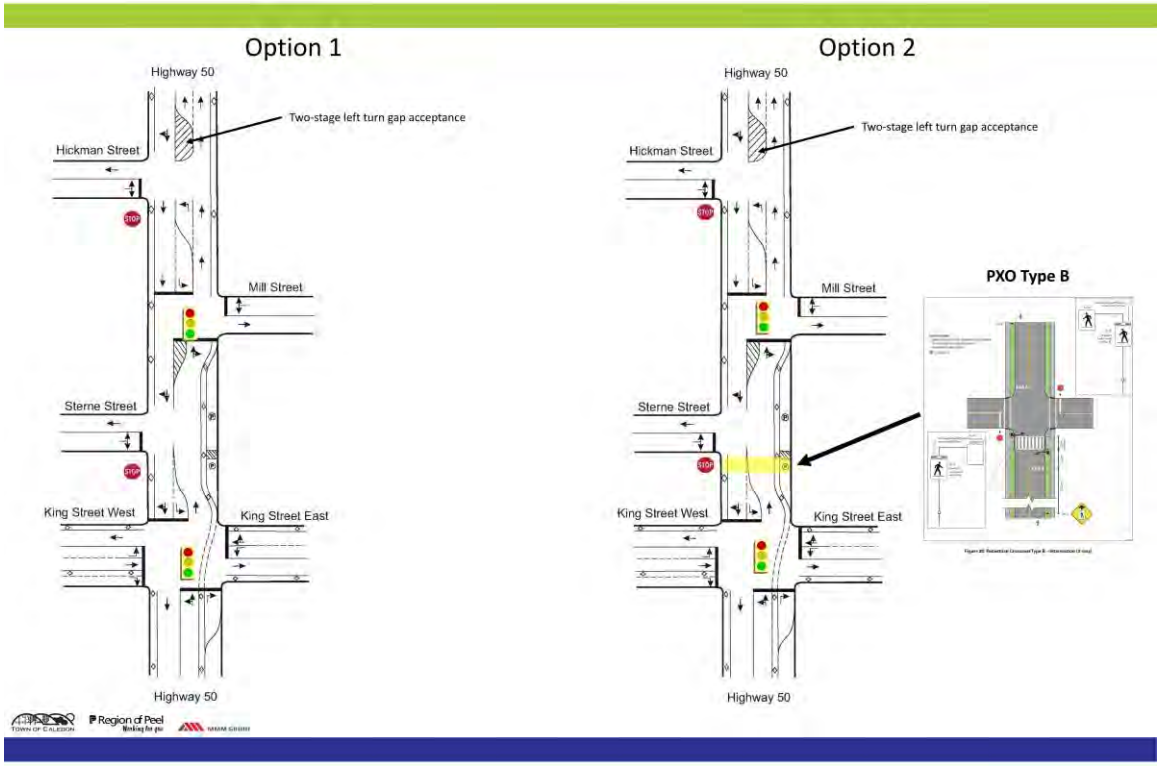

Figure 37 – Option 1 and Option 2 – Traffic Control Plan

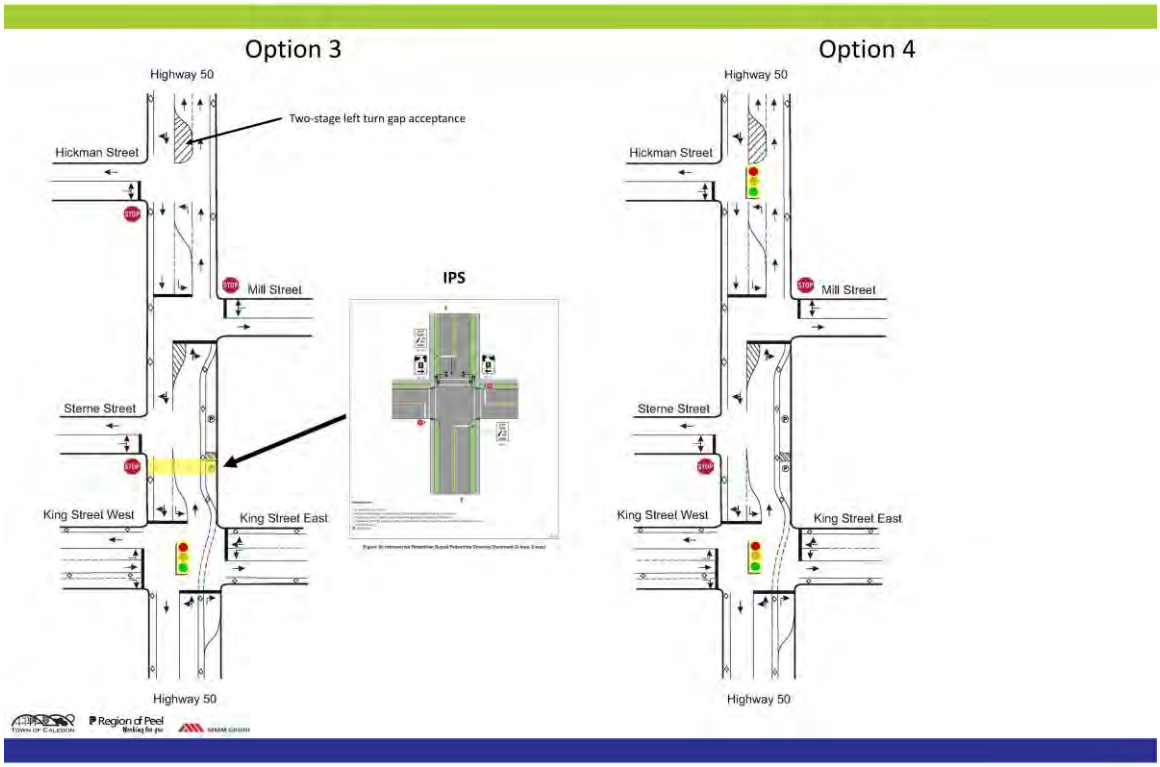

Figure 38 – Option 3 and Option 4 – Traffic Control Plan

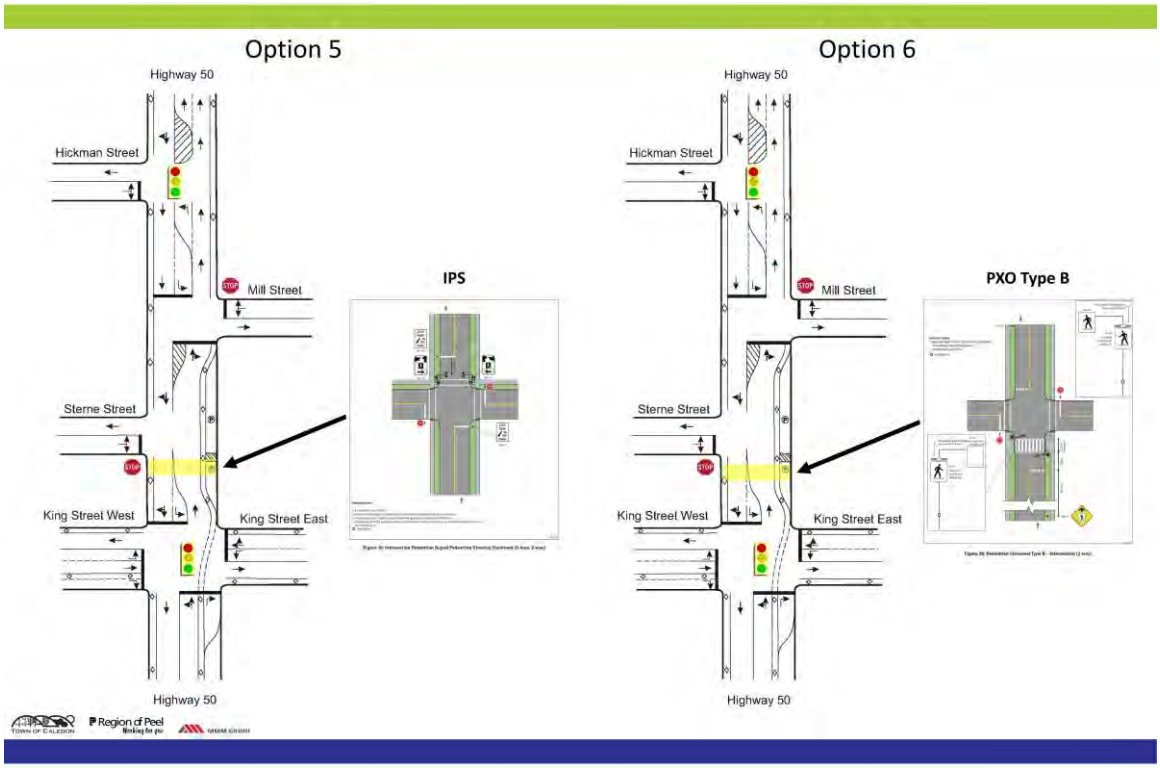

Figure 39 – Option 5 and Option 6 – Traffic Control Plan

These six options were analyzed both from a traffic signal warrant perspective and a traffic operations perspective. The results of the analysis are summarized in **Table 27,** below.

The full analysis is provided in the "Modelling and Truck Memo" in **Technical Appendix F**. To be conservative in the analysis, parking was assumed on both sides of the street.

Table 27 – Summary of Downtown Sensitivity Analysis

Option	Pros	Cons
1	► No additional "traffic control" cost; ► Longer intersection spacing (150m); ► Traffic operations allow coordination of signals, resulting in lower delays and queues; ► Signal spacing adequate to accommodate 50th percentile queues on Highway 50; ► Jaywalking can potentially be addressed by utilizing shorter cycle lengths at King Street and Mill Street intersections (minimizing delays for pedestrians).	► Mill Street signal is not warranted; ► Low pedestrian utilization of the existing signalized pedestrian crossings; Does not address jaywalking; midblock crossings will likely continue to occur between King Street and Mill Street.
2	► PXO signal warranted; ► Low cost; ► Will likely reduce a number of midblock crossings between King Street and Mill Street.	► 90m intersection spacing, does not meet minimal spacing (200m) required for a PXO (OTM Book 12 and 15); ► Might not completely address midblock jaywalking. PXO will be located approximately 60m from the location where the majority of midblock crossings occur. This is slightly longer distance than to the signal at King Street. If pedestrians are not willing to walk now to the signal at King Street, it could be expected that some pedestrians will continue jaywalking; ► Queue blockages and spillbacks; ► Potentially low vehicle compliance to PXOs. Not as safe as IPS; ► Unpredictable impact on traffic operations (cannot coordinate due to the random nature of pedestrian calls); ► Loss of at least 2 parking spaces per side to accommodate pedestrian bulb outs. Potential loss of additional 5 parking spaces on the east side (it is recommended to restrict parking within 30 meters of a PXO due to safety concerns, OTM Book 15).

Option	Pros	Cons
3	▶ IPS warranted on Sterne Street; ▶ Higher pedestrian utilization of the signal, compared to Mill Street, will likely reduce the number of midblock crossings between King Street and Mill Street; ▶ Traffic operations allow coordination of signals.	▶ Medium cost; ▶ Short intersection spacing provided; ▶ Queue blockages and spillbacks; ▶ Might not address mid-block jaywalking (same distance to the King Street signal); ▶ Loss of at least 2 parking spots per side in order to accommodate pedestrian bulb outs..
4	▶ Best in terms of traffic operations, due to sufficient spacing between signals; ▶ Safer eastbound-left movement at Hickman[1].	▶ No pedestrian crossing between King and Hickman Street, potentially higher number of jaywalkers within this section; ▶ Medium cost; ▶ Hickman Street signal not warranted; ▶ Potential increase in rear-end collisions.
5	▶ IPS warranted on Sterne Street; ▶ Higher pedestrian utilization of the Sterne Street signal, compared to the Mill Street signal; ▶ Safer eastbound-left movement at Hickman[1].	▶ High Cost; ▶ Hickman Street signal not warranted; ▶ Traffic operations, three closely spaced signals (increased delays and queues); ▶ Potential increase in rear-end collisions; ▶ Loss of at least 2 parking spots due to IPS.
6	▶ PXO signal warranted; ▶ Safer eastbound-left movement at Hickman[1].	▶ High Cost; ▶ Hickman Street signal not warranted; ▶ PXO results in unpredictable impact on traffic operations; ▶ Potentially low vehicle compliance to PXOs. Not as safe as IPS; ▶ 90m spacing, doesn't meet minimal spacing required for a PXO; ▶ Loss of at least 2 parking spots per direction.

Based on the summary criteria were developed and an evaluation table was designed to determine the best control plan option. The criteria utilized were:

- Cost: the cost of implementing the suggested changes. "10" was given to the least expensive option while "0" was given to the most expensive;
- Warrants: analyzes if pedestrian/vehicle signal warrants were satisfied. A score of "10" was given to the option that meets all its warrants or is currently existing (therefore does not require warrants). "0" was given to options that met none of the warrants. Values in between are given depending on how many warrants are satisfied;



- Pedestrian Jaywalking/Safety: examines the level of crosswalks available for pedestrians to cross Queen Street. PXOs were deemed to be less safe than IPSs. A score of "10" was given to the highest option, while "0" to the lowest option.
- Signal Coordination Potential/Queues: examines the cycle lengths required at the signalized intersections and the easiness of coordinating the signal timings through the core. The easier the signals are to coordinate, the better the vehicle traffic will operate. With shorter cycle lengths, pedestrians are serviced more frequently, potentially leading to less jaywalking. Criteria ranges from "0" to "10", with "10" being the highest score with the shortest cycle lengths and easiness of coordination;
- Parking Availability: examines the number of available on-street parking stalls. Criteria ranges from "0" to "10", with "10" being the highest score with the most parking spaces available.

The results of the analysis are shown in **Table 28**.

Table 28 – Scoring of Each Option

Option	Cost	Warrants	Pedestrian Jaywalking / Safety	Signal Coordination Potential / Queues	Parking Availability	Total
1	10	10	2	6	8	36
2	8	10	10	0	0	28
3	6	10	7	8	4	35
4	4	0	0	10	10	24
5	0	5	7	4	4	20
6	2	5	4	2	4	17

Cost

The cost was based on the amount of signals that were removed and implemented. The least expensive option was Option 1, with no changes, while the most expensive option was Option 5, with the removal of Mill Street signal, implementation of Hickman Street signal and an installation of the IPS at Sterne Street. It was deemed that an IPS costs more to implement than a PXO, which is why Option 6 was less expensive than Option 5.

Warrant

Option 1 required no warrants to be satisfied as the traffic signals were not being implemented, therefore this option scored "10". Under Options 2 and 3 the PXO and the IPS at Sterne Street met the warrants, therefore these options also scored "10". Under Options 4 the signalization of Hickman Street was not warranted, which is why this option scored "0". While under Options 5 and 6 the signal at Hickman Street did not meet the warrants, but the PXO and IPS warrants at Sterne Street were met, therefore these options scored "5".

Pedestrian Jaywalking/Safety

Option 6 was ranked the lowest, with a score of "0", because it removed the existing signal at Mill Street and implemented a signal at Hickman Street (an intersection that has an underpass for pedestrians and cyclists

already), resulting in less locations for the pedestrians to cross and in turn encouraging jaywalking. Option 1 was ranked slightly higher, because it maintained the traffic signal at Mill Street allowing pedestrians to cross at that location, however it did not address the existing jaywalkers. Option 2 was ranked the highest, as it covers the most crossings, allowing the pedestrians to cross Queen Street at four locations safely.

Signal Coordination Potential/Queues

Option 2 was the lowest scored, "0" points, as it has very closely spaced signals (the middle of which is a PXO, which cannot be coordinated due to the random activation). Option 4 was ranked the highest, "10" points, simply because the two signals (at King Street and Hickman Street) were spaced far apart, allowing for proper coordination between signals and eliminating issues with queue spillbacks. The rest of the options were ranked in between. As mentioned, due to the random nature of PXO activations, it is impossible to coordinate with PXO signals, therefore options that contained PXOs were ranked lower than similar options with IPSs.

Parking Availability

Option 4 scored the highest, because the removal of the Mill Street signal allowed slightly more parking spaces. Option 2, scored the lowest because it had both a PXO and the signal at Mill Street, which greatly reduces the number of parking stalls that can be provided. It was assumed that PXOs require a removal of a larger number of parking stalls, than IPSs.

The results show a significant increase in vehicle queues on Queen Street when the impact of an adjacent parking lane is simulated in Synchro. This is to be expected as a portion of the green time at a downstream traffic signal might be wasted as motorists are trying to maneuver in and out of the adjacent parking lane (parallel parking). If parking is provided on both the east and west side of Highway 50 it would result in a drastic increase in queue lengths.

Based on the results of the assessment, Option 1 and Option 3 were identified as potential solutions. Option 1 represents the best balance in terms of improving the active transportation environment while maintain adequate traffic operations within the Bolton core. While desirable from the traffic signal spacing and traffic operations perspective, the removal of the traffic signal from Mill Street to Hickman Street is not desirable from the traffic safety perspective.

Under Option 1, the existing signal timings should be modified to run on 100 second cycle lengths, which would improve the pedestrian environment, as it would reduce the pedestrian crossing delay time by 20 seconds. This option is also inexpensive as it only requires the cost of updating the signals (this option will be used in the analysis below). In case jaywalking continues in the area, Option 3 should then be considered. However, under Option 3, longer traffic signal cycle lengths are required from a traffic perspective, which would increase pedestrian crossing delays and may affect pedestrian compliance (resulting in jaywalking).

5.3 BOLTON INTERSECTION ANALYSIS

Based on the projected volumes the projected levels of service and volume-to-capacity ratios were calculated. The results are shown in **Table 29.** The projected 2031 intersection levels of service are also shown in **Figure 40.**

Table 29 – 2031 Intersection Analyses

Intersections	Control Type (Suggested Improvement)	WEEKDAY A.M.		WEEKDAY P.M.	
		LOS (Delay in seconds)	Critical Movements (v/c)	LOS (Delay in seconds)	Critical Movements (v/c)
Hwy 50 & Mayfield Rd / Albion Vaughan Rd	Signalized	D (42)	WB-L (0.99) WB-TR (0.89) NB-L (1.02) SB-T (0.87)	D (43)	WB-L (0.97) SB-T (0.89)
	Signalized (implement P.P. NB-L in the a.m.)	D (43)	EB-L (0.96) WB-L (0.95) SB-T (0.94)	D (43)	WB-L (0.97) SB-T (0.89)
Hwy 50 & George Bolton Pkwy	Signalized	A (9)	WB-L (0.85)	B (14)	--
Coleraine Dr & Healey Rd	Signalized	C (21)	--	D (36)	EB-L (0.99) EB-TR (0.89) WB-TR (0.89)
Hwy 50 & Queensgate Blvd	Signalized	C (28)	SB-TR (0.90)	D (37)	EB-TR (0.88) NB-T (0.95)
Albion Vaughan Rd & Queensgate Blvd	Signalized	B (15)	--	B (15)	--
Albion Vaughan Rd / Caledon King Town Line S & King St E / King Rd	Signalized	D (36)	EB-T (0.88) WB-L (0.94) NB-L (0.87) SB-L (0.86)	C (34)	WB-TR (0.96) NB-TR (0.91)
Hwy 50 & King St W / King St E	Signalized	D (39)	WB-L (0.91) SB-TR (0.95)	D (37)	EB-T (0.90) WB-L (0.87) WB-TR (0.93) NB-TL (0.86)
Hwy 50 & Mill St	Signalized	A (6)	--	A (8)	--
Coleraine Dr & Harvest Moon Dr / King St W	Signalized	C (22)	--	B (12)	--
Hwy 50 & Columbia Way	Signalized	B (16)	--	A (7)	--
Humber Station Rd & King St	Signalized	C (30)	--	F (90)	EB-LTR (0.96) WB-LTR (1.25) NB-LTR(1.05)

Intersections	Control Type (Suggested Improvement)	WEEKDAY A.M.		WEEKDAY P.M.	
		LOS (Delay in seconds)	Critical Movements (v/c)	LOS (Delay in seconds)	Critical Movements (v/c)
	Signalized (Introduce exclusive left turns)	C (25)	--	D (37)	WB-TR (0.93)
Hwy 50 & Ellwood Dr W / Ellwood Dr E	Signalized	C (21)	--	C (24)	EB-LTR (0.93)
Hwy 50 & Wilton Dr / Allan Dr	Signalized	C (29)	WB-LTR (0.87)	C (25)	--
Hwy 50 & McEwan Dr W/ McEwan Dr E	Signalized	B (19)	SB-TR (0.93)	C (31)	EB-R (0.85) SB-L (0.94)
Hwy 50 & Cross Country Blvd / Bolton Heights Dr	Signalized	B (16)	--	A (6)	--
Hwy 50 & Parr Blvd	Signalized	A (9)	--	C (22)	--
Coleraine Dr & Mayfield Rd	Signalized	D (42)	EB-L (0.98) SB-L (0.92)	D (43)	EB-TR (0.88) WB-L (0.87) SB-R (0.94)
Hwy 50 & Healey Rd	Signalized	B (14)	--	C (25)	--
The Gore Rd & King St	Signalized	C (27)	--	C (33)	WB-TR (0.85) NB-TR (0.89)
The Gore Rd & Mayfield Rd	Signalized	D (39)	EB-L (0.94) WB-L (1.03)[1] SB-T (0.97)	C (34)	WB-TR (0.91) NB-TR (0.92)
Hwy 50 & Old Church Rd	Signalized	B (20)	--	C (26)	--
Coleraine Dr & George Bolton Pkwy	Unsignalized	F (Error)[1]	EB-L (Error)[1] WB-TR (Error)[1]	F (Error)[1]	EB-L (Error)[1] WB-L (Error)[1]
	Signalize	B (15)	--	B (17)	--
Hwy 50 & Hickman St	Unsignalized	EB-LR: C (18)	--	EB-LR: C (19)	--
David St / Mill St & King St E	Unsignalized	SB-LTR: B (15)	--	SB-LTR: C (18)	--
King St W & Ann St	Unsignalized	SB-LR: C (15)	--	SB-LR: C (19)	--
Hwy 50 & Sterne St	Unsignalized	EB-LR: D (27)	--	EB-LR: F (71)	EB-LR (0.65)

Note: 1. Calculated values exceed the limitations. The volumes greatly exceed capacity and delays cannot be computed in this case.

The majority of the intersections are expected to operate with acceptable levels of service and within capacity in the 2031 horizon year. The northbound left turn movement at the intersection of Mayfield Road and Highway 50 is expected to operate slightly over capacity. A northbound left turn protected+permissive phase



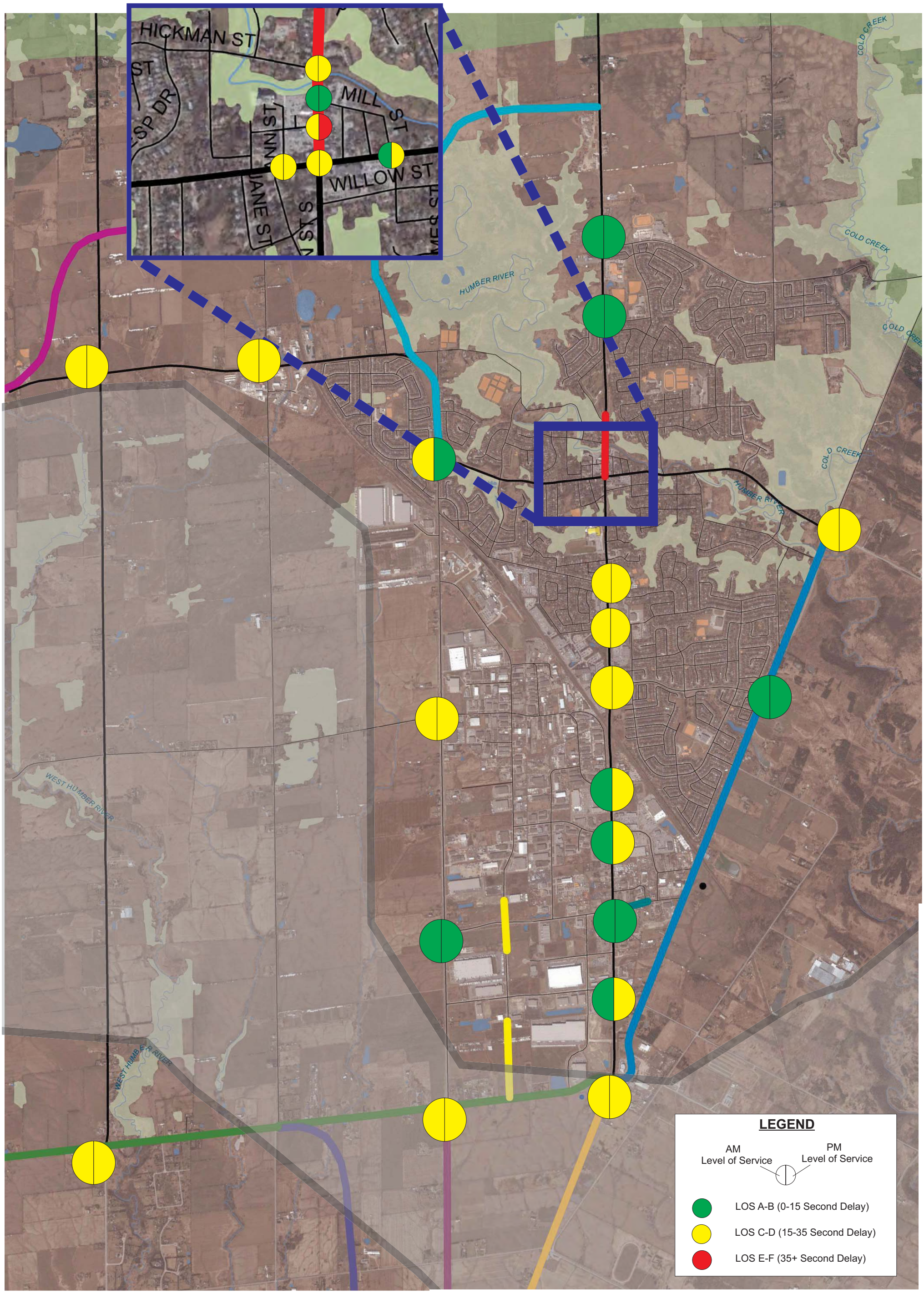

Figure 40: Bolton Transportation Master Plan

2031 Projected Traffic Operations

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is suggested to be implemented during the a.m. peak period. The intersection of The Gore Road and Mayfield Road is shown to exceed capacity during the a.m. peak hour, however this is due to Synchro underestimating the left turn capacity. The westbound left turn movements at this intersection was projected to be around 60 vehicles, which given the 120 cycle length and assuming a conservative two vehicles through during the intergreen, results in the capacity of at least 60 vehicles.

Due to the large residential development and the GO Rail Station located in its vicinity, the intersection of the Humber Station Road and King Street is expected to experience a significant increase in through traffic. The relatively high left turn volumes on the approaches result in significant delays, due to all the movements being shared left/through/right. By providing exclusive left turn lanes on all approaches, there will be a significant capacity increase and all movements at this intersection will operate within capacity.

The intersection of Coleraine Drive and George Bolton Parkway was initially assumed as an unsignalized intersection, with stop-controls on George Bolton Parkway. This resulted in significant delays to the side street movements. Therefore, it is recommended that this intersection be signalized in the future. All the suggested improvements are shown in **Figure 41**.

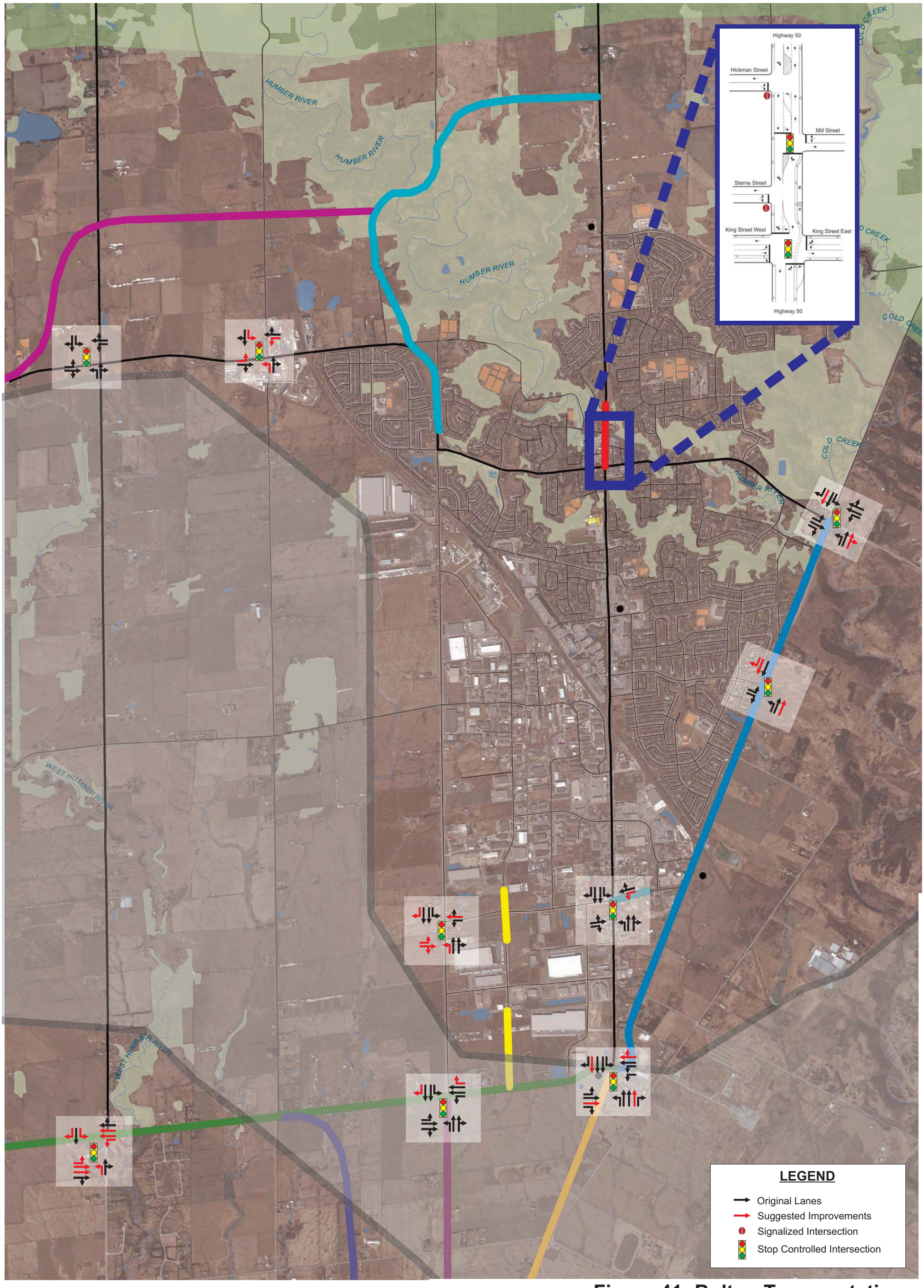

Figure 41: Bolton Transportation Master Plan

Intersections with Suggested Improvements (2031)

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6.0 ADDITIONAL SENSITIVITY ANALYSIS

Several sensitivity analyses were conducted during the study, including:

- Sensitivity Test of the GTA West Highway;
- Assessment of optimum interchange locations; and
- Grade separated railway crossings.

These sensitivity analyses are described in this section.

6.1 ASSESSMENT OF OPTIMUM INTERCHANGE LOCATIONS

The Ministry of Transportation (MTO) is underway with Stage 2 of its GTA West Corridor Planning and Environmental Assessment (EA) to identify the route and develop the preliminary design for the new transportation corridor. The new highway will extend from Highway 400 (between Kirby Road and King-Vaughan Road) in the east to the Highway 401/407 ETR interchange area in the west, and will feature a 400-series highway, a transitway, and potential goods movement priority features.

The new highway is expected to traverse either within or very near to the study area of the Bolton TMP. Whether the highway is within the Bolton TMP study area or not, it will play an important role in transportation in Bolton. Figure 39 (from Section 5.2.3) shows the assumed location of the GTA West Highway. As part of the work on the TMP and before the analysis of multiple alternatives for the year 2031, it was important to identify the interchange location(s).

Three scenarios, listed below, were analyzed, under Alternative 3 road improvements, to determine the best location(s). The analysis is summarized in **Table 30.**

- Mayfield Road (east of Humber Station Road) only;
- Coleraine Drive (north of Countryside Drive) only; and
- Mayfield Road and Coleraine Drive.

Table 30 – Producing the P.M Growth Rates by Reversing the A.M Growth Rates

Metrics	Alternative 3a (Mayfield Interchange Only)	Alternative 3b (Coleraine Interchange Only)	Alternative 3c (Both Interchanges)
Bolton Population	45,253	45,253	45,253
Total Lane Kilometres (lane*km)	398.4	398.6	399.0
Vehicle Kilometres Travelled (VKT)	139,214	140,880	139,843
% of Total VKT on Congested Links	27%	23%	25%
Vehicle Hours Travelled (VHT)	3,213	3,200	3,183
% of Total VHT on Congested Links	42%	36%	38%
Travel Time Index (TTI)	1.282	1.277	1.274
% of Congested Lane-Kilometres	11%	10%	10%
Lane-kms per 1,000 people	8.8	8.8	8.8

It is important to acknowledge that interchanges at both locations would be very unlikely due to the close proximity of two interchange locations and the geometric constraints posed by these locations. In addition, the cost of building one interchange would be significantly less than building both interchanges. The Coleraine Drive interchange has the highest vehicle kilometres travelled and the lowest percent of kilometres travelled on congested links. Alternative 3c has the lowest vehicle hours travelled (although Alternative 3b has the lowest percent of hours travelled on congested links) and the lowest travel time index.

The Coleraine Drive Interchange (Alternative 3b) was selected as the preferred option. The Coleraine Drive interchange was also selected over the Mayfield Road interchange because it provides a direct access to Coleraine Drive (and the surrounding industrial lands) as well as Emil Kolb Parkway. The direct access should improve trucking routes as it will minimize the number of required turning movements. The Coleraine Drive interchange on the GTA West Highway was incorporated into Alternatives 4 and 5.

6.2 SENSITIVITY TEST OF THE GTA WEST HIGHWAY

A sensitivity analysis was undertaken to determine what impacts might be experienced on roads in Bolton and the surrounding area if the GTA West Highway is not constructed by the year 2031. The preferred alternative, Alternative 4, was used as the base network for the sensitivity analysis. Two model runs were conducted:

- Alternative 4a: Alternative 4; and
- Alternative 4b: Alternative 4 without the GTA West Highway.

The roadway metrics taken from the travel demand model are shown in **Table 31.** Two sets of results are shown for Alternative 4a. The first set of metrics (under column Alt 4a) show the results with GTA West kilometres and hours travelled included in the metrics. The second set of metrics (under column Alt 4a*) show the results without including the GTA West corridor in the metrics (i.e. only the kilometres and hours travelled on Town and Regional roads is included).

Table 31 – Sensitivity Analysis Roadway Metrics

Metrics	Alt 4a - Ultimate (with GTA West)	Alt 4a* - Ultimate (with GTA West)	Alt 4b - Intermediate (without GTA W)
Vehicle Km Travelled (VKT)	140,393	123,454	132,203
Vehicle Hours Travelled (VKT)	3,134	2,932	3,417
% of Total VKT on Congested Links	23%	26%	32%
% of Total VHT on Congested Links	36%	38%	47%
Lane Km	407.7	391.2	391.2
% of Congested Lane-Kilometres	9.7%	10.1%	12.9%

Note: *These values do not take into account the vehicle kilometres travelled and vehicle hours travelled on the GTA West Highway. The numbers reflect the conditions on the Town's and Region's roadways.

Alternative 4b, with no GTA West Highway in the travel demand model, has significantly higher congestion, which was expected. Also without the GTA West Highway the number of vehicle kilometres travelled and vehicle hours travelled on the Town's and Regional roadways increases (comparing results from Alt 4a* and Alt 4b).

An analysis of specific links on the various roadway corridors within Bolton is summarized in **Table 32.**

Table 32 – Sensitivity of Specific Links

Roadway	Alt 4a – Ultimate (with GTA W)	Alt 4b – Intermediate (without GTA W)
Emil Kolb Parkway	SB: 0.7-0.83	SB: 0.81-1.00
Coleraine Dr	**King to Holland** SB: 0.98-1.07 **Holland to George Bolton** SB: 0.52-0.81 **George Bolton to Mayfield** NB: 0.84 **Mayfield to Countryside** SB: 0.84	**King to Holland** SB: 1.06-1.20 **Holland to George Bolton** SB: 0.63-0.87 **George Bolton to Mayfield** Acceptable **Mayfield to Countryside** Acceptable
Albion Vaughan Rd	**Columbia to King** SB: 1.06 **King to Queensgate** SB: 0.80-1.12 **Queensgate to Mayfield** SB: 0.96-1.14	**Columbia to King** SB: 1.07 **King to Queensgate** SB: 1.01-1.20 **Queensgate to Mayfield** SB: 0.98-1.23



Roadway	Alt 4a – Ultimate (with GTA W)	Alt 4b – Intermediate (without GTA W)
Highway 50	**Old Church to Castlederg** SB: 0.88 **Castlederg to Emil Kolb** SB: 1.16 **Columbia to King** SB: 0.87-1.07 **King to Queensgate** SB: 0.70-0.87 **Queensgate to Mayfield** SB: 0.95-1.22 **Mayfield to Major Mackenzie** SB: 0.90-0.94	**Old Church to Castlederg** SB: 0.92 **Castlederg to Emil Kolb** SB: 1.18 **Columbia to King** SB: 0.92-1.15 **King to Queensgate** SB: 0.79-0.91 **Queensgate to Mayfield** SB: 0.99-1.35 **Mayfield to Major Mackenzie** SB: 0.95-1.03
Simpson Rd	Acceptable	Acceptable
A2	Acceptable	Acceptable
The Gore Rd	**Old Church to Castlederg** SB: 0.98 **Castlederg to Re-aligned King** SB: 0.92 **King to Healey** SB: 0.83 **GTA West Interchange to Mayfield** SB: 0.92	**Old Church to Castlederg** SB: 1.00 **Castlederg to Re-aligned King** SB: 0.96 **King to Healey** SB: 0.92 **GTA West Interchange to Mayfield** Acceptable
Old Church Rd	**Highway 50 to The Gore** Acceptable **The Gore to Airport** WB: 0.75	**Highway 50 to The Gore** Acceptable **The Gore to Airport** WB: 0.83
Mayfield Rd	**Airport to The Gore** EB: 0.80-0.92 **The Gore to Humber Station** Acceptable **Humber Station to A2** EB: 1.06 **A2 to Coleraine** Acceptable **Coleraine to Highway 50** Acceptable	**Airport to The Gore** EB: 0.90-1.00 **The Gore to Humber Station** Acceptable **Humber Station to A2** EB: 1.22 **A2 to Coleraine** EB: 0.83 **Coleraine to Highway 50** Acceptable

Roadway	Alt 4a – Ultimate (with GTA W)	Alt 4b – Intermediate (without GTA W)
Old King St	**Airport to Re-aligned King** EB: 0.88-0.93 WB:0.82-1.39 **The Gore to Humber Station** EB: 0.99 WB: 1.19 **Humber Station to Coleraine** Acceptable **Coleraine to Highway 50** Acceptable **Highway 50 to Humber Lea** WB: 0.90-1.00 **Evans Ridge to Albion Vaughan** EB: 0.91	**Airport to Re-aligned King** EB: 0.92-0.97 WB: 0.62-1.38 **The Gore to Humber Station** EB: 1.00 WB: 1.21 **Humber Station to Coleraine** Acceptable **Coleraine to Highway 50** Acceptable **Highway 50 to Humber Lea** WB: 1.04-1.15 **Evans Ridge to Albion Vaughan** EB: 0.93
Re-aligned King St	**King to The Gore** WB: 0.80 **The Gore to Emil Kolb** Acceptable	**King to The Gore** Acceptable **The Gore to Emil Kolb** Acceptable
George Bolton Pkwy	Acceptable	Acceptable

Note: only the worst directional v/c ratio is shown, unless both directions are at/over capacity

For the most part, the volumes to capacity ratios are higher in Alternative 4b than in Alternative 4a. However, the increases generally are not forecast to be drastic enough to warrant any additional improvements other than the road improvements already identified in Alternative 4. Generally, the volume to capacity (v/c) ratio between Alternatives 4a and 4b remain within the same band of values. The only two exceptions are:

- Emil Kolb Parkway. Emil Kolb Parkway operates within acceptable v/c ratios with the GTA West Highway, however a small link is at capacity without the GTA West Highway. Based on the v/c ratio it would be recommended that if the GTA West Highway is not implemented by 2031, this road should be monitored for traffic volumes and traffic congestion;
- Highway 50/Queen Street between Mayfield Road and Major Mackenzie Drive (which is just south of the study area). With the GTA West Highway in place this section approaches capacity, however without the GTA West Highway in place this road exceeds capacity. Again, based on the v/c ratio it would be recommended that if the GTA West Highway is not implemented by 2031, this road is monitored.

The reasoning behind the lack of significant improvements required to the roadway network within Bolton without the GTA West Highway is because the GTA West Highway provides relief for the vehicles making long distance eastbound/westbound trips. Therefore the roadways that are impacted the most by the removal of the GTA West Highway are the ones that provide long distance east/west connections. Within the boundaries of Bolton study area there are only a couple roadways that provide continuous east/west access (King Street, Old Church Road, Castlederg Side Road), therefore the significant change in travel patterns is not present.

However, looking outside of the Bolton area to include roadways such as Nashville Road/Countryside Drive, Major Mackenzie Drive and Rutherford Road (roadways that provide continuous long distance east/west connections), the analysis shows that the v/c ratios drastically increase and the required roadway improvements would be more drastic. For example:



- Major Mackenzie Drive:
  - EB just east of Highway 50, the v/c ratio increases from (0.80-0.99) to (1.17-1.39)
- Rutherford Road:
  - EB east of Highway 50 v/c ratio increases from (0.80-1.28) to (1.02-1.42)
- Nashville Road:
  - EB approaching Highway 27, v/c ratio increases from 0.71 to 1.00
  - WB approaching Huntington Road increases from (0.75-0.97) to (1.01-1.24)

Outside of the Bolton area, east-west arterial roads also are forecast to have capacity concerns. Improvements to these roads will be considered by other jurisdictions. Roads such as Nashville Road may be constrained from improvements due to environmental concerns.

6.3 ANALYSIS OF THE NEED FOR GRADE-SEPARATED RAIL CROSSINGS

There presently is only one grade-separated rail crossing in Bolton, on Highway 50 at the CP rail line. An analysis of four other locations in the study was undertaken to determine if additional locations should be considered for grade separation. A rail exposure index was calculated using the traffic volumes from the preferred alternative, Alternative 4, and an assumption of 16 trains per day, which would maintain the existing average daily train volumes. The four locations studied included:

- Albion Vaughan Road
- Coleraine Drive;
- King Street; and
- Realigned King Street.

The rail exposure index was calculated by multiplying the average daily vehicle volume at the rail crossing by the anticipated number of trains per day. If the resulting amount was greater than 200,000, then the location was identified as exceeding the threshold and would be a candidate for grade separation. This methodology is used by both Transport Canada and the United States Federal Highway Administration.

Peak hour vehicle volumes were taken from the travel demand model and multiplied by ten in order to estimate average daily traffic volumes. At all locations, 16 trains were assumed to travel each day. This number of trains is the same used in previous analyses of grade separation conducted in Bolton by the Region of Peel.

The results of the analysis are shown on the map in **Figure 42.** The rail exposure index exceeds the threshold at Albion Vaughan Road and Coleraine Drive locations. Grade separation should be considered at these two locations. Albion Vaughan Road is recommended for road widening and grade separation should be considered in conjunction with future widening of the road.

The rail exposure index is not met for the existing King Street location or the realigned King Street location. However, traffic volumes for Alternative 3, which does not include the King Street realignment, were reviewed and were found to exceed the rail exposure index. The crossing point on King Street is constrained by existing adjacent land uses.

By constructing a realigned King Street, traffic volumes on the existing King Street would be expected to go down and would no longer exceed the rail exposure index.

The realignment of King Street reduces the need to provide a grade separated crossing at a constrained site and also provides the opportunity to create a grade separated crossing at a new site with fewer constraints as

Alternative	MULTIPLE ACCOUNT EVALUATION								Total
	Active Transportation	Air Quality	Congestion	Construction Cost	Downtown Bolton	Environment	Goods Movement	Transit	
4	10	0.7	10	2.5	10	4.8	8.4	8	**54.4**

Note: Scoring from 0 to 10, with 10 being the best score

Alternative Highlights

1. Provides solutions for active transportation and transit
2. Best mitigates congestion
3. Includes transportation enhancements to downtown Bolton

Realigned King Street at CP Rail Line
Daily Vehicle Traffic: 6,050
Daily Train Traffic: 16
Exposure Index: 96,800

King Street at CP Rail Line
Daily Vehicle Traffic: 11,130
Daily Train Traffic: 16
Exposure Index: 178,080

Coleraine Drive at CP Rail Line
Daily Vehicle Traffic: 15,340
Daily Train Traffic: 16
Exposure Index: 245,440

Albion Vaughan Town Line Road at CP Rail Line
Daily Vehicle Traffic: 24,050
Daily Train Traffic: 16
Exposure Index: 384,800

0 0.25 0.5 1 1.5 2 Kilometers

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus

Legend

- Community Centre
- Recreation Centre
- Woodland
- Oak Ridges Moraine
- Water
- GTA West Corridor Study Area
- Proposed GO Train Station
- School
- Place of Worship
- Childcare Centres
- Major Go Bus Stop
- Carpool Lot
- Railway
- Simpson Road Extension
- Highway 50 Widening
- Albion Vaughan Town Line Road Widening
- Bolton Arterial Road
- King Street Realignment
- Mayfield Road Widening
- Arterial Corridor A2
- George Bolton Parkway Extension
- Highway 50 Narrowing
- Coleraine Drive Widening (2-4 lanes)
- Recommended Interchange at Coleraine Drive
- Potential Interchange at GTA West Corridor and 427 Extension
- Highway 427 Extention

- Exceeds exposure index: grade-separation warranted
- Beneath exposure index: grade-separation not warranted

Exposure Index = (Daily vehicle traffic) x (Daily train traffic)

An exposure index with the value of 200,000 or higher is typically considered to be the threshold at which grade-separation is warranted (Transport Canada and U.S. Federal Highway Administration).

Bolton Transportation Master Plan
Figure 42: Analysis of Grade-Separated Crossings: Alternative 4

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no road or major development exists at the moment. The grade separation could be included in the design of the road from the very beginning of the planning and design process. The realigned King Street would serve as a potential east-west bypass of Bolton. It also would facilitate development of the Bolton Residential Expansion area. While not exceeding the rail exposure index, grade separation should be considered at this site for its multiple benefits.

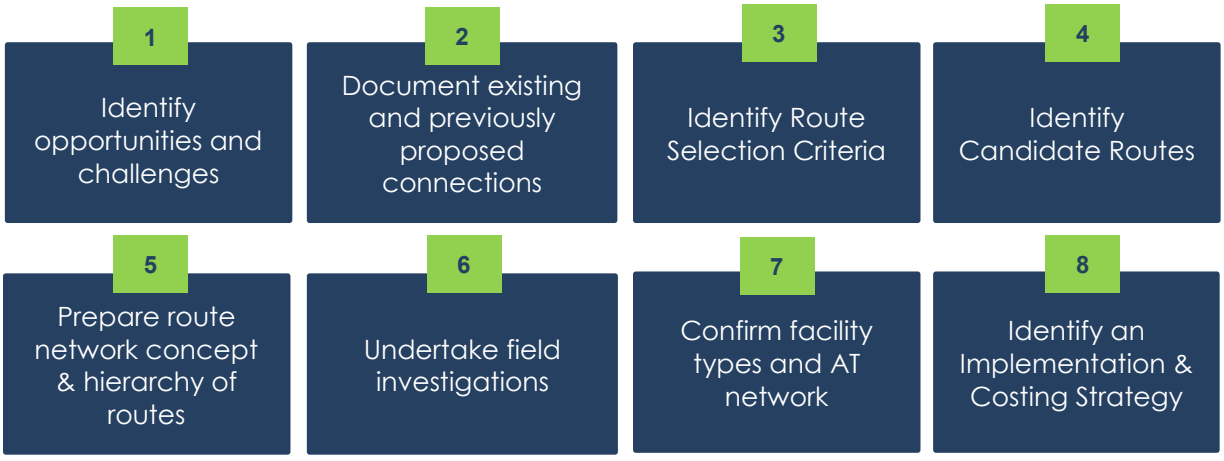
7.0 ACTIVE TRANSPORTATION

The development of a continuous and connected system of AT facilities that seamlessly connects to alternative modes of transportation and highlights the natural and cultural features of a community can help to achieve the strategic vision set out in the Bolton Transportation Master Plan. As part of the development of the Bolton Transportation Master Plan, the project team worked with the Region of Peel and the Town of Caledon to build upon the existing and previously proposed AT routes as identified in the Region's 2011 Active Transportation Strategy and the Town's Comprehensive Trails Master Plan, to establish a long-term vision for AT improvements.

AT is defined as any form of self-propelled forms of transportation including walking, cycling, in-line skating, hiking, etc. AT can be used to undertake a number of different trips with various purposes including recreational trips (for fitness or enjoyment), commuting or utilitarian trips (to get to and from work or school) and touring trips (to take long-distance trips to community destinations).

For the purposes of the Bolton TMP, MMM Group undertook an 8 step network development process to identify a connected and continuous system of AT facilities throughout the community of Bolton (see **Figure 43** below). The steps were identified based on the requirements set-out in the original Request for Proposal and were refined through discussions with the Region of Peel and the Town of Caledon. A detailed description of the approach used to address each of these steps as well as the outputs that were generated is provided in the Bolton AT Strategy Report (see **Technical Appendix E**).

Figure 43 – Active Transportation Strategy Network Development Process



The recommended AT network for the community of Bolton builds on the successes of the Town of Caledon, the Region of Peel and the Toronto and Region Conservation Authority. The proposed routes and facility types

identified highlights the opportunities available, complements the community culture and strives to enhance economic and liveability of Bolton.

The network development process was founded on three key tools:

- Route Selection Criteria;
- OTM Book 18 Facility Selection Process; and
- Field Investigations.

7.1 EXISTING ACTIVE TRANSPORTATION FACILITIES

Within the community of Bolton there are a number of existing and previously proposed AT facilities. The existing routes were identified and mapped based on input received from the Region of Peel and the Town of Caledon at project initiation. Additional information was provided over the course of the assignment to clarify network connections and future improvements. All information was provided in GIS format and was consolidated to prepare an AT database which can be used by all parties, once the project has been completed, to track next steps and implementation.

Table 33 – Total Distance of Existing Facility Types summarizes the total distance of existing facility types in Bolton.

Table 33 – Total Distance of Existing Facility Types

Facility Type	Total Distance (km) by Jurisdiction				
	Town	Region		Toronto & Region Conservation Authority	
	Existing	Existing	Previously Proposed	Existing	Previously Proposed
Paved Shoulder	-	0.6	12.8	-	-
Bike Lane	-	-	13.7	-	-
In-Boulevard multi-use trail	-	0.5	6.4	-	-
Sidewalk along a Local Road	126.6	-	-	-	-
Sidewalk along a Regional Road	-	10.	17.6	-	-
Off-Road Trail	15.3	-	-	11.5	6.4
Total (km)	**141.9**	**11.1**	**50.5**	**11.5**	**6.4**

Also included in the AT strategy is a detailed summary of costs associated with each of the proposed projects. The cost has been determined based on a set of unit costs prepared by the consultant team through discussions with the Town and Region. The costs that are identified in the unit cost schedule are consistent with the costing provided for the AT strategy report and reflect best practices and current standards within southern Ontario. The following is a summary of the total kilometres proposed for the short and long-term implementation timeline and the cost associated with each.

Table 34 – Summary of AT Network Costing

Facility Type	Phase 1		Phase 2			Cost
	Town	Region	Town	Region	TRCA	
Off-Road Trail	0	0	0	0	6.4	$768,000
In-Boulevard Trail	0	1.1	0	5.3	0	$1,675,000
Cycle Track	0	0	0	1.5	0	$1,530,000
Buffered Paved Shoulder	0	2.5	3.2	7.1	0	$1,906,500
Paved Shoulder	0	10.2	1	1.4	0	$1,327,700
Buffered Bike Lane*	5.2	0	1.3	7.5	0	$4,889,500
Bike Lane	3.7	0.8	1	0	0	$44,850
Signed Bike Route with Edgeline	4.2	0	1.8	0.0	0	$24,120
Signed Bike Route with Sharrow	0	2.2	0	0.0	0	$7,525
Signed Bike Route	14.5	0	2.3	0	0	$25,185
Total	**27.9**	**16.7**	**10.4**	**22.9**	**6.4**	**$12,198,380**

It should be acknowledged that the implementation of the AT network is meant to be a collaborative and coordinated effort between the Region of Peel, the Town of Caledon and key stakeholders. It will be further facilitated through partnerships with other key organizations and stakeholders as well as strategic funding and grant programs, coordination with capital projects and annual resource allocation, among other creative funding alternatives.

Following the adoption of the TMP, the Town and Region should move forward with the implementation of the short-term implementation projects and should work with their partners to explore the appropriate education, encouragement, evaluation and enforcement programs and initiatives.

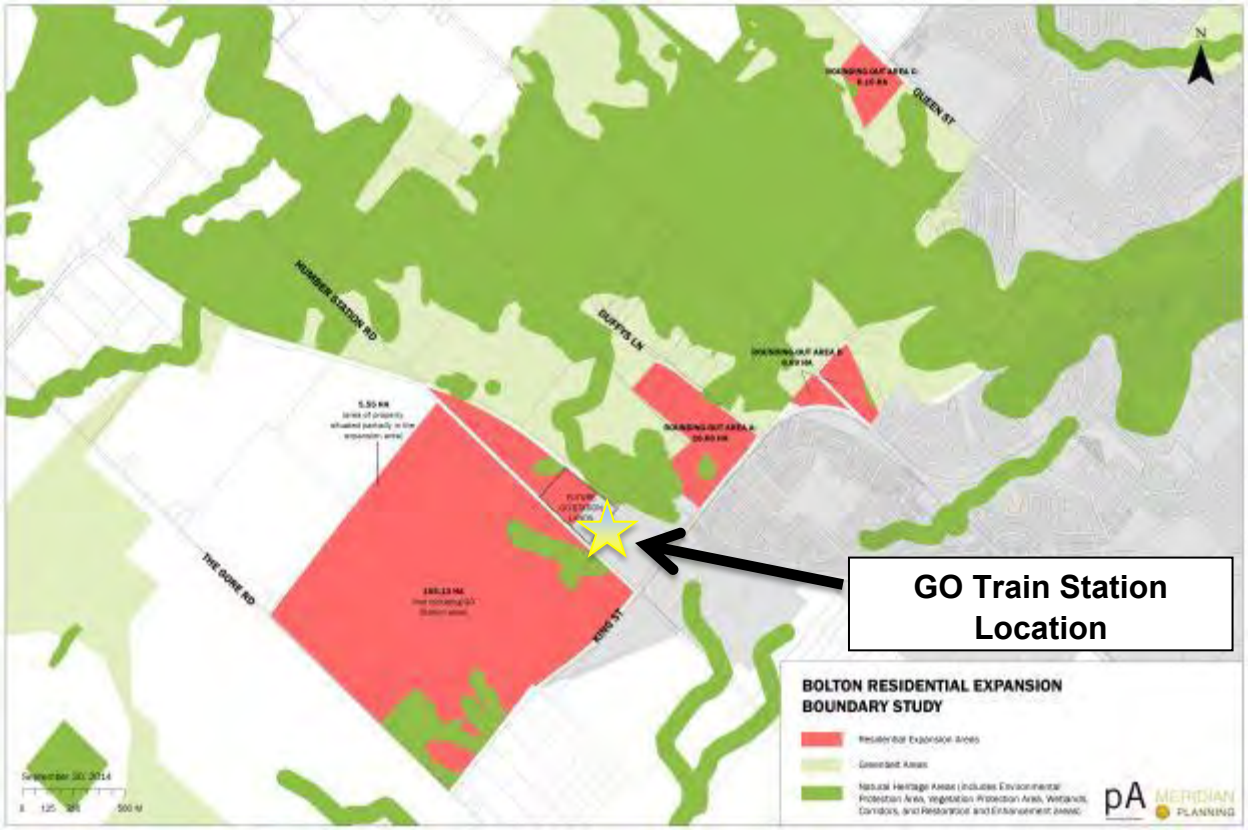
8.0 TRANSIT

Transit is considered a key component of Bolton's future transportation network. The introduction of a GO Train Station and train service to Bolton and additional options to introduce new transit service to Bolton were considered on a strategic level as part of this study.

8.1 POTENTIAL GO TRAIN STATION

The November 2010 Bolton Commuter Rail Feasibility Study advocated for expanded GO Rail service from Toronto to Bolton. The Town of Caledon and Region of Peel need to continue to advocate for the implementation of this service. The Town's decision on the Bolton Residential Expansion Study frames a location for the future GO Train Station, as shown on **Figure 44**.

Figure 44 – Possible Location of Future GO Train Stations in Bolton



A GO Train Station at this location will help foster an environment for transit-oriented development in this new development expansion area. The analysis undertaken as part of the TMP showed that 45% of trips by transit in the year 2031 would be by GO Train. This equates to 530 trips in the three-hour peak commuter period. The forecast transit demand needs to be brought forward on the technical and political level in order to promote the Bolton GO Train Station to the list of those approved for construction.

8.2 OTHER OPPORTUNITIES FOR FUTURE TRANSIT PROVISIONS

GO Rail will only service a portion of the population, and only the portion of the population destined for Toronto, and does not wholly address the need for transit in the Bolton community. Transit within the community and connections to the Cities of Brampton and Mississauga should be contemplated. Community connections to the Bolton downtown could foster additional activity in this area and would increase the ways to access the downtown. As the northeastern portion of the City of Brampton develops, there could be the opportunity for Brampton Transit to extend its reach to service Bolton.

Transit planning will need to happen in incremental steps given the limited services currently available in Bolton (only GO Bus service to/from Toronto). Providing convenient connections to major desire points locally and outside of Bolton should be the goal of any future transit service.



9.0 TRANSPORTATION DEMAND MANAGEMENT MEASURES AND TRAFFIC CALMING

9.1 EXISTING TDM INITATIVES

Transportation Demand Management (TDM) is a means of influencing people's transportation choices as a result of strategic programming and initiatives. These programs and initiatives as well as promotion and outreach campaigns are typically developed specifically for unique target audiences related to geographic, demographic or social characteristics of the population. The programs and initiatives are intended to complement and enhance the infrastructure being implemented to influence behavioural change.

The Community of Bolton has a number of TDM measures and policies in place through initiatives completed by the Region of Peel and the Town of Caledon. The measures and policies have been developed with the primary goal of reducing travel demand, reliance on the single vehicle occupancy, and redistribute this demand in space and time.

There are three (3) TDM programs / initiatives that have been initiated or are in the process of being initiated as a result of the Region of Peel and the Town of Caledon's partnership with Smart Commute Brampton-Caledon. Smart Commute, a program of Metrolinx, looks to work with residents of the Greater Toronto and Hamilton Area to explore and try out smart travel options. Smart travel options are classified as walking, cycling, transit, and carpooling to ultimately reach its goal of easing gridlock while helping its users save time and money. The Community of Bolton, and larger Town of Caledon, is a member of the Smart Commute Program (www.smartcommute.ca/brampton-caledon/).

Initiated in 2006, this program provides a means for employees and employers to educate and participate in a variety of initiatives that aim to reduce and manage travel demand throughout the region. Current efforts include carpooling; transit; bike or walk; telework and emergency ride home initiatives.

The three (3) programs noted above are described in further detail below.

LET YOUR GREEN SHOW

The Let Your Green Show was an online social media campaign that promoted green living and encouraged the Region of Peel residents to "give their car a break". The third phase of the campaign was designed to promote alternative forms of transportation use within the Region of Peel. The region has accomplished this by applying multiple forms of marketing tactics, Facebook and Twitter, website and email campaigns, transit shelter advertising posters, libraries, events, and the use of municipal and Regional websites.

During this campaign four initiatives were publicized through marketing tactics to advocate the use of active transportation and public transportation in the region. These four initiatives included:

- "Give your car a break! Bike, rollerblade, walk";
- "Give your car a break! Use local trails to get where you need to go";
- "Give your car a break! Try out transit" and;
- "Give your car a break! Make your commute green"

CALEDON'S 2015 INDIVIDUALIZED MARKETING PILOT FOR SUSTAINABLE TRANSPORTATION

The Caledon Individualized Marketing Pilot for Sustainable Transportation looks to improve the Town of Caledon's awareness of sustainable modes of transportation such as access to nearby public transportation, carpooling, and biking to work. This project will look to enable behaviour change by engaging with the public through public surveys, followed by an in evaluation phase to assess the projects impact.

This project will result in the following:

- A project identity and brand;
- Newsletters, surveys and postcards;
- A transportation Asset Map of the community in and around Southfields Village;
- A Town-devoted webpage on Caledon.ca;
- An online sustainable transportation store; and
- Community outreach and educational events.

PROMOTION OF THE MAYFIELD ROAD AND HIGHWAY 50 CARPOOL LOT

The goal of the Individualized Marketing campaign is to encourage carpooling and public transit use through the use of the Mayfield Road at Highway 50 carpool lot or through GO Transit services. By reducing single occupancy vehicle trips, residents within the Community of Bolton will acquire an improved quality of life through the reduction of greenhouse gas emission and improved air quality.

According to the Region of Peel's Five Year TDM Plan (2014-2018) Individualized Marketing is outlined as a key strategy to promote sustainable forms of transportation. These sustainable forms of transportation are outlined to achieve the long term growth of a healthier, livable and sustainable community.



9.2 OPPORTUNITIES FOR TRANSPORTATION DEMAND MANAGEMENT

There are several opportunities for improvement with the development of TDM measures in the Community of Bolton. Active transportation and transit are two focal points to reduce vehicle demand on Bolton roads. Other measures, such as carpooling, also are viable. Carpooling works when commuters starting and ending in the same general area find each other and agree to share rides. In an area such as Caledon which may not have a substantial number of commuters travelling along one route to necessitate a fixed route transit system, carpooling could be a useful solution.

One of the objectives of Smart Commute Brampton Caledon is to link commuters whose origins and destinations are conducive to carpooling. Smart Commute Brampton Caledon also works with employers to set up carpooling and other transportation demand management programs to help reduce the number of single occupancy vehicles on the road.

Over the last decade the Region of Peel has done considerable work in TDM, such as the preparation of the *Peel Region Transportation Demand Management Plan 2008*. The Town could build upon this work by collaborating with the Region and with Smart Commute to encourage more Bolton businesses to join the Smart Commute network and to explore additional ways to implement TDM measures in Bolton.

9.3 TRAFFIC CALMING

The Institute of Transportation Engineers (ITE) defines traffic calming as "the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driving behaviour and improve conditions for non-motorized street users." Traffic calming is intended to reduce speeds for motor vehicles, and improved safety of non-motorized users of the street. By making the streets feel safer, traffic calming has the potential to increase pedestrian and cycling usage.

Input received from the public information centres for the Bolton TMP indicated a strong demand for the design and implementation of traffic calming measures along local roads that are currently being used as parallel routes or informal by-passes to major regional roads e.g. Hickman Street, Deer Valley Drive and DeRose Avenue. Local residents and stakeholders expressed their interest in very specific traffic calming measures such as speed humps traffic but also recognized that by designing for and implementing active transportation routes and facilities, some indirect traffic calming may occur.

The project team completed a review of traffic calming best practices for consideration by the Town of Caledon on selected local roadways which provide direct access to local schools, community destinations, existing off-road trails or those that provide alternate routes to Regional connections. **Table 33** presents the alternatives that were reviewed. This is not an exhaustive list of all traffic calming measures and not all measures may be appropriate due to geometric or other constraints.

In addition to the traffic calming design alternatives noted above, the Region of Peel and the Town of Caledon are also encouraged to focus on the implementation of the active transportation system as a means of calming local traffic. By implementing on and off-road cycling and walking facilities there is a potential for increased motorist awareness – both visual and physical – of the presence of different users. Research shows that as a result, motorists typically decrease their speed on the roadway and also tend to be more respectful of cyclist and pedestrian operating space make the route / facilities more comfortable for users.

Table 35 – Overview of Traffic Calming Best Practices

Options	Picture	Description
Pavement Markings	 **	The use of pavement markings (such as bike lanes) to visually narrow the travelled portion of a roadway
Bump outs	 **	Similar to pavement markings but a horizontal intrusion of the curb into the roadway is used to narrow the travelled portion of the roadway.
Speed hump / Speed cushions	 *	Designed features which are raised above the roadway forcing the drivers to slow down as they drive over them. Speed cushions are similar to speed humps except they are spaced in sections that let the emergency vehicles pass without having to slow down.
Hatched crosswalk / Raised crosswalk	 **	Hatch the crosswalk to contrast it against the adjacent asphalt roadway. The crosswalk can also be raised. The hatched/raised crosswalks become more visible to the driver. The raised crosswalk acts as a speed hump as well, forcing the driver to slow down.
Raised intersections	 **	Intersections, including crosswalks, raised above the roadway forcing drivers to slow down as they approach the intersection.
Vehicle actuated traffic calming signs (VATCS) / Speed Display Boards	 **	Electronic LED signs that remain blank until triggered by a vehicle exceeding the speed limit.

Source: *Taking the Road together – Region of Peel
** Neighbourhood Traffic Management Guide – City of Brampton



10.0 DOWNTOWN BOLTON

Downtown Bolton is centered on the intersection of Queen Street (Highway 50) and King Street. The downtown area has a number of commercial businesses including restaurants, banks, hair salons and specialty retail stores in addition to business offices and institutional uses. There also are residential units in the downtown, mostly multifamily dwellings but some single family dwellings as one gets to the periphery of the downtown.

As part of the TMP, special focus has been paid to the downtown area in order to create a vision of a people-first place that embraces the concept of "complete streets", meaning that the street network should be designed for all modes of transportation and all transportation system users.

10.1 LAND USES AND ROAD NETWORKS

Although Queen Street and King Street are both major arterial roads, the existing traffic analysis indicates that the intersections along King Street through the downtown core operate at reasonable levels of service and delay, without any critical movements.

There are a number of available off-street parking areas accessible via Queen Street. Parking restrictions are in place on Queen Street prohibiting on-street parking on the west side (southbound direction) between 6 a.m. and 9 a.m., and on the east side (northbound direction) between 4 p.m. and 7 p.m. There are two off-street parking lots located in the vicinity off the King Street and Queen Street intersection, each parking lot is accessible by one of the two arterials.

10.2 A VISION FOR BOLTON

The historic core of downtown Bolton is something worth saving. Originally settled in 1822 and with a building cornerstone stating "1893" still evident on the northwest corner of Queen and King Streets, the historic core has weathered numerous decades of activity and has seen the Bolton community grow, especially in the last 30 years.

In those last 30 years main north-south artery, Queen Street, has become a conduit for traffic travelling "through" the downtown core, with only a fraction of the traffic travelling "to" the downtown core. A common theme heard throughout the Bolton TMP, especially from the downtown business community and downtown residents, is a desire to reclaim the downtown for people and customers.

There is an aspiration to shift the focus from moving cars and trucks through the downtown to bringing people to the core. The vision for downtown Bolton is to complete the street network, thus enabling all transportation modes and types of users to access the core.

Central to this vision is the enhancement of Queen Street to attract more people and make it more exciting for customers. Queen Street could be re-purposed with two vehicle travel lanes, bike lanes in both north and south directions and all day on-street parking on the east side. The opening of the Emil Kolb Parkway is expected to provide sufficient relief for the commuters to by-pass the downtown core. Existing sidewalks would be maintained and are recommended to be enhanced in line with other improvements to the downtown transportation network.

10.3 ALTERNATIVE TRUCK ROUTES AND ROUTE RESTRICTIONS

Trucks are currently allowed on Queen Street and King Street but truck turning movements between these two roads are prohibited at all times of the day. The recently constructed Emil Kolb Parkway runs parallel to Queen Street as an alternative north/south connection. This new road also provides connections to east/west roads south of King Street. This TMP proposes to restrict truck movements (except for local deliveries) along Queen Street through the downtown area (between Emil Kolb Parkway and Healey Road). Truck restrictions can be implemented on King Street; however, efforts should be made to implement an exclusive northbound right turn lane at the intersection of King Street and Albion Vaughan Road in order to address capacity concerns at this intersection.

10.4 THE FUTURE OF DOWNTOWN BOLTON

The preferred TMP alternative is an agent for change in the downtown, helping to transition the downtown from a traffic conduit to a people-friendly place where customers and the general public want to be. The downtown streetscape has safety in mind and embodies the concept of "complete streets" in that Queen Street has been re-visioned as a street that provides transportation facilities for all modes of transportation and all types of transportation system users. The transformation of the downtown has been developed with interim and ultimate solutions. In the interim solution, all-day on-street parking is permitted with no time-of-day restrictions. Cyclists are accommodated using "super sharrows", which indicate that the cyclists should travel in the centre of the travel lane through this short portion of the downtown core. Bulb outs are used to decrease pedestrian crossing distances across Queen Street. Queen Street in the southbound direction between Hickman Street and Centennial Drive will be narrowed from two lanes to one lane. In the northbound direction between Mill Street and Hickman Street only a single northbound through lane will be maintained while the existing inside lane will be converted to a back-to-back left turn lane. This narrowing of Queen Street is intended to reduce the vehicle capacity of Queen Street through the downtown, which will then result in the decrease of the through traffic volumes. It will also provide an opportunity to implement two-stage left turn gap operations and address the existing safety concerns at the intersection of Queen Street and Hickman Street.



A Queen Street midblock rendering is shown in **Figure 45.** At the intersection of Queen Street and King Street, cyclists would remain in the centre of the lane. South of King Street, cyclists would transition to a proposed cycle track. A rendering of a cyclist heading south and approaching the Queen Street at King Street intersection is shown in **Figure 46.**



Figure 46 – Interim Solution: Looking South on Queen Street Approaching King Street

In the ultimate solution, all-day on-street parking is permitted on the east side and bike lanes are provided northbound and southbound on Queen Street through the downtown core. A buffer has been provided between the northbound cycle lane and the northbound on-street parking in order to reduce the chance that cyclists might collide with people in parked cars opening their car doors. The midblock rendering of the ultimate solution is shown in **Figure 47**.



Figure 47 – Ultimate Solution: Looking South on Queen Street Approaching King Street

At the intersection of Queen Street and King Street in the ultimate solution, two-stage left-turn boxes are proposed for cyclists. On each corner of the intersection, left- turn boxes that are outside of the travel lane have been designated for cyclists to wait until the traffic signal turns green in the direction that they wish to travel. This proposed treatment is illustrated in **Figure 48**.



Figure 48 – Ultimate Solution: Looking South on Queen Street Approaching King Street

10.5 RATIONALE FOR IMPLEMENTING THE DOWNTOWN VISION

Existing conditions, the interim solution and the ultimate solution for the downtown were analyzed previously in Section 5.2. Eight different accounts were considered before recommending the ultimate solution as the preferred transportation solution for Queen Street in the downtown core. The interim and ultimate solutions for Queen Street in downtown Bolton are important to implement in order to re-vision downtown Bolton, reclaim the downtown for people and to embrace the concept of "complete streets" that provide for all transportation users and all modes. In addition the analysis in Section 5.2, the benefits of implementing this vision are numerous, and include:

- Complete street design;
- Removal of truck through traffic on Queen Street (local deliveries only);
- All-day on-street parking;
- Facilities for cyclists;
- Opportunities for bicycle parking;
- Opportunities for enhanced pedestrian safety and amenities:
  - Bulb outs to reduce pedestrian crossing time;
  - Fewer travel lanes for pedestrians to cross;
  - Public seating
  - Streetscaping, street furniture and public art;
- Special materials such as brick paving to create a sense of place;
- Increase in the number of street trees that could be planted;
- Reduced vehicle speeds
- Potential for increased retail sales
- Increase in resident, business and customer satisfaction; and
- Responsive to public input.

Vehicle traffic congestion would be expected to increase over existing conditions; however, Emil Kolb Parkway provides an alternative route for through traffic. Increased congestion also could lead to a decrease in prevailing speeds of motor vehicles. As shown in **Section 5.2**, the ultimate solution includes multi-modal benefits that will help create a sense of place through a complete street design on Queen Street in the downtown core and are deemed to vastly outweigh any increases to vehicle travel times.



11.0 PHASING AND IMLPEMENTATION STRATEGY

With the preferred alternative selected and multi-modal improvements recommended, an implementation strategy was set to define the steps needed to make the TMP a reality. The implementation strategy addresses the following topics:

- Truck restrictions;
- Roads;
- GTA West Highway Interchange Locations;
- Grade-separated Crossings;
- Active Transportation;
- Transit;
- Transportation Demand Management; and
- Downtown Bolton.

11.1 TRUCK RESTRICTIONS

Considerable work was undertaken to analyze existing truck volumes and travel patterns and to determine the road network's capacity to restrict truck movements through the downtown core and re-route trucks around this area. The restriction of trucks in the downtown core and the enforcement of any restrictions was the most ardent comment received from the general public throughout the consultation process.

As a result of the technical analysis and in consultation with the public and stakeholders, the following truck restriction recommendations are made:

- Restrict north-south through truck movements on Queen Street from Emil Kolb Parkway in the north to Healey Road in the south;
- Restrict east-west truck movements on King Street from Coleraine Drive to Albion Vaughan Road, recognizing that intersection improvements are needed to provide a northbound right turning lane on Albion Vaughan Road at the intersection with King Street; and
- Restrict truck movements on Queensgate Boulevard.

11.2 ROADS

Future road projects have been identified in the TMP Alternative. As these often take time to plan, design and construct, they have been listed in this section with recommended projects to implement by the year 2021 and projects to implement by the year 2031.

11.2.1 Road Improvements Recommended by the Year 2021

Road improvements recommended for implementation by the year 2021 are listed in **Table 36,** with their locations shown on a map in **Figure 49.**

Table 36 – Road Improvements Recommended by the Year 2021

	Road	From	To	Type of Improvement
1	Emil Kolb Parkway	King Street	Highway 50	New Road Construction (0-2 lanes)
2	Highway 50	South of King Street	Hickman Street	Narrowing (4-2 lanes)
3	Simpson Road	Mayfield Road	George Bolton Parkway	Extension (0-2)
4	Mayfield Road	Albion Vaughan Road	The Gore Road	Widening (2-4 lanes)
5	Coleraine Drive	Mayfield Road	Arterial Corridor A2	Widening (2-4 lanes)
6	Arterial Corridor A2	Mayfield Road	Highway 50	New Road Construction (0-6 lanes)

Emil Kolb Parkway, Arterial Corridor A2 and Highway 427 are new road construction projected recommended to be completed by 2021. The widening of Mayfield Road and Coleraine Drive has been recommended by the year 2021. Highway 50 and Simpson Road have been recommended for narrowing and an extension, respectfully.

11.2.2 Road Improvements Recommended by the Year 2031

The Bolton residential expansion is expected to increase population post 2021. Additional transportation measures were considered to accommodate the population as well as employment growth. Road improvements recommended for the 2031 horizon year are listed in **Table 37** and are shown on **Figure 49.**

Table 37 – Road Improvements Recommended by the Year 2031

	Road	From	To	Type of Improvement
7	Albion Vaughan Road	Mayfield Road	King Street	Widening (2-4 lanes)
8	Highway 50	Mayfield Road	Castlemore Road	Widening (5-7 lanes)
9	Mayfield Road	Humber Station Road	Airport Road	Widening (4-6 Lanes)
10	George Bolton Parkway Extension	Highway 50	Industrial Road	Extension (0-2 lanes)



	Road	From	To	Type of Improvement
11	King Street Realignment	King Street	Emil Kolb Parkway	New Road Construction (0-2 lanes)
12	Highway 427	Highway 427 (Existing)	GTA West Corridor	New Road Construction
13	GTA West Corridor	--	--	New Road Construction
14	GTA West Corridor / Highway 427 Extension Interchange	--	--	New Road Construction
15	GTA West Corridor / Coleraine Drive Interchange	--	--	New Road Construction

11.3 GTA WEST HIGHWAY INTERCHANGE LOCATIONS

Three potential GTA West Highway interchange location scenarios were analyzed as part of the TMP. These scenarios included:

- Full interchange at Mayfield Road and at Coleraine Drive;
- Full interchange at Mayfield Road only; and
- Full interchange at Coleraine Drive only.

The results of the analysis lead to the recommendation that the Town and Region advocate for a full interchange at Coleraine Drive only in order to best meet the needs of Bolton.

11.4 GRADE-SEPARATED CROSSINGS

Grade-separated crossings were analyzed using the traffic volumes forecast in the preferred alternative, Alternative 4. By the year 2031, grade-separated crossings are recommended for:

- Albion Vaughan Road;
- Coleraine Drive; and
- Realigned King Street.

The grade-separated crossing on Albion Vaughan Road should be constructed in coordination with the planned widening of this road. While the realigned King Street does not meet the rail exposure index, the construction of this new road allows for grade separation to be included in the original design. If King Street is not realigned, the existing King Street location will meet the rail exposure index and will be a candidate for grade separation. Constraints at the existing King Street location make grade separation difficult.

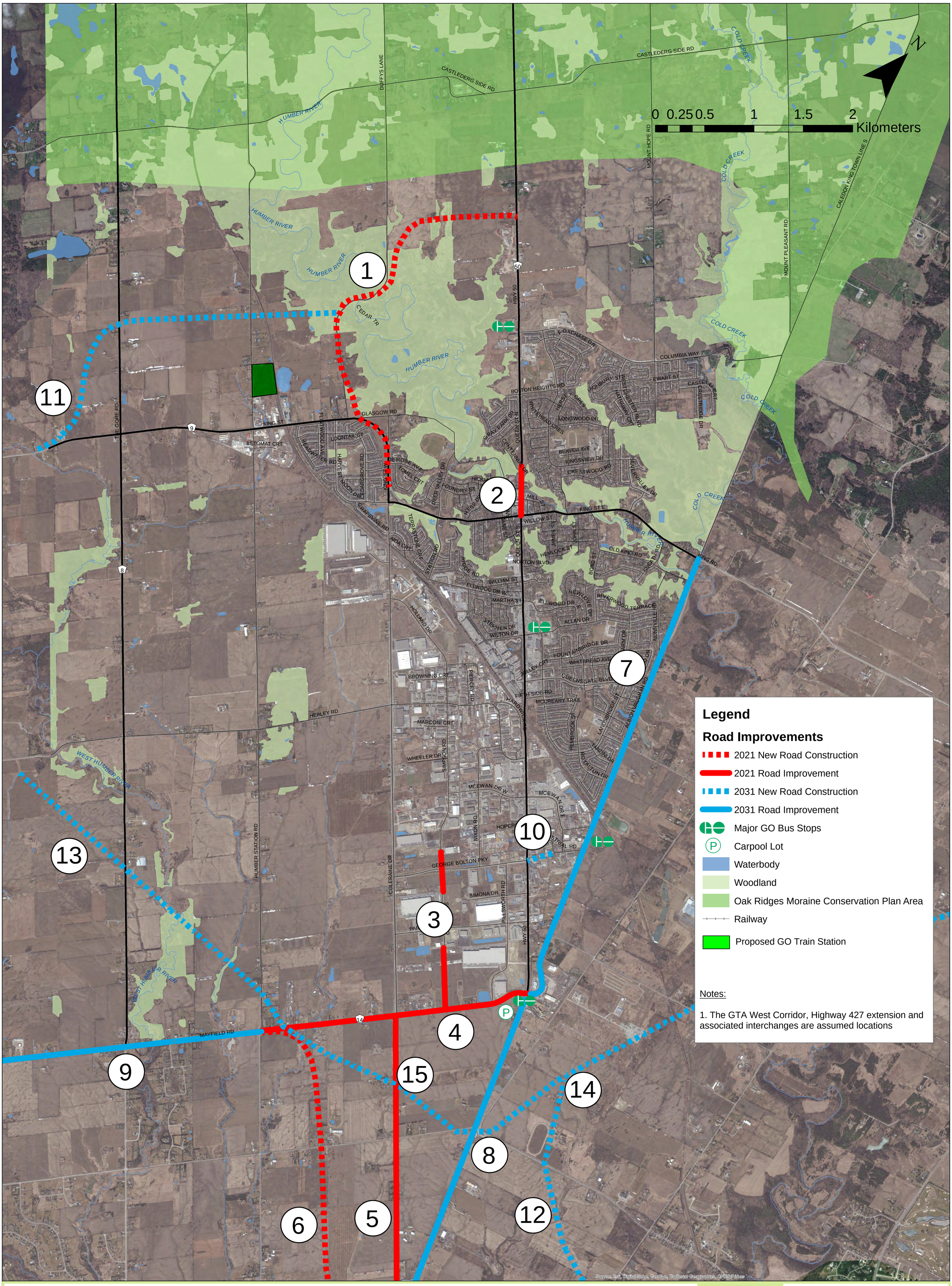


Figure 49: Bolton Transportation Master Plan

Roadway Phasing: Year 2021 and 2031 Recommendations

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11.5 ACTIVE TRANSPORTATION

The implementation of the AT Strategy is intended to complement the TMP schedule as well as other planning and design initiatives being undertaken by the Town and Region. A timeline / phased approach to implementation was determined based on discussions with the Region and Town. There are two (2) phases - Short Term (0 – 5 years) and Long Term (6 – 15+ years). **Figure 50** illustrates the proposed phasing for each of the routes identified to form part of the Bolton AT Network.

To facilitate the implementation of AT improvements, the strategy outlines key recommendations for consideration by the Town / Region and also identifies an action plan to guide the implementation of short-term routes. Each of the short-term recommendations were reviewed and prioritized to identify an order which they are recommended to be implemented (see **Figure 51).** There are responsibilities identified for the Town as well as the Region. The priorities and the action plan are not intended to be prescriptive. The Town and Region are encouraged to implement the linkages within this order; however should opportunities arise to implement a route earlier than anticipated it should be explored and the network database should be updated to reflect this.

The order of implementation and for each priority is presented in **Table 38** below.

Table 38 – Order of Implementation and Priority

Priority	Proposed Route and Rationale
1	Deer Valley Road (Glasgow Road to King Street) Proposed Signed-Only Bike Route
2	Hickman Street (Deer Valley Road to Queen Street / Highway 50) Proposed Signed-Only Bike Route
3	Emil Kolb Parkway (King Street to Duffy's Lane) Proposed In-Boulevard Trail
4	Emil Kolb Parkway (Duffy's Lane to Queen Street / Highway 50) Proposed Paved Shoulder
5	Glasgow Road (Emil Kolb Parkway to Deer Valley Road) Proposed Signed-Only Bike Route
6	Station Road (Old Ellwood Drive / Ellwood Drive to King Street) Proposed Signed-Only Bike Route
7	King Street (Queen Street / Highway 50 to Station Road) Proposed Bike Lane & Proposed Signed-Only Bike Route with Sharrows
8	King Street (Queen Street / Highway 50 to Albion Vaughan Road) Proposed Signed-Only Bike Route with Sharrows
9	Queen Street / Highway 50 (Hickman Street to Bolton Heights Road) Proposed In-Boulevard Trail
10	Queen Street / Highway 50 (King Street to Hickman Street) Proposed Bike Lane and Proposed In-Boulevard Trail
11	The Gore Road / Regional Road 8 (Mayfield Road to Castlederg Side Road) Proposed Paved Shoulder

Priority	Proposed Route and Rationale
12	Landsbridge Street / Saint Farm Drive (Allan Drive western portion to Allan Drive eastern portion) Proposed Signed-Only Bike Route with Edgeline
13	Queensgate Boulevard (Highway 50 / Queen Street to Albion Vaughan Road) Proposed Buffered Bike Lane
14	Allan Drive (Saint Farm Drive to Queen Street / Highway 50) Proposed Signed-Only Bike Route
15	Wilton Drive (Queen Street / Highway 50 to Ellwood Drive) Proposed Bike Lane
16	Old Ellwood Drive / Ellwood Drive (Coleraine Drive to Off-Road Trail connecting to Mellow Crescent); and Mellow Crescent (Off-Road trail to Allan Drive) Proposed Signed-Only Bike Route
17	DeRose Avenue (King Street to Road Terminus) Proposed Signed-Only Bike Route
18	Highway 50 / Queen Street (Foxchase Drive to Castlederg Side Road) Proposed Buffered Paved Shoulder
19	Cedargrove Road (Harvest Moon Drive northern portion to Harvest Moon Drive southern portion) Proposed Signed-Only Bike Route
20	Harvest Moon Drive (King Street to Coleraine Road) Proposed Signed-Only Bike Route with Edgeline
21	Strawberry Hill Court (Allan Drive to Road Terminus) Proposed Signed-Only Bike Route
22	Bond Street (King Street to Road Terminus) Proposed Signed-Only Bike Route
23	Sneath Road (King Street to pedestrian trail bridge) Proposed Signed-Only Bike Route
24	Healey Road (The Gore Road / Regional Road 8 to Coleraine Drive) Proposed Bike Lane
25	Coleraine Drive (Healey Road to King Street) Proposed Buffered Bike Lane
26	Columbia Way (Highway 50 to Kingsview Drive) Proposed In-Boulevard Multi-use Trail
27	Kingsview Drive (Foxchase Drive to Longwood Drive); Bolton Heights Road (Highway 50 / Queen Street to Kingsview Drive); Taylorwood Avenue (Existing Off-Road Trail to Existing Off-Road Trail); Silvermoon Avenue (Kingsview Drive to Silver Valley Drive); Silver Valley Drive (Silvermoon Avenue to road cul-de-sac); Evans Ridge (Silver Valley Drive to King Street East; and Humberlea Road (Kingsview Drive to King Street East). Proposed Signed-Only Bike Route

Once the transportation master plan and associated AT strategy has been adopted, the Bolton Arterial Roadway will have been implemented. As such, the AT facilities identified on this linkage will be considered existing.

See inset map for details of urban area

0 0.5 1 2 Kilometres

Legend

Existing Facilities
- Existing Off-Road Trail
- Existing In-Boulevard Multi-Use Trail
- Existing Paved Shoulder

Proposed Facilities
- Proposed Off-Road Trail[1]
- Proposed In-Boulevard Multi-Use Trail
- Proposed Cycle Track
- Proposed Buffered Paved Shoulder
- Proposed Paved Shoulder
- Proposed Buffered Bike Lane
- Proposed Bike Lane
- Proposed Signed-Only Bike Route with Edgeline
- Proposed Signed-Only Bike Route with Sharrows
- Proposed Signed-Only Bike Route

Proposed Phasing
- Short Term (0-5 Years)
- Long Term (6-25+ Years)

Key Community Destinations
- Emergency Service
- Library
- Other Community Destination
- School
- Existing Park & Ride Lot
- Existing GO Bus Stop
- Future Planned GO Train Station
- Community Centre
- Park / Recreation Centre

Road Network
- Regional Road
- Local Road
- Future Regional Road
- Future Local Road

Other
- Railway
- Oak Ridges Moraine Conservation Plan Area
- Woodland
- Waterbody
- Watercourse
- Municipal Boundary

Note:
1. Proposed Off-Road Trails based on information provided by the Toronto Region Conservation Authority.

Figure 50: Proposed Network Phasing Bolton Transportation Master Plan

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Once the transportation master plan and associated AT strategy has been adopted, the Bolton Arterial Roadway will have been implemented. As such, the AT facilities identified on this linkage will be considered existing.

See inset map for details of urban area

0 0.5 1 2 Kilometres

Legend

Existing Facilities
- Existing Off-Road Trail
- Existing In-Boulevard Multi-Use Trail
- Existing Paved Shoulder

Proposed Facilities
- Proposed Off-Road Trail[1]
- Proposed In-Boulevard Multi-Use Trail
- Proposed Cycle Track
- Proposed Buffered Paved Shoulder
- Proposed Paved Shoulder
- Proposed Buffered Bike Lane
- Proposed Bike Lane
- Proposed Signed-Only Bike Route with Edgeline
- Proposed Signed-Only Bike Route with Sharrows
- Proposed Signed-Only Bike Route

Proposed Phasing
- Short Term (0-5 Years)

Short Term Network
- MC Mid-block Crossing
- NE Other Network Enhancement

Key Community Destinations
- Emergency Service
- Library
- Other Community Destination
- School
- Existing Park & Ride Lot
- Existing GO Bus Stop
- Future Planned GO Train Station
- Community Centre
- Park / Recreation Centre

Road Network
- Regional Road
- Local Road
- Future Regional Road
- Future Local Road

Other
- Railway
- Oak Ridges Moraine Conservation Plan Area
- Woodland
- Waterbody
- Watercourse
- Municipal Boundary

Note:
1. Proposed Off-Road Trails based on information provided by the Toronto Region Conservation Authority.

Figure 51: Proposed Priorities for the Short-Term (0-5 Years) Phase Bolton Transportation Master Plan

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11.6 TRANSIT

Transit needs to play an increasingly important role in the future transportation network in Bolton in order to provide a viable alternative to travel by the personal automobile. As neither the Town nor the Region presently operates a transit service, the Town and Region must be advocates to initiate new transit service and extend existing services to Bolton. Transit recommendations include:

- Advocate for a GO Train Station to be constructed in the Bolton Residential Expansion area.
- Work with neighbouring jurisdictions that presently operate transit services and determine opportunities to expand transit service to Bolton.

11.7 TRANSPORTATION DEMAND MANAGEMENT

Transportation demand management (TDM) offers additional opportunities to reduce vehicle travel in the peak travel periods. TDM recommendations include:

- Start publicizing changes to truck routes and truck restrictions.
- Promote Emil Kolb Parkway as the best route to take for through movements of trucks as well as passenger cars.
- Expand carpooling opportunities.
- Support and promote existing and planned Regional TDM measures.

11.8 DOWNTOWN BOLTON

With the summer 2015 opening of Emil Kolb Parkway, the time to implement changes in the downtown core is now. Short term measures are designed to create a "complete street" on Queen Street in the downtown core and should entail the implementation of the interim solution, which would include:

- Restriction on through truck movements on Queen Street;
- Restriction on through truck movements on King Street;
- All day on-street parking;
- Reduction in travel lanes;
- Super sharrows indicating cycling space; and
- Bulb outs to reduce pedestrian crossing distance and to provide space for streetscaping such as trees, pedestrian furniture, public art or other amenities.

These changes would help transform downtown Bolton into a people friendly environment and would embody the comments received through public consultation.

TOWN OF CALEDON



APPENDIX A – CONSULTATION SUMMARY

FOR

THE BOLTON TRANSPORTATION MASTER PLAN STUDY

MMM GROUP

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A. CONSULTATION & ENGAGEMENT SUMMARY

Public and stakeholder consultation was integral to developing the Bolton Transportation Master Plan. The activities used to gather input and engage members of the public, local stakeholders, interest groups and public agencies were strategically selected to maintain momentum over the course of the study and to maximize the number of comments provided to inform the development of key study deliverables and outcomes.

Prior to the commencement of the study, a consultation and communication strategy was developed which was guided by a number of key transportation considerations specific to the Bolton context including:

- **Transportation:**
  - Caledon is auto-dependent, but seeking a more multi-modal balance in the future. Internally and externally generated truck movements support local business and degrade the quality of life in the historic core.
  - Bolton is expected to experience increased growth with accompanying elevated congestion in the near future. Potential residential expansion in Bolton and the Highway 427 extension will have major impacts on transportation facilities.
  - Building on the Caledon Areas Transportation Needs Study Update (CATSU), completed in 2009, the Town's intention is to complete an overall TMP study that addresses existing and future developments, Provincial transportation corridor plans, studies related to multi-modal transportation options and road character, and the impact of other recent and ongoing Regional TMP studies.
- **Demographic:**
  - Bolton is experiencing residential growth with young families moving into new developments.
  - Community building is desired to integrate these growth areas with long-established residential neighbourhoods.
- **Local Industry:**
  - The industrial growth in Bolton is impacting upon the viability of the historic downtown core.
- **Employment:**
  - Bolton is becoming a major centre for goods movement; a role which is likely to expand in the future.

These key considerations were highlighted by Town and Regional staff and confirmed / further defined by members of the public. They were also used to help define the most appropriate consultation activities.

By having an understanding of the key issues and opportunities, the study team was better able to identify strategic consultation activities and to guide the development of interactive and idea generating materials.

Effective, accessible and efficient communication and engagement were the cornerstones for public and stakeholder consultation (see **Figure A-1**) in the community of Bolton.

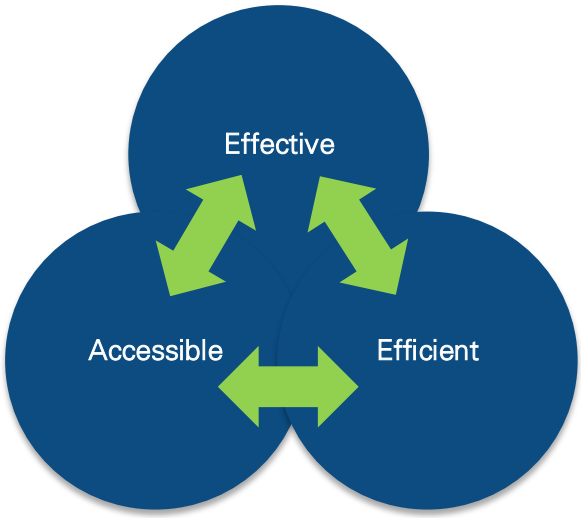


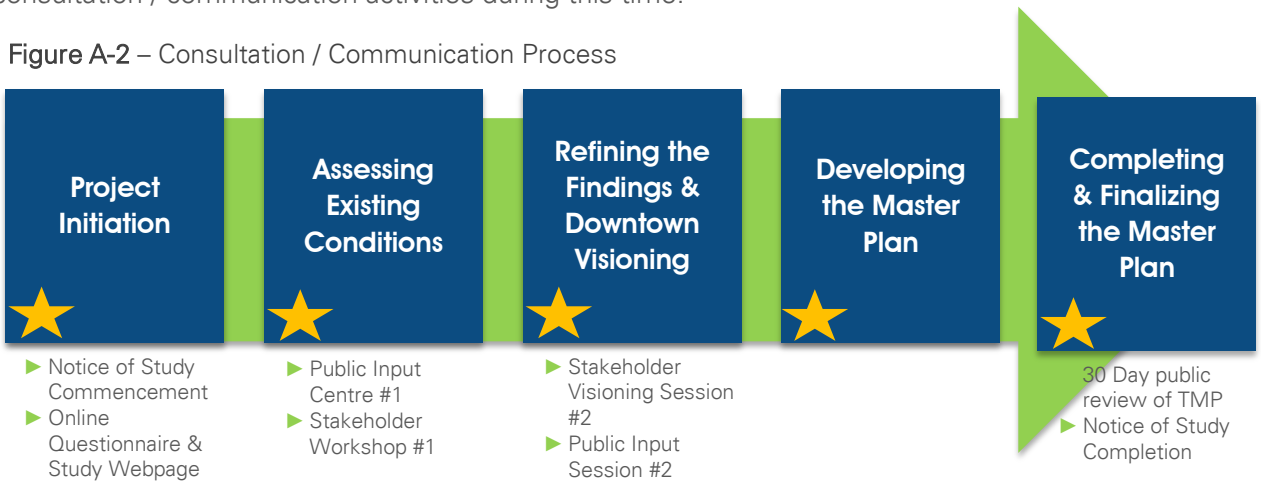
Figure A-1 – Cornerstones of Communication / Consultation for the Bolton TMP

The activities that were ultimately identified built on existing Town and Regional communication and outreach techniques while identifying and initiating, where possible, more innovative / context-specific opportunities. The following sections provide an overview of the consultation and communication process used throughout the Bolton TMP study. It also documents and responds to the input received that informed the development of master recommendations and proposed transportation solutions.

A.1 AN OVERVIEW OF THE PROCESS

The study was completed between March 2014 and December 2015. During this time, consultation and communication was being undertaken at key stages and study milestones. The goal of the consultation program was to identify a menu of consultation / communication opportunities for stakeholders and members of the public. Driven by the goal of "accessibility" and enhanced by the principle of "convenience where possible", a set of consultation activities were identified over the 22 month study timeline. **Figure A-2** illustrates the TMP study process and the occurrence of consultation / communication activities during this time.

Figure A-2 – Consultation / Communication Process



A.2 WHO WAS ENGAGED?

The goal of the communication strategy was to identify key public, private, political, and technical groups that could provide the input needed to develop realistic and feasible solutions for the community of Bolton. **Table A.1** provides an overview of the **public agencies, businesses** and **interest groups, elected officials** and **members of the public** that were engaged over the course of the study.

Table A.1 – Summary of Public & Agency Representatives Engaged

Public Agencies	Businesses & Interest Groups	Elected Officials	Members of the Public
► Provincial Staff (MTO, MOE, MMAH, etc.) ► Town and Regional Staff ► Staff from surrounding municipalities and Regions ► Metrolinx ► GO Transit ► Regional Transit	► Local / Regional Trail / Cycling Representatives ► Local Businesses ► Accessibility Committee ► BIA representation ► Transit Support groups	► Councillor representation from each of the Wards within the Town	► Youth & Seniors ► Working Professionals ► Multi-generational families ► Multi-lingual families ► Rural residents

A.3 HOW WERE THE GROUPS CONSULTED?

When developed, the strategy identified key communication and consultation themes. The themes were guided by each of the study stages and their objectives. In total there were six themes – **ongoing consultation, in-person public outreach, stakeholder engagement, steering committee coordination, documentation of the findings** and **reporting to Council**. **Figure A-3** provides additional details / descriptions of the consultation / communication themes that were established for the Bolton TMP.

Once the objectives and timeline were confirmed, the themes were used to guide the selection of specific consultation / engagement activities. **Table A.2** provides an overview of the consultation / communication activities that were undertaken to inform the development of the TMP.

1

Ongoing Consultation:
To provide members of the public and stakeholders with ongoing and consistent communication and outreach regarding the study to ensure that they are up to date with study findings and are aware of the consultation and engagement opportunities as they arise.

2

In-person Public Outreach:
To provide members of the public and stakeholders (where applicable) with the opportunity to engage one-on-one with study team members, discuss, review and comment on study findings and engage with other members of the community at local community locations or events when at key study milestones

3

Stakeholder Engagement:
to strategically engage different stakeholders groups to review key elements of the master plan and to address specific concerns or highlight potential solutions based on their local experience or ideas moving forward.

4

Steering Committee Coordination:
To engage with members of the steering committee on an ongoing basis to ensure that they are involved in the development of study findings and solutions. Meetings will also be used to ensure that the team is on-track and that key issues, challenges or opportunities are highlighted and addressed.

5

Documenting the Findings:

To clearly document the input received and demonstrate how it has been incorporated into the study report and how they mold study findings and solutions.

6

Reporting to Council:

To highlight study findings and key outcomes of the master plan to Council to demonstrate how the plan will move forward and to gather support and buy-in from local politicians to facilitate implementation.

Figure A-3 – Summary of Consultation & Communication Themes

Table A.2 – Summary of Consultation / Communication Activities

Consultation Activity	Purpose	Target Audience
Theme 1: Ongoing Consultation		
Study Notices	► To notify the public and local stakeholders of the study's commencement, ► To provide them with relevant background information and ways to get involved over the course of the study. ► Notices developed at the beginning and end of the study.	► Residents ► Visitors ► Local Stakeholders ► Interest Groups
Online Outreach Campaign	► To provide members of the public and stakeholders with an up to date online resource for study information as deliverables are developed and consultation initiatives are scheduled. ► The campaign was used to strategically gather input from the public as well as stakeholders regarding existing transportation habits and trends as well as future needs and opportunities for additional engagement / consultation. ► A study webpage and online questionnaire was developed to promote the study online.	► Residents ► Visitors
Awareness Campaign & Outreach	► To notify the public and local stakeholders of the study, explain the study process, outline the study's vision, goals, objectives and problem statement as well as announce upcoming public information centres, stakeholder meetings and additional ways to participate throughout the study process.	► Residents ► Stakeholders
Theme 2: In-Person Outreach		
Public Information Centre #1	► To host a three hour session which was used to gather input regarding existing transportation conditions as well as opportunities and issues related to transportation for future consideration when developing the master plan. ► The session was held in open-house format at key community locations such as the community centre or arena.	► Members of the public
Public Information Centre #2	► To host a three hour session which was used to gather input on the proposed transportation solutions and recommendations identified in the transportation master plan. ► The session was held in open-house format at key community locations such as the community centre or arena.	► Members of the public



Consultation Activity	Purpose	Target Audience
Theme 3: Stakeholder Engagement		
Stakeholder Workshop #1	▶ To provide local stakeholders with opportunities to discuss with the study team their vision and goals for the transportation master plan including local opportunities and challenges which could be addressed through the TMP study process. ▶ The session was interactive and allowed attendees to document their input on study maps, materials and renderings.	▶ Stakeholders from the study contact list and any additional representatives who arise over the course of the study.
Stakeholder Workshop #2	▶ To provide local stakeholders with the opportunity to review the draft network and recommendations developed for the transportation master plan and to review the recommended design concepts for the core area vision. ▶ The session was facilitated by members of the study team and was intended to be interactive. This allowed attendees to document their input on study maps, materials and renderings.	▶ Stakeholders from the study contact list and any additional representatives who arise over the course of the study.
Theme 4: Steering Committee Coordination		
Steering Committee Meetings	▶ To provide the study steering committee with opportunities to discuss key study findings and deliverables with the study team. ▶ There were a total of 6 Steering Committee meetings that occur over the course of the study.	▶ Steering committee Members
Theme 5: Documenting the Findings		
Summarizing Input & Informing Report Development	▶ Input received over the course of the study at consultation and engagement sessions was documented and incorporated into the master plan report. ▶ Documentation included meeting minutes, workshop summaries, PIC consultation summary report and responses to select inquiries	▶ Members of the Public ▶ Stakeholders ▶ Steering Committee Members
Theme 6: Reporting to Council		
Presentation to Council	▶ To present the findings of the TMP to members of Council at the Town and Regional level	▶ Members of Council

Though the strategy set out specific consultation and communication of activities, the process was intended to be as flexible as possible. Over the course of the study additional consultation and engagement activities were identified and used to increase study awareness and to strategically engage the public and stakeholders using other venues / forums.



Table A.3 provides a summary of the additional consultation activities that were undertaken and some of the input received from each.

Table A.3 – Summary of Additional Consultation / Engagement Activities

Phase	Additional Consultation Activities	
Phase 1: Project Initiation	► Bolton Farmer's Market – June 14th, 2014 ► Approximately 100 people were engaged with 50 flyers distributed and a number of one-on-one discussions; ► The attendees were half residents and half visitors; ► Many attendees were opposed to transit (bus or rail) within the community and many prefer to drive by themselves ► Comments were received about the lack of cycling facilities and a connected system of routes	

A.4 INPUT RECEIVED AND TRENDS DOCUMENTED

A.5.1 Online Questionnaire Results

An online questionnaire was made available to members of the public – with a focus on local residents. The questions posed through the questionnaire were developed to gather input on existing transportation trends as well as future wants and needs with regard to the transportation system in Bolton. The questionnaire was initiated in May 2014, was made available over the course of the study and was completed by 70 respondents over a 14 month period. The results provided the study team with transportation specific priorities and improvements which informed the development of master plan strategies and recommendations. Results and highlights from the questionnaire are presented below.

- Respondents generally represented residents of the community with 80% indicating that they live within Bolton and 20% noting that they live outside of the community boundaries. Of those that indicated that they do not live within the community, the majority of respondents identified that their primary residence is in Brampton or Toronto.
- Of those 80% of residents only 33% indicated that they work within the community with 67% noting that they work outside of Bolton. The responses indicate a high commuter population with 64% involved in office work with a commute of 21 – 60+ minutes (52%) at a distance of greater than 20km (59%).

- The long distance commutes indicate a strong support and demand for commuting alternatives including transit to surrounding municipalities. However, there were some respondents (11%) that noted that they had a commute of 1 – 3 km which indicates some opportunity for trips to be taken by more active forms of transportation e.g. walking or cycling.
- The modes that are currently being used to get to and from work or a major destination in the community show a reliance on the single occupancy vehicle. 57% of respondents identified "driving by myself" as the preferred mode with 50% of those respondents indicating that they use that mode 5 days / week. There were some responses for walking / jogging and cycling; however, the responses were typically identified for fewer days / week (~2 – 3 days a week) which could be due to the local employment (11%) or a stronger preference to use active forms of transportation for recreational purposes.
- Respondents were asked about their thoughts on the key messages that should be conveyed through the master plan. All messages identified by the project team were ranked as "most important" with the expansion of regional transit (GO) with the highest amount of support at 53% followed by the expansion of local transit (40%).
- When asked about the historic features that should be preserved within the community the common responses provided included the downtown core including the architecture and the charm. A number of respondents indicated that they would like to also highlight the natural features such as the trails and Humber River through future improvements.
- Those who took the survey were also asked about potential barriers to using alternative forms of active transportation (e.g. walking, cycling, transit, carpooling, etc.). A number of barriers were identified and respondents were asked to rank each. Each of the barriers identified had a moderate response indicating that they provided some influence but not a significant amount of influence on transportation related decisions. Of all of the barriers, the highest ranked were the lack of walking and cycling facilities and the perceived sense of comfort and safety.

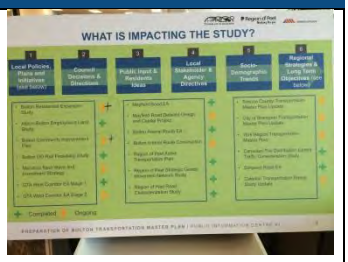
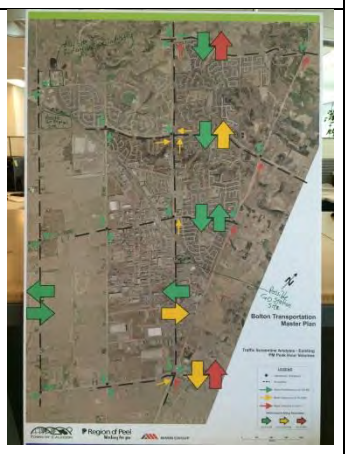
A detailed summary of responses is found in **Appendix X.**

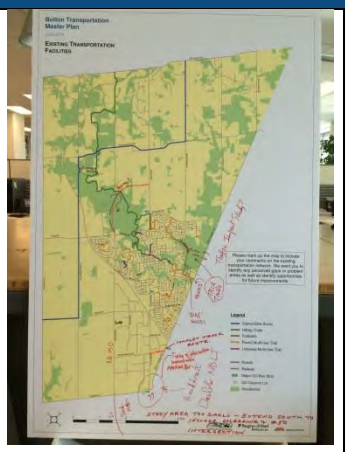
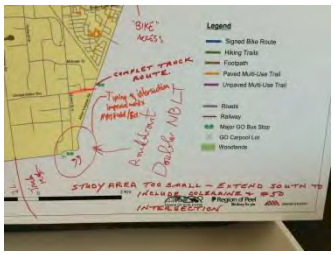
A.5.2 Public Information Centre #1

On Wednesday June 25th, 2014 between 6:00 p.m. and 9:00 p.m. the first public open house was held. The open house was intended to be used as a venue for discussion between study team members and public representatives to highlight existing conditions and ideas on how to move forward. Attendees were provided with background information on transportation in Bolton and were asked to highlight potential issues and opportunities related to transportation for the community.

The session was held at the Caledon Centre for Recreation and Wellness. A total of 37 attendees, including representatives from the public, stakeholders and local and regional staff were present. The materials prepared provided attendees with an opportunity to document their thoughts on current issues and opportunities through a set of interactive display boards. Comments, questions and input were documented on these display boards as well as through one-on-one discussion with members of the study team. Comments to the display boards have been documented / summarized in **Table A.4.**

Table A.4 – Summary of Input Received to Display Boards at PIC #1

Display Board	Comments Received	Graphic
Display Board #6 – What is Impacting the Study?	► Comments were provided regarding the status of some of the plans noted e.g. Bolton Community Improvement Plan may have been completed, as of June 24 and the Bolton Residential Expansion Study is complete.	
Map: Truck Restrictions & Existing Total Truck Volumes	► Southbound truck volumes on Coleraine Dr. are perceived to be too low ► Suggest truck restriction on Queensgate Blvd., between Queen St S and Albion Vaughan Rd ► Force trucks to turn left going northbound at Hwy 50 and Mayfield Rd ► Extend GB Parkway from Albion Vaughan Rd to Hwy 50 ► Allow no truck traffic on Hwy 50 between Mayfield Rd and McEwan Dr.	
Map: Existing Traffic Operations	► Investigate impact of Husky development around Queensgate Blvd and Hwy 50	
Map: Traffic Screenline Analysis	► A GO station could be located at Hwy 50 intersection with railway ► The northeast area of King St at Humber Station Rd is a key site for the agriculture industry ► The southeast corner of King St at Humber Station Rd, between Humber Station Rd and the railway, is a potential GO station site	

Display Board	Comments Received	Graphic
Map: Existing Transportation Facilities	► The TRCA EA, for the area just south of Humber Station Rd at Castlederg Side Rd, is on hold ► Bypass from Glasgow Rd at Chickadee Ln to Queen St N? ► Link is in progress from King St E at Sneath Rd to Longwood Dr. at Kingsview Dr. ► There is bike access on Sneath Rd from King St E to Old King Rd ► Westbound trucks make left-turns at Albion Vaughan Rd at King St E ► TRCA trails are located at the northwest corner of Albion Vaughan Rd at King St E ► Complete Industrial Rd truck route from Albion Vaughan Rd to Queen St S ► Mayfield Rd at Hwy 50 needs timing and intersection improvements ► Roundabout at Mayfield Rd/Albion Vaughan Rd at Hwy 50, with double northbound left-turns ► Study area is too small, extend south to include the intersection of Coleraine Rd at Hwy 50 ► Restrict trucks on the southern, 2-lane link of the intersection of Coleraine Rd (RR 150) at Mayfield Rd	 

The one-on-one discussions between attendees and study representatives also highlighted key themes which could be reviewed and considered for incorporation into the master plan report. Some highlights from these discussions are documented below.

- Need to develop solutions to mitigate truck traffic;
- Need more walking and biking facilities:
  - Active transportation facilities need to be connected into a network
  - Existing active transportation facilities need to be better promoted – the public does not know what already exists
- Do not destroy public area e.g. bridge over valley;
- Already dangerous to cross Hwy 50. Improvements need to be made to improve crossings for all users;
- Develop transportation improvements that make Bolton more accessible to other parts of the GTHA;

- The need for GTA West was questioned in light of the Hwy 427 extension;
- Is there any warrant for GO Rail service? – does it require improvements, additions or removal?;
- Explore the development of additional GO Train Stations in addition to those already in place including:
  - Current plans shows station on urban periphery
  - See map boards for 2 locations closer to the existing urbanized area;
- Maintain access to important farm fertilizer business (identified on map); and
- Staff from Caledon Community Services (CCS) wish to be involved in the study.

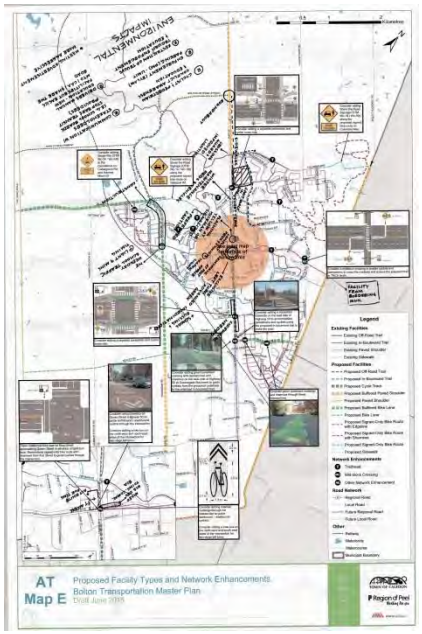
The input received from the first open house was used to update existing mapping and inform the development of transportation alternatives. Following the PIC the display materials were posted on the project webpage for members of the public to review following the open house. Visitors to the webpage were encouraged to provide any additional comments to the study team following the session and were also asked to fill-out and promote the use of the online questionnaire.

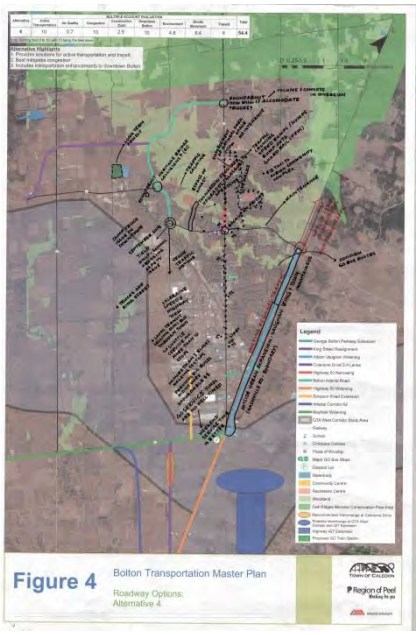
A.5.3 Public Information Centre #2

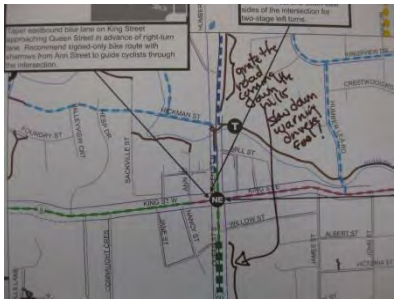
On Monday June 22nd, 2015 between 6:00 p.m. and 9:00 p.m., the second public open house was held. The open house was used to facilitate discussions between the study team, staff from the Town and the Region, members of the public and other key stakeholders. The second public information centre was used to present the different transportation alternatives and the results of the evaluation which was undertaken by the study team to identify the preferred solution. There was also a significant component of the PIC that focused on the downtown visioning exercise and the active transportation strategy. For the AT strategy, the study team presented the draft preferred network including proposed walking and cycling facility types as well as short, medium and long-term priorities. Display boards prepared for the downtown visioning component included a mock-up of the preferred solution at key locations along Highway 50 (north of King Street).

The approach used for the second public information centre was the same as the first – an open house style session with interactive display boards and facilitated one-on-one discussions with key groups. In total there were approximately 70 people who attended the session. Each member of the study team was able to engage with a number of the public representatives during the open house.

The interactive displays that were prepared allowed the attendees to document their input during the open house. It also allowed the study team to discuss and engage with the attendees during the event. A week prior to the meeting there was a significant transportation related issue that occurred in downtown Bolton. Because of the contentious nature of the meeting, it became evident that select groups were looking to engage in more focused discussions with members of the study team. As a result, some of the study team members broke out into focus groups and engaged with members of the public by documenting their comments on network mapping. The comments provided through the interactive display boards and the focus group sessions are illustrated below.









Through the discussions with the public, the study team gathered the following key comments and themes for consideration as the proposed network improvements and recommendations were reviewed and finalized:

- Wide consensus to prohibit trucks on Queen Street and King Street in the downtown core
  - Enforcement will be a major issue – people note that existing turning restrictions are not enforced
- The interim solution for the downtown core was favoured more than the ultimate solution – people want the on-street parking and think that there are too few cyclists to warrant bike lanes
  - Cycling facilities must be perceived as safe in order to be accepted by the public. Safe = separated facility in the comments I heard
- Create a sense of place in the downtown core – even more can be done to create a plaza or add other amenities
- Significant concern regarding the safety of youth – there is a need for safer routes to school in areas where there is the potential for conflict between pedestrians, cyclists and motorists. Designated and safe crossings may also improve these conditions.
- Consideration for more education and awareness for safe walking, cycling, driving, etc. should be distributed throughout the community
- Signage and traffic calming is needed to increase awareness of different users of the roadways throughout the downtown and surrounding residential areas
- Sidewalk improvements – including missing links – should be a priority for implementation both on Regional as well as local roads
- If the Town or Region implements facilities for pedestrians and cyclists they should also consider the maintenance of those facilities following implementation

The input received from the second public open house was used to refine the draft AT network and downtown visioning concept. It was also used to select the preferred transportation alternatives invading future transit, TDM and roadway improvements. Following the PIC the display materials were posted on the project webpage for members of the public to review.

A.5.4 Stakeholder Workshop #1

On Wednesday June 11th, 2014 the study team undertook the first stakeholder workshop. The workshop engaged 25 local stakeholders, interest groups and agency representatives and was used to gather input on transportation opportunities, barriers, issues and potential priorities / solutions for consideration.

The workshop was held at the Bolton Community Complex / Arena. Attendees were given a brief presentation / study update by members of the study team including an overview of ongoing Town / Regional initiatives which influence the development of the TMP, the study vision / problem and opportunity statement and future engagement / consultation activities.

Following the presentation, attendees were asked to separate into two groups where they were each asked to undertake a specific activity. These activities included a mapping exercise where group members were asked to assess existing transportation conditions and a roundtable discussion spurred on by a set of questions regarding transportation trends, opportunities and challenges. Each activity was facilitated by a member of the study team.

The input received was documented by the study team and used to inform the development of key deliverables / outcomes for Phase 1 of the study process.

NETWORK COMMENTS:

- Grade separation may be required at crossings of the railway tracks
- Sidewalk connectivity should be completed on both sides of Queen Street
- King Street improvements for cycling are required – on the approach to Bolton consider paved shoulder application
- Despite truck restrictions on select roadways there are still trucks that turn / use these roads
- Possible missing links include the extension of Parr Boulevard and George Bolton Parkway
- Should consider the redesign of Queen Street to be more pedestrian and cyclist friendly
- The downtown area of Bolton should be designed to be pedestrian and cyclist friendly including possible road diets and bikeway boulevard applications – speed reduction etc.
- Intersection improvements needed at King Street and Queen Street as well as key locations within the downtown core
- All potential users should be considered as part of the redesign of the downtown core – unique transportation needs may need to be addressed e.g. seniors or youth
- The implementation of the BAR may help to alleviate some of the downtown truck traffic, however, additional design considerations may need to help dissuade trucks from using main streets

- Linkages are needed to facilitate transportation to and from the GO stations at different times of the day without requiring too much more parking
- Local cycling connections could be reviewed on parallel routes to the King Street and Queen street which may be more comfortable for families and local cyclists

Table A.5 – Summary of Input Received to Workshop Questions

Question	Responses
1. There are limited transit options / connections within the community and to surrounding areas. Does this need to be improved? Should the Town / Region explore additional transit connections in the future?	▶ Agreement in place already with Brampton Transit ▶ There are gaps in the Brampton North system which creates a disconnect between service providers. Until the connections are made nothing will happen locally. ▶ 70% of residents work outside of the community which could increase the potential demand for transit ▶ GO Transit is a political issue, the Town / Region may want to explore shuttle services where possible.
2. There are a number of local businesses that generate truck traffic within the community and to surrounding areas. Are there alternate routes that might be more appropriate? How can the transportation system be designed to accommodate trucks and other modes of transportation?	▶ Bolton By pass less attractive because of level grade crossing and lack of fueling facility for truckers ▶ Central Bolton – industrial area needs to go east – trucks are going down Queensgate (a residential area). Explore the expansion of George Bolton. ▶ Albion-Vaughan access – trying to encourage pedestrian and cyclists into the downtown core. Vehicles should be encouraged to go to Mayfield then onto A-V. King Street should not be the destination for vehicles.
3. Active transportation (walking, cycling, etc.) is important to enhance the quality of life of local residents and visitors. Do you think the Town and community should design new walking and cycling facilities? Are there additional routes which could be explored throughout Bolton or to surrounding areas?	▶ Bike Share Programs ▶ Connectivity – identify gaps in the existing system and a strategy to connect them ▶ Connectivity to key destinations / multi-modal linkages e.g. carpool lots, transit stations, schools, etc. ▶ Active transportation needs to be functional and work inter-regionally ▶ Explore bicycle friendly community status

Question	Responses
4. The downtown of the Bolton community has significant historical significance and natural features/ what do you think should be preserved or enhanced? How the downtown could be redesigned to highlight or improve these features.	► Public are to commemorate / recognize historical features ► Purposeful creation of public realm ► Façade enhancements of historical buildings ► Consider the implementation of a "heritage conservation district" ► Heritage Humber River as a potential partner
5. There are a number of key groups that require significant consideration e.g. the elderly and youth. How do you think transportation in Bolton could be improved to increase opportunities or engagement with these groups?	► Engage with cycling groups ► Look into youth/children programs including AT to schools or Safe Routes to Schools ► Engage in "Deliberate Dialogue" with key groups including parents, commuters, trucking industry and youth

The input received was used to update the display materials in advance of the public open house. The ideas regarding potential programs and outreach initiatives were reviewed and considered as potential policies and recommendations in the master plan. Network improvements were used to inform the development of potential transportation alternatives and to mitigate current transportation issues within the community.

A.5.5 Stakeholder Workshop #2

The second stakeholder workshop was held on June 22nd, 2015 in advance of the second public information centre. In total 11 people were in attendance at the workshop including town and regional staff, members of the study team and key stakeholders from local businesses, interest groups and surrounding regions and municipalities.

At the beginning of the workshop a presentation was given to the stakeholders to provide them with an overview of the information being presented. The information presented was the same as the display materials provided at the public information centre including the draft and preferred transportation alternatives, proposed transportation improvements, trucking restrictions within the downtown core, downtown visioning and the draft active transportation network and phasing strategy.

Following the presentation, the meeting attendees were invited to participate in a roundtable discussion regarding some of the key recommendations identified. Instead of a roundtable discussion, the group selected to engage in a discussion using the interactive display boards. All input provided was documented on the display boards and used to update the recommendations to inform the development of the transportation master plan report.

Some of the key points of discussion included:

- The proposed trucking restrictions through the downtown core. Concern was expressed by one of the local businesses that restricting truck traffic would significantly impact the travel times

and costs to ship local goods. Additional information is needed to identify the preferred recommendation moving forward and the specific impacts that it may cause on local industry.

- The proposed improvements along Albion-King Town Line are neither the Town nor the Region's jurisdiction. If this improvement is recommended as part of the preferred alternative selected for the transportation network, the Town and Region will have to engage in discussions with the City of Vaughan and the Township of King to determine the timeline and cost of improvements, operations and maintenance.
- The proposed AT improvements address both pedestrians and cyclists. The vision for the downtown core reflects making pedestrians and cyclists a priority as opposed to motorize vehicles and trucks. The interim solution, though not the ultimate solution, was developed with safety in mind and should be implemented in the short-term. Additional considerations for trail improvements should be discussed with key stakeholders including the TRCA and Humber Valley Heritage Trail Association following the adoption of the TMP and AT Strategy.



TOWN OF CALEDON



APPENDIX B – PLANNING AND POLICY REVIEW

FOR

THE BOLTON TRANSPORTATION MASTER PLAN STUDY

MMM GROUP

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1.0 PLANNING CONTEXT

Considerable transportation-related planning work has been undertaken within and in proximity to the study area by the Town of Caledon, Peel Region and other levels of government. The development of the Bolton TMP has been shaped by policies and plans presented in these documents. Descriptions of key Federal, Provincial, Regional, Town and bordering jurisdiction plans and policies are documented in this section.

1.1 FEDERAL PLANNING DOCUMENTS

Policy Document	Policy Description	Relevance to the Transportation Master Plan
National Vision for Urban Transit to 2020	The report, commissioned by Transport Canada, supports the concept that public transit has numerous benefits to the environment beyond the reduction in greenhouse gas (GHG) emissions.	The benefits which have been identified and considered when developing the Bolton TMP include: ► A reduced need for new road construction; ► Improved air quality due to fewer vehicles on the road; ► Reduced traffic congestion; ► Healthier downtowns; ► Improved social mobility; and ► Positive impacts on economic sectors such as tourism and export development.
Federal Sustainable Development Act (2008)	The Federal Sustainable Development Act (FSDA) requires the development of a federal sustainable development strategy. The FSDA will strengthen sustainable development practices within the federal government. It is a positive step towards being more accountable to Canadians in the implementation of sustainable environmental practices.	This policy allows the government to set environmental sustainability policies more effectively and to align the work of other federal departments with these sustainable policies. The federal strategy includes goals and targets for sustainable development along with an implementation strategy for each. These sustainable strategies have been considered and included in the Bolton Transportation Master Plan as appropriate.

1.2 PROVINCIAL PLANNING DOUCMENTS

Policy Document	Policy Description	Relevance to the Transportation Master Plan
Provincial Policy Statement (2014)	The Provincial Policy Statement (PPS) is currently under review and will include a greater focus on healthy communities. The PPS sets the foundation for regulating land use and development within the province and supports Provincial goals. The PPS provides for appropriate development and protects resources of provincial interest. The vision of the land use planning system in the PPS is that the "long-term prosperity and social well-being of Ontarians depend on maintaining strong communities, a clean, healthy environment and a strong economy."	The PPS promotes the use of alternative transportation choices to increase the mobility of all. Contained in the PPS are policies pertaining to cycling, pedestrians, and transit on transportation and infrastructure corridors. These have been used to inform and develop similar policies in the Bolton Transportation Master Plan.
Growth Plan for the Greater Golden Horseshoe (2013)	The plan aims to promote dense, mixed-use communities that support public transit, walking and cycling as viable transportation options for people. These mixed-use communities should have a traditional main street feel featuring attractive and relevant commercial establishments that serve surrounding communities. If this built form is achieved, transportation demand may be lowered as more people may choose to leave the car at home in favour of taking public transit, walking or cycling to their destination.	The plan supports growth which will reduce community reliance on the single occupant motor vehicle. New development should be less automobile-oriented and more pedestrian friendly. The TMP will provide recommendations on how residents of Bolton can utilize alternative transportation choices such as GO service, carpooling and walking or cycling in favor of using a car.

Policy Document	Policy Description	Relevance to the Transportation Master Plan
Ministry of Transportation Cycling Strategy (2013)	In September 2013, the Ontario Ministry of Transportation (MTO) published #CycleON, Ontario's Cycling Strategy. The strategy acknowledges the importance of developing cycling facilities to help reduce greenhouse gas (GHG) emissions, ease gridlock, provide benefits to the economy, increase tourism and increase the quality of life for the residents of Ontario. The Province's vision is to ultimately "develop a safe cycling network that connects the province, for collision rates and injuries to continue to drop, and for everyone from the occasional user to the daily commuter to feel safe when they get on a bicycle in Ontario." The strategy is intended as a guide to make sure this vision is achieved.	The Cycling Strategy outlines a 20-year vision for cycling in the province, with proposed cycling infrastructure, education and legislation including a set of proposed changes to the Highway Traffic Act. This strategy, along with other Provincial documents, all promote and aim to strategically develop sustainable transportation infrastructure province-wide.
Ontario Ministry of Transportation Transit Supportive Guidelines (2012)	The Ministry of Transportation's Transit Supportive Guidelines, 2012, outlines a set a guidelines to encourage transit-friendly planning and design through all communities in Ontario. More specifically, the policy document provides direction on supportive land-use planning, urban design and operational procedures based on current best practices. The document is intended to be a guide for planners, developers and others who are involved in developing more transit-supportive communities.	The guidelines provide direction on how to integrate all modes of transportation when designing for transit to create more complete streets. The document provides guidelines for the improvement of transit facilities including design recommendations. It complements the Bolton TMP and should be used as a guide for future design and development of transit facilities throughout Bolton.

Policy Document	Policy Description	Relevance to the Transportation Master Plan
GTA West Corridor Environmental Assessment (2012)	The purpose of the GTA West study is to address long-term inter-regional transportation problems and opportunities and consider alternative solutions to address these issues as part of developing an integrated, multi-modal transportation system that enables the efficient movement of people and goods, and provides better economic transportation linkages between Urban Growth Centres in the GTA West area. The proposed Transportation Development Strategy represented the culmination of the "building block" approach taken though the project and is comprised of elements including: optimization of existing networks, improvements to non-road infrastructure, widen/improve roads and new transportation corridors and links to existing freeway networks.	The Bolton TMP incorporates the GTA West Corridor into its modelling and mapping. The Community of Bolton is located in close proximity to and just north of the corridor and thus will be influenced as the corridor is developed.
The Big Move (2009)	The Big Move is the third piece in a three-part approach by the provincial government to prepare the GTHA for growth and sustainability. It builds on the Greenbelt Plan and the Growth Plan for the Greater Golden Horseshoe. Together these three initiatives will lead to development of more compact and complete communities that make walking, cycling and transit part of everyday life. The goal of the Big Move is to create a long-term strategic plan for an integrated, multi-modal, regional transportation system. It serves as a blueprint for a more sustainable transportation future. With a 25 year time horizon, it reaches into the future to guide and direct decision making. Priorities, policies and programs have been established to enhance mobility.	The Bolton TMP used the specific guidelines of the Big Move when developing the transportation network which considers all modes of transportation, promotes integration of transit systems and aims to reduce congestion, commuting times and transportation-related emissions. The Big Move improvements that will benefit mobility in Bolton include: ► GTA West Corridor ► Highway 427 North Extension ► A regional improvement to rail service ► Direct GO service into the Community of Bolton

Policy Document	Policy Description	Relevance to the Transportation Master Plan
Accessibility for Ontarians with Disabilities Act (2005)	The Accessibility for Ontarians with Disabilities Act was passed on June 13, 2005, and is a Provincially legislated policy that calls on the business community, public sector, not-for-profit sector and people with disabilities or their representatives to develop, implement and enforce mandatory standards. This policy is a first of its kind in Canada to apply to both the private and public sectors. These accessibility standards are the rules that local governments, agencies and businesses in Ontario should follow to identify, remove and prevent barriers to accessibility.	The Built Environment is the most relevant standard that can be applied to the planning, design and construction of transportation-related facilities including pedestrian crossings, public accesses, parking, transit stations, transit shelters, stops and signage. This policy provides direction on the appropriate design and location of these facilities, and is a key reference document in the development of the Bolton TMP.
Greenbelt Plan (2005)	The Greenbelt Plan is a cornerstone of Ontario's Greater Golden Horseshoe Plan. The Greenbelt Plan identifies where urbanization should not occur in order to provide permanent protection of the agricultural land base and the ecological features and functions occurring on this landscape. The Greenbelt Plan includes land within, and builds upon the ecological protection provided by, the Niagara Escarpment Plan (NEP) and the Oak Ridges Moraine Conservation Plan (ORMCP).	The Community of Bolton is surrounded by the Oak Ridges Moraine Conservation area. During the development of the overall transportation network, the TMP takes into account sensitive greenbelt areas.

1.3 REGIONAL PLANNING DOCUMENTS

Policy Document	Policy Description	Relevance to the Transportation Master Plan
Peel Region Official Plan (2013)	The Peel Region Official Plan provides Regional Council with a long-term policy framework for decision making. It sets the regional context for more detailed planning by protecting the environment, managing resources, and directing growth and sets the basis for providing Regional services in an efficient and effective manner.	The overall development pattern set by the Official Plan was considered in the development of future transportation networks, policies and guidelines.



Policy Document	Policy Description	Relevance to the Transportation Master Plan
Strategic Goods Movement Network Study (2013)	The Peel Region Strategic Goods Movement Network Study was developed by the Peel Region Goods Movement Task Force to ensure that goods movement is efficiently attained in the Region and to ensure that roads and infrastructure are efficiently used.	The strategies found in the report have been considered in the development of the Bolton Transportation Master Plan. As the Region of Peel continues to develop its freight plans and goods movement network, the Town of Caledon will benefit from the broader strategic perspective.
Peel Region Long Range Transportation Plan (LRTP) Update (2012 Draft)	The LRTP Update identifies the transportation challenges anticipated by the Region over the next 20 years, as well as appropriate policies, strategies and a road improvement plan to address these challenges.	The initiatives found in this report have been considered in the development of TDM policies and recommendations for the Bolton Transportation Master Plan. Regional road improvements that fall within the boundary of the Community of Bolton have been incorporated into the future transportation network.
Region of Peel Road Characterization Study (2011)	The Region of Peel Road Characterization Study outlines Regional roads and their associated road typologies. This study was completed to ensure all roads are used to their maximum potential and to seek solutions on corridors that fall within overlapping municipalities.	The Community of Bolton is within the Town of Caledon and incorporated in the Region of Peel. This may result in roads being classified with multiple typologies. The review of this report helped guard against the application of conflicting visions during the development of the Bolton Transportation Master Plan.
Peel Region Active Transportation Study (2011)	The Active Transportation (AT) Plan outlines Peel Region's short, medium and long term goals for increasing active transportation trips, enhancing modal integration, and creating an attractive, safe, accessible and integrated walking and bicycle-friendly environment.	The Bolton Transportation Master Plan considered this report and incorporated elements of the active transportation network identified on City roads.

Policy Document	Policy Description	Relevance to the Transportation Master Plan
Caledon Transportation Needs Study Update (2009)	The Caledon Transportation Needs Study Update is a project conducted jointly by the Town of Caledon and the Region of Peel to assess and identify the potential transportation improvements to accommodate future transportation demand within the Town.	Developments and strategies to the proposed transportation network in Caledon were considered as part of the Bolton Transportation Master Plan.
Peel Region Transportation Demand Management (TDM) Plan (2008)	This plan provided an update to the adoption of the Peel Region TDM Study Report in 2004. ► The following were recommended: o TDM support program; o AT including an AT coordinator and safe routes to school program; o Regional TDM programs to include a five year marketing campaign, employer individual marketing program, TDM workshops; and o New strategies including goods movement, a commuter store feasibility study and employer-based trip reduction programs.	The strategies outlined in the Peel Region Transportation Demand Management are a crucial part of the Bolton Transportation Master Plan. Additional measured outlined in this report were considered in the development of the Transportation Demand Management section of the Bolton TMP.
Highway 50 / 427 Extension Area: Arterial Road Network Study (2007)	This study was initiated to understand the possibility of extending Highway 427 to a point south of the Green Belt and Oak Ridges Moraine. The main objective of this study was to evaluate municipal long term road network solutions to accommodate transportation demands and logical connections.	The Community of Bolton's southern edge will be influenced with the expansion of Highway 427. Modelling and mapping elements have incorporated this roadway expansion and are included throughout the Bolton TMP where appropriate.



1.4 TOWN PLANNIG DOCUMENTS

Policy Document	Policy Description	Relevance to the Transportation Master Plan
Bolton Residential Expansion Study (BRES) 2012	This plan serves to follow the Community of Bolton's planning process and determine how and where an additional 10,000 residences and 2,600 jobs will be created in the region throughout 2031.	The Bolton Transportation Master Plan ensures that appropriate roadway capacity impacts are understood and that the future transportation network can meet the expanded growth of the community to year 2031. Where appropriate, projected growth figures and roadway capacity have been incorporated into the Bolton TMP.
Canadian Tire Distribution TIS (2012)	The Canadian Tire Bolton Distribution Centre (DC) at Coleraine Drive and Holland Drive is a planning project that looks to relocate the distribution center within the Community of Bolton. This report summarizes transportation considerations that influence the relocation of the DC. .	Upcoming full occupancy of the new Canadian Tire DC will impact the Community of Bolton transportation network. This study was reviewed and where appropriate considered in future traffic, population and employment growth. The long term traffic forecasts incorporate the relocated DC into the TMP's traffic and employment forecasts.
Bolton Commuter Rail Feasibility Study (2010)	The Bolton Commuter Rail Feasibility Study investigates the feasibility of routing options for the development of an all rail service between Bolton and Toronto. This study was planned to focus on the services offered by GO Transit's scope of services and to determine infrastructure and service modifications to accommodate freight and commuter travel demand.	This report concludes that a new commuter rail transit service on the Bolton corridor is feasible based on the outlined analysis. The findings and recommendations have been reviewed and implemented in the Bolton Transportation Master Plan's mapping and analysis where appropriate. Included is the proposed Bolton GO Station facility at Humber Station Road and King Street.

1.5 NEIGHBORING JURISDICTION PLANNING DOCUMENTS

Policy Document	Policy Description	Relevance to the Transportation Master Plan
King Township Transportation Master Plan (2015)	This plan serves as a roadmap for all crucial transportation initiatives in the Township of King through the year 2031. The King Transportation Master Plan addresses transportation challenges and strategies to develop a functional and optimized transportation network within the Township in the region. This plan outlines active transportation, public transportation, and motorised transportation in King Township.	The Bolton Transportation Master Plan considers connections to Bolton's future transportation network.
Brampton Transportation Master Plan Update (2015)	The Brampton Transportation Master Plan Update serves as an update to the 2009 Transportation and Transit Master Plan. In conjunction with the City's Strategic and Official Plans, the update provides the basis for strategies, policies, and tools of development for a sustainable transportation system that will support the objectives of the City of Brampton until 2041.	Connections to the transportation and transit networks in the City of Brampton were considered where appropriate and incorporated in the development into the Bolton Transportation Master Plan.
County of Simcoe Transportation Master Plan (2014)	The County of Simcoe Transportation Master Plan serves as the foundation for significant transportation initiatives in the County through the year 2031. Serving as an update to the 2008 TMP, this update addresses the region's growth and provides a set of strategic recommendations to guide future transportation and transit development.	Connections to the future transportation and transit networks in the County of Simcoe were reviewed and incorporated as part of the Bolton Transportation Master Plan were appropriate.

Policy Document	Policy Description	Relevance to the Transportation Master Plan
Highway 427 Industrial Secondary Plan - Area 47 (2014)	The Highway 427 Industrial Secondary Plan (Area 47) addresses land use designation and a policy framework of a complete community incorporating residential, retail, industrial and employment lands.	Directly south of the Town of Caledon and the Community of Bolton sits the proposed development site of Area 47. This report outlines the proposed development which will influence the surrounding transportation network. Area 47 is planned to accommodate 27,000 people and 20,500 jobs at full build out, and has been considered during the development of the Bolton TMP.
A New Path: Vaughan Transportation Master Plan (2012)	In response to the Provincial Growth Plan for the Greater Golden Horseshoe, The Vaughan Transportation Master Plan serves as an update to the region's growth management strategy. This plan outlines the need for regional and municipal transportation improvements until 2031.	Connections to the proposed transit and transportation networks in the City of Vaughan were considered where appropriated as part of the Bolton Transportation Master Plan.
Health Background Study (2011)	This plan serves as a joint initiative between Toronto Public Health and the Region of Peel Public Health to establish a mechanism to integrate health impact considerations into the land use development approval process.	The Bolton Transportation Master Plan considered the Health Background Study.
York Region Transportation Master Plan (2009)	This plan serves as the basis for all major transportation initiatives in the Region through the year 2031. The TMP addresses transportation challenges and strategies that will promote sustainable development in York Region. It complements other initiatives in the Region including Regional goals of Sustainable Natural Environment, Economic Vitality and Healthy Communities.	Connections to current transportation network initiatives in York Region were considered in the development of the future transportation network in the Bolton TMP.

TOWN OF CALEDON



APPENDIX C – TMP MODEL VALIDATION

FOR

THE BOLTON TRANSPORTATION MASTER PLAN STUDY

MMM GROUP

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Document Control:

Client:	Bolton
Project Name:	Bolton Transportation Master Plan
Report Title:	Bolton TMP Model Validation
MMM Reference:	1614005-001-T01
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1.0 INTRODUCTION

MMM is preparing the Bolton Transportation Master Plan in order to identify transportation improvements needed in Bolton for the year 2031 and beyond. MMM was provided with Peel Region's 2007 Travel Forecasting model to be used as a basis to determine the transportation improvements that will best benefit Bolton. In reviewing the existing model, MMM determined that updates to the model were needed to accurately reflect existing conditions. Of note, MMM discovered the model had been calibrated with 2001 TTS data "seed" matrices. This problem is discussed with detail in Section 2.

This report documents the performance of the Peel Region's 2007 Travel Forecasting Model (PFM), the updates carried out to the model, and the updated model's accuracy.

Of note, it is natural for a strategic model of this nature to include certain generalizations, which sometimes result in less than acceptable sub-area and/or corridor-wide performance. Thus the focus of the update completed as part of this study was not as much to critique the PFM, but to make it more sensitive to the study in question.

This report is divided in five sections, including the introduction. The sections are as follows:

- Section 2: documents the PFM's model results for Bolton;
- Section 3: notes the changes made to the model;
- Section 4: documents the updated PFM's results for Bolton; and,
- Section 5: conclusion

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2.0 PEEL REGION 2007 TRAVEL FORECASTING MODEL (PFM) EVALUATION

The PFM was evaluated across a number of modeling elements, which can be broadly classified in two categories. First, supply side, which refers to the network characteristics in the PFM and the traffic zone structure. Second, demand side elements that correspond to trip generation, distribution, and assignment. In addition, the PFM's macros and basic input data like "seed matrices" were also evaluated as part of this study.

Given the relatively sparse Bolton-specific network in the PFM and the outdated "seed" matrices (2001 TTS), it was necessary to implement some basic changes to the PFM before a credible assessment could be made as to its accuracy. These changes were also necessary in order to understand the auto assignment because a significant number of locations where turning-movements and link-level count data was collected by City and Regional staff were not present in the road network of the PFM. Thus, the references to "PFM" made throughout this document are indicative of a PFM that was modified to reflect a more appropriate road network in the Bolton area (Exhibit 12) and 2011 TTS "seed" matrices. More clarification to the type of improvements implemented in the PFM and the Updated PFM are shown in the table below. **Exhibit 1** shows the various improvements made to the models.

Exhibit 1. Improvements made to the models

Model	New Road Links	2011 TTS "seed" matrices	Macro Updates	New Zones	Updated Network Characteristics, except VDFs*	Revised VDFs	Trip Generation Updates	Trip Distribution Updates
PFM (originally from the Region)	X	X			X			
Updated PFM	X	X	X	X	X	X	X	X

*VDF: Volume-Delay Functions

Two primary data sources were used for comparing model performance. The 2011 Transportation Tomorrow Survey (TTS) was used to assess trip generation and distribution, whereas the 2013 turning movement and link-level count information provided by Peel Region staff was used for measuring the PFM's auto assignment.

The 2011 Cordon Count data was found to be of limited use given the location of the study area and the inaccuracies observed in it along Mayfield Road.

To undertake a truly objective evaluation of the PFM a set of benchmarks were established to measure model performance. The benchmarks cover all except the modal split component of the PFM, which is a policy-based input and thus its effects are expected to be captured in trip assignment.

2.1 Model Performance Benchmarks

The list of validation benchmarks used to measure the PFM's performance is shown in **Exhibit 2**.

Exhibit 2. Model Performance Benchmarks

Metric	Dataset	Benchmark
Trip Generation	TTS	+/- 10% of observed
Trip Distribution	TTS	GEH (85% less than 10)
Assignment Performance • **Volumes** • **Travel Times** • **VKT by Road Class**	Traffic Counts MTO's Travel Time Survey FHWA Validation Manual	GEH[1]: • 0-5 (good) • 5-10 (acceptable) • >10 (needs investigation) • 85% less than GEH 10

1. For an explanation of GEH see Appendix A.

2.2 Supply Review

A comprehensive review of the PFM's auto network and traffic analysis zone (TAZ) structure was completed.

As noted earlier, the PFM had a very basic roadway network within Bolton with only major arterial roadways. To improve trip assignment, a number of roadways were entered into the model, in addition to an update to the network characteristics. In total, an additional 90 lane kilometers were added within Bolton to the PFM.

The network characteristics were compared to the data collected during a site visit as well as Google satellite and street view images of Bolton. The review addressed the following network characteristics:

- Length and number of centroid connectors within the traffic zones;



Exhibit 3. Roadway Updates

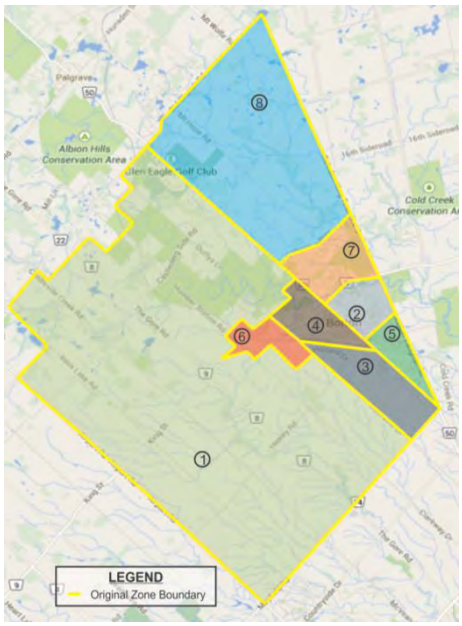


Exhibit 4. Original PFM Zones in Bolton

- Roadway links;
- Number of lanes;
- Link speeds; and,
- Per lane capacity.

A summary of the links created/edited are shown in **Exhibit 3**. Large generalizations in the TAZ geography for Bolton and the surrounding areas were noted. The generalizations were in the form of extremely large zone sizes that encompassed a variety of distinctive land uses and bisecting roadways, as shown in **Exhibit 4**.

2.3 Update of "Seed" Matrices

The PFM was originally calibrated to the 2001 TTS data, which meant that all the "seed" matrices in the model were based on 2001 TTS data. This presented problems given the substantial growth in this area over the last decade, the significant changes in travel across the GTHA due to land use policy changes, exponentially higher gas costs from 2001, increases in housing prices and auto operating costs, amongst others. Given the above, it was decided to replace all the "seed" matrices in the PFM with those generated from the 2011 TTS data as part of the basic updates needed to assess its performance.

2.4 Trip Generation and Distribution

Exhibit 5 and **Exhibit** 6 document the trip generation and distribution of modeled auto trips in the PFM an d compare them to the 2011 TTS data, for zones in Bolton.

Exhibit 5. PFM Auto Trip Distribution within Bolton (AM Peak Hour)

PFM		Rest of GTHA	Original EMME Zones								Total Internal (Bolton)	Total
			1689	1692	1691	1694	1690	1753	1693	1695		
Rest of GTHA			365	137	1,110	178	85	32	87	30		**2,024**
Original EMME Zones	**1689**	201	167	8	34	12	2	1	4	1	229	**430**
	1692	592	57	85	288	70	62	12	37	2	613	**1,205**
	1691	21	1	1	24	2	1	0	1	0	30	**51**
	1694	486	71	60	282	126	22	12	17	17	607	**1,093**
	1690	394	14	42	314	32	47	5	42	2	498	**892**
	1753	312	37	37	182	32	22	24	8	2	344	**656**
	1693	733	91	83	255	60	16	13	65	52	635	**1,368**
	1695	115	7	4	19	7	2	2	3	8	52	**167**
Total Internal (Bolton)			445	320	1,398	341	174	69	177	84	3,008	
Total		**2854**	**810**	**457**	**2,508**	**519**	**259**	**101**	**264**	**114**		**7,886**

Exhibit 6 shows the differences between the original modeled auto trips and the 2011 TTS results for the same zones, within Bolton. A negative value indicates that the model is under reporting. Additionally, GEH values were also calculated for the two distributions. GEH values of greater than 10.0 represent less than acceptable model performance. Of note, the model is not expected to replicate the observed TTS distribution exactly given the complexity involved in people's decision-making for a given origin (O) and destination (D) compared with the relatively simple form of the gravity model. However, it is desirable to achieve at least 85% of the O-D interchanges with a GEH of less than 10, for ensuring model reasonableness. Only 68% (67 out of 99) of the O-D interchanges have a GEH of less than 10.0.

Exhibit 6. Distribution differences between PFM and the 2011 TTS – Auto Drive Only (AM Peak Hour)

PFM - TTS		Rest of GTHA	Original EMME Zones								Total Internal (Bolton)	Total
			1689	1692	1691	1694	1690	1753	1693	1695		
Rest of GTHA			86	-293	310	-409	-593	-181	-274	-148		**-1,502**
Original EMME Zones	**1689**	48	126	-5	-1	12	2	1	4	1	140	**188**
	1692	-211	57	34	260	-18	62	-11	-10	2	376	**165**
	1691	-180	1	1	-15	2	1	0	1	0	-9	**-189**
	1694	9	71	37	264	85	-1	-11	-53	-1	391	**400**
	1690	-436	14	19	279	9	-22	-30	-42	2	229	**-207**
	1753	-185	37	19	159	32	-32	24	8	2	249	**64**
	1693	-438	68	-18	197	-22	-67	13	-23	5	153	**-285**
	1695	-131	-16	-45	19	-11	-26	2	-25	8	-94	**-225**
Total Internal (Bolton)			358	42	1,162	89	-83	-12	-140	19	1,435	
Total		**-1,524**	**444**	**-251**	**1,472**	**-320**	**-676**	**-193**	**-414**	**-129**		**-1,591**

GEH		Rest of GTHA	Original EMME Zones								Total
			1689	1692	1691	1694	1690	1753	1693	1695	
Rest of GTHA			4.8	17.4	10.0	20.9	30.4	16.4	18.3	14.5	28.5
Original EMME Zones	**1689**	3.6	12.4	1.5	0.2	4.9	2.0	1.4	2.8	1.4	10.3
	1692	8.0	10.7	4.1	20.7	2.0	11.1	2.6	1.5	2.0	4.9
	1691	17.1	1.4	1.4	2.7	2.0	1.4	0.0	1.4	0.0	15.7
	1694	0.4	11.9	5.7	21.6	9.3	0.2	2.6	8.0	0.2	13.4
	1690	17.6	5.3	3.3	21.1	1.7	2.9	6.7	5.3	2.0	6.6
	1753	9.2	8.6	3.6	15.7	8.0	5.2	6.9	4.0	2.0	2.6
	1693	14.2	9.0	1.9	15.7	2.6	9.5	5.1	2.6	0.7	7.3
	1695	9.8	4.1	8.7	6.2	3.1	6.7	2.0	6.4	4.0	13.5
Total		25.3	18.3	10.4	35.0	12.3	27.7	13.7	19.1	9.7	17.1

The total trips to/from Bolton are underreported by close to 17% (1591/[7886+1591]) when compared to the 2011 TTS, with zones 1689 and 1691 as the primary source for this discrepancy. However, the PFM over reports 1,435 a.m.

peak hour trips that start and end within Bolton itself. This suggests a higher percentage of short-distance trip making. Modeled productions from zone 1691 seemed extremely low while attractions are relatively high, based on general inspection of the zone characteristics, the land use in the area and the turning movement counts. In addition, the percentage of modeled productions versus attractions also seemed extremely skewed for a zone containing close to 11,500 jobs and 300 residents.

A summary of the total trips (productions plus attractions), trip generation from the ITE Trip Generation Manual v9.0, and the directional distribution observed in the traffic counts around the zone is shown in **Exhibit 7**.

Exhibit 7. Special Generator Comparison (AM Peak Hour)

Generator Name	Employees/ Residents	Original Model	ITE Estimate Industrial Park (ITE Manual 9.0)	Traffic Counts
		Total Trips In%/Out%	Total Trips In%/Out%	Total Trips In%/Out%
Industrial Area (Zone 1691)	11491/ 287	2559 98%/2%	3363 87%/13%	2822* 57%/43%

*Some of these could be cut through trips, i.e. trips entering the zone on one end and exiting on the other.

The ITE trip rates significantly over report trips in zone 1691, whereas, the traffic counts are reasonably closer to what the PFM originally predicted. However, the PFM underestimates the productions (2% of trips), greatly skewing the directionality of trip making in the a.m. peak hour.

2.5 Auto Assignment

2.5.1 Turning Movement Counts

The modeled volumes were compared to the a.m. peak hour counts at the link-level and by road classification. The roadways were classified into one of four categories, major arterials, rural arterials, collectors and local roadways. **Exhibit 8** shows the comparison on an individual roadway basis.

Exhibit 8. Performance by Roadway – PFM (AM Peak Hour)

Roadway	Counts	PFM Volumes	GEH	PFM/Counts
HWY 50	25,597	11,958	99.5	0.47
King St	9,193	7,127	22.8	0.78
Mayfield Rd	4,578	3,395	18.7	0.74
Albion Vaughan Rd	2,041	1,213	20.5	0.59
Old Church Rd	390	468	3.7	1.20
Queensgate Blvd	921	921	0.0	1.00
Castlederg Side Rd	336	1,464	37.6	4.36
Coleraine Dr	4,582	5,733	16.0	1.25
Humber Station Rd	203	1,306	40.1	6.43
The Gore Rd	2,458	2,460	0.04	1.00
George Bolton Pkwy	141	3	16.2	0.02
Industrial Rd	37	320	21.1	8.65
McEwan Dr W	354	333	1.1	0.94
Healey Rd	1,194	633	18.5	0.53
Wilton Dr/Allan Dr	273	18	21.1	0.07
Elmwood Dr W	427	631	8.8	1.48
Bolton Heights Dr	283	394	6.3	1.39
Columbia Way	338	1	25.8	0.00
Evans Ridge	147	392	14.9	2.67
Old King Rd	38	0	8.7	0.00
Humber Lea Rd	383	493	5.2	1.29
Station Rd /Deer Valley Dr	139	322	12.0	2.32
Harvest Moon Dr	542	632	3.7	1.17
Glasgow Rd	28	89	7.9	3.18
Duffys Lane	42	280	18.7	6.67
Parr Blvd	23	0	6.7	0.00
Holland Dr	76	3	11.6	0.04
Total	**54,764**	**40,589**	**64.9**	**0.74**

As seen in the above table, overall the model has a GEH value of 65. Only 41% (11 out of 27) of the links in question exhibit a GEH of less than 10.0. When aggregated, the model underreports volumes by approximately 26%, or 14,200 vehicles. **Exhibit 9** shows the comparison based on road classification.

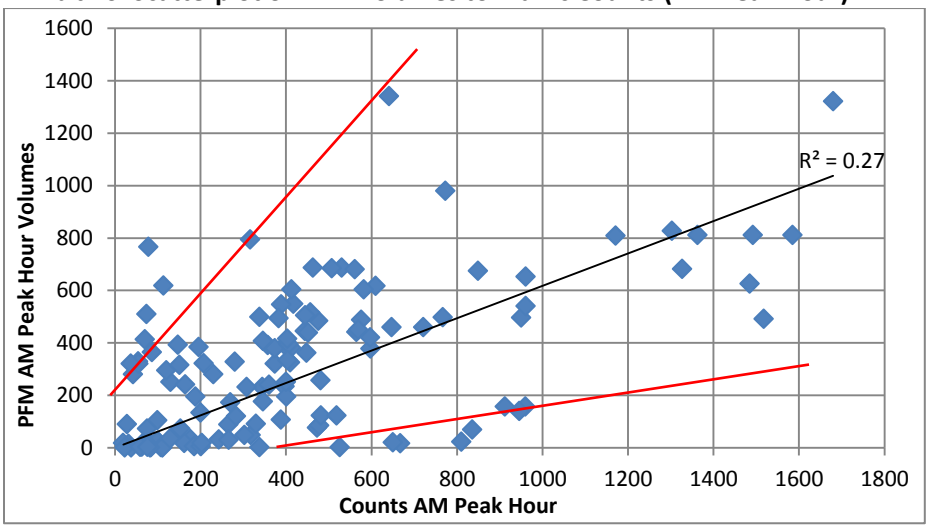
Exhibit 9. Performance by Road Classification – PFM (AM Peak Hour)

Class Type	Counts	PFM Volumes	GEH	PFM/Counts
Major Arterial	45,991	29,426	85.3	0.64
Rural Arterial	4,646	6,611	26.2	1.42
Collector	2,867	2,907	0.7	1.01
Local	1,260	1,645	10.1	1.30

Other than collector roadways, all the other road classes are exhibiting poor assignment performance. The arterial roads, which carry the heaviest traffic flows in the area, have a GEH value of 85, with significantly lower flows. The tendency of the PFM to underreport would result in the model forecasting better roadway

conditions across the system for the future horizon years. **Exhibit 10** presents a scatter plot comparing the original model volumes to traffic counts.

Exhibit 10. Scatterplot of PFM Volumes to Traffic Counts (AM Peak Hour)



The calculated R-squared value for the model is close to 0.27, which is extremely low compared to the acceptable standards of greater than 0.8. Further, the cone-like spreading pattern evident in the scatter plot indicates that the error in assignment performance is proportionate to roadway capacity i.e. higher capacity roadways are witnessing higher assignment discrepancies; meriting a review of the Volume Delay Functions (VDF) used in the PFM.

2.5.2 Vehicle Kilometers Travelled and Vehicle Hours Travelled

The Vehicle Kilometers Travelled (VKT) and the Vehicle Hour Travelled (VHT) by road class for links within and surrounding Bolton are shown in **Exhibit 11** and **Exhibit 12**.

Exhibit 11. VKT comparison for the links with TMC data (AM Peak Hour)

VKT	Count VKT (% of Total)	PFM Model VKT (% of Total)	GEH	PFM VKT / Counts VKT
Major Arterial	31,215 (74%)	22,083 (56%)	55.94	0.71
Rural Arterial	9,252 (22%)	15,547 (39%)	56.54	1.68
Collector	997 (2.5%)	1,059 (3%)	1.93	1.06
Local	529 (1.5%)	657 (2%)	5.27	1.24
Total	41,992	39,345	13.12	0.94

Exhibit 12. VHT comparison for the links with TMC data (AM Peak Hour)

VHT	Count VHT (% of Total)	PFM Model VHT (% of Total)	GEH	PFM VHT / Counts VHT
Major Arterial	32,117 (74%)	22,539 (56%)	57.94	0.70
Rural Arterial	8,655 (20%)	14,591 (36%)	55.06	1.69
Collector	1,465 (3%)	1,717 (4%)	6.34	1.17
Local	1,113 (3%)	1,530 (4%)	11.49	1.38
Total	43,349	40,377	14.52	0.93

Exhibit 11 and Exhibit 12 show that in comparison to Exhibit 8 and Exhibit 9 the 2011 PFM VKT and VHT is closer to observed conditions, which were estimated from 2013 traffic counts. The PFM also tends to over represent the percentage of VKT and VHT on the rural arterials, at the expense of the other road classes. Understanding this pattern is important because under future congested conditions the rural arterials with their limited corridor capacities will reach congestion relatively faster and consequently record relatively higher congested VKT and VHT. Both of these metrics are a measure of congestion in the network.

3.0 MODEL NETWORK REVIEW/UPDATES

This section identifies the list of model improvements that were implemented to the original model. These improvements were broadly divided into three parts:

Zones: Improved the zone structure of the network by introducing additional TAZs;

Roadways: Refined the capacity, VDF, and centroid connector locations; and,

Macro and Demand Updates: Improved the macros used to run the model, and key input matrices that are used to "seed" the trip distribution in the PFM.

3.1 Zones

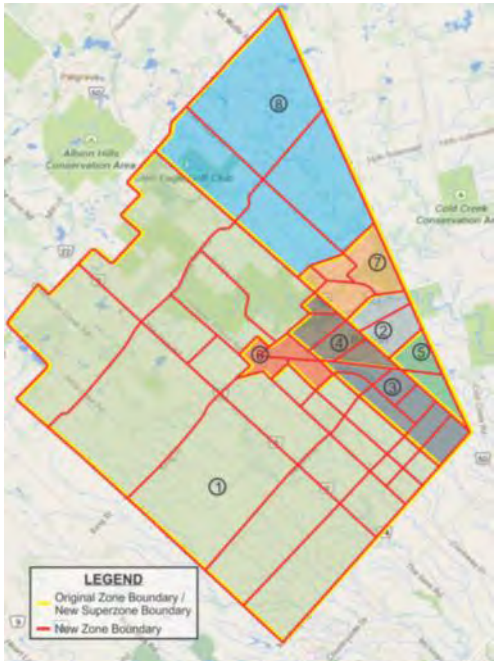


Exhibit 13. Updated PFM Zones in Bolton

Through this review large TAZs or those with relatively incompatible land uses were split into two or more zones to improve local assignments. The zones were divided along major corridors and distinctive land uses. The model was expanded from six zones in Bolton to 48 zones. The employment and residential numbers were divided between the parent and child zones based on the area and land uses. To be able to maintain a direct comparison between the new data and old data, superzones were created, which encompassed the same area as the original six zones. Additionally, the new TAZs were created as a subset of only one original TAZ, which allowed easy aggregation of the 48 zones to the six original zones in the PFM. The original zones and the new zones are shown in **Exhibit 13**.

3.2 Roadways

The PFM implemented some basic improvements to the road network in Bolton in terms of missing links and appropriate network characteristics. The initial auto assignment results presented in Section 2 indicated that further refinement is needed, specifically to the per lane capacity assumptions and the VDFs used for the roadways.

The lane capacity assumptions and VDF definitions were edited based on various model iterations in an attempt to refine the PFM's auto assignment.

3.3 Macro and Demand Updates

To improve the trip generation and distribution within Bolton the macro processes in the PFM were updated and in some cases modified. The changes are listed below:

- Trip generation: factors were added to the calculated attractions and productions of specific zones within Bolton to converge the total trip making to 2011 TTS estimates, and to 2013 traffic count data. The factors were also used to re-balance the proportion of productions and attractions from these zones.
- Trip distribution: To improve key zone-to-zone linkages, factors were introduced at the trip distribution stage, which are akin to k-factors. K-factors are used to model individual zone or superzone variations that are not otherwise accounted for in a gravity model.

4.0 UPDATE MODEL RESULTS

With the various improvements implemented to the PFM, the performance of the model was evaluated again. The focus of the post-improvement documentation was mainly limited to the validation of the auto assignment. This was done for two primary reasons; first, brevity and ease of comprehending the impact of the improvements; and second, all the improvements are expected to ultimately result in an improved auto performance because it is the dominant mode of travel.

4.1.1 Auto Assignment

Exhibit 14 shows the revised model performance of individual roadways. The original model results were kept for comparison purposes.

Exhibit 14. Updated PFM Performance – AM Peak Hour

Roadway	Counts	Updated PFM Volumes	PFM		Updated PFM	
			GEH	PFM / Counts	GEH	PFM / Counts
HWY 50	25,597	25,679	99.5	0.47	0.51	1.00
King St	10,222	11,150	22.8	0.78	8.98	1.09
Mayfield Rd	5,397	5,639	18.7	0.74	3.26	1.04
Albion Vaughan Rd	2,041	2,070	20.5	0.59	0.64	1.01
Old Church Rd	390	752	3.7	1.20	15.15	1.93
Queensgate Blvd	921	1,313	0.0	1.00	11.73	1.43
Castlederg Side Rd	336	479	37.6	4.36	7.08	1.43
Coleraine Dr	5,392	5,044	16.0	1.25	4.82	0.94
Humber Station Rd	355	102	40.1	6.43	16.74	0.29
The Gore Rd	2,458	2,258	0.04	1.00	4.12	0.92
George Bolton Pkwy	141	29	16.2	0.02	12.15	0.21
Industrial Rd	37	68	21.1	8.65	4.28	1.84
McEwan Dr W	354	62	1.1	0.94	20.25	0.18
Healey Rd	1,390	1,357	18.5	0.53	0.89	0.98
Wilton Dr/Allan Dr	273	315	21.1	0.07	2.45	1.15
Elmwood Dr W	427	652	8.8	1.48	9.69	1.53
Bolton Heights Dr	283	322	6.3	1.39	2.24	1.14
Columbia Way	338	242	25.8	0.00	5.64	0.72
Evans Ridge	147	401	14.9	2.67	15.34	2.73
Old King Rd	38	0	8.7	0.00	8.72	0.00
Humber Lea Rd	383	448	5.2	1.29	3.19	1.17
Station Rd /Deer Valley Dr	139	181	12.0	2.32	3.32	1.30
Harvest Moon Dr	542	818	3.7	1.17	10.58	1.51
Glasgow Rd	28	87	7.9	3.18	7.78	3.11
Duffys Lane	42	43	18.7	6.67	0.15	1.02
Parr Blvd	55	63	6.7	0.00	1.04	1.15
Holland Dr	76	7	11.6	0.04	10.71	0.09
Total	**56,594**	**59,581**	**64.9**	**0.74**	**7.34**	**1.03**

As seen in Exhibit 14, the updated PFM has witnessed significant improvements over the original PFM, with 71% of the roads now exhibiting a GEH value of less than 10.0 and the overall GEH dropping to only 7.3. **Exhibit 15** shows the performance of the updated PFM by road classification.

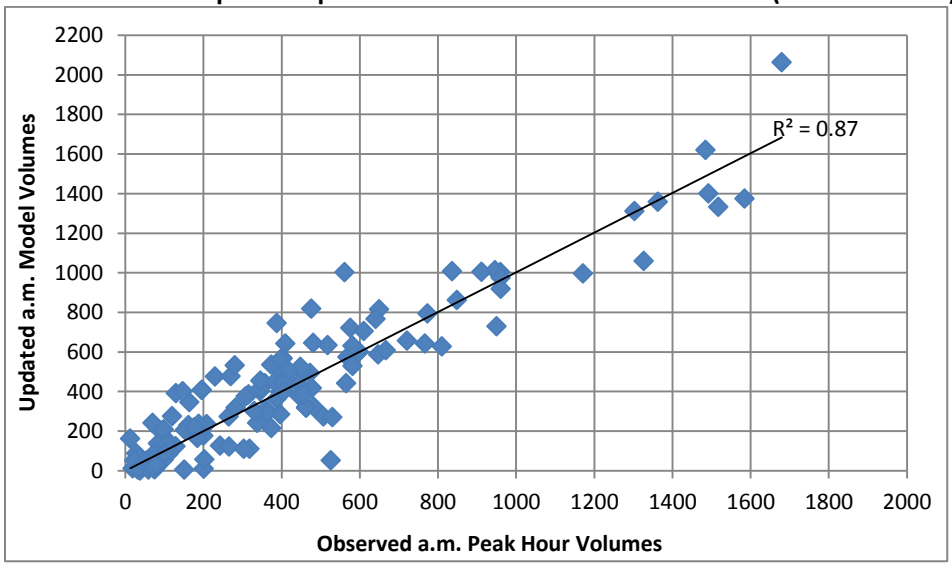
Exhibit 15. Performance by Road Classification – Updated PFM (AM Peak Hour)

Class Type	Counts	Updated PFM	PFM		Updated PFM	
			GEH	PFM / Counts	GEH	PFM / Counts
Major Arterial	48,649	49,582	85.3	0.64	4.2	1.02
Rural Arterial	4,244	4,929	26.2	1.42	10.1	1.16
Collector	3,662	3,851	0.7	1.01	3.1	1.05
Local	1,260	1,381	10.1	1.30	3.3	1.10

Of all the road classes, only the rural arterials are just over the acceptable GEH value of 10.0. The updated PFM is over reporting volumes on the rural arterials by close to 1,000 vehicles in both directions combined. However, this over estimation is not at the expense of under reporting vehicles on other road classes, that would have resulted in the model reporting fewer existing capacity constraints in the system.

The 2031 forecasting exercise that will be undertaken with the updated PFM will be cognizant of the model's tendency to marginally over report volumes on the rural arterials as capacity improvements are tested in the network. **Exhibit 16** presents a scatter plot comparing the updated PFM volumes to traffic counts.

Exhibit 16. Scatterplot of Updated PFM Volumes to Traffic Counts (AM Peak Hour)



The R-squared value has increased drastically from 0.27 to 0.87. This updated R-squared value is above the acceptable range of 0.8. Further, the cone-like spreading pattern has also been eliminated.

4.1.2 Vehicle Kilometers Travelled and Vehicle Hours Travelled

The Vehicle Kilometers Travelled (VKT) and the Vehicle Hours Travelled (VHT) for links within and surrounding Bolton from the updated PFM by road class is shown in **Exhibit 17** and **Exhibit 18**.

Exhibit 17. VKT comparison for the links with TMC data (AM Peak Hour) – Updated PFM

VKT	Count VKT (% of Total)	Updated PFM Model (% of Total)	PFM		Updated PFM	
			GEH	PFM VKT/ Count VKT	GEH	PFM VKT/ Count VKT
Major Arterial	27,369 (81%)	28,810 (81%)	55.94	0.71	8.60	1.05
Rural Arterial	4,571 (14%)	5,158 (14%)	56.54	1.68	8.42	1.13
Collector	1,380 (4%)	1,416 (4%)	1.93	1.06	2.92	1.08
Local	409 (1%)	389 (1%)	5.27	1.24	1.00	0.95
Total	33,656	35,773	13.12	0.94	11.36	1.06

Exhibit 18. VHT comparison for the links with TMC data (AM Peak Hour) – Updated PFM

VHT	Count VHT (% of Total)	Updated PFM Model (% of Total)	PFM		Updated PFM	
			GEH	PFM VHT/ Count VHT	GEH	PFM VHT/ Count VHT
Major Arterial	33,163 (81%)	34,574 (80%)	57.94	0.70	7.66	1.04
Rural Arterial	5,117 (12%)	5,540 (13%)	55.06	1.69	5.81	1.08
Collector	1,985 (5%)	2,399 (6%)	6.34	1.17	8.84	1.21
Local	782 (2%)	827 (2%)	11.49	1.38	1.58	1.06
Total	41,047	43,340	14.52	0.93	11.16	1.06

4.1.3 Trip Distribution

The updated PFM's trip distribution, differences between the 2011 TTS, and GEH values are shown in **Exhibit 19**. In the updated PFM, 90% of the O-D interchanges exhibit a GEH value of less than 10.0 as compared to an acceptable threshold of 85%.

MMM GROUP

Exhibit 19. Updated PFM Auto Trip Distribution within Bolton (AM Peak Hour)

Updated PFM		Rest of GTHA	Original EMME Zones								Total Internal (Bolton)	Total
			1689	1692	1691	1694	1690	1753	1693	1695		
Rest of GTHA			503	469	885	494	576	325	460	106		**3,818**
Original EMME Zones	**1689**	188	33	2	45	7	7	0	1	0	95	**283**
	1692	935	47	74	184	70	73	9	44	0	501	**1,436**
	1691	290	0	0	10	1	1	0	25	0	37	**327**
	1694	594	48	53	141	68	32	8	33	15	398	**992**
	1690	643	27	50	162	54	53	6	52	1	405	**1,048**
	1753	562	37	38	98	37	34	13	20	0	277	**839**
	1693	1201	62	78	154	69	36	7	69	51	526	**1,727**
	1695	196	48	9	29	19	9	11	17	17	159	**355**
Total Internal (Bolton)			302	304	823	325	245	54	261	84	2,398	
Total		**4609**	**805**	**773**	**1,708**	**819**	**821**	**379**	**721**	**190**		**10,825**

Updated PFM - TTS		Rest of GTHA	Original EMME Zones								Total Internal (Bolton)	Total
			1689	1692	1691	1694	1690	1753	1693	1695		
Rest of GTHA			224	39	85	-93	-102	112	99	-72		**292**
Original EMME Zones	**1689**	35	-8	-11	10	7	7	0	1	0	6	**41**
	1692	132	47	23	156	-18	73	-14	-3	0	264	**396**
	1691	89	0	0	-29	1	1	0	25	0	-2	**87**
	1694	117	48	30	123	27	9	-15	-37	-3	182	**299**
	1690	-187	27	27	127	31	-16	-29	-32	1	136	**-51**
	1753	65	37	20	75	37	-20	13	20	0	182	**247**
	1693	30	39	-23	96	-13	-47	7	-19	4	44	**74**
	1695	-50	25	-40	29	1	-19	11	-11	17	13	**-37**
Total Internal (Bolton)			215	26	587	73	-12	-27	-56	19	825	
Total		**231**	**439**	**65**	**672**	**-20**	**-114**	**85**	**43**	**-53**		**1,348**

GEH		Rest of GTHA	Updated EMME Zones								Total
			1689	1692	1691	1694	1690	1753	1693	1695	
Rest of GTHA			11.3	1.8	2.9	4.0	4.1	6.8	4.9	6.0	4.8
Original EMME Zones	**1689**	2.68	1.3	4.0	1.6	3.7	3.7	0.0	1.4	0.0	2.5
	1692	4.48	9.7	2.9	15.2	2.0	12.1	3.5	0.4	0.0	11.3
	1691	5.68	0.0	0.0	5.9	1.4	1.4	0.0	7.1	0.0	5.2
	1694	5.06	9.8	4.9	13.8	3.7	1.7	3.8	5.2	0.7	10.3
	1690	6.89	7.3	4.5	12.8	5.0	2.0	6.4	3.9	1.4	1.6
	1753	2.82	8.6	3.8	9.6	8.6	3.0	5.1	6.3	0.0	9.2
	1693	0.87	6.0	2.4	9.3	1.5	6.1	3.7	2.1	0.6	1.8
	1695	3.36	4.2	7.4	7.6	0.2	4.4	4.7	2.3	5.8	1.9
Total		3.45	18.1	2.4	18.1	0.7	3.8	4.6	1.6	3.6	13.4

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5.0 CONCLUSION

The analysis presented in this document shows that the updates carried out to the PFM have resulted in a robust strategic forecasting tool. The supply-side (network) improvements carried out to the PFM were focused for the Bolton area, but the demand-side (trip generation, distribution, macros, and input matrices) improvements are applicable for the entire PFM and add significant value to the model and the Region of Peel.

Any forecasting in the Bolton study area based upon the original PFM would have been of poor quality and thus of questionable value to the Transportation Master Plan. The updated PFM will now be used to undertake future horizon year forecasts under different land use and infrastructure conditions.

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APPENDIX A: GEH STATISTIC

The GEH statistic was used for measuring the performance of the auto assignments within the model. This statistic allows the user to compare two sets of numbers (volumes) instead of using simple percentages, which can lead to distortion. Its primary advantage is that it is self-scaling and can be used over a relatively wide range of traffic volumes. The other important theoretical consideration in using the GEH is that its mathematical form (shown below) is similar to the Chi-squared test, which allows the user to identify whether a given set of numbers are truly "different" from another set.

$$GEH = \sqrt{\frac{2(M-C)^2}{M+C}}$$

where, M is the hourly traffic volume from the model and C is the observed traffic volume.

The GEH is widely used as an acceptance criterion for travel demand forecasting models in the field of transportation modeling.

TOWN OF CALEDON



APPENDIX D – OD SURVEY RESULTS

FOR

THE BOLTON TRANSPORTATION MASTER PLAN STUDY

MMM GROUP

To:	Kant Chawla, Town of Caledon Eric Chan, Peel Region	**Date:**	January 23, 2015
From:	Ismet Medic, MMM Chris Tam, MMM	**Job No.:**	1614005-001-TP1
Subject:	**Bolton Transportation Master Plan** Results of the OD Truck Survey - Update	**CC:**	Peter Hillier, MMM Brett Sears, MMM

This memo summarizes the results of the OD truck survey conducted on August 14, 2014 from 6:00 AM to 8:00 PM. The purpose of the survey was to establish origin/destination patterns and to identify the proportion of trucks travelling on King Street and Highway 50 that would be affected by prohibition of truck movements through the Bolton core. The survey results were also used to quantify the proportion of trucks that serve a local business need versus the number of trucks that are using King Street and Highway 50 for through trips. The survey captured point-to-point movements of trucks between 9 survey stations located on King Street, Highway 50 and Mayfield Road. These movements were obtained by matching the license plates of trucks passing through the stations. The memo also compares result of the new OD truck survey and the OD truck survey conducted on May 16, 2013.

Capture Rates

The capture rate represents the ratio between a number of plates recorded and a total number of trucks observed at stations. Based on information received from AccuTraffic, plates were recorded for more than 97% of trucks passing through the stations. This represents a significant improvement compared to the 2013 OD truck survey which had the capture rate of 55.9%.

King Street East-West Direction

Eastbound/Westbound point to point truck movements were captured at the 5 survey stations on King Street/Road from Coleraine Drive and Highway 400. The survey results are as follows:

- The results show that a number of trucks using King Street for through trips is considerably higher compared to the previous survey. It was observed that 20% of the westbound trucks and 23% of the eastbound trucks travel along the entire section of King Street/Raod between Highway 400 and Coleraine Drive. Based on the results of the previous survey, the percentage of the westbound and eastbound through trips between these two stations is only 8.8% and 5.9% respectively. These “longer-distance” through trucks trips would be provided with a number of alternative travel routes if a restriction through the Core is implemented and they might be less affected compared to “short-distance” trucks that originate or stay within the Bolton boundaries.

- The results show that 34% of the total number of the eastbound trucks passing through Station 6 at Coleraine Drive did not pass through Station 4 at Highway 50. In the previous survey Station 4 on Highway 50 was located north of King Street; hence, the results of these two surveys cannot be compared. However, the results of the both surveys for Station 7 at Albion Vaughan Road are very similar and show that approximately 34% of the total number of the eastbound trucks passing through Station 6 at Coleraine Drive did not pass through this station. This demonstrates that the results of the new survey are accurate and that a significant percentage of trucks turn on side streets from King Street between Coleraine Drive and Highway 50 despite the truck movements

being prohibited on almost all side streets. The additional more detailed analysis of the licence plate match results was undertaken to identify the potential reasons for this occurrence. It was identified that 5% of the total number of the eastbound trucks passing through Station 6 at Coleraine Drive travel in the southbound direction on Highway 50 through Station 4. It appears that these are delivery trucks and/or trucks that utilize Ann Street and Sterne Street in order to avoid the eastbound right turn restrictions at the King Street and Highway 50 intersection. Additionally, it was identified that 11% of the total number of the eastbound trucks passing through Station 6 at Coleraine Drive were captured as the westbound trucks passing through the same station. This suggests that these are delivery trucks servicing local businesses, including the industrial sites located south of Old Elwood Drive and west of Wilton Drive, which then return back on King Street and travel in the opposite direction. After accounting for these trucks and the trucks that utilize Ann Street and Sterne Street, there is still 18% of trucks that turn from King Street and probably use restricted routes to access Highway 50. It is reasonable to assume that not all trucks servicing the industrial uses located south of Old Elwood Drive and west of Wilton Drive return back on King Street, but that some of these trucks instead continue travelling eastbound on Elwood Drive and/or Wilton Drive to access Highway 50. The remaining trucks are likely the "through" trucks that use restricted routes in order to avoid the eastbound right turn restrictions at the King Street and Highway 50 intersection. These trucks would likely continue to violate restrictions such as those on Station Road or Old Ellwood Dr in the future.

- The new survey data shows that 24% of the eastbound trucks travelling on King Street turn on side streets between Station 7 at Albion Vaughan Road and Station 8 at Highway 27. The results of the previous survey are even higher and show that almost 47% of the eastbound trucks turn onto side streets between these two stations. Since only through truck movements were captured at Station 8, it is anticipated that a significant percentage of these trucks turn onto Highway 27. Based on a review of the existing road network and traffic patterns, it is likely that the majority of trucks turning onto Highway 27 travel in the southbound direction. Another possibility is that some trucks are turning left onto Concession 11, although trucks are prohibited on this road, and continue to travel northbound to Highway 9. Moreover, given that eastbound trucks are not allowed to turn left from King Street onto Highway 50, Concession 11 represent the first feasible alternative to travel north and access Highway 50. If the survey results and these assumptions are accurate, then it is likely that these trucks turning onto Highway 27 northbound and/or Concession 11 will divert to the new Bolton Arterial Road and will not be affected by the potential prohibition of trucks on King Street through the Bolton core.

- The results of the new survey show that 76% of the total number of the westbound trucks passing through Station 9 at Highway 400 passed through Station 8 at Highway 27. This is significantly higher compared to 25.5% based on the results of the previous survey. It seems very unlikely that Weston Road, which runs parallel to Highway 400 and is the only possible alternative, will attract 74.5% of all the westbound trucks that pass though Station 9 at Highway 400. Hence, it is our opinion that the results of the new surveys are more accurate.

- Similar to the eastbound direction, the results of the new survey show that a significant percentage (44.0%) of the westbound trucks travelling on King Road turn on side streets between Station 8 at Highway 27 and Station 7 at Albion Vaughan Road. Since only through truck movements were captured at Station 8, it is anticipated that a significant percentage of these trucks turn onto

Highway 27. Based on the review of the existing road network and traffic patterns, it is likely that the majority of trucks turning onto Highway 27 travel in the southbound direction. Another feasible explanation for this occurrence again seems to be that some of those trucks are turning right (north) onto Concession 11 and continue to travel northbound to Highway 9.

- The results of the survey show the percentage of the westbound trucks to increase from 21% at Station 7 at Albion Vaughan Road to 24% at Station 4 at Highway 50 and then decreases to 20% at Station 6 at Coleraine Drive. This results in a difference of 5 westbound trucks between Station 7 and Station 4, which is marginal and could be explained as a result of different capture rates achieved at these two stations. Therefore, the survey results appear to be reliable.

Highway 50 North-South Direction

Northbound/Southbound point to point truck movements were captured at the 4 survey stations on Highway 50 from Mayfield Road and Old Church Road. The survey results are as follows:

- The result of the previous survey indicated that 37% of the northbound truck trips passing through Station 2 at Mayfield Road entered the industrial area south of Healey Road, and 25% entered the area north of Healey Road. The new survey indicates that 74% of the truck trips entered the industrial area south of Healey Road and only 8% north of Healey Road. Given that the land use pattern has the majority of industrial lands south of Healey Road, the new survey is likely more realistic. A review of the 11-hour turning movement counts previously provided by the Region for 2012 and 2013 also show that the industrial area bounded by Coleraine Drive, Highway 50, Mayfield Road and George Bolton Parkway is a significant generator of truck trips. This conclusion is also supported by the results of the licence plate matches between Station 1 at the Mayfield Road and Coleraine Drive intersection which show that this industrial area attracts the majority of the eastbound truck trips passing through the Mayfield Road and Coleraine Drive intersection. The results of the 11-hour turning movement counts also show that approximately 70% (335 out of 483) of the eastbound truck trips on Mayfield Road turn left onto Pillsworth Road after passing though the Mayfield Road and Coleraine Drive intersection.

- The results of the new survey show that 9% of the northbound truck trips turned left onto Healey Road while 17% proceeded northbound. As indicated above, 8% of these truck trips entered the industrial area north of Healey Road and only 9% proceeded northbound through Station 4 at King Road and Station 3 at Old Church Road. The previous survey indicated that 23% of the northbound truck trips deviated from Highway 50 north of Warbrick Lane. However, given that there are no authorized east-west truck routes north of Warbrick Lane, this is unlikely. The new survey indicates that no trips deviate from Highway 50 until after Old Church Road which is more realistic. Hence, this suggests that only 9% of the total number of the northbound truck trips passing through Station 2 at Mayfield Road will be affected by the potential prohibition of truck movements on Highway 50 through the Bolton core. In the case that a restriction through the Bolton core is implemented, these trucks will be able to utilize the new Bolton Arterial Road.

- The new surveys indicates that 68% of the total number of the southbound truck trips passing through Station 3 at Old Church Road did not pass through Station 4 at Highway 50. The survey data shows that 344 southbound trucks passed though Station 3 which suggests that 234 truck trips

entered the area between Old Church Road and King Street. Given that there are no authorized east-west truck routes between Old Church Road and King Street, the survey results seems to be unlikely. However, the survey results at Station 5 at Healey Road and Station 2 at Mayfield Road are consistent and appear to be realistic. Moreover, the results of the previous 2013 OD truck survey also indicated that 34.7% of the southbound truck trips entered the area north of Warbick Lane, and 24.2% entered the area between Warbrick Lane and Healey Road. The review of the 11-hour turning movement counts provided by the Region for 2012 and 2013 also revealed a significant difference in the southbound truck trips observed at Old Church Road and the intersections to the south. Therefore, it appears that the survey results may be accurate and that for unknown reasons a proportion of southbound trucks left the Highway 50 corridor between Old Church Road and King Street.

A more detailed analysis of the licence plate match results and the TMC data was undertaken to identify the potential reasons for this occurrence. The possibility that some truck drivers utilized Sterne Street and Ann Street to turn onto King Street and travel westbound was assessed. It was anticipated that some truck drivers might opt to utilize this option due to the truck turning restrictions implemented at the King Street and Highway 50 intersection. However, the survey results indicated that only 1% of trucks utilized this manoeuvre. Similarly, the results show that only 1% of the southbound truck trips turned left onto Mill Street and then continued travelling in the eastbound direction on King Street. The additional analysis also revealed that 100 trucks or 29% of the total number of 344 southbound trucks passing through Station 6 were captured as the northbound trucks passing through the same station. It is reasonable to assume that these are delivery trucks servicing local businesses located between Old Church Road and King Street. Moreover, it is likely that a significant percentage of these truck trips is generated by James Dick Construction Ltd. site located north of Columbia Way. Another possibility is that some of these are construction trucks used for the Bolton Arterial Road construction. However, the licence plates of 126 southbound trucks or 37% of the total number of truck passing through Station 4 still could not be matched. A review of the 11-hour turning movement counts shows that along this section of Highway 50 between Old Church Road and King Street, a number of trucks turning onto Highway 50 from the side roads exceeds a number of trucks turning from Highway 50 onto the side roads. Therefore, it is unlikely that the discrepancy in the number of the southbound trucks passing through Station 3 and Station 4 is due to the utilization of the restricted side routes. A feasible explanation for this is that these trucks stayed at the James Dick Construction Ltd. site and did not return back on Highway 50 and/or the Bolton Arterial Road construction tucks utilized other routes for their return trips.

Mayfield Road – Trips to Highway 50 and Albion Vaughan Road

- The results show that only 9% of trucks continue along Albion Vaughan compared to 25% in the previous survey. This is likely due to the poor capture rate of the old surveys. In addition, 34% turn south onto Highway 50, which are trips likely destined to the CP Intermodal Facility.

Local Delivery Trucks Servicing the Bolton Core

Based on the Region consolidated traffic by-law 15-2013, local deliveries are exempt from truck prohibitions. Therefore, even if truck restrictions/prohibitions are implemented on King Street and

Highway 50, delivery trucks will not be affected and will continue traveling through the Bolton core. To identify a number of the local delivery trucks servicing the Bolton core, the first step was to determine a number of trucks which passed through upstream stations but did not arrive at Station 4 at Highway 50. The next step was to identify a number of trucks that passed through these upstream stations in both directions. It was assumed that the both categories are delivery trucks servicing businesses located between two stations. The results of the local deliver truck analysis are summarized below:

- The results show that 38 trucks or 34% of the total number of 111 eastbound trucks passing through Station 6 at Coleraine Drive did not pass through Station 4 at Highway 50. It was additionally determined that 18 of these trucks or 16% (5% observed as the southbound trucks at Station 4 and 11% observed as the westbound trucks at Station 6) are likely the delivery trucks servicing local businesses. The reaming 18% of trucks are comprised of the local delivery trucks and the "through" trucks using restricted routes to access Highway 50. Based on the available data it is not possible to estimate the spit between these two categories. Hence, the number of the local delivery trucks coming from the west on King Street is estimated to be between 18 and 38.
- It was identified that 17 trucks or 40% of the total number of 41 westbound trucks passing through Station 7 at Albion Vaughan Road were captured as the eastbound trucks passing through the same station. Hence, these 17 trucks are likely the local delivery trucks coming from the east on King Street and returning back in the opposite direction.
- It was identified that 4 trucks or 1% of the total number of 344 southbound trucks passing through Station 3 at Old Church Road utilized Sterne Street and Ann Street to turn onto King Street and travel westbound. Similarly, the results show that 4 trucks or 1% of the southbound truck trips turned left onto Mill Street and then continued travelling in the eastbound direction on King Street. These 8 trucks are assumed to be local deliver trucks. The results also show that additional 226 trucks of the total number of the southbound trucks passing through Station 3 did not pass through Station 4 at Highway 50, and that 100 of these 226 trucks returned back on Highway 50 and proceeded northbound through Station 3 while 126 trucks could not be traced. It cannot be estimated how many of these 226 trucks travel south of Columbia Way and enter the Bolton core, but it is anticipated that this number is relatively low.
- The results show that 21 trucks or 17% of the total number of 125 northbound trucks passing through Station 5 at Healey Road were captured as the southbound trucks passing through the same station. It is assumed that some of these trucks are local delivery trucks servicing the Bolton core, but it is likely that the majority of these trucks are generated by land uses located south of Elwood Drive and do not enter the Bolton core.
- It is important to recognize that the local delivery trucks analysis results above do not account for trucks which proceed in the same direction after servicing local businesses in the Bolton core. These trucks cannot be identified based on the available data.

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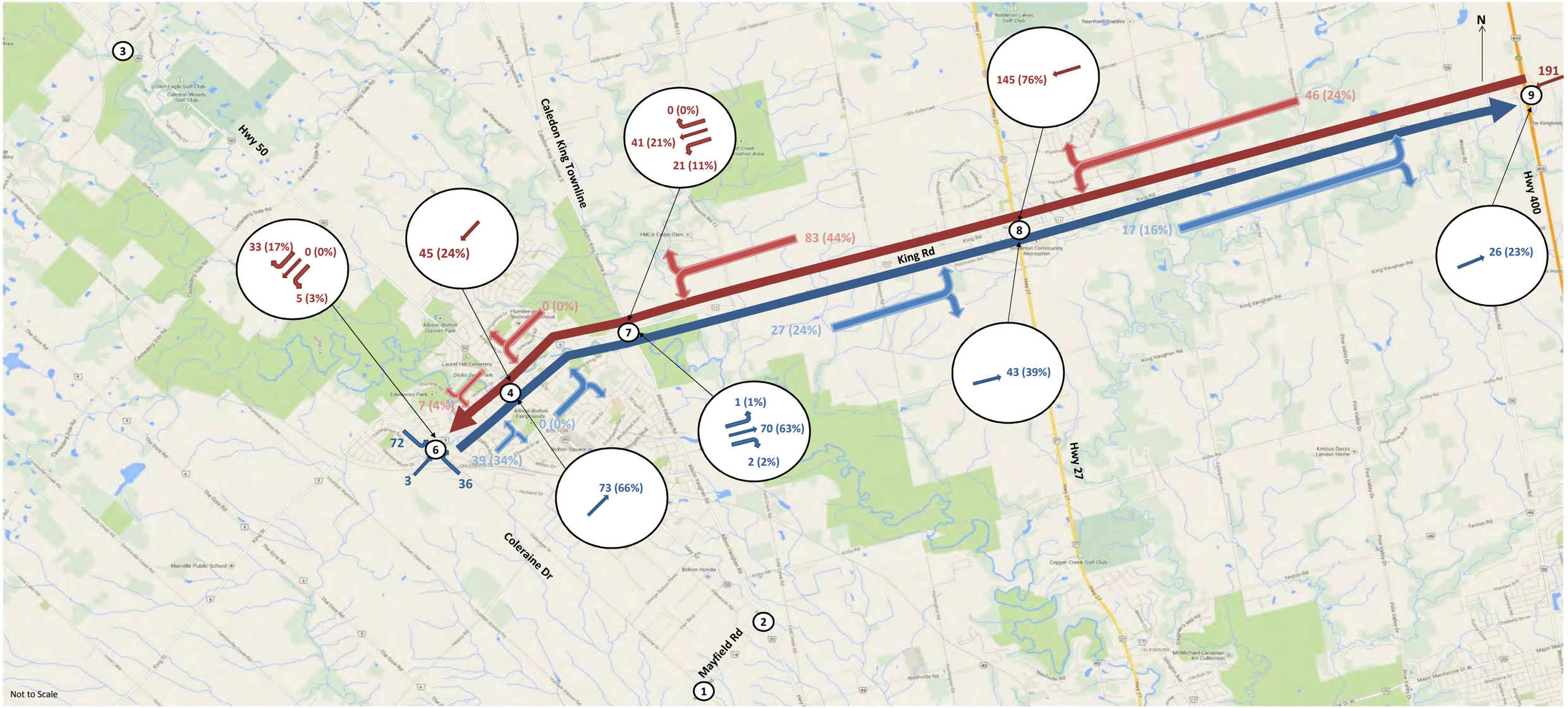
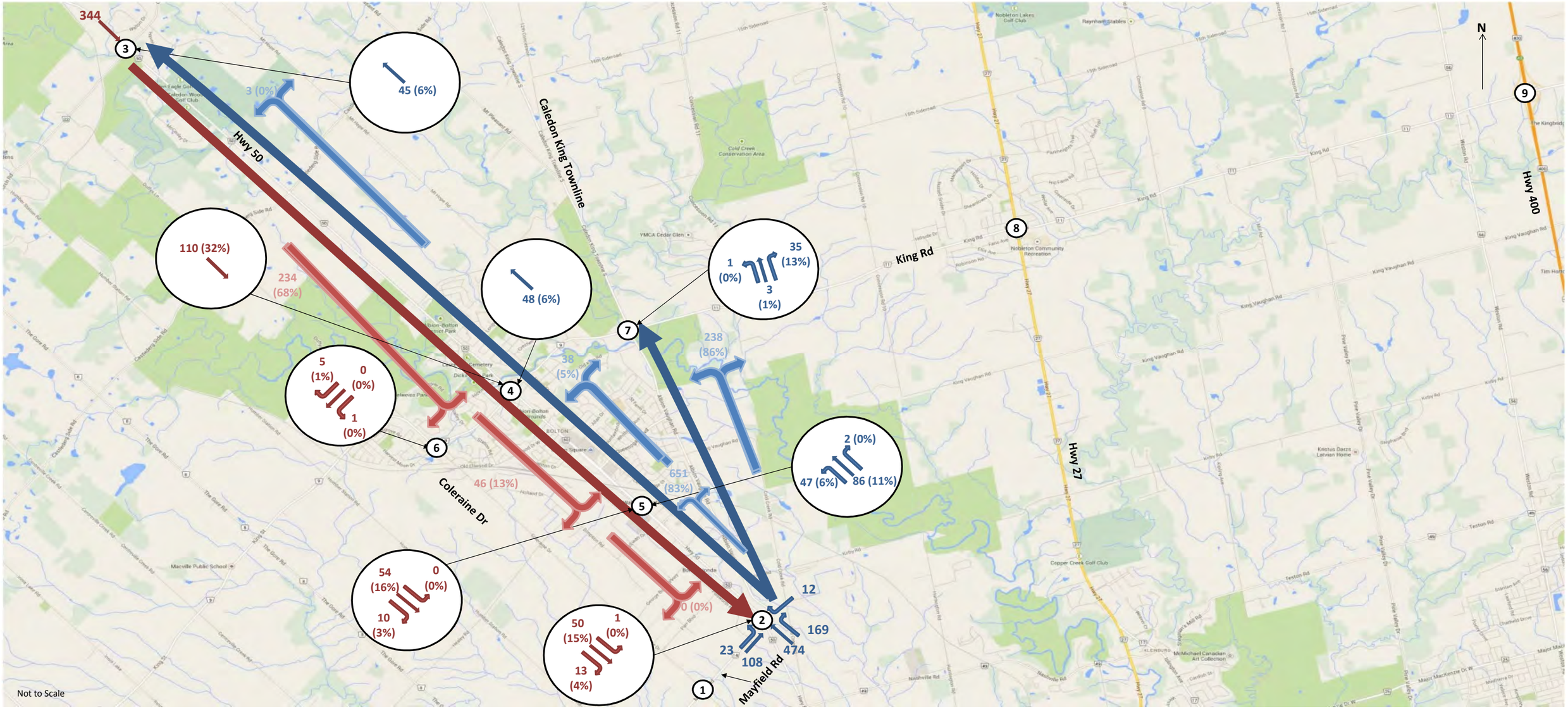
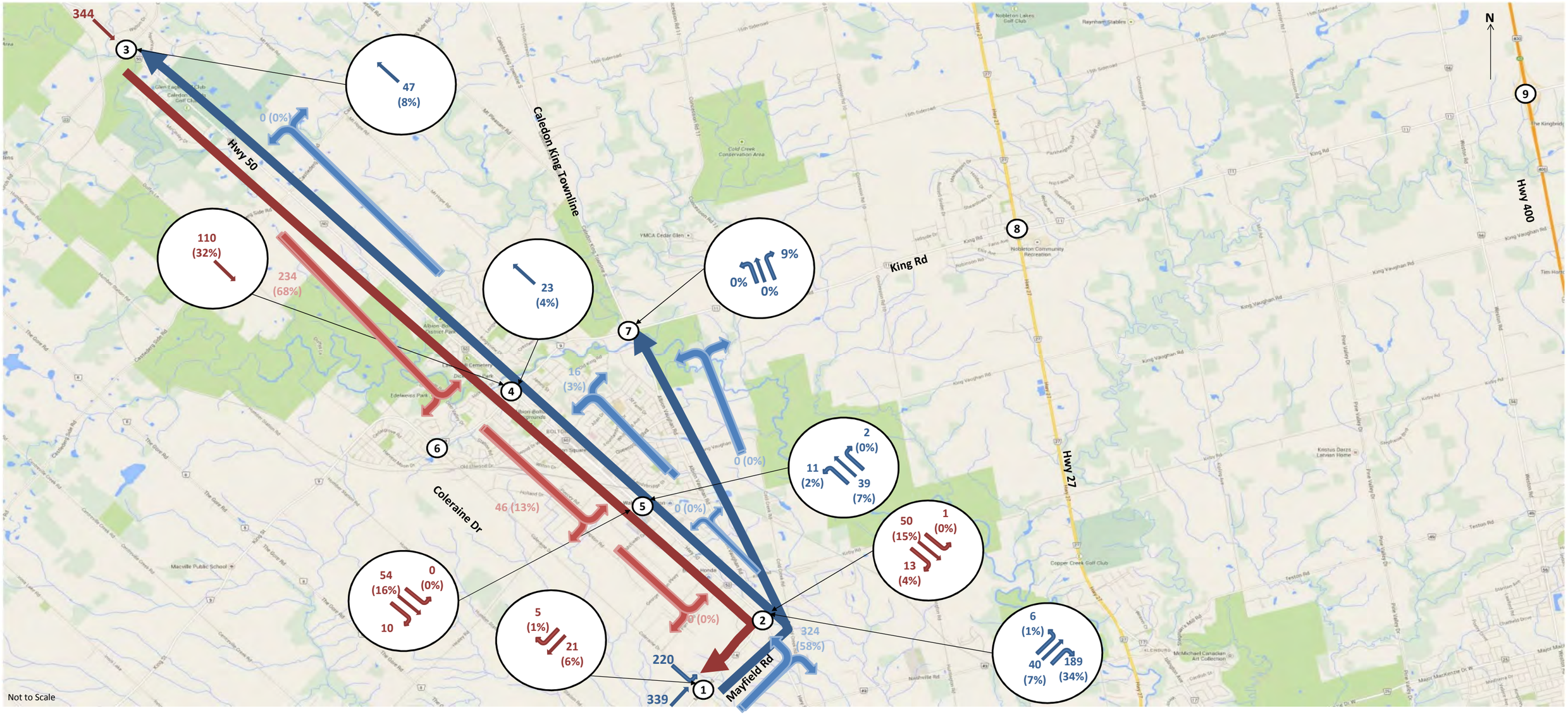
East-West Truck Movements between Coleraine Dr and Hwy 400



North-South Truck Movements Between Mayfield Rd and Old Church Road



North-South Truck Movements Between Coleraine Dr and Old Church Road via Mayfield Rd





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Region of Peel
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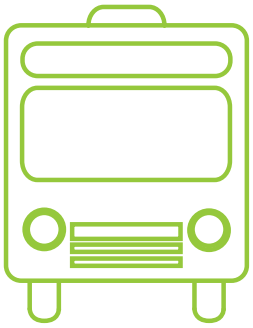



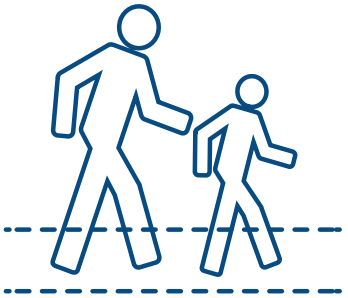











ACTIVE TRANSPORTATION STRATEGY

FOR

THE BOLTON TRANSPORATION MASTER PLAN STUDY

JULY 2015

MMM GROUP



D16-14-012



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1.0 INTRODUCTION

The Bolton Transportation Master Plan (TMP) sets out a strategic vision and is supported by clear objectives. Many of these objectives support the development of a community that is active, sustainable and attractive to businesses, shoppers, tourists, and residents of all ages. The development of a continuous and connected system of Active Transportation (AT) facilities that seamlessly connects to alternative modes of transportation and highlights the natural and cultural features of a community can help to achieve this. The following is an AT strategy for the community of Bolton that builds on the successes of the Town of Caledon, Peel Region and the Toronto and Region Conservation Authority, highlights the opportunities available, complements the community culture and strives to enhance economic and liveability of Bolton.

1.1 WHAT IS ACTIVE TRANSPORTATION?

Active Transportation is defined by Transport Canada as:

"All human-powered form of transportation, in particular walking and cycling. It includes the use of mobility aids such as wheel chairs, and can also encompass other active transport variations such as in-line skating, skateboarding, cross-country skiing…."





Though the term active transportation is typically associated with human powered activities, these sustainable and health supportive modes also play a role in the bigger multi-modal and complete streets picture. Everyone's day-to-day trip starts with walking. AT can easily be combined with and support other travel modes, including public transit to expand travel choices and increase connectivity when travelling within and to and from a community.

Bolton's AT Strategy focuses on accommodating pedestrians and cyclists throughout the community of Bolton for predominantly recreational and short distance utilitarian trips. It is also recognized that Bolton can be a stopping point / destination for hikers or cyclists engaging in touring trips.

Though pedestrians and cyclists are the focus of this strategy, there are other user groups that use some of these facilities, where feasible and permitted. Other users include individuals with mobility limitations, including those who require assistive devices, as well as users of e-bikes, ATVs and snowmobiles where permitted. When developing the AT network and proposed facility types / network improvements, accessibility for people of all ages and abilities were considered. In addition to the different modes of AT, walking and cycling routes can also be defined by the intent of the trip. Based on trends and best practices these "trip types" can be organized into three (3) categories:

- Recreational Trips: Where the primary objective is to enjoy one's experience. Pedestrians and cyclists tend to use AT routes for fitness or leisure. Trips are typically taken on the weekend and will be used to access community destinations or areas of cultural and natural significance.



- Utilitarian Trips: Where the primary objective is to reach a particular destination for day-to-day activities. These users typically use active transportation for their daily mode of transportation and use them year-round. They typically have good mobility skills and understand the rules of the road.
- Touring Trips: Where the primary objective is to cover long distances for both utilitarian and recreational trips. Pedestrians and cyclists will engage in full day or multi-day excursions and may plan trips in advance.

When designing facilities, it is important to understand both the "who" and "why" of different users. By understanding the characteristics and needs of different user groups, designers can make more informed planning and design decisions about "how" different users should be accommodated.

1.1.1 Benefits of Active Transportation

In order to demonstrate to residents, businesses, Councillors and visitors that active transportation is a viable and important part of the transportation system in Bolton, it is important to highlight and promote the different benefits that can be generated from improved programming and infrastructure. The benefits of AT can typically be categorized into six themes:

- Community Safety: as the number of individuals walking and cycling increases, motorists become more aware of these users reducing the rate of collision with AT users; furthermore, active transportation users can also serve as "eyes on the street" which can lead to a reduction in certain types of crime;
- Health: walking and cycling are excellent forms of physical activity and are associated with well documented improved health outcomes such as improved physical fitness, lower obesity and a lower risk of cardiovascular disease;
- Transportation: as active travel modes achieve a greater mode share, the proportion of trips being taken in motor vehicles decreases which can reduce congestion and improve the efficiency of the overall transportation system;
- Economy: the economic benefits of cycling occur at both the individual level – due to lower transportation costs resulting in higher disposable incomes for other purposes – and for multiple levels of governments – due to lower road investment costs and potentially lower healthcare costs;
- Environment: active transportation benefits the environment by reducing both the amount of energy consumed, the amount of greenhouse gas emissions and air pollution produced in the transportation sector; and
- Tourism: from long distance bicycle touring routes to vibrant sidewalks and animated pedestrian realms to hiking and cycling trails, many communities have experienced the tremendous tourism benefits associated with active transportation.

1.2 SUPPORTING ACTIVE TRANSPORTATION IN BOLTON

Trends in AT can be defined by a number of factors including demographics, mode choice, trip length, trip purpose and overall demand / visibility of the routes. To inform the development of an AT network and strategy, it is important to understand the unique characteristics found in Bolton that guide future planning, design and development.

1.2.1 The Socio-Demographic Trends & Demand

AT has a small but important role in Bolton's existing transportation system. The mode share for walking and cycling is estimated to be 2.0% for trips made to and from Caledon (see Figure 1).

More detailed information about the demand and use of existing AT routes in Bolton is revealed through heat maps of running and cycling activity. The maps are generated by users who track their movement with GPS-based mobile applications. In addition, through the Region's AT Strategy demand mapping for pedestrian activity through Bolton was documented using the results of the Transportation Tomorrow Survey. The findings are illustrated in Map 1.

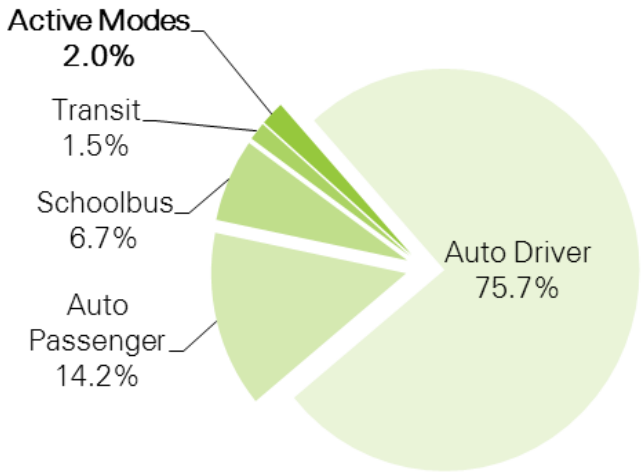


Figure 1 – Travel Mode of trips to and from Caledon
Source: Transportation Tomorrow Survey (TTS), 2011

From this information it can be concluded that high demand for cycling exists along the majority of Regional roads, including King Street East and West and Queen Street North, while the pedestrian trips are occurring mostly on the roads in local neighbourhoods.

The demographic trends and user / demand data can inform current use patterns and corridors as well as suggested locations for improved AT facilities. AT can play a greater role in Bolton's transportation system. Growth can be optimized by understanding the current trip lengths of local residents. Research shows that trips less than 2 km are, in many cases, walkable.

For trips that are 5 km or less, cycling is a feasible option for a growing segment of the population. Based on an assessment of typical walking and cycling trips (see AT Map A), the majority of the Bolton community could walk or bike to local schools or community destinations if motivated to do so. Figure 2 illustrates the estimated trip length and purpose for trips that either begin or end in Caledon. More than 20% of the documented trips are less than 5 km, and more than 10% of trips are less than 2 km. These findings suggest that there is significant potential for increased AT mode share.

The data also suggests that home based discretionary trips, e.g. trips to meet friends, run errands or recreational activities, have a strong potential for greater AT mode share. Less than 1% of these trips are currently made by AT; however, approximately 30% of these trips are less than 5 km in length. For Home-Based School trips, approximately 18% of these trips are less than 2 km in length, yet only 12% of all Home-Based School trips are taken with active modes.

The Region of Peel's Walk and Roll Peel online mapping tool includes a school trip planner, which allows users to select a specific school and then generates a catchment area that highlights the areas that are within a 5, 10 and 15 minute walking distance of that school.

This is an important tool that provides parents and children with helpful information about whether walking or cycling to a school is an option that would be applicable to their schedules and lifestyles. Though these tools are available, there may be other factors that contribute to a lack of walking and cycling to school by local students. One of the primary factors would be the perceived sense of a lack of safety by parents. With more infrastructure options, there may be a return to local trips to school being undertaken by active modes.

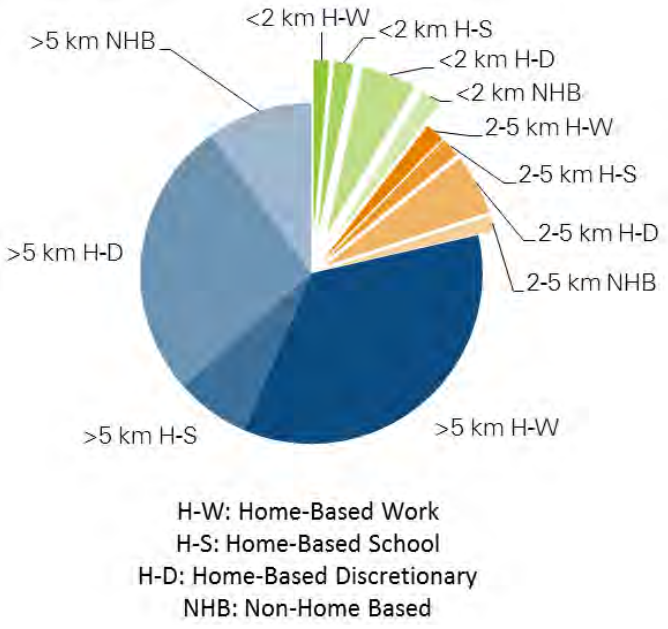


Figure 2 – Trip Length and Purpose in Caledon
Source: Transportation Tomorrow Survey, 2011

1.2.2 Policy, Programs & Initiatives

1.2.2.1 Policies

Beyond these data trends, there is also broad support for AT from all levels of government. Figure 3 shows a snapshot of relevant policies and plans.

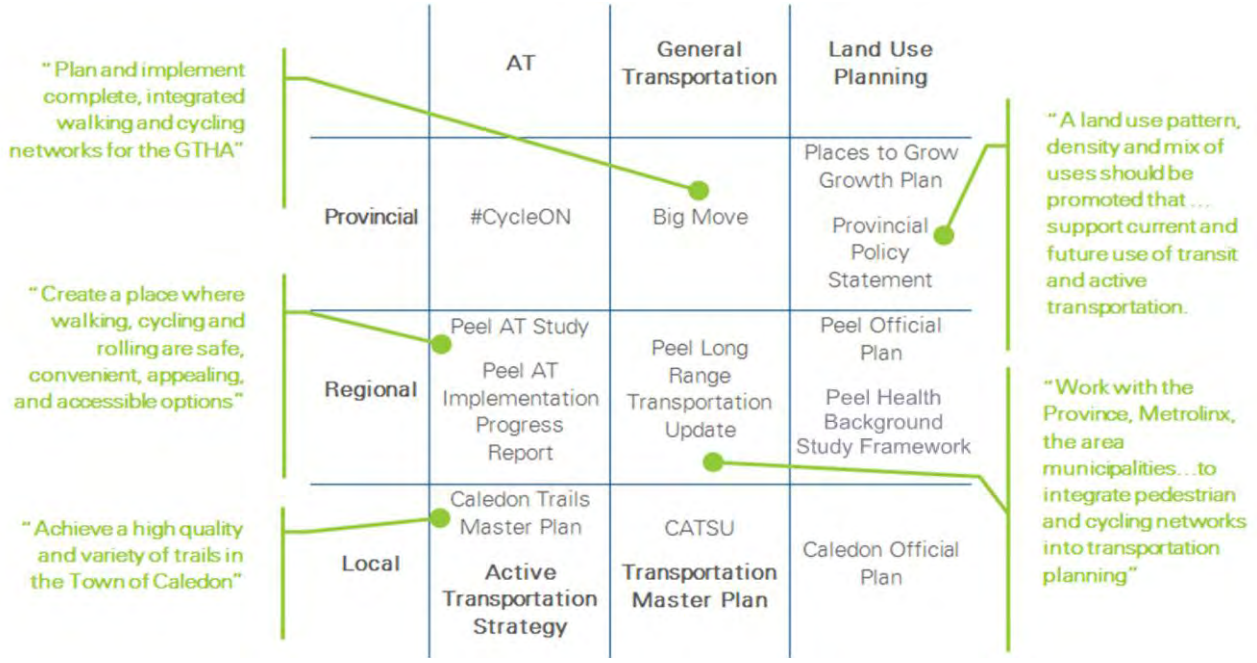


Figure 3 – Policies & Plans that Support Active Transportation in Bolton, ON

1.2.2.2 Programs

Policies are not the only means of AT reinforcement. Programs and initiatives have a strong role in the promotion and marketing of active transportation as a viable mode of transportation. The Region of Peel has developed strong connections with local partners to establish supportive programs and initiatives promote AT in and around the community Bolton. There are numerous examples at all levels including programs and initiatives coordinated by Smart-Commute Caledon-Brampton, the Region of Peel and the Town of Caledon.

Smart-Commute Caledon-Brampton strongly encourages a multi-modal approach to commuting. On their webpage, they provide users with a trip planning tool which identifies the most efficient way to get from your origin to your destination (please see Figure 4 for a sample of the tool)

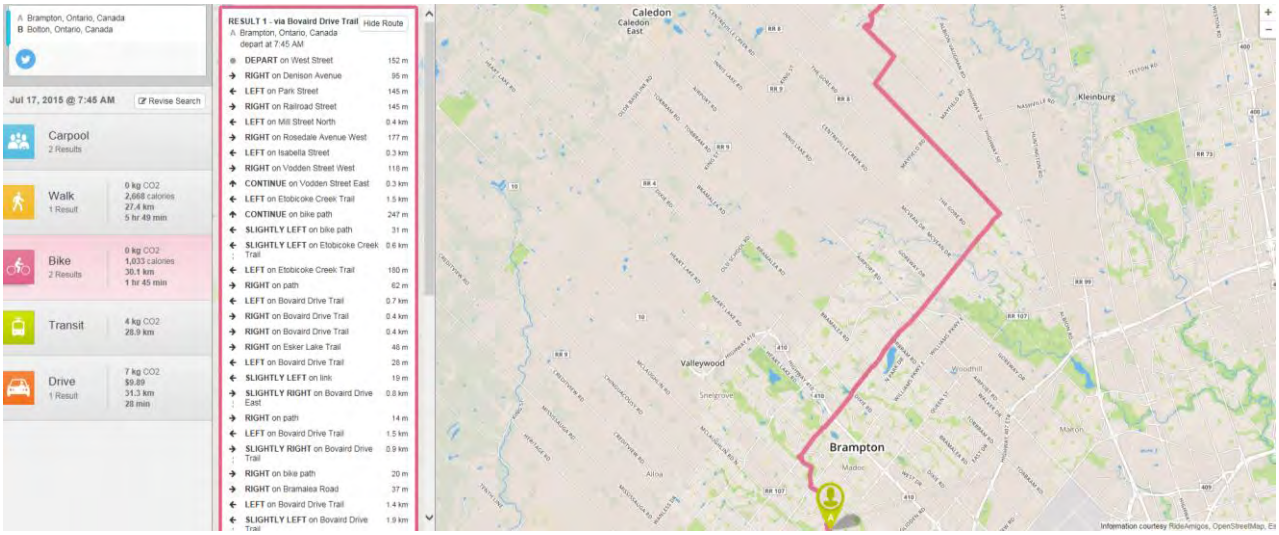


Figure 4 – Smart-Commute Brampton-Caledon Trip Planning Tool

The Region of Peel also provides residents and visitors with an extensive database of information and resources provided on the Region's Walk and Roll Peel webpage (www.walkandrollpeel.ca).

This hub of information can not only be used to gather resources on where and when to safely walk and ride around the Region but also provides users with mapping, trip calculators, and weather and road condition reports to help inform residents of when and how they can participate in active modes of transportation Region-wide. See Figure 5 for a snapshot of the project webpage.

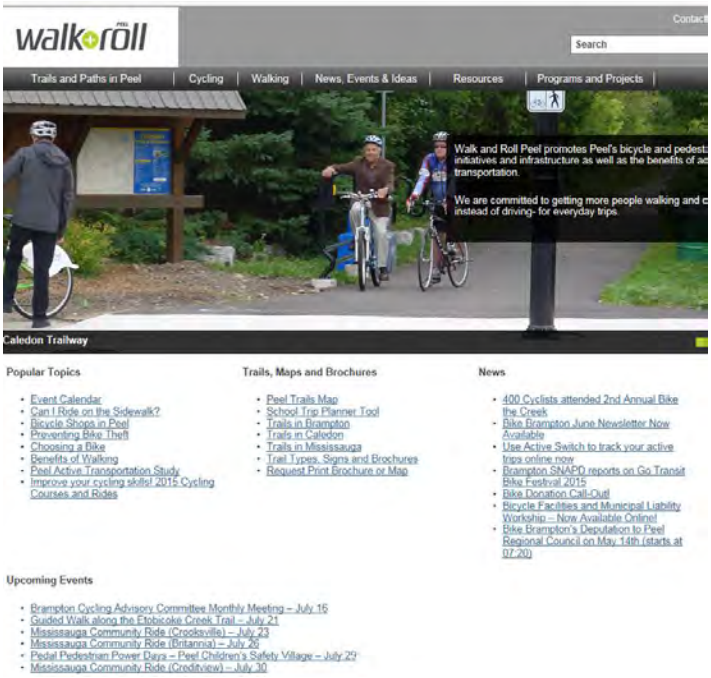


Figure 5 – Region of Peel Walk and Roll Peel Webpage

The Town of Caledon also provides users with resources specific to the Town and its walking and cycling opportunities. Promoted on both the Town's webpage as well as the Region's active transportation hub, the information provides detailed information on the various trails found within the Town. Information provided includes, surface type, types of amenities e.g. washrooms, parking availability, lighting, maintenance and intended users.

These programs provide a strong foundation from which to grow. The success at all levels should be continued through ongoing partnerships between the key stakeholders. A set of recommended initiatives related to education and encouragement (promotion / outreach) are provided in section 4.4 and should be considered by the key partners for future programs in addition to building on those that already exist.

Recommendation(s):

1 The Region of Peel, Town of Caledon and Smart-Commute Brampton-Caledon should continue to work together to promote active forms of transportation throughout the Region of Peel, the Town of Caledon and the Community of Bolton. They should continue to promote existing programs and should explore new programs and initiatives to build on previous successes.

2 The Region, Town and their partners should work with Bolton to identify community specific programs and outreach initiatives which encourage local utilitarian and recreational trips. The Region and Town should consider exploring the recommended programs identified in section 4.4 of the AT strategy.

1.2.2.3 Initiatives

In 2009, the Region of Peel worked with several partners to create the Healthy Development Index (HDI). The HDI outlines recommendations and strategies, based on health related research and evidence that can be used by the Region to increase walkability. The index summarizes empirical evidence linking attributes of the built environment to health outcomes, and configures it into elements and quantifiable measures. The elements under which these standards are organized are: Density, Service Proximity, Land Use Mix, Street Connectivity, Streetscape Characteristics and Parking.

In response to feedback obtained during HDI feasibility testing, the Health Background Study Framework (HBSF) was developed as a user-friendly health implementation tool. The framework is applicable across a range of different contexts and allows developers to identify and pre-emptively mitigate any potential health impacts associated with future developments. The framework has been developed in a manner such that it can be refined by the area municipalities to suit their needs and contexts.

Between 2012 and 2014, the Region of Peel worked collaboratively with the local municipalities and the Waterloo Public Transportation Initiative to undertake a GPS study to evaluate cycling trends within the Region. The study was intended to engage regional cyclists to better understand what motivates them and what hinders them from cycling and, cycling in the bigger picture of transportation choices. GPS units were provided to select cyclists who volunteered to be part of this particular study. The GPS units were able to gather information on where and when cyclists travel, the infrastructure / facilities that are most widely used and areas where cyclists feel additional improvements could be made.

There were a total of 212 participants throughout the Region of Peel with 20 representatives from the Town of Caledon. Results indicated that:

- The primary reason for cycling within the Region is because of the health and fitness benefits that can be realized as well as personal enjoyment / recreation aspects.
- Obstacles or barriers that need to be overcome to increase cycling in the Region include the sense of a lack of safety with specific reference to the conflict between motorists and other users. The weather and road conditions were identified as the second highest concerns.
- Typical trip distances averaged 6.4km (for utilitarian / commuting trips) with a speed of approximately 15 km/h.
- Results showed a strong preference for improved infrastructure including more connected systems.

A total of 2,100 km were travelled in the Town of Caledon. The trips logged within are illustrated in Figure 6. Results indicate some level of cycling within the community of Bolton which primarily occurs for local trips within the downtown core as opposed to accessing surrounding areas within the Town / Region.

A more detailed summary of the results generated can be found using the following link: http://walkandrollpeel.ca/projects/peel-gps-cycling-study.htm

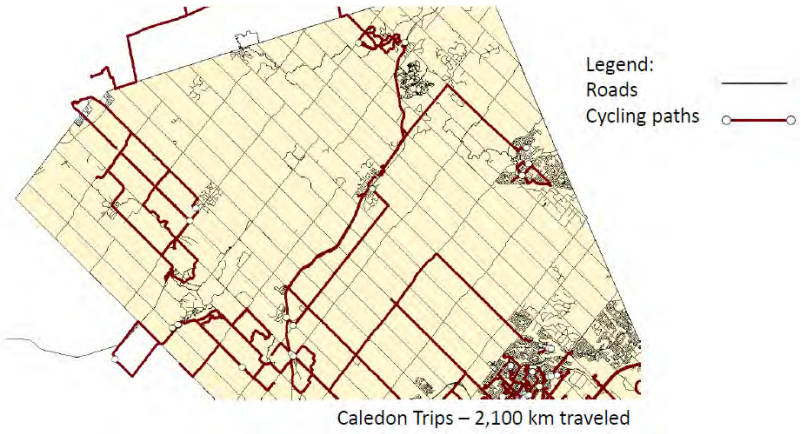


Figure 6 – Cycling Trips logged in the Town of Caledon
Source: Region of Peel Cycling GPS Study (2014)

Building upon the policies, programs and initiatives, the AT strategy includes specific projects that can be implemented in Bolton to make AT a safer, more convenient and more enjoyable way of travelling in and around the community.



1.3 DEVELOPING THE BOLTON AT STRATEGY: THE ASSUMPTIONS

It is important to clearly articulate the assumptions that were made when developing the AT strategy for Bolton. Due to the fact that there are both Regional and Town roads found within the community as well as lands that are privately owned it is important to understand what some of the limitations, opportunities and assumptions are in order to have a common understanding of how this strategy was developed. The following is a list of assumptions that were made by the consultant team based on discussions with the public, stakeholders and Regional and Town staff.

- The Region's Active Transportation Strategy – Walk and Roll Peel – was adopted in 2012. The initial recommendations were investigated and updated as needed to reflect current conditions and emerging design principles.
- The Toronto and Region Conservation Authority (TRCA) is undertaking a master planning assignment on lands in the north-eastern area of Bolton. Future implementation of off-road trails will be determined by their master planning outcomes.
- Roads within the community of Bolton will be designed and developed based on the jurisdiction under which they fall. For example, the facilities identified on Regional roads will be designed and implemented by the Region.
- Maintenance of both on and off-road routes will need to be discussed in further detail and a common and consistent approach, where possible, will need to be applied for Region as well as Town Roads in addition to trails found under different jurisdictions.
- Once implemented, the Bolton Arterial Bypass (BAR) will help to alleviate traffic within the downtown core which will allow for more walking and cycling access and opportunities.
- Future transit connections and sites will require access by walking or by bicycle. Connections to these future planned sites as well as the design of amenities once at the site will be needed.
- Truck traffic is considered a significant barrier to walking and cycling within Bolton. The Town and Region will work together to move forward to restrict truck traffic along key Regional routes within the downtown core to alleviate traffic volumes and encourage walking and cycling.
- In some cases, the ultimate cycling facility identified may not be possible within the short-term. For these select locations, the study team had explored interim facilities which can be implemented in a shorter timeline due to costing, political or coordination constraints.
- The implementation of the strategy will need to be a collaborative and coordinated effort between the Town of Caledon, Region of Peel, Toronto and Region Conservation Authority, private land owners and other stakeholders within the community. It will require ongoing updates to Council and communication between those working on key initiatives.

It is also important to define the intents and purposes of a master plan / strategy. The document is intended to be a high-level planning document which outlines proposed improvements, programs, and initiatives for further investigation and consideration by the Town, Region and its partners. Moving forward, all parties will need to undertake a more detailed feasibility and design studies to confirm the final design details prior to implementation and construction.



2.0 SHAPING THE FUTURE OF ACTIVE TRANSPORTATION IN BOLTON

The future of active transportation in Bolton was shaped by a number of key inputs and considerations. The first is the input provided by members of the study team, stakeholders and interest groups as well as members of the public. The project team engaged in a number of public and stakeholder consultation activities. AT specific highlights are presented in section 2.1. Through the input received, the study team was able to highlight a number of opportunities and challenges related to AT in Bolton. These opportunities and challenges were used to shape the recommendations identified in the strategy and were also used to prepare a study vision and objectives. Each of these items is documented in section 2.0 of the report.

2.1 CONSULTATION: WHAT WE HEARD

Public and stakeholder consultation was a key cornerstone of the Bolton TMP. Over the course of the study, members of the project team engaged with residents, businesses, interest groups, regional and town staff, councillors and other community representatives to gain a better understanding of the desired active transportation improvements. The study team undertook two Public Information Centres (PICs) and stakeholder workshops and an online questionnaire over the course of the study.

Input was gathered at key stages of the study process. At the first PIC and workshop, attendees were asked to review mapping of existing and previously proposed conditions and asked to highlight network / infrastructure related opportunities and barriers. At the second PIC and workshop, attendees were presented with the draft AT network and route phasing. They were asked to rank routes and organize priorities. Input was gathered and tracked using a consultation spreadsheet. We have extracted the key messages that were received at these consultation events which speak specifically to AT improvements in Bolton. The following is a list of these comments:

- Bolton needs more cycling and walking facilities that form a network
- Existing AT facilities should be promoted since many residents are not aware of them
- Residents have safety concerns about crossing Hwy 50 as a pedestrian
- Transportation improvements should enhance, not degrade, the public realm
- Residents are concerned by the high volume of truck traffic and would support the diversion of truck traffic around the community
- Cycling improvements should aim to increase the level of comfort for families who wish to cycle
- Distance and travel time are considered one of the biggest barriers
- Consideration for crossings of major roadways. There should be clear guidance for how to cross the road as a pedestrian and a cyclist
- When implementing the strategy there should be consideration for how community stakeholders e.g. local businesses can work with the Region and Town
- Safe routes to school for children should be a priority for the network. Routes should be more separated on major roads.

The comments were documented in a detailed summary (see Appendix X). They were used to shape the network and programming recommendations included in the AT strategy.



2.2 IDENTIFYING THE OPPORTUNITIES & CHALLENGES

Developing an AT Strategy that is tailored for the community of Bolton requires an understanding of the opportunities that can be enhanced and the challenges that need to be overcome. The study team collected input from Regional and Town staff, consulted with the public and local stakeholders. In addition, more detailed field investigations were undertaken to document (through GPS waypoints and photos) these opportunities and barriers. The findings of the field investigation were documented in a database and used to prepare an overlay (KMZ) for GoogleEarth illustrating these conditions. A snapshot of these results is provided below and was provided to the Town and Region

The active transportation opportunities and challenges informed the network development process (see section 3.0) and helped the study team to identify route selection criteria and candidate routes as part of the Bolton AT Strategy. The following is a summary of the key opportunities and challenges associated with active transportation in Bolton.

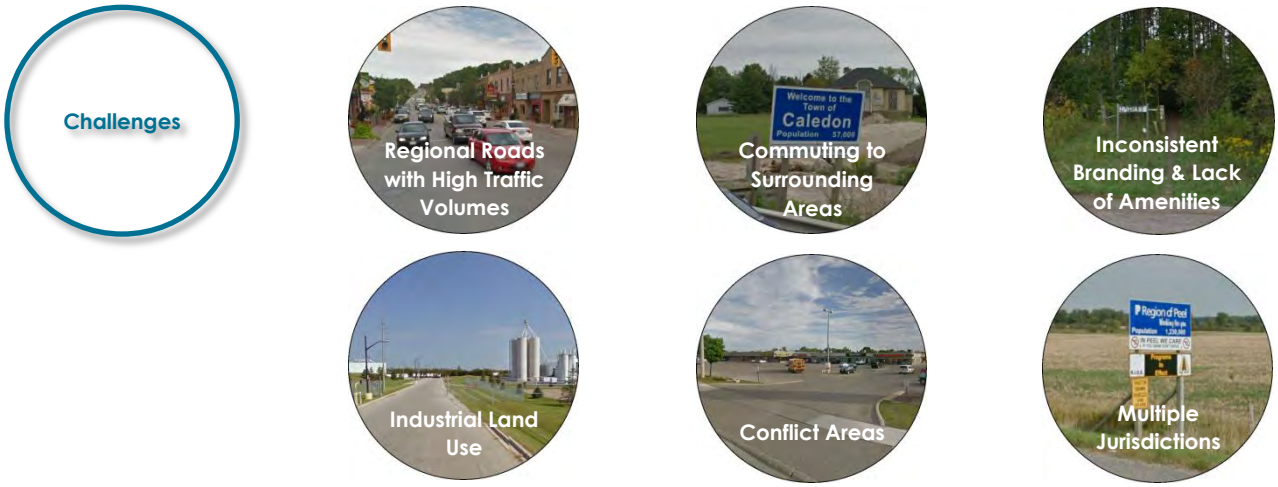
Table 1 – AT Opportunities and Challenges in the Bolton Community

Opportunities
► Existing and previously proposed spine network of on and off-road linkages under the Region, Town and Conservation Authority's jurisdiction;
► Opportunity to build on Regional planning initiatives including new AT infrastructure and outreach initiatives;
► Existing base of local stakeholders and interest groups at the Town and Regional level are supportive of AT growth and development;
► Geographic and topographic landscape within and surrounding the Town is supportive of recreational walking and cycling;
► Destinations within and around the community are accessible and within close proximity – walkable and bikeable;
► The downtown core has potential as a thriving commercial destination for recreational travel; and
► GO Transit is being used for utilitarian trips, better access by walking and cycling could improve multi-modal trip choices.



Challenges

- The industrial land uses surrounding the community causing an increased number of trucks through the community;
- The community has major Regional roads as the main east-west and north-south connections with high-volumes of through traffic;
- Multiple jurisdictions e.g. Town, Region, Conservation Authority, etc. are responsible for making decisions which could cause potential disconnect in the implementation phase;
- High number of commercial uses leads to a high number of commercial drive-ways along major roadways increasing potential conflict;
- High number of commuters to surrounding areas limiting the potential for utilitarian travel; and
- Inconsistent branding and promotion of on and off-road facilities and lack of complementary amenities (e.g. bike racks, signage, etc.)



2.3 ESTABLISHING THE AT VISION

The proposed AT vision for Bolton is unique to the community. It also builds upon the long-term strategic visions developed by the Town and the Region. Each vision is meant to be consistent in their high-level principles but vary in some detail based on the geographic area of focus. The AT visions that influence design, development and implementation of AT facilities in Bolton are as follows:

Regional Vision

"To create a place where walking, cycling and rolling are safe, convenient, appealing and accessible options for all citizens, especially children, youth, older adults, persons with disabilities and priority populations."

Town Vision

"Smart commuting, through active transportation, carpooling and alternate fuels (whether biodiesel, hybrid or electric vehicles) is encouraged to reduce the environmental impact of transportation."

Bolton Vision

"Bolton is a naturally and culturally diverse community that supports active, safe and healthy community activities, travel and exploration. The tourism draws span beyond local attractions to key community destinations that are sustainable (e.g. trails) and accessible."

2.4 IDENTIFYING COMMUNITY OBJECTIVES

This made-in-Bolton AT strategy includes long-term objectives which were identified by the study team, in consultation with the Region and Town, local stakeholders and members of the public. The objectives for the AT strategy build upon the objectives outlined in the Region's AT Plan and provides further clarification to the overarching TMP (Transportation Master Plan). As is the case for the AT vision, the objectives are intended to be more specific as they address a more focused geographic area.

The following is a summary of the objectives that were used to shape the community AT strategy objectives.

Region's AT Strategy Objectives:

- Sets out policies that direct the practices of the Region of Peel to support more walking and cycling;
- Recommends active transportation infrastructure improvements along Regional Roads the support the area municipal plans and fill in gaps in the network; and
- Establish partnerships with key stakeholders such as Peel Health, Smart Commute, Peel district school boards to develop programs to help shift travel behaviour of target audiences to travel by active transportation, such as providing education in promoting benefits of active transportation, safety and skills training.

TMP Objectives:

- Support current and future municipal and regional planning objectives;
- Identify opportunities to improve pedestrian, parking and cycling infrastructure;
- Addressing transportation deficiencies and network needs;
- Identify alternative transportation options to the motorized vehicle; and
- Exploring traffic calming measures for key collector roadways.

Bolton AT Objectives:

- Improve walking and cycling in Bolton's downtown;
- Provide connections with public transit hubs and stops;
- Connect with existing off-road linkages e.g. Conservation Authority or Regional forests
- Coordinate with Regional and Town planning and promotion initiatives;
- Provide local neighbourhood connections that bridge gaps in the Regional system;
- Connect new development areas with established communities;
- Design for complete streets on major connections through the downtown;
- Highlight and protect areas of natural significance; and
- Establish routes in high demand areas and decrease conflict zones.

Objectives are considered more specific and refined versions of the vision or the means of achieving the vision. The objectives lay the foundation for strategic recommendations and the development of the active transportation network. As such, the objectives confirmed for Bolton were used to develop a set of route selection criteria. The criteria, presented in section 3.0, were used to select candidate active transportation routes and to refine those routes to confirm the preferred AT network for Bolton.





3.0 DEVELOPING THE ACTIVE TRANSPORTATION NETWORK

Developing the active transportation network for Bolton requires an iterative process that builds upon the work already completed by the Region of Peel, Town of Caledon and other key stakeholders and partners e.g. Toronto & Region Conservation Authority, the Bruce Trail Club, Humber Valley Trail Association, etc. The steps used to inform the development of the AT network are presented and the results are documented in the following sections.

3.1 THE NETWORK DEVELOPMENT PROCESS: AN OVERVIEW

The network development process is an iterative set of steps that uses sound planning and engineering judgement and input from members of the public and stakeholders to establish the route alternatives and ultimately the selection of preferred routes and facilities that make up the AT network. A number of the steps used to develop the network were based on the facility selection process identified in Ontario Traffic Manual Book 18: Cycling Facilities. Additional details about this process and how it was used for the Bolton AT Strategy are provided in section 3.1.6.

The network development process used for the Bolton AT Strategy included 8 steps (see Figure 7). The steps were identified based on the requirements set-out in the original Request for Proposal and were refined through discussions with the Region of Peel and the Town of Caledon. The rationale behind this network development process included the need to:

- Highlight opportunities and provide solutions to existing barriers;
- Confirm and build on what has already been done with regard to AT infrastructure;
- Develop a connected system of on and off-road AT facilities;
- Design for recreational and utilitarian pedestrians and cyclists;
- Complement ongoing planning and policy initiatives;
- Identify priorities that can be implemented over the short-term and long-term horizon; and
- Coordinate implementation with the TMP in a realistic and feasible way.

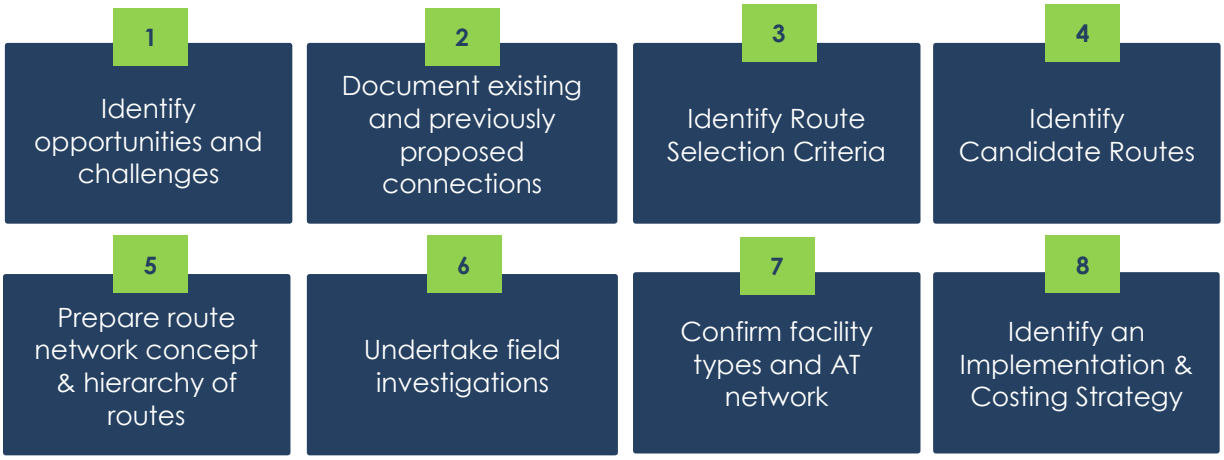


Figure 7 – Network Development Process Steps



The results of each step are presented in the following sections with the exception of the implementation and costing strategy which is presented in section 4.0.

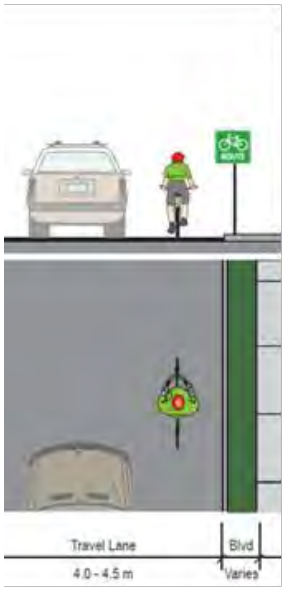
3.1.1 Documenting Existing and Previously Proposed Connections

Within the community of Bolton there are a number of existing and previously proposed AT facilities. The existing routes were identified and mapped based on input received from the Region of Peel and the Town of Caledon at project initiation. Additional information was provided over the course of the assignment to clarify network connections and future improvements. All information was provided in GIS format and was consolidated to prepare an AT database which can be used by all parties, once the project has been completed, to track next steps and implementation.

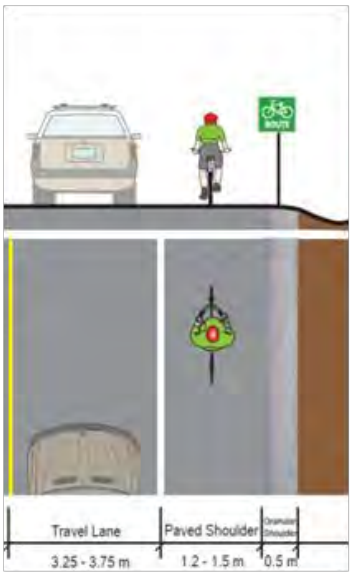
The existing and previously proposed routes are illustrated on AT Map B and a summary of the facilities and the total number of kilometres (km) is provided in Table 2. To better understand the types of existing facilities found in Bolton, illustrates the typical cross-section / design for paved shoulders, bike lanes, in-boulevard multi-use trail and off-road trails.

Table 2 – Summary of Existing Active Transportation Conditions

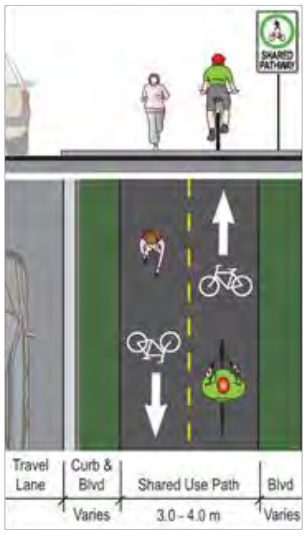
Facility Type	Total Distance (km) by Jurisdiction				
	Town	Region		Toronto & Region Conservation Authority	
	Existing	Existing	Previously Proposed	Existing	Previously Proposed
Paved Shoulder	-	0.6	12.8	-	-
Bike Lane	-	-	13.7	-	-
In-Boulevard multi-use trail	-	0.5	6.4	-	-
Sidewalk along a Local Road	126.6	-	-	-	-
Sidewalk along a Regional Road	-	10.	17.6	-	-
Off-Road Trail	15.3	-	-	11.5	6.4
Total (km)	141.9	11.1	50.5	11.5	6.4



Signed Only Bike Route



Signed Only Bike Route with Paved Shoulder



In-Boulevard Multi-use Trail



Off-road Trail (Multi and Single Use)

It is important to note that Region's previously proposed facility types are consistent with the recommendations outlined in the AT Plan (2011). Though the Town has a Trails Master Plan, the document speaks more to policy improvements, high-level design and implementation principles. As part of the Trails Master Plan, the Town identified conceptual areas for trail improvements but did not identify specific linkages where trail infrastructure is proposed to be implemented.

The existing sidewalk network contains numerous gaps where a sidewalk is located on either one side of the street or is absent entirely. This is predominantly the case on local roads under the jurisdiction of the Town of Caledon. To address these gaps, it is recommended that a more detailed sidewalk gap analysis be undertaken in conjunction with a public consultation process to establish an approach to identified and evaluate missing links and to prioritize gaps for future implementation. This process should also identify the capital budget implications of expanding the sidewalk network.

Recommendation(s):

3 The Town of Caledon should undertake a more detailed sidewalk gap analysis to determine the criteria to evaluate missing links and to identify priorities for future improvements in the sidewalks system on local roads with a focus on neighbourhoods with schools, community centres and other destinations.

The existing and previously proposed conditions are the basis from which candidate routes were selected. The candidate routes included but were not limited to missing links and additional connections in both the urban area as well as the rural / surrounding areas of the community. They are described in more detail in section 3.1.3.

3.1.2 Establishing the Route Selection Criteria

Prior to identifying the candidate AT routes, the study team identified a set of criteria to which each potential route was compared. The criteria were developed based on the project objectives as well as the key network development principles identified in the Ontario Traffic Manual (OTM) Book 18: Cycling Facilities (see section 2.4 of the report).

The criteria used to inform the selection of candidate routes included:

- Connectivity – routes that connect to other routes either within Bolton or to adjacent communities;
- Access – routes that provide access to key destinations such as schools and employment areas;
- Attractiveness – routes that showcase Bolton's natural and built heritage; and
- Sustainable – routes that can be designed, implemented and sustainable over the long period of time
- Environmentally sensitive – routes that provide minimal environmental impacts on the surrounding natural area
- Safety and comfort – routes that minimize risk to cyclists and provide a level of comfort that is acceptable for a broad range of users.
- Accessible – routes and designed with AODA in mind and to provide community access for all user groups
- Context Sensitive – routes are designed and modified based on the conditions of the roadway or of surrounding areas



3.1.3 Identifying Candidate Routes

Candidate routes are linkages that are identified in the initial stages of the network development process. They aim to identify possible solutions to address key infrastructure objectives. The candidate routes identified for the Bolton AT Strategy were identified based on the following considerations:

- Providing east-west linkages through the community and to surrounding municipalities (e.g. Township of King)
- Providing north-south linkages through the community and to surrounding municipalities (e.g. City of Brampton)
- Linking to off-road routes that were previously recommend in lands owned and operated by the Toronto Region Conservation Authority (e.g. Bolton Camp)
- Connecting missing links to gaps in the existing walking and cycling network
- Identifying local neighbourhood connections parallel to the proposed key east-west and north-south linkages.
- Identifying potential solutions to the existing infrastructure barriers identified by public and key stakeholders.

Figure 8 illustrates the study team's initial review of the potential candidate routes. The routes were refined based on input from the Town and the Region and were updated to reflect comments and input provided by the public and stakeholders as a result of the first public information centre.

The candidate routes were reviewed based on the application of route selection criteria as well as an initial investigation of routes using a desk-top exercise. The desk-top exercise generated an initial database of existing conditions including roadway width, location of utilities, characteristics of the roadway, pavement markings, etc. A more detailed investigation of routes was undertaken as part of the facility selection process and is documented in section 3.1.5.

Through this investigation, the study team refined the candidate route network. In some cases, routes were removed and others were added that were considered more desirable connections. The result was a network concept of preferred routes, a high-level system of future AT linkages, for the community of Bolton . The preferred route network concept is documented in section 3.1.4.



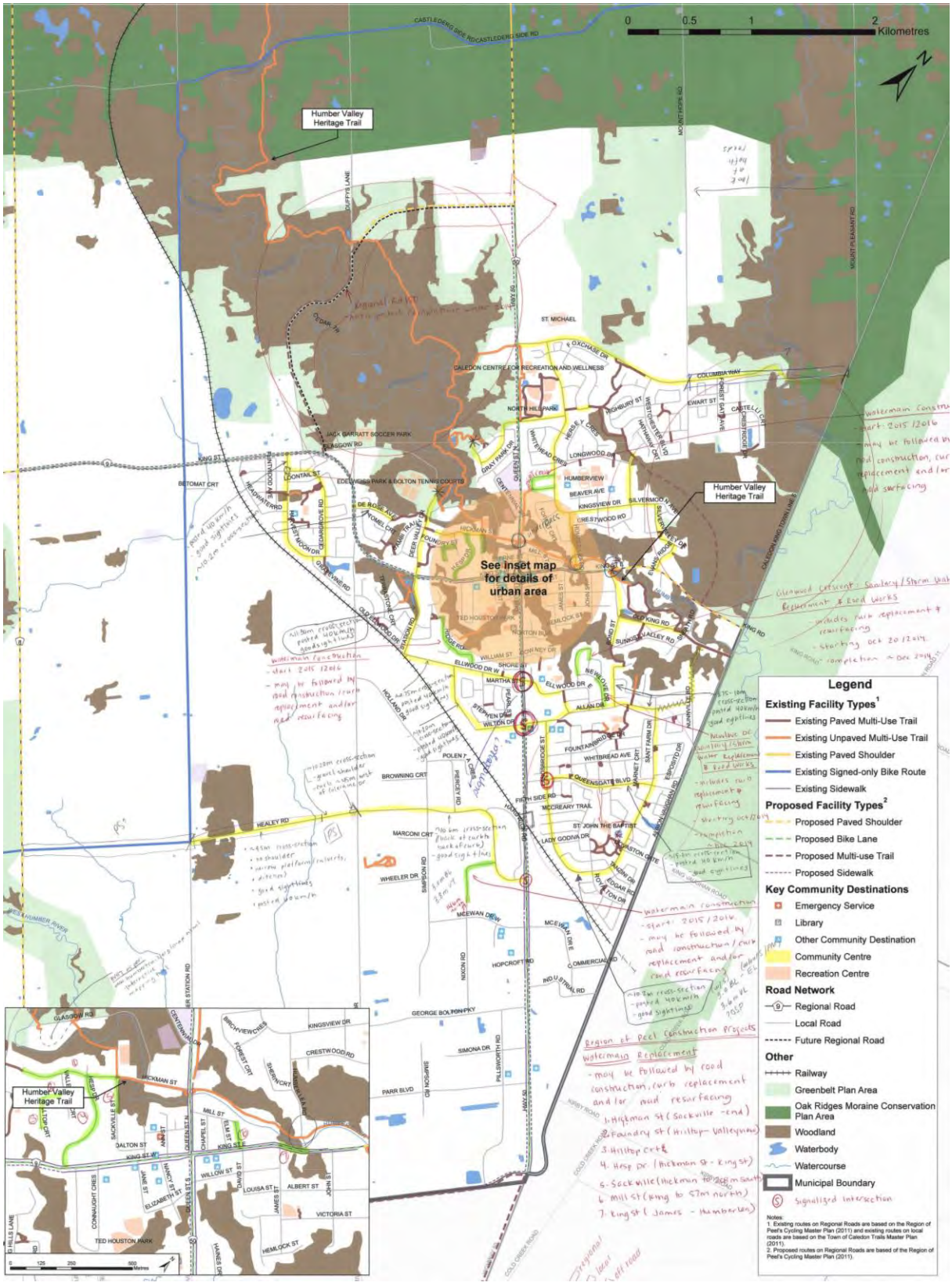


Figure 8 – Investigation of Potential Candidate Routes for the Bolton AT Network

3.1.4 The Route Network Concept & Hierarchy of Routes

The route network concept is a high level system of on and off road AT routes that illustrates the proposed alignment of proposed AT routes. As part of this step in the network development process the study team identified a hierarchy of routes. The hierarchy is defined by the overall route objectives as well as the anticipated user group. There are three types of routes that make up the hierarchy including the primary system (routes proposed along on Regional Roads); secondary system (routes proposed along local roads) and recreational system (off-road connections).

AT Map C illustrates the route network concept as well as the hierarchy of routes in Bolton. The network concept includes two line types, the solid line represents the existing routes within the community – both on and off-road and the dashed line is both the previously proposed (Regional AT Plan and TRCA trail master planning process) as well as the candidate routes that were selected through the evaluation process. Additional details about each system are presented in **Error! eference source not found.**

Table 3 – Overview of Route Hierarchy Objectives

	Route Objectives	Anticipated User Groups
Primary System	▶ North-south and east-west routes ▶ Direct connections through and within the community ▶ AT facilities along Regional roads that provide access to adjacent land uses such as employment, retail services, community services, and institutions and off-road recreational systems ▶ Connect with AT routes in adjacent communities to provide regional connectivity	▶ Primarily used by utilitarian cyclists ▶ More confident cyclists who are comfortable using on-road cycling facilities on busier roads ▶ Pedestrians typically use the sidewalks to access community destinations ▶ Touring and fitness cyclists
Secondary System	▶ Local neighbourhoods connections ▶ Parallel routes to the primary routes ▶ Provides connections to local destinations e.g. schools or community centres ▶ Less direct connections	▶ Attractive to younger or less confident cyclists ▶ Primarily for recreational use or utilitarian connections within neighbourhoods ▶ Attractive for pedestrians making short-distance local trips within their neighbourhood
Recreational System	▶ Off-road connections including local neighbourhoods pathway linkages as well as destination trails ▶ Leisurely off-road connections that provide both long and short opportunities	▶ Leisure cyclists – both long and short-distance ▶ Some utilitarian cyclists who work locally and can access on-road connections to place of employment ▶ Hikers and walkers – local residents and visitors - typically use the facilities on weekend



3.1.5 Investigating in the Field

In addition to the initial desktop exercise, the study team also undertook a more detailed investigation of the candidate routes with a focus on the regional connections as well as some of the local roads with higher volumes of traffic.

The first investigation was undertaken by Region of Peel staff. A number of staff members reviewed the proposed routes and facility types in the field by driving each of the routes and documenting key considerations. The routes were also cycled for a greater appreciation of the cyclist experience in the current conditions. Information documented through this exercise was provided to the consultant team for their review and consideration.

A second day of field investigation and evaluation was completed by the consultant team in May 2015. Through this investigation the study team documented GPS waypoints, photos and measurements of key network linkages. The results were documented in an excel spreadsheet and in KMZ file which overlays the information onto Google Earth. Illustrates the information presented in GoogleEarth format.

The information gathered through both of these exercises was used to review and determine the appropriate facility design solutions for local routes and regional routes. A full summary of the findings from all field investigations is presented in Appendix A. A sample of the format of the database of information is presented Table 4.

Table 4 – Sample of Field Investigation Documentation

Location	Comment	Graphics
The Gore Road (King Street to Castlederg Side Road)	► Posted 70 km/h speed ► Ditches on west side of roadway ► Keep recommendation of proposed paved shoulder but widen before implementing (add buffer)	
King Street (The Gore Road to De Rose Avenue)	► Rural cross-section e.g. no curbs ► Proposed buffered paved shoulders or buffered bike lane (if roadway is planned to be urbanized / reconstructed in future) ► Add Share the Road signs ► Bypass construction currently occurring to the north and south of King Street	

Recommendation(s):

4 The Town and the Region should use the database of field work findings to inform future decision making when moving forward with the design and implementation of routes identified in the AT Strategy. As needed, the team should update the database to reflect changes to roadway conditions.

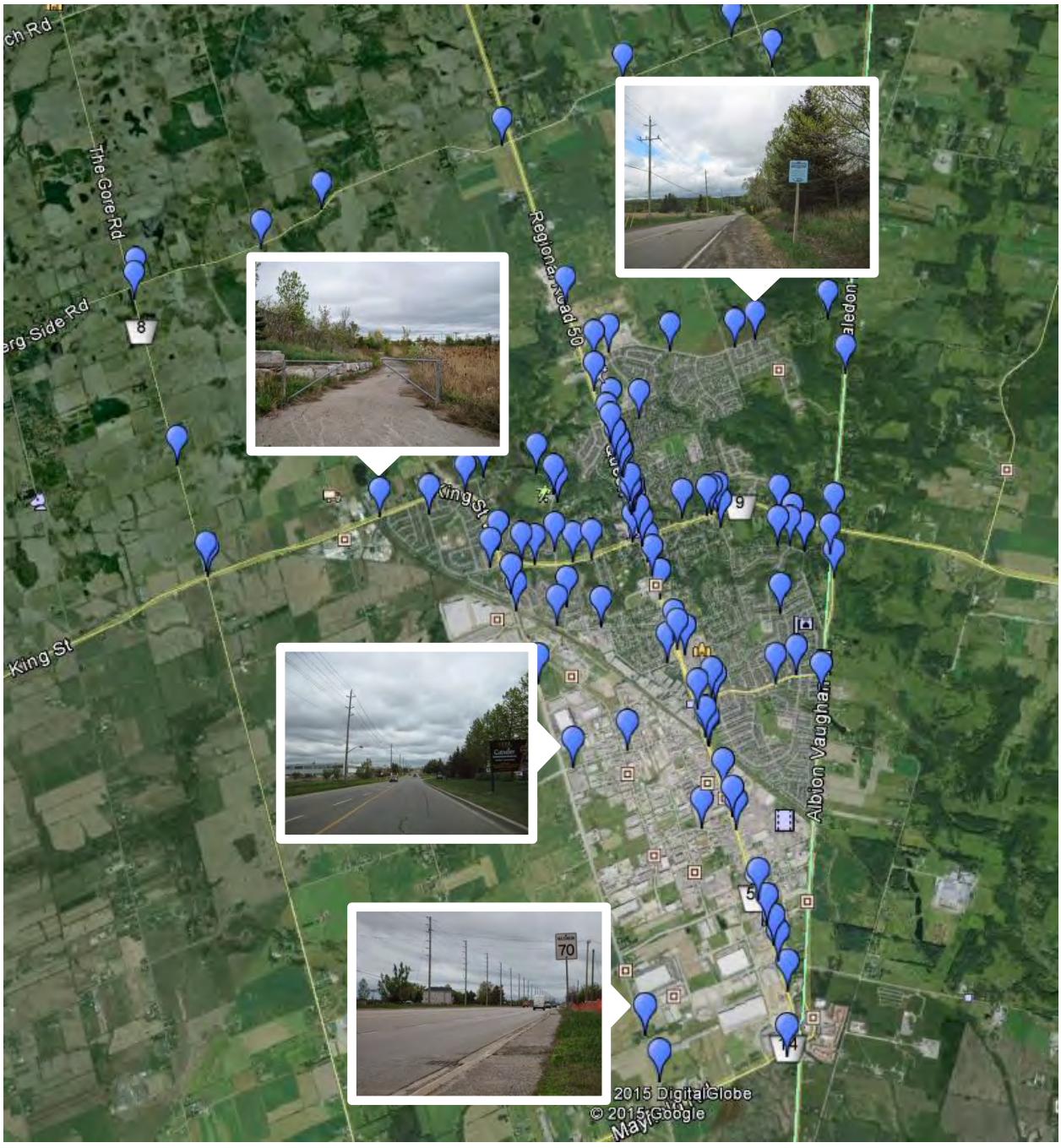


Figure 9 – Documentation of Field Investigation

3.1.6 Identifying the Recommended Facility Types

Once routes were selected and organized into a hierarchical network, appropriate facility types were identified and investigated using the Step 1 of the facility selection process identified in OTM Book 18 as well as input gathered as part of the field work. The following subsections describe the considerations that informed the selection of preferred AT facilities.

3.1.6.1 Design Considerations for the AT Network

Cycling Facility Considerations

The Ontario Traffic Manual Book 18: Cycling Facilities provides a three step process to select an appropriate facility type. This process fosters consistent decision-making around facility types by taking a transparent and comprehensive approach. As a provincial design guideline, municipalities are encouraged – though not legally required – to use this process.

Within the context of the Bolton AT Strategy, the first step of the OTM Book 18 process was applied to each route segment in the network. The first step identifies an appropriate facility type based on two key variables: motor vehicle traffic volume and motor vehicle speed. OTM Book 18 includes a "nomograph" which plots these variables and to provide an initial recommendation for the type of facility that should be considered for this location. The locations have been selected by the Region of Peel and the Town of Caledon as areas which require further investigation and design due to the roadway characteristics. Additional details regarding the design of these specific locations can be found in section 4.1.3.

Where a transition from one facility type to another facility occurs, special consideration should be given to marking these transitions. Sharrow markings, tapered lane markings as well as bicycle lane begins and ends signs (Rb-84, Rb-84A, Rb-84t and Rb-85t [OTM]) are common approaches to marking facility transitions. A number of these transition or conflict points were highlighted to the study team through the public information centres. Additional design considerations and network enhancements were identified for these locations which are presented in section 4.1.4.





Pedestrian Facility Considerations

OTM Book 15 outlines a wide range of pedestrian crossings and provides a defined process to select the most appropriate crossing type from a range of potential crossing facilities. This process requires specific data on motor vehicle volumes, pedestrian volumes, pedestrian delay, distance to traffic control signals, the number of traffic lanes, and connectivity in the pedestrian network.

While this process was not undertaken for this AT Strategy, a number of locations where it may be appropriate to undertake a pedestrian crossover warrant have been identified.

3.1.6.2 Designing the Primary System: Confirming Regional Facilities

As noted in section 3.1.4, the primary system is made up of routes identified along Regional roads. Cycling facilities were previously identified for these linkages as part of the Region's AT Plan – adopted by Council in 2011. Through the Bolton AT Strategy, the study team investigated the original recommendations in more detail to confirm the most appropriate facility type.

Using data collected in the field (e.g. cross-section width, roadway characteristics, etc.), road volume data and operating speed data the study team completed Step 1 of the OTM Book 18 facility selection process and identified preferred facility types for the current conditions. In some places the original recommendation varies from that identified in the AT strategy which is likely attributed to the new guidelines and emerging design considerations set-out in the OTM Book 18 manual as well as changes to the conditions of the roadway.

Table presents the findings of this exercise and presents both the original facility type recommended, the facility type identified as part of the Bolton AT network and the rationale for the change.

Table 5 - Rationale for revised Facility Types on Regional Roads

Region of Peel Recommended Facility Type	Revised Facility Type	Rationale for Change
King Street (Queen Street / Highway 50 to Albion Vaughan Road)		
Bike Lane and Paved Shoulder	Signed Bike Route with Sharrows	▶ Roadway recently reconstructed and is an urban cross-section e.g. curb and gutter. Not suitable for rural design such as paved shoulder. ▶ Current cross-section approximately 8.0m. Not sufficient space to accommodate a minimum 1.5m bike lanes, especially at constrained locations e.g. bridge over Humber River. ▶ Proposed signed bike route with sharrows as roadway width is narrow. In addition, consider installing 'Share the Road' signs in locations where sight lines are obstructed. ▶ Posted speed 50 km/h.

Region of Peel Recommended Facility Type	Revised Facility Type	Rationale for Change
Highway 50 / Queen Street (Mayfield Road to Queensgate Boulevard)		
Bike Lane	In-Boulevard Trail	► High volume, high speed roadway (posted speed 60 km/h, 85th percentile is approximately 80 km/h.) ► Using Step 1 of the OTM Book 18 process, the desirable facility type should be separated. ► Current cross-section width has sufficient space to accommodate in-boulevard trail. Few constrained areas such as the bridge over the CN rail corridor.
Highway 50 / Queen Street (Queensgate Boulevard to King Street)		
Bike Lane	Cycle Track	► High volume, high speed roadway (posted speed 60 km/h, 85th percentile is approximately 80 km/h.) ► Using Step 1 of the OTM Book 18 process, the desirable facility type should be designated or separated. ► Current cross-section width has sufficient space to accommodate uni-directional bike lanes on both sides of the roadway. Few areas of constrained width. ► Transition to on-road (bike lanes) on the approach of the King Street intersection.
Highway 50 / Queen Street (Hickman Street to Bolton Heights Road)		
Bike Lane	In-Boulevard Trail	► High volume road with steep grade into downtown core. ► Posted speed 60 km / h. ► Existing paved boulevard on east side of roadway. Sufficient space to accommodate in-boulevard trail on both side of roadways. ► Connect to the existing in-boulevard trail on the east side on Highway 50 / Queen Street north of Bolton Heights Road to provide continuous off-road linkage.
Highway 50 / Queen Street (Bolton Heights Road to Castlederg Sideroad)		
Paved Shoulder	Paved Shoulder	► Proposed facility type consistent with Region's recommendation
Mayfield Road (Albion Vaughan Townline to The Gore Road)		
Multi-use Trail	Paved Shoulder	► Posted speed 60 km/h. ► Coordinate with future roadway improvement (consistent with TMP recommendation). ► Using Step 1 of the OTM Book 18 process, a designated facility type is recommended. ► Paved shoulder is sufficient for current conditions (e.g. Rural Cross Section – no curb).

Region of Peel Recommended Facility Type	Revised Facility Type	Rationale for Change
The Gore Road (Mayfield Road to Castlederg Sideroad)		
Paved Shoulder	Paved Shoulder	▶ Proposed facility type consistent with Region's recommendation.
Bolton Arterial Bypass (King Street – Highway 50 / Queen Street)		
Multi-use Trail and Paved Shoulder	Multi-use Trail and Paved Shoulder	▶ Proposed facility type consistent with Region's recommendation

3.1.6.3 Designing the Secondary & Recreational System

Cycling and pedestrian facilities were identified for the secondary system – local roadways as well as the recreational system – off-road linkages. The facilities identified along the routes that form the secondary system range from shared facilities that are identified on roads with lower operating speed and traffic volumes to more separated facilities with higher posted speed or traffic volumes. The recreational system will consist of off-road trails under the TRCA's jurisdiction. Further investigation and design considerations will be undertaken by the TRCA to confirm the preferred trail design for these locations.

Recommendation(s):

5

The Town and Region should use the facility type recommendations identified on AT Map D. These routes should be investigated and confirmed through a feasibility study (for each routes), which would complete the facility selection process outlined in OTM Book 18 which involves a broader range of selection criteria and documenting the design rationale.

3.1.6.4 The Proposed Active Transportation Network

The proposed facility types identified for each linkage of the Bolton AT network are illustrated on AT Map D. A summary of each of the proposed facility types by length and jurisdiction is presented in Table 6.

Table 6– Proposed Active Transportation Facilities

	Total Distance (km) by Jurisdiction		
Facility Type	**Town**	**Region**	**HVHTA**
Off-Road Trail	-	-	6.4
In-Boulevard Trail	0.2	6.3	-
Cycle Track	-	1.5	-
Buffered Paved Shoulder	3.2	9.5	-
Paved Shoulder	0.5	11.6	-
Buffered Bike Lane	6.5	7.5	-
Bike Lane	5.0	1.0	-
Signed-only Bike Route with Edgeline	6.0	-	-
Signed-only Bike Route with Sharrows	-	2.2	-
Signed-only Bike Route	16.8	-	-
Total (km)	38.2	39.6	6.4

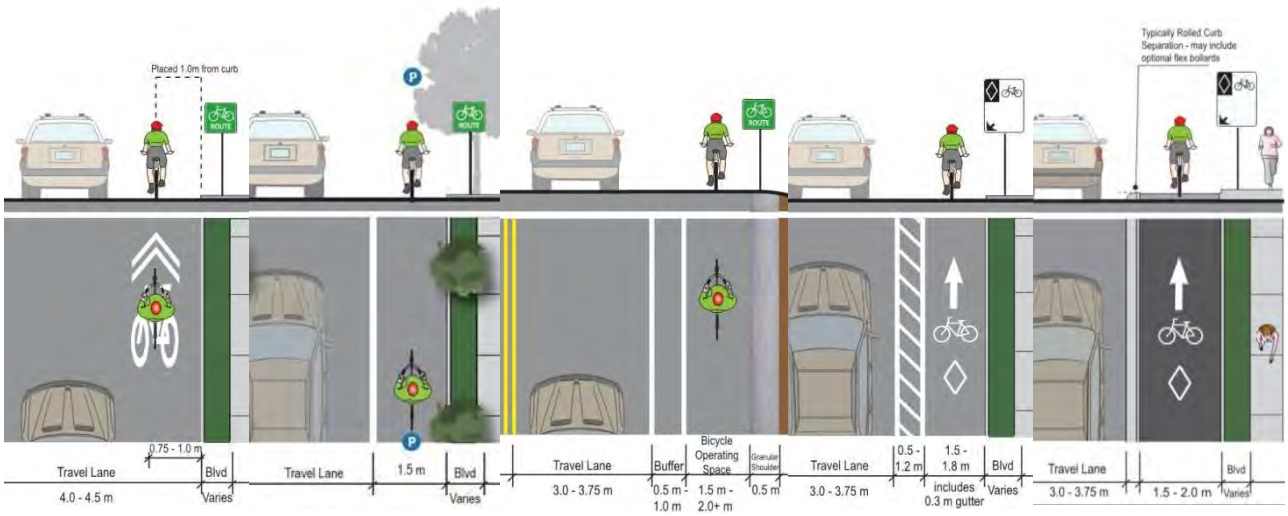


4.0 DESIGNING THE AT NETWORK

4.1 DESIGNING THE SYSTEM

The Bolton AT network identifies on-road, off-road and in-boulevard facility types that support walking and cycling within the community and to surrounding areas. The design of these facility types should be determined based on the guidelines and standards outlined in the provincial cycling manual – OTM Book 18. Because of the work completed by the Region and Town prior to the development of the Bolton AT Strategy, there are already a number of existing cycling facilities within the downtown core and surrounding areas. However, through the facility selection process (outlined in section 3.1.6) there are a number of other design concepts that are being proposed for implementation.

Details regarding the design of these facilities can be found in OTM Book 18 and should be considered once a feasibility study has been prepared for each route. The following are graphics of



Signed Only Bicycle Route with Sharrow

Signed Only Bicycle Route with Edgeline (Urban Shoulder)

Buffered Paved Shoulder

Buffered Bike Lane

One Way Cycle Track

the new facility types identified as part of the AT network for Bolton.

4.1.1 Identifying Interim Facilities

In some locations, there may not be the political and / or public support to implement the preferred facility design concept. For the Bolton AT strategy two (2) specific locations have been identified where this is the case:

- Highway 50 / Queen Street (King Street to Hickman)
- King Street (Queen Street / Highway 50 to Station Road)

In these locations, the Town and Region staff should consider implementing an interim solution to provide route connectivity and continuity in the short term. Table 7 identifies the specific locations where an interim solution is recommended until such time when the ultimate preferred design solution is approved for implementation.

Table 7 - Interim Facility Design Rationale

Location #1	King Street (Queen Street / Highway 50 to Station Road)
Interim	Signed Route with Sharrows
Ultimate	Bike Lanes
Rationale	► Due to on-street parking and current roadway conditions, the interim solution is to add sharrow stencils on the road and install green 'Bike Route' signs. This would provide cyclists with a short-term connection and increase awareness for motorists of the shared roadway space. Parking would be maintained on both sides of the roadway. ► The ultimate preferred design solution would be to restrict on-street parking and implement bike lanes on the both sides of the roadway from Station Street to Ann Street. The ultimate design solution also recommends sharrows from Ann Street through the Queen Street / Highway 50 intersection to guide cyclists to the proposed facility east on King Street. ► To determine to feasibility of the ultimate design solution, it is recommended the Region and Town undertake as assessment of the on-street parking to determine current demand and usage. Additionally the Region and Town can consider updating the on-street parking to allow motorists to park their vehicles during specific times (e.g. allow on-street parking Sunday morning to accommodate church services).
Location #2	Highway 50 / Queen Street (King Street to Hickman)
Interim	Signed Route with Sharrows
Ultimate	Bike Lanes
Rationale	► The interim design solution is to add super sharrows north on Highway 50 / Queen Street from King Street. This would provide cyclists with a short-term connection through the downtown core and surrounding routes (e.g. Humber Valley Heritage Trail). Parking would remain be permitted on both sides of the roadway. ► The ultimate design solution is to implement buffered bike lanes on the east side of Highway 50 / Queen Street and bike lanes on the west side of the roadway. As part of the TMP roadway improvements, it is recommended that the on-street parking be removed on the west side of the roadway (providing space for bike lanes) but keep the on-street parking on the east side (requiring a buffer between the bike lane and parking lane). ► Through consultation and input collected, it has been noted that the public is interested in creating a more bicycle and pedestrian friendly downtown area but hesitant to eliminate on-street parking. Additionally, local businesses in the downtown core have expressed concerns that the removal of on-street parking could affect their business. To implement the ultimate design solution it is recommended that the Town / Region undertake an assessment of the on-street parking to determine demand and usage.

It is important to note that though these are not considered the ultimate preferred facility type, they are still being designed with safety of users in mind and have been informed based on sound planning and engineering judgement.



Recommendation(s):

6 The Region should consider the implementation of the proposed interim design alternatives for Highway 50 / Queen Street (King Street to Hickman) and King Street (Queen Street / Highway 50 to Station Road) and should undertake the necessary parking studies to confirm demand of on-street parking.

4.1.2 Designing Select Linkages

In addition to the political / public limitations there are also select locations within the Bolton AT network that have physical limitations which make the design and implementation of select facilities more complex. Six (6) locations which include the two (2) noted in section 4.1.2.

[Insert additional text and design details once completed]

Recommendation(s):

7 To be Confirmed.

4.1.3 Network Enhancements

In addition to the pedestrian and cycling infrastructure that is proposed on and off-road, it is also important to identify and design for transition points between different facility types, or at key points of conflict e.g. intersections. Within this "complementary" infrastructure, routes may seem less desirable by users if it becomes unclear how to use the next facility, where to go next and how to "safely" do all of this as part of a larger trip.

Ontario Traffic Manual Book 18 outlines a number of specific treatments and amenities are available that improve the user experience and / or reduce risk to cyclists and pedestrians. Based on input received from the public and stakeholders, a number of transition points, intersections and key locations throughout the AT network were identified which require additional design consideration to enhance connectivity. These locations have been identified on AT Map E and a proposed design treatment for each of these locations is illustrated. The treatments that are relevant to Bolton are described in more detail below.

- Crossrides: a relatively new treatment for Ontario, crossrides allow cyclists to legally cross through an intersection. OTM Book 18 outlines three types of crossrides. The most common type of cross ride is a separated cross ride, which is shown on AT Map E and demonstrates the bicycle crossing area with elephant's feet, adjacent to a pedestrian crosswalk. This approach not only allows cyclists to legally cross a road without dismounting, but also reduces potential conflicts between crossing cyclists and crossing pedestrians.
- Chevrons and Green Pavement Markings: to mark a cycling facility through intersections, it is recommended that either green pavement markings or dashed lines with chevrons are considered as possible treatment options. These treatments draw road users' attention to the bicycle crossing, thereby increasing the visibility of cyclists and increasing motorists' awareness of cyclists.
- Bike Boxes: where cyclist left turn movements are anticipated at higher volume intersections, left turn queue boxes should be considered. At intersections where there is sufficient space in the boulevard and or where the left turn movement is on to an in-boulevard cycling facility, the left turn queue box can be located within the boulevard, as shown on AT Map E.



- Share the Road Signage and Sharrows: where cyclists and motorists share space on lower volume / lower speed roads, Share the Road signage encourages cyclists to not use more of the roadway than is required for safe cycling and encourages motorists to allow a comfortable amount of space between their vehicle and a cyclist when overtaking.
- Mid-block pedestrian and / or bicycle crossings: mid-block pedestrian crossings increase the connectivity and directness of the pedestrian / cycling network and improve safety for pedestrians and cyclists. A range of crossing treatments may be implemented, as outlined in OTM Book 15.
- Trailheads: trailheads provide an area for pedestrians and cyclists to rest and are ideal locations for information displays, maps, etc. Trailheads also improve the visibility of the trail access point, and may provide parking for both motorists and cyclists.

Recommendation(s):

8

When implementing the AT network, the Town and Region should also consider points of transition between differing facility types and conflict points such as intersections. The network enhancements illustrated in AT Map E should be implemented at the same time as the routing is developed to improve connectivity and continuity.

4.1.4 Integration with Transit

The link between AT and transit is another important consideration for the development of an AT network. In a well-planned network transit and AT are mutually supportive. Walking and cycling are supportive of transit as they can be efficient and cost-effective ways to complete the "first" or "last mile" of a trip. AT is well suited for completing these initial and final trip segments because it is not bound by schedules, it allows users to avoid the costs associated with using an automobile for a segment of the trip, and it often does not extend the total trip time significantly, assuming the initial and final trip segments are relatively short distances.

Similarly, the transit network can support AT by providing users an alternate mode to complete a trip in specific instances when AT is not feasible or appealing, such as during inclement weather. These considerations have been integrated into this AT strategy by considering transit stops in the route selection process and recommending end of trip facilities such as bicycle parking at existing transit stops. As Bolton considers implementing a local transit system or expanding regional transit service, there will be a growing potential for transit and AT to mutually support each other.

Within the Bolton context, GO Bus service is the only transit that is provided. There are routes and stops locations throughout the downtown core. In the future there may be an opportunity to expand GO service, specifically rail, or to expand transit from surrounding municipalities (e.g. Brampton Transit) to downtown Bolton. For existing conditions and future potential improvements, when implementing the AT network along transit routes, the following considerations should be reviewed:

- Integrating AT and transit planning such that future transit plans consider the proposed AT network in the development of an expanded transit network. Moreover, the proposed sidewalk gap analysis should prioritize any sidewalk gaps that are near existing or proposed bus stops;
- Providing ample bicycle parking at bus stops and mobility hubs, including sheltered bicycle parking for more significant stops and stations. OTM Book 18 provides guidance on appropriate bicycle parking facilities;

- Designing transit stops to minimize conflict between cyclists and buses. The proposed AT network includes in-boulevard facilities, cycle tracks, buffered bicycle lanes and signed only routes with sharrows. While signed only routes typically do not require any design modifications to accommodate transit stops, buffered bike lanes and cycle tracks often require some design modification to accommodate transit stops. Typical options include raising the cycle track / buffered bike lane to an integrated transit platform or routing the bicycle facility behind the transit stop. In boulevard facilities may not require any design modifications at transit stops, provided there is no sidewalk located behind the facility. Examples of this application are provided below.





Recommendation(s):

9 For AT routes that are identified along transit ways (e.g. Queensgate Boulevard) that have proposed on-road facility types, additional consideration will be needed to appropriately design for cyclists as well as transit vehicles.

4.1.5 AODA

The Accessibility for Ontarians with Disabilities Act (AODA) was passed on June 13, 2005. The policy calls on the business community, public and not-for-profit sector and people with disabilities to develop, implement and enforce mandatory standards. The policy makes Ontario the first jurisdiction in Canada to develop, implement and enforce accessibility standards applied to both private and public sectors. The AODA and the associated Built Environment Standards provide directives on how to identify, remove and prevent barriers to accessibility.

The Built Environment is the most relevant standard that can be applied to sidewalk and trail planning, design and construction. A revision and update of the Built Environment Standard was recently undertaken and released in early 2013:

"The goal of the Accessibility Standards for the Built Environment is to remove barriers in public spaces and buildings. This will make it easier for all Ontarians — including people with disabilities, seniors and families — to access the places where they work, travel, shop and play".

The standard applies to new construction and redevelopment of existing facilities. The standards for public spaces cover: Recreational Trails and Beach Access Routes, Outdoor Public Use Eating Areas, Outdoor Play Spaces, Exterior Paths of Travel, Accessible Parking and Obtaining Services.

Some highlights of the technical requirements for recreational trails under the new regulation O. Reg. 191/11 (January 1st 2013 consolidation) Sections 80.1 to 80.9 and Sections 80.11 to 80.15 include a minimum clear width of 1,000 mm; a clear height that provides a minimum head room clearance of 2,100 mm above the trail; a firm and stable surface type; and where a trail is constructed adjacent to water or a drop-off, it must have edge protection that constitutes an elevated barrier running along the edge of the trail with a top edge of at least 50 mm above the trail surface; a protection barrier that does not impede the drainage of the trail surface; a clear opening of between 850 mm and 1,000 mm, whether the entrance includes a gate, bollard or other entrance design; and trail head signage that provides relevant accessibility information (i.e., the length of trail; the type of surface of which the trail is constructed; the average and the minimum trail width; the average and maximum running slope and cross slope and the location of amenities, where provided).

Sections 80.21 through 80.31 addresses AODA requirements for sidewalks. Highlights include a minimum clear width of 1,500 mm; a maximum slope of no more than 1:20 or the slope of the adjacent roadway; and various details regarding curb ramps and tactile surfaces, depressed curbs, accessible pedestrian signals, and rest areas. This information is provided as a brief summary, and guidance for any project designs or plans should be taken directly from the current Ontario regulation.



5.0 A GUIDE FOR IMPLEMENTING THE NETWORK

The intent of a master plan is to provide the tools, strategies and processes to guide future decision making. The recommendations should be implementable and infrastructure recommendations should be developed with "action" in mind. As part of developing the AT Strategy, the consultant team has developed a suggested approach to implementation for consideration by the Town and Region to facilitate short and long-term implementation of infrastructure, programs and initiatives.

5.1 IMPLEMENTING THE NETWORK: A PHASED APPROACH

The implementation of the AT Strategy is intended to complement the TMP schedule as well as other planning and design initiatives being undertaken by the Town and Region. A timeline / phased approach to implementation was determined based on discussions with the Region and Town. There are two (2) phases - Short Term (0 – 5 years) and Long Term (6 – 15+ years).

Each of the proposed routes was reviewed to determine the preferred phase for implementation. More specifically, the routes were reviewed based on:

- The Town and Region's Capital Works schedules;
- Input from the public and stakeholders;
- Achieving connectivity within the community and to surrounding areas;
- Designing a system of continuous walking and cycling facilities;
- Phasing identified for the Region's AT Plan; and
- Phasing identified for the TRCA's trail improvements.

Map F illustrates the proposed phasing for the Bolton's AT Strategy. Coordination of implementation should be achieved where possible. The Region and Town should work together to implement the routes and network improvements to establish a continuous and connected system of AT facilities.

Recommendation(s):

11 The network phasing identified in Map F should be used by the Town and Region as a guide for the development of the AT network in Bolton and should be a reference for the Region and Town as well as the TRCA and surrounding municipalities when future connections are considered.

5.1.1 The Action Plan

The development of an AT network for Bolton will be achieved through collaboration between the Region of Peel, the Town of Caledon and other key stakeholders. The Bolton AT Strategy is not intended to be a prescriptive document but meant to be used as a guide to inform future decision making regarding design, development, and implementation of the AT network.

An action plan to guide the implementation of short-term routes is needed to support the Region / Town with the next steps associated with design and construction. The short-term priorities were reviewed and, the following suggests the order in which they should be implemented. Map G illustrates the short-term priorities and Map H illustrates the long-term projects. Map I includes a number beside each to identify the order of intended implementation.



The order was identified based on similar considerations as were used to determine the route phasing. The order of implementation and the rationale for each is presented in Table 6. It is important to note that though the Town and Region are encouraged to implement the linkages within this order, should opportunities arise to implement a route earlier than anticipated it should be explored and the network database should be updated to reflect this.

Table 6 – Order of Short-Term Priority Implementation

Priority	Proposed Route and Rationale
1	Deer Valley Road (Glasgow Road to King Street) Proposed Signed-Only Bike Route Rationale: ▶ Provides users with a direct connection between the existing in-boulevard trail along King Street (Deer Valley Road to Coleraine Road) and the Humber Valley Heritage Trail at the road terminus. ▶ Local neighbourhood connection to link cyclists to the playing fields (soccer field, volleyball courts, and tennis courts) in Edelweiss Park and Dicks Dam Park. ▶ Low volume, low speed (posted speed 40 km/h), pavement in good condition – low cost to implement signed bike route with installation of green 'Bike Route' signs. ▶ Connects to other smaller existing off-road trails that link users to Foundry Street, De Rose Avenue, Hickman Street and Tomel Court.
2	Hickman Street (Deer Valley Road to Queen Street / Highway 50) Proposed Signed-Only Bike Route Rationale: ▶ Provides users with a connection to priority project #1, Deer Valley Road (via the existing off-road trail at Hickman Street terminus) and the Humber Valley Heritage Trail at Highway 50 / Queen Street (under the road bridge). ▶ Provides a connection between downtown area and residential areas east of Highway 50 / Queen Street. ▶ Local neighbourhood connection to link cyclists to Dicks Dam Park. ▶ Parallel connection to King Street that also provides access to the downtown core. ▶ Low volume, low speed (posted speed 40 km/h), pavement in good condition – low cost to implement signed bike route with installation of green 'Bike Route' signs.
3	Bolton Arterial Bypass (King Street to Duffy's Lane) Proposed In-Boulevard Trail Rationale: ▶ Connection identified in the Region of Peel's Active Transportation Network. ▶ Economies of Scale: cost of constructing an in-boulevard trail can be integrated into the overall cost of the new roadway construction. ▶ Parallel connection to Queen Street so cyclists / pedestrians can avoid travelling through a congested downtown area. ▶ Provides users with a connection to the Humber Valley Heritage Trail. ▶ Provides link for cyclists and pedestrian accessing the future planned development areas.



Priority	Proposed Route and Rationale
4	Bolton Arterial Bypass (Duffy's Lane to Queens Street / Highway 50) Proposed Paved Shoulder Rationale: ► Connection identified in the Region of Peel's Active Transportation Network. ► Economies of Scale: Building upon and connecting to priority project #3, the cost of constructing paved shoulders can be integrated into the overall cost of the new roadway construction. ► Parallel connection to Queen Street so cyclists can avoid biking through a congested downtown area. ► Provides a connection to the Humber Valley Heritage Trail.
5	Glasgow Road (Bolton Arterial Bypass to Deer Valley Road) Proposed Signed-Only Bike Route Rationale: ► Provides a local connection to the Humber Valley Heritage Trail. ► Connects users to the playing fields (soccer field, volleyball courts, and tennis courts) in Edelweiss Park, Dicks Dam Park and Jack Garrat Soccer Park. ► Construction of a proposed signed route on Glasgow Road would provide an inter-municipal linkage for users along the Humber Valley Trail. Users could connect to the trail via Bolton Arterial Bypass, then cycle along Glasgow Road to the trail and east to the Township of King. ► Provides connection to priority project #1 (Deer Valley Road) and #3 (Bolton Arterial Bypass) ► Low volume, low speed (posted speed 40 km/h), pavement in good condition – low cost to implement signed bike route with installation of green 'Bike Route' signs. Consider implementing 'Share the Road' signs in locations where sight lines are obstructed.
6	Station Road (Old Ellwood Drive / Ellwood Drive to King Street) Proposed Signed-Only Bike Route Rationale: ► Provides local connection to the existing in-boulevard trail along the north side of King Street and priority project #1 (Deer Valley Road). ► Low volume (posted speed 40 km/h), pavement in good condition – low cost to implement signed bike route with installation of green 'Bike Route' signs. ► Connects to other smaller existing off-road trails that link users to Boltonview Crescent

Priority	Proposed Route and Rationale
7	King Street (Queen Street / Highway 50 to Station Road) Proposed Bike Lane & Proposed Signed-Only Bike Route with Sharrows Rationale: ▶ Connection identified in the Region of Peel's Active Transportation Network. ▶ Key east-west connection for users travelling from residential areas to the downtown core for different trip purposes (e.g. going to / from work, running errands, social reasons, etc.) ▶ Facilitates utilitarian travel and inter-municipal connections along with other sections of King Street (e.g. priority project #8) ▶ Provides connection to the existing in-boulevard multi-use trail on the north side of King Street. ▶ Key community destinations on King Street including churches, businesses, post office, retail stores, and an art gallery. ▶ Road in good condition – requires pavement marking and signage to implement proposed bike lanes.
8	King Street (Queen Street / Highway 50 to Albion Vaughan Townline) Proposed Signed-Only Bike Route with Sharrows Rationale: ▶ Connection identified in the Region of Peel's Active Transportation Network. ▶ Key east-west connection for users travelling from residential areas to the downtown core different several trip purposes (e.g. going to / from work, running errands, social reasons, etc.) ▶ Facilitates utilitarian travel and inter-municipal connections along with other sections of King Street (e.g. priority project #7) ▶ Provides connection to the Humber Valley Heritage Trail and the future proposed trails in TRCA Lands (Bolton Camp Property). ▶ Roadway recently constructed (pavement in good condition). Low cost to paint sharrow markings and install 'Share the Road' signs in locations where needed.
9	Queen Street / Highway 50 (Hickman Street to Bolton Heights Road) Proposed In-Boulevard Trail Rationale: ▶ Connection identified in the Region of Peel's Active Transportation Network. ▶ Key north-south connection for users travelling from residential areas to the downtown core for different trip purposes (e.g. going to / from work, social reasons, etc.). ▶ Facilitates utilitarian travel and inter-municipal connections along with other sections of Queen Street (e.g. priority project #10) ▶ Provides connection to priority project #2 (Hickman Street) and #10 (Queen Street / Highway 50 - King Street to Hickman Street) ▶ Connects to existing in-boulevard multi-use trail north of Bolton Heights Road and Albion-Bolton District Park. ▶ Integrate construction of proposed facility type into timeline of the proposed roadway improvement as per the Transportation Master Plan.



Priority	Proposed Route and Rationale
10	Queen Street / Highway 50 (King Street to Hickman Street) Proposed Bike Lane and Proposed In-Boulevard Trail Rationale: ► Connection identified in the Region of Peel's Active Transportation Network. ► Facilitates utilitarian travel and inter-municipal connections along with other sections of Queen Street (e.g. priority project #9) ► Provides connections to priority project #7 (King Street West), #8 (King Street East) and the Humber Valley Heritage Trail (under the Highway 50 road bridge). ► Key community destinations on Queen Street / Highway 50 Street including businesses, retail stores, restaurants and bars. ► Integrate construction of proposed facility type into timeline of the proposed roadway improvement as per the Transportation Master Plan.
11	The Gore Road / Regional Road 8 (Mayfield Road to Castlederg Sideroad) Proposed Paved Shoulder Rationale: ► Economies of scale: Identified in the 2015 Regional Ten Year Capital Plan for two lane reconstruction and / or pavement rehabilitation from Highway 9 / King Street to Patterson Drive (schedule for 2018). ► Key north-south linkage connecting residents to rural areas in Bolton.
12	Landsbridge Street / Saint Farm Drive (Allan Drive to Allan Drive) Proposed Signed-Only Bike Route with Edgeline Rationale: ► Potential to encourage multi-modal trips – GO Transit bus service along Queensgate Boulevard that connects to Landsbridge Street. ► Provides connection to large retail complex (south west of Landsbridge Street / Queensgate Boulevard), RJA Potts Memorial Park , Dell'Unto Parkette and an elementary school. ► Connects to other smaller existing off-road trails that link users. ► Connects to priority project #13 (Allan Drive).
13	Queensgate Boulevard (Highway 50 / Queen Street to Albion Vaughan Road) Proposed Buffered Bike Lane Rationale: ► Potential to encourage multi-modal trips – GO Transit bus stops and service along Queensgate Boulevard ► Connects to priority project #12 (Landsbridge Street / Saint Farm Road) and #14 (Allan Drive).

Priority	Proposed Route and Rationale
14	Allan Drive (Saint Farm Drive to Queen Street / Highway 50) Proposed Signed-Only Bike Route Rationale: ► Potential to encourage multi-modal trips – GO Transit bus stop on Allan Drive / Queen Street (Highway 50) ► Provides connection to large retail complexes, a church, health centre, Fountainbridge Community Park and two schools. ► Connects to priority projects #12 (Landsbridge Street / Saint Farm Drive) and #20 (Strawberry Hill Court).
15	Wilton Drive (Queen Street / Highway 50 to Ellwood Drive) Proposed Bike Lane Rationale: ► Connects to priority projects #14 (Allan Drive) and #16 (Old Ellwood Drive / Ellwood Drive). ► Low volume, low speed (posted speed 40 km/h), road in good condition. Requires pavement marking and signage to implement proposed bike lanes. ► Local neighbourhood connection that links to other priority projects and avoids travel on Highway 50 / Queen Street.
16	Old Ellwood Drive / Ellwood Drive (Coleraine Drive to Off-Road Trail connecting to Mellow Crescent); and Mellow Crescent (Off-Road trail to Allan Drive) Proposed Signed-Only Bike Route Rationale: ► Connects to priority projects #14 (Allan Drive), #15 (Wilton Drive) and #16 (Station Road) ► Low volume, low speed (posted speed 40 km/h), road in good condition. Low cost to implement signed bike route with installation of green 'Bike Route' signs.
17	De Rose Avenue (King Street to Road Terminus) Proposed Signed-Only Bike Route Rationale: ► Low volume, low speed (posted speed 40 km/h), road in good condition. Low cost to implement signed bike route with installation of green 'Bike Route' signs. ► Connect to existing off-road multi-use trail (at road terminus) that provides link to playing field in Edelweiss Park. ► Once completed, De Rose Avenue along with Hickman Street will provide a parallel route from King Street.

Priority	Proposed Route and Rationale
18	Highway 50 / Queen Street (Foxchase Drive to Castlederg Sideroad) Proposed Buffered Paved Shoulder Rationale: ► Connection identified in the Region of Peel's Active Transportation Network. ► Provides connection to the Humber Valley Heritage Trail. ► Key north-south connection to facilitate utilitarian travel through the community along with other priority projects on Highway 50 / Queen Street. ► Potential to encourage multi-modal trips – GO Transit bus stop on Highway 50 / Foxchase Drive. ► Connects to existing in-boulevard multi-use trail south from Foxchase Road, schools, parks and community centres.
19	Cedargrove Road (Harvest Moon Drive to Harvest Moon Drive) Proposed Signed-Only Bike Route Rationale: ► Low volume, low speed (posted speed 40 km/h), road in good condition. Low cost to implement signed bike route with installation of green 'Bike Route' signs. ► Provides a connection to the existing multi-use trail that links to Adam Wallace Memorial Park and an elementary school. ► Connects to priority project #20 (Harvest Moon Drive).
20	Harvest Moon Drive (King Street to Coleraine Road) Proposed Signed-Only Bike Route with Edgeline Rationale: ► Provides a connection to the existing multi-use trail that links to an elementary school and Adam Wallace Memorial Park. ► Low volume, low speed (posted speed 40 km/h), road in good condition. Low cost to paint edge line and install green 'Bike Route' signs. ► Connect to priority project #19 (Cedargrove Road).
21	Strawberry Hill Court (Allan Drive to Road Terminus) Proposed Signed-Only Bike Route Rationale: ► Local neighbourhood connection to link user to Bond Street (priority project #22) and the Humber Valley Heritage Trail. ► Short route and low cost to install green 'Bike Route' signs. ► Provides local residents with a parallel connection to Queen Street / Highway 50 (along with Bond Street) to access downtown.

Priority	Proposed Route and Rationale
22	Bond Street (King Street to Road Terminus) Proposed Signed-Only Bike Route Rationale: ► Provides local residents with a parallel connection to Queen Street / Highway 50. ► Connects to the Humber Valley Heritage Trail. ► Short route and low cost to install green 'Bike Route' signs.
23	Sneath Road (King Street to pedestrian trail bridge) Proposed Signed-Only Bike Route Rationale: ► Connects to existing pedestrian bridge over the Humber River. ► Potential to connect to the future planned trails in TRCA Lands (Bolton Camp Property). ► Connects to priority project #10 (King Street East). ► Short route and low cost to install green 'Bike Route' signs.
24	Healey Road (The Gore Road / Regional Road 8 to Coleraine Road) Proposed Bike Lane Rationale: ► Parallel east-west connection to King Street ► Provides connections to major employers and facilitates utilitarian travel for those traveling to / from work by bike. ► Connect to priority project #8 (The Gore Road) and #25 (Coleraine Drive).
25	Coleraine Drive (Healey Road to King Street) Proposed Buffered Bike Lane Rationale: ► Provides north-south parallel route to Highway 50 / Queen Street ► Connects to priority projects #20 (Harvest Moon Drive) and #24 (Healey Road) and#15 (Old Ellwood Drive / Ellwood Drive) ► Provides connections from residential areas to key employment areas. Potential to facilitate utilitarian travel for employees travelling to / from work. ► Provides linkage through the railway crossing
26	Columbia Way (Highway 50 to Kingsview Drive) Proposed In-Boulevard Multi-use Trail Rationale: ► Recommended by Regional Staff ► Potential to extend the existing in-boulevard trail through Highway 50 / Queen Street ► Potential to provide users with a connection to St. Michael Catholic Secondary School – signalized crossing at Kingsview Drive and existing in-boulevard along the north side of Foxchase Drive into the school property ► Connections to priority projects #18.



Priority	Proposed Route and Rationale
27	Kingsview Drive (Foxchase Drive to Longwood Drive); Bolton Heights Road (Highway 50 / Queen Street to Kingsview Drive); Taylorwood Avenue (Existing Off-Road Trail to Existing Off-Road Trail); Silvermoon Avenue (Kingsview Drive to Silver Valley Drive); Silver Valley Drive (Silvermoon Avenue to road cul-de-sac); Evans Ridge (Silver Valley Drive to King Street East; and Humberlea Road (Kingsview Drive to King Street East). Proposed Signed-Only Bike Route Rationale: ► Recommended by Regional Staff ► Local neighbourhood connection that links users to several schools and parks ► Provides connection to other small existing multi-use trail ► Proves connections to the future planned off-road trail in TRCA lands (Bolton Camp Property) ► Provides connections to priority projects #8 (King Street East), #9 (Highway 50 / Queen Street), and #26 (Columbia Way) ► Low volume, low speed (posted speed 40 km/h), roads are in good condition. Low cost to install green 'Bike Route' signs.

Recommendation(s):

12 Table 7 should be reviewed by the Region and Town and should be used as a guide to determine the timeline, approach and order in which the short-term priorities are implemented. Annually, the Town and Region should work together to update the list to document annual outcomes and next steps.

5.2 MAINTAINING THE ROUTES

Proper maintenance of AT routes is essential to increase AT use and achieve the vision and objectives. A municipality cannot plan and budget for on and off-road AT facilities without taking into consideration the maintenance level of service that is needed to provide a sense of comfort and safety for different user groups.

Within the Town of Caledon, the public works department provides winter operations including sanding and plowing on all Regional roads to meet the minimum requirements set-out under the Ministry of Transportation Minimum Maintenance Standards and the Highway Traffic Act. For winter maintenance of arterial roads in the Town of Caledon (e.g. Highway 50, King Street, Mayfield Road, Gore Road (RR8)) it is currently the responsibility of the Region of Peel. Currently under review, the Minimum Maintenance Standards are being updated to reflect maintenance practices as it relates to more varied transportation modes and alternatives throughout the various seasons.

The Municipal Act indicates that lower tier municipalities are responsible for maintaining all sidewalks, including those along regional roads. The Town of Caledon currently winter-maintains 140km of sidewalks and pathways to provide year-round access to pedestrians and some cyclists. On-road cycling facilities are typically maintained by the respective road authority or are determined through an agreement between the upper and lower-tier municipalities. As such, for all on-road facility types identified along Regional roads (that are not Arterial Roads) it would be the responsibility of the Town of Caledon to determine the maintenance approach. For facilities found along arterial roads, it is the responsibility of the Region of Peel.



The maintenance of multi-use trails, either in-boulevard or off-road, is typically negotiated between upper and lower tier municipalities, and where applicable, conservation authorities. For all facilities found within the TRCA lands, it is the responsibility of the conservation authority to maintain facilities to the standards they have identified.

The goal of maintenance should be to reduce risk for AT users and to provide facilities that are comfortable to use and aesthetically acceptable. To achieve this, a number of maintenance activities are typically required, including:

- Sweeping to remove road debris which often accumulates in cycling facilities that are adjacent to motor vehicle lanes;
- Surface repairs to provide a smooth riding / walking surface for cyclists and pedestrians and proper drainage;
- Vegetation management to ensure sufficient operating space for users;
- Inspection and maintenance / replacement of signage and pavement markings;
- Inspection and maintenance of bicycle parking facilities; and
- Winter maintenance on key routes.

As the Town and Region develop the network of AT facilities within the community of Bolton there are a number of key considerations and steps that will be required to There a number of steps that the Town and the Region can take to develop efficient and effective maintenance practices. These include:

- Identifying a priority network of routes that are maintained year round;
- Developing maintenance levels of service for cycling and pedestrian facilities. Many municipalities apply their roadway maintenance levels of service to on-road cycling facilities; and
- Coordinating maintenance responsibilities and procedures between the Town and the Region to ensure consistent maintenance of facilities and to achieve maximum efficiency.

Recommendation(s):

13 The Town and Region should review their current approach to maintenance and should determine any revisions or adaptations to reflect the maintenance level of service and practices needed to accommodate the implementation and seasonal use of select on and off-road facilities.

14 The Town and Region should review their maintenance budgets on an annual basis as the network is implemented. As the number of kilometres of AT facilities increases, the budget should be adapted as needed to reflect the level of service and practices needed to facilitate their use.



5.3 PLANNING FOR AT

In addition to the design and implementation considerations, the Town and Region will also need to consider planning requirements which could arise as the strategy is implemented. The information included in this section provides an overview of some of the planning considerations that the Town and Region may wish to address as they move forward with the implementation of the strategy.

5.3.1 Community Planning and Design Strategies to Support AT

The design of a community can determine how and when people engage in active transportation and recreation. Research indicates a direct link between the layout and design of communities and increases in health, social interaction, safety and economic development. Community planning and design strategies that are supportive of AT include mixed land uses, higher density development, convenient school locations, neighbourhood integration of pedestrian and cycling infrastructure, designing appealing streetscapes and the provision of recreational facilities. The Town of Caledon and Region of Peel are encouraged to consider these strategies for future land use and community planning initiatives.

- Mixed Uses: mixing residential and other land uses to decrease the distance between people's place of origin and their destination making trip length shorter.
- High Density Development: encouraging higher-density development and strategically planning for amenities to be located within walking or cycling distance of residential areas. This can also benefit businesses as people who are able to walk or cycle to major commercial nodes are more likely to spend monies within their own community.
- Convenient school locations: Conveniently location schools so there is access for children to safely and securely cycle or use trails to get form the school to home or other key destinations.
- Integrating cycling and walking infrastructure: Designing cycling and walking supportive infrastructure and amenities when designing for other projects e.g. park spaces and making these modes more visible within the community e.g. bike parking along major AT corridors.
- Appealing streetscape: Designing streetscapes that accommodate or are appealing to pedestrians and cyclists through effective design, good lighting, well-maintained facilities, signage, crossing treatments, etc.

Recommendation(s):

15 When next updated, the Town's Official Plan and other relevant planning policies at the Regional and Local level should be reviewed to ensure that they are supportive of the design and implementation of AT facilities and speak to AT supportive land-use and community planning, design and development.

5.3.2 Cycling in New Development Areas

Planning for AT facilities is a critical component of the land development process. Developers should be expected to work through an iterative process with the Town and the Region early in the planning stages to create appropriate pedestrian and cycling networks within their development area that reflect the vision established in this AT Strategy. Many developers understand and acknowledge the value of integrating active transportation facilities into their projects. The added value that these features provide can have a positive effect on home sales and neighbourhood desirability.



Wherever possible, AT facilities should be constructed prior to, or at the same time as other community infrastructure and homes are being built. When facility installation is deferred until after homes are built, there can be conflict when residents adjacent to planned routes claim that they were not aware of plans for construction even if this intention has been clearly indicated in municipal planning documents.

Developers should be encouraged to be pro-active about notifying prospective buyers about planned AT facilities. Providing information at sales offices, including information in sales packages and erecting signs in locations where infrastructure will be constructed may help to alleviate difficulties at a later date.

Recommendation(s):

16

Changes to the way on and off-road AT facilities are planned, designed and constructed as part of the development process should be communicated to the development community. Clear directions on the approach used to review site plans and the development applications should be clearly laid out in Town and Regional policies.

5.4 PROMOTING THE NETWORK

In order to achieve the benefits of a comprehensive AT network it must be well used by the community. Many communities have been able to promote their networks using the "four Es" – Encouragement; Education; Enforcement and Evaluation.

The "four E's" are further reinforced through the Province's #CycleON strategy as the principles for cycling promotion. As noted in section 1.2.2 the Region and its partners have initiated a number of AT supportive programs which the Bolton AT Strategy is intended to build upon. For each of the "four E's" initiatives have been identified which the Region / Town should consider for implementation through partnerships with key stakeholders and interest groups.

Encouragement

Encouragement typically involves providing incentives or special events that inspire people to walk or cycle and reduce the barriers that may otherwise prevent them from doing so. A number of encouragement initiatives are already in place in and around Bolton including but not limited to historical walking tours that have been led by the Albion-Bolton Historical Society and the RideDon'tHide bicycle ride that takes place west of Bolton.

- Initiative #1: Host 2-4 community bicycle rides each summer that would be led by citizen volunteers including a bike to work day event. A similar program has been launched in the City of Mississauga, where the community bicycle rides provide an opportunity for community members to get to know each other and their neighbourhood, and provides a more comfortable environment for cyclists who may not be as comfortable cycling on their own.
- Initiative #2: Work with Peel District School Board, Dufferin-Peel Catholic District School Board, school principals and parent-teacher associations to launch a Walking School Bus program. A walking school bus is a program organized by the Active and Safe Routes to School organization which helps coordinate a group walk to school that is supervised by at least one adult. Many parents feel more comfortable with their child walking to school if they know that they are walking in a supervised group. This initiative should begin with one school and expand to other schools based on demand and available resources.

Education

Education can take the form of programs that improve road users walking, riding and driving skills or simply providing information about AT facilities, the benefits of using AT, safety tips as well as legal information about road and trail use.

- Initiative #3: CAN-BIKE courses are currently offered in Caledon East and could also be offered in Bolton. A range of CAN-BIKE courses are available, ranging from courses for children and beginners to courses for experienced commuting cyclists. Courses for beginners cover the basics of how to ride a bike and basic safety skills while advanced courses train cyclists to make good decisions in traffic, develop safer riding habits, avoid collisions, and understand the rights and responsibilities of various road users as outlined in the Highway Traffic Act.

Enforcement

Enforcement is about ensuring that the laws governing trail and road use are followed and that all trail and road users are held accountable. The goal of enforcement should be to discourage dangerous walking, cycling and driving behavior and provide education about how to improve safety while using roads and trails. It is important that enforcement initiatives focus on all potential users and are designed to improve road and trail use behaviour and not to discourage AT use.

- Initiative #4: Partner and engage with local and County enforcement officers (e.g. by-law officers, Peel Regional Police, Conservation Authority Officers etc.) to ensure that ongoing pedestrian and cycling enforcement is facilitated.
- Initiative #5: Collect accurate trail and cycling collision data to help identify any potential problem areas as well as safety and enforcement priorities.

Evaluation

Evaluation involves monitoring the success of AT initiatives. This will allow all of the partners involved in implementation to understand what aspects of the strategy have worked well and where ongoing challenges exist. The end result is better decision making and more efficient use of resources.

- Initiative #6: Identify performance metrics and targets for three key goals, such as the timely implementation of short term priorities, the number of users on a facility or the level of participation in a Walking School Bus program.
- Initiative #7: Gather data for the established performance metrics and use them to improve the implementation process and report on successes.

Recommendation(s):

17 The Town and Region should work with Smart Commute Brampton-Caledon and other stakeholder e.g. the health unit to review the proposed initiatives and to identify preferred initiatives to move forward with in the short-term.

18 The Town and Region should work with local businesses and interest groups to determine their level of interest and involvement in recommended initiatives and should engage with them to identify other opportunities to improve AT promotion.

5.5 HOW MUCH WILL IT COST?

The proposed capital cost to implement the Bolton AT Network has been developed based on a set of unit costs used on recent design and construction project across Ontario. Appendix B lists the unit cost for construction of the various elements of the AT network and also includes unit costs for AT amenities that may be considered on a project by project specific basis.

The unit costs (in 2015 dollars) have been developed based on the following assumptions:

- They assume typical or normal / average conditions for construction.
- Estimates do not include the cost of property acquisition, utility relocation, driveway / entrance restorations, permits or approvals for construction.
- Annual inflation, which includes increased cost of labour, materials, fuel, etc., is not included.
- Professional services and / or staff time for detailed design have not been included.
- Applicable taxes are not included.

Based on the assumptions noted above and the unit costs outlined in Appendix B, a cost estimate has been developed to show the estimate capital cost by facility type, phase and jurisdiction. The estimated capital cost to implement the 15+ year plan is estimated at $12,198,380.

Table 7 summarizes the estimated capital cost to implement Phase 1 (0-5 years) of the Bolton AT network. These costs are associated with the short-term priority projects identified in Section **Error! eference source not found.**.

Table 7 – Estimated Capital Cost of Short-Term Active Transportation Network

	Short Term (0-5 Years)	
Proposed Facility Type	**Town of Caledon**	**Peel Region**
Off-Road Trail	$0	$0
In-Boulevard Trail	$66,000	$267,500
Cycle Track	$0	$0
Buffered Paved Shoulder	$0	$367,500
Paved Shoulder	$0	$1,123,100
Buffered Bike Lane	$1,820,000	$0
Bike Lane	$27,675	$6,300
Signed-Only Bike Route with Edgeline	$16,920	$0
Signed-Only Bike Route with Sharrow	$0	$7,525
Signed-Only Bike Route	$21,555	$0
Total	**$1,952,330**	**$1,771,925**

A more detailed summary can be found in Appendix C. It is important to note that the costing associated with Phase 2 (6 – 15+ years) would need to be revisited as the plan is implemented. The budget associated with these routes will be dependent on achieving economies of scale through future capital plans as well as municipal priorities as identified by Council and staff.



There are other costs associated with the implementation of select off-road multi-use trails. However, those costs will be the responsibility of the Toronto and Region Conservation Authority and will be determined based on the master planning assignment currently being undertaken.

Recommendation(s):

19 To implement the short-term priorities in the next 5 years, the Town of Caledon should budget a total of $1,952,330 and the Region of Peel should budget $1,771,925. This translates to $385,066 per year for the Town of Caledon and $354,395 for the Region of Peel.

5.5.1 Coordinating with Capital Projects

The implementation of the Town's AT network should be identified in the capital budget and based on opportunities and objectives for the coming year. Roads which have been identified in the Bolton AT strategy for the implementation of on-road or in-boulevard facilities should be given priority when moving forward with the planning, design and budgeting for a project.

It is expected that many of the capital costs related to the construction / implementation of on-road and in-boulevard facilities will be included within planned local roadway construction or resurfacing projects, or other Regional projects. The Region and Town should also consider the costs associated with maintenance of facilities and should consider this when identifying annual operations budgets for on and off-road facilities.

Recommendation(s):

20 The Town and Region should review their capital works on an annual basis and consider the projects and phasing timelines identified in the AT Strategy to maximize cost savings and ensure a network of connected routes (on-road, off-road and in-boulevard) as it is constructed over time.

5.6 MOVING FORWARD: PARTNERSHIPS & FUNDING

The implementation of the AT Strategy will require coordination and communication between Town and Regional staff as well as local partners, interest groups and stakeholders. As the Town and Region move forward with AT related initiatives they are encouraged to develop a group of staff to help guide the future of AT within Bolton. The group or committee would not only be made up of Regional and Town staff but would also identify representatives from the Toronto and Region Conservation Authority, the Humber Valley Heritage Trail Association and surrounding municipalities to ensure that opportunities are highlighted to facilitate coordination and collaboration between the key decision makers. The committee would be responsible for coordinating events, working with agencies to implement programming and would inform the design and implementation of facilities. This group is encouraged to meet, at least, on an annual basis to discuss the progress of implementation, to highlight new or emerging opportunities and to plan for future implementation.

In addition to the staff "committee" and building on the significant interest expressed by the community residents and businesses over the course of the study, the Town and Region may consider engaging with community representatives at key stages as the strategy is implemented to gather their insights on potential programs and initiatives as well as infrastructure projects and complementary amenities e.g. bike parking, signage, wayfinding, etc.



If the Town and / or Region are able to secure the funding and partnership commitment to proceed with the implementation of this strategy, they are strongly encouraged to commence the design and development of key linkages and the implementation of programming that supports the future of AT in Bolton. Potential funding opportunities which are currently available which could be explored by the Town and Region include:

- Federal/Provincial Gas Tax;
- Transport Canada's MOST (Moving On Sustainable Transportation) and Eco Mobility (TDM) grant programs;
- Federation of Canadian Municipalities Green Municipal Fund;
- Ontario Ministry of Health grant programs and partnership streams such as the Healthy Communities Fund and promotional initiatives related to health, active living and active transportation;
- Ontario Ministry of Environment Community Go Green Fund (CGGF);
- Ontario Ministry of Transportation Demand Management Municipal Grant program;
- Various Federal and Provincial Infrastructure stimulus programs that are offered from time to time;
- The Ontario Trillium Foundation that was recently expanded in response to the money collected throughout the Province by casinos;
- Human Resources Development Canada program that enables personnel positions to be made available to various groups and organizations; and
- Ministry of Transportation Ontario Cycling Infrastructure Funding Program.

There are significant opportunities available for the residents and visitors of the community of Bolton to engage in active forms of transportation using various routes and facility types. If a continuous and connected AT system is implemented it will contribute to the attractiveness and economic strength of the community as well as the preservation of natural and cultural features. Interest has been generated through the Region's AT Study, local and Regional initiatives as well as this TMP. This momentum should be leveraged to enhance the potential for future endeavours.

Recommendation(s):

21 The Town and Region should identify a group of staff members and representatives from key stakeholder and interest groups to form a committee focused on implementing the Bolton Active Transportation Study.

22 The Town and Region should consider priority projects identified as part of the AT strategy which could be considered for additional funding opportunities e.g. MTO Infrastructure Funding Program and should explore additional opportunities for partnerships to disperse costs where possible.



6.0 CONCLUSIONS

The Active Transportation Strategy for the community of Bolton has been developed as a long-term blueprint and guide for the Town and the Region. The strategy is intended to provide those responsible for the planning, design and implementation of AT facilities, programs and policies which impact the Bolton with the tools needed to move forward with community development as it relates to improved transportation alternatives.

The proposed linkages have been identified to achieve the vision and objectives set-out in the strategy and to support strategic objectives outlined in other planning documents at the regional and local level. The Town, Region and their partners are encouraged to use this document as a resource, to guide the next steps in the implementation process. The recommendations and improvements identified in the strategy have been developed with feasibility in mind.

The information included in the report reflect the input received from those members of the public, stakeholders and staff who were involved throughout the study process and helped to shape much of the content prepared. The study team would like to thank all of those who were involved in the development of the strategy that will help to influence short and long-term changes to improve active and sustainable forms of transportation in Bolton.



TOWN OF CALEDON



APPENDIX F – MODELLING AND TRUCK MEMO

FOR

THE BOLTON TRANSPORTATION MASTER PLAN STUDY

MMM GROUP

MMM GROUP Memo

To:	Eric Chan, Peel Region Kant Chawla, Town of Caledon	Date:	August 14, 2015
From:	Ismet Medic, MMM Nemanja Radakovic, MMM	Job No.:	1614005-001-TR2
Subject:	Bolton TMP, Downton Core Vision and Truck Movement Assessment	CC:	Peter Hillier, MMM Brett Sears, MMM

This memo documents the background assumptions and the results of the Bolton downtown core vision assessment. The focus of the assessment was to provide a recommendation regarding traffic control, including controlled pedestrian crossing locations and treatments, at the intersections of Hwy 50/Hickman Street, Hwy 50/Mill Street and Hwy 50/Sterne Street in the Bolton downtown core. The memo also provides recommendations regarding the restriction of heavy trucks on Hwy 50 and King Street through the Bolton downtown core.

MODELLING

UPDATED EXISTING

Based on discussions with Region of Peel and Town of Caledon staff, it was agreed that narrowing of Highway 50 to two lanes though the Bolton downtown core is probably the most effective option to achieve a goal of reducing traffic volumes and improving pedestrian environment within the Bolton core as well as making the Bolton Arterial Road (BAR) an attractive alternative to Highway 50 for the existing traffic on Highway 50.

Hence, MMM was directed by Peel Region and Town of Caledon staff to analyze the traffic impacts of narrowing Highway 50 (from a four-lane cross-section to a two-lane cross-section) through downtown Bolton, and the construction of the BAR. One of the main concerns was to determine if there is sufficient capacity on the surrounding north/south roadways to handle the displaced traffic created by the narrowing of Highway 50 through the Bolton downtown core. The updated Peel Region macro model was utilized to determine the available capacity on these roadways. Within the updated model, the existing roadway network was reprogrammed to include the implementation of the BAR and the narrowing of Highway 50 between Hickman Street and King Street. **Figure 1** shows the volume-to-capacity (v/c) ratios obtained from the modified existing model run.

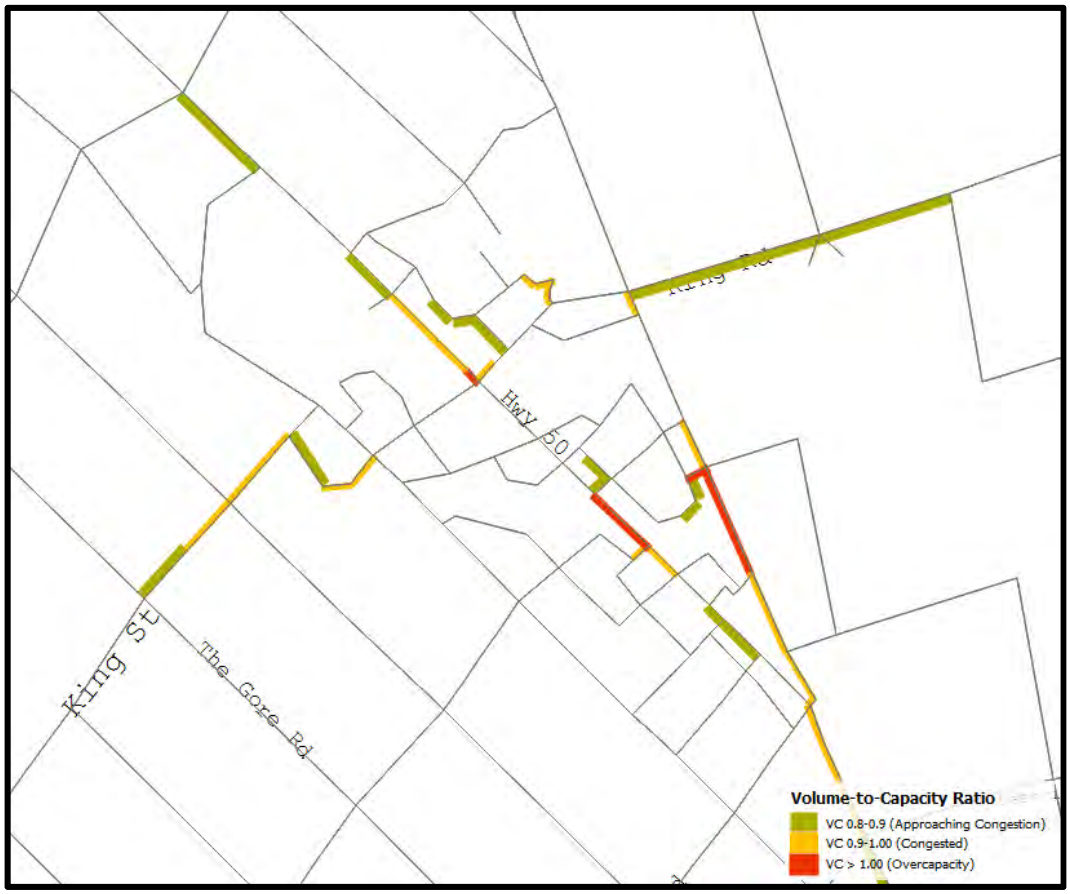


Figure 1: V/C Ratios for Modified Existing Model Containing BAR and Highway 50 Narrowing

Based on the results, there is sufficient capacity along the BAR/Coleraine Drive corridor to accommodate the existing trips which will be displaced as a result of the narrowing of Highway 50.

The difference in volumes between the modified and existing model is shown in **Figure 2**. Due to the narrowing there is a significant reduction of traffic along Highway 50. This traffic seems to have been diverted to the BAR and Coleraine Drive. The reduction of trips northbound on Coleraine Drive could be due to traffic that originated in the Columbia Way area that previously utilized King Street-Coleraine Drive-King Street but now utilizes the BAR to go westbound on King Street.

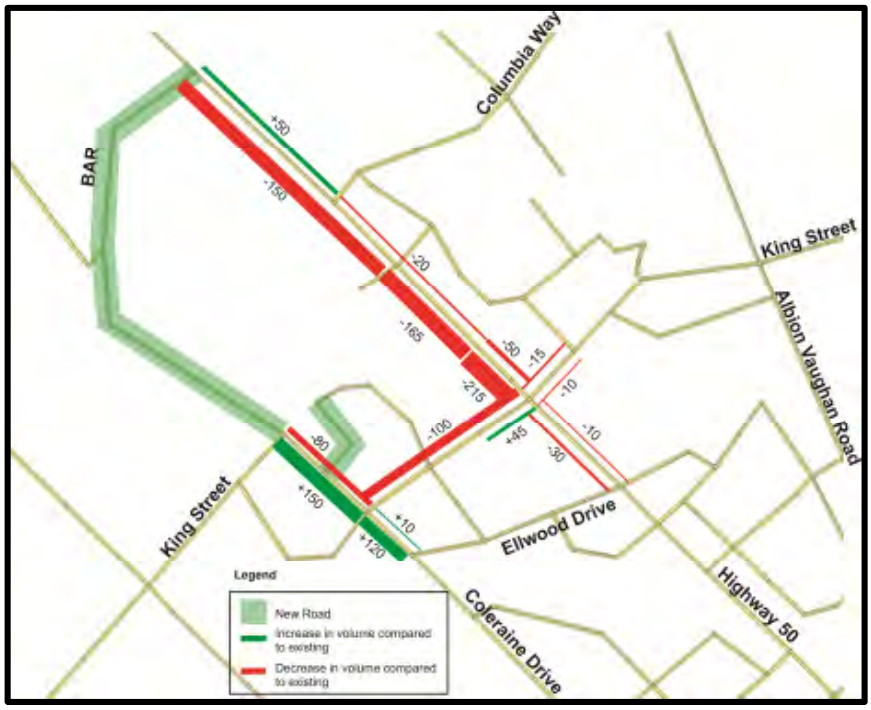


Figure 2: Volume Difference between the Modified and Existing Models

UPDATED 2031

It was also important to consider the long term impacts the Highway 50 narrowing through the Bolton core will have on the surrounding roadway network under 2031 conditions. In order to do this in the context of the other recommendations of the Bolton TMP, the 2031 preferred macro model scenario was analyzed. **Figure 3** shows the v/c ratios obtained from the 2031 model run.

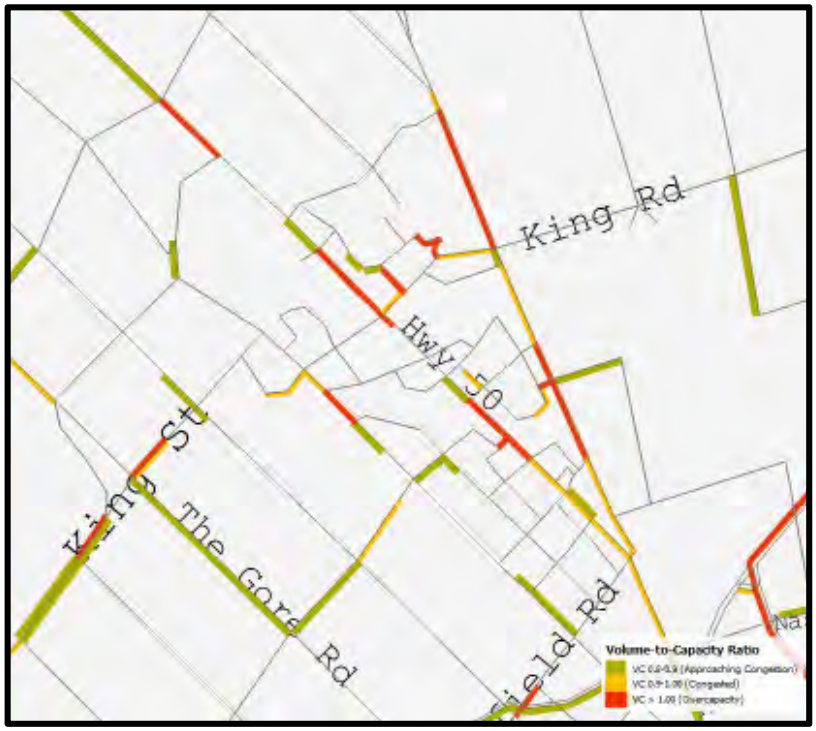


Figure 3: Preferred 2031 Model Results

It is important to note that the 2031 model has a number of significant land use and roadway changes that result in a different traffic distribution throughout Bolton compared to the existing model. However, both for the existing and the preferred 2031 scenarios, the model shows that Highway 50 through downtown Bolton is either congested or over capacity, which was expected due to the narrowing. At the same time, in both of the scenarios the BAR and Coleraine Drive have sufficient capacity to accommodate the displaced traffic. It should be noted that the impact of the closely spaced traffic signals within the Bolton core is not reflected in the model results, and as a result the number of the displaced vehicles is likely slightly underestimated.

OBTAINING PROJECTED VOLUMES

2016 Volumes

Based on discussions with Region of Peel staff, it was determined that the percent change in the macro model results between the original existing scenario (roadway network as is), and the modified existing scenario (with the opening of the BAR and Highway 50 downtown narrowing), should be applied to the existing turning movement count data to project the traffic volumes after the narrowing and the opening of the BAR.

Using these results, during the a.m. peak period, the southbound volumes along Highway 50 decreased by approximately 20% while the northbound volumes decreased by approximately 2%-9%. The link volumes along King Street decreased by approximately 3%, except the eastbound volumes approaching Highway 50, which saw an increase of 10%. The increase was due to more drivers opting to exit their neighbourhood onto King Street, as opposed to Highway 50. The volumes along Coleraine Drive increased, which was expected due to the addition of the BAR and the displacement of Highway 50 volumes. The volumes along Mayfield Road and Albion Vaughan Road stayed approximately the same. The percent changes in volumes were applied to the existing through movements at each intersection. For the p.m. peak hour volumes the percent change was applied to the opposite movements, to account for the change in directionality in the afternoon. The heavy vehicle percentages were also updated based on the new truck and traffic volumes.

2031 Volumes

Due to the drastic change in land uses surrounding the Community of Bolton, a slightly different approach was utilized in projecting the future 2031 traffic volumes. Once the preferred 2031 alternative was selected, the link volumes were extracted from the 2031 a.m. model and converted into turning movement counts. For the majority of the intersections in the a.m. peak hour, EMME's projected turning movements were utilized. The projected turning movements in EMME are not capacity constrained, therefore, at a number of intersections EMME showed significant turning movements that could not be accommodated. To resolve this problem, exclusive turning movement links with an adjusted capacity were provided and the traffic reassigned. This allowed for more realistic turning movement volumes. Once the volumes were projected using EMME, the volumes were checked for reasonableness. The volumes were then balanced between intersections and input into Synchro.

Due to the absence of a p.m. model, the methodology for projecting the p.m. peak hour volumes was different. To project the p.m. peak hour volumes, the a.m. peak hour growth rates (comparing the 2031 projections with the existing turning movements) were reversed, to the opposite movement, and applied to the existing p.m. peak hour turning movements. The process is illustrated in **Figure 4**. This methodology assumes that people use the same routes to and from work, school, etc. (in the evening drivers follow the same route as they did in the morning, just in the reverse direction). The volumes were then reviewed to check for reasonableness. The volumes were then balanced between intersections and populated into Synchro.

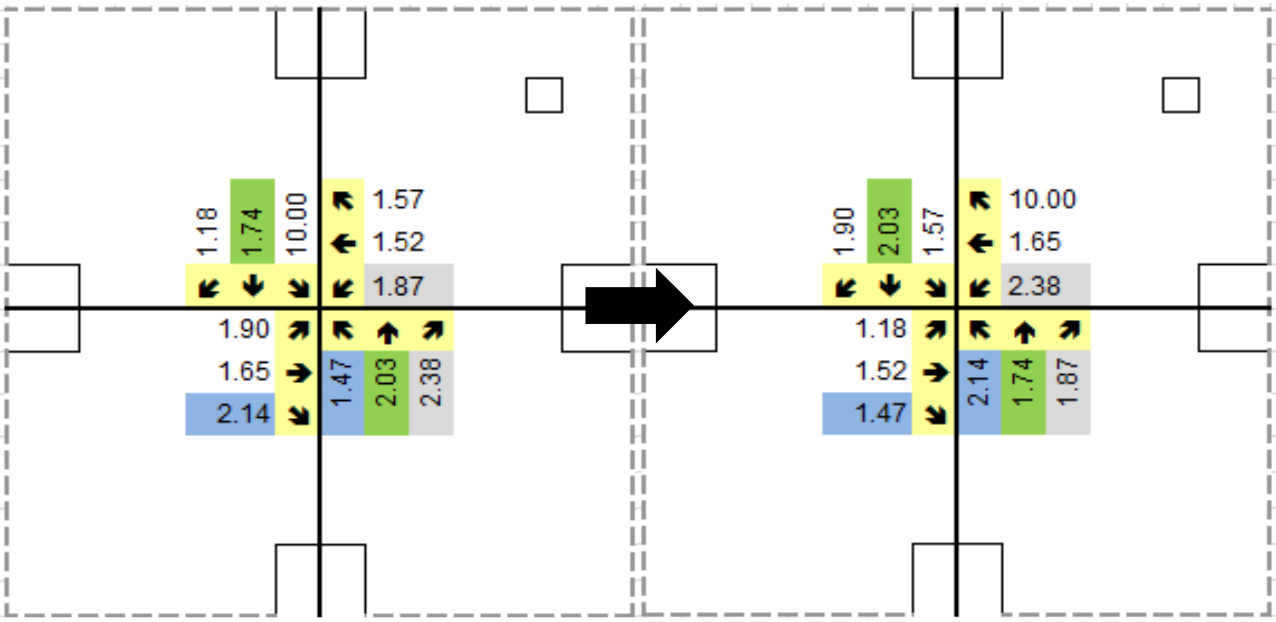


Figure 4: Producing the P.M. Growth Rates by Reversing the A.M. Growth Rates

ASSUMED LANE CONFIGURATIONS

The lane configurations were based on the available right-of-way and the projected traffic volumes. The assumed lane configurations are shown in **Figure 5**. At locations where the pedestrian crossing distance was modified (due to the narrowing of Highway 50) the "Flashing Don't Walk" (FDW) times were recalculated to allow a person to cross the roadway safely at a speed of 1.2 m/s (as specified in OTM Book 12). In addition, a standard 7 seconds of "Walk" time was provided.

TRUCK MOVEMENTS

The analysis also confirmed whether there was sufficient capacity at the critical intersections inside Bolton to allow a truck restriction to be implemented along King Street and Highway 50 through downtown Bolton. The methodology, assumptions and the analysis are shown below.

Truck Diversion

The number of trucks diverted away from Highway 50 and King Street was based on the Truck O-D Surveys conducted in August 2014 commissioned by MMM. Based on the O-D surveys it was determined that approximately 86% of the existing trucks along Highway 50 and 71% of the trucks along King Street are through truck trips that would divert away from these roads in case that a truck restriction is implemented (based on the Region's consolidated traffic by-law 15-2013, local deliveries are exempt from truck prohibition). This resulted in a diversion of 25 trucks per direction during the a.m. peak hour and approximately 18 trucks per direction during the p.m. hour from Highway 50. The trucks which were not diverted were assumed to be for local deliveries. Along King Street a diversion of 6 eastbound trucks and 11 westbound trucks was assumed for the a.m. peak hour, while 4 eastbound and 6 westbound trucks were diverted during the p.m. peak hour.

The diverted trucks would have a number of alternate options to by-pass the downtown area, however, to be conservative we assumed that all the diverted trucks used the same route. This represents a conservative approach as this methodology results in a higher than expected number of heavy vehicles at the critical intersections on trucking routes within Bolton. Trucks which were diverted from Highway 50 were assumed to use the BAR, Coleraine Drive, Mayfield Road before returning to Highway 50. The assumed diversion path, as well as other potential alternatives, is shown in **Figure 6**. Trucks diverted from King Street were assumed to use Coleraine Drive, Mayfield Road, Albion Vaughan Road and

before returning to King Street. The assumed diversion path is shown in **Figure 7**, along with potential alternatives. The total number of trucks diverted from Highway 50 and King Street are shown in **Figure 8**.

The geometric improvements at the intersections of Mayfield Road and Coleraine Drive, and Mayfield Road and Highway 50 are planned to occur in 2019. The focus of the assessment was to determine if even with these conservative assumptions, the truck prohibition through downtown Bolton could be implemented in 2016 before the planned improvements at these two intersections.

In addition to the diverted trucks added along Coleraine Drive and Mayfield Road, the projected truck trips to and from the proposed Canadian Tire Distribution Centre, located on the northwest corner of the intersection of Coleraine Drive and Healey Road, were added to our truck volumes, using the volumes from the Traffic Impact Study completed by BA Group.

Truck Analysis

The analysis was completed utilizing the assumptions above and is shown in **Table 1**. The control type through downtown Bolton was assumed to remain unchanged from the existing conditions for the purposes of this analysis.

Table 1: Summary of Truck Analysis

Intersections	Control Type (Suggested Improvement)	WEEKDAY A.M.			WEEKDAY P.M.		
		LOS (Delay in seconds)	Critical Movements (v/c)	Queue 50th (95th)	LOS (Delay in seconds)	Critical Movements (v/c)	Queue 50th (95th)
King Street at Highway 50	Signalized	D (38)	--	EB-T: 67(96) WB-TR: 74(101) NB-TL: 51(79) SB-TR: 135(204)	D(37)	WB-TR (0.85)	EB-T: 69(99) WB-TR: 102(#142) NB-TL: 188(260) SB-TR: 67(95)
King Street at Albion Vaughan Road	Signalized	C (31)	WB-L (0.95)	--	D (47)	WB-L (0.92) NB-TR (1.02)	--
	Signalized (implementation of exclusive NB-R lane, change cycle length)	C (22)	WB-L (0.89)	WB-L: 49(#101) WB-TR: 28(45) NB-T: 14(26) NB-R: 0(13)	C (23)	--	WB-L: 35(#80) WB-TR: 54(84) NB-T: 71(#136) NB-R: 38(#91)
Mayfield Road at Highway 50	Signalized	C (34)	WB-L (0.89)	EB-L: 28(44) EB-T: 31(51) EB-R: 3(23) WB-L: 90(133) WB-T: 81(112) WB-R: 0(0) NB-L: 14(46) NB-T: 58(78) NB-R: 0(10)	B (19)	--	EB-L: 30(39) EB-T: 39(52) EB-R: 2(7) WB-L: 30(45) WB-T: 35(53) WB-R: 0(0) NB-L: 12(#26) NB-T: 78(112) NB-R: 8(31)
Mayfield Road at Coleraine Drive	Signalized	C (28)	--	--	B (18)	--	SB-L: 14(28) SB-TR: 17(31)
	Signalized (SB-L prot+perm movement in the a.m. peak hour)	C (22)	--	SB-L: 17(31) SB-TR: 51(66)			

The intersection of King Street and Albion Vaughan Road approaches capacity during the a.m. peak hour and operates above capacity during the p.m. peak hour. This is due to the existing traffic volumes and not due to truck diversions. An exclusive northbound right turn lane is recommended to be implemented at this intersection. There is a limited space available on the east side of Albion Vaughan Road, and the feasibility to accommodate the proposed northbound turn lane will have to be determined based on a detailed engineering/feasibility study.

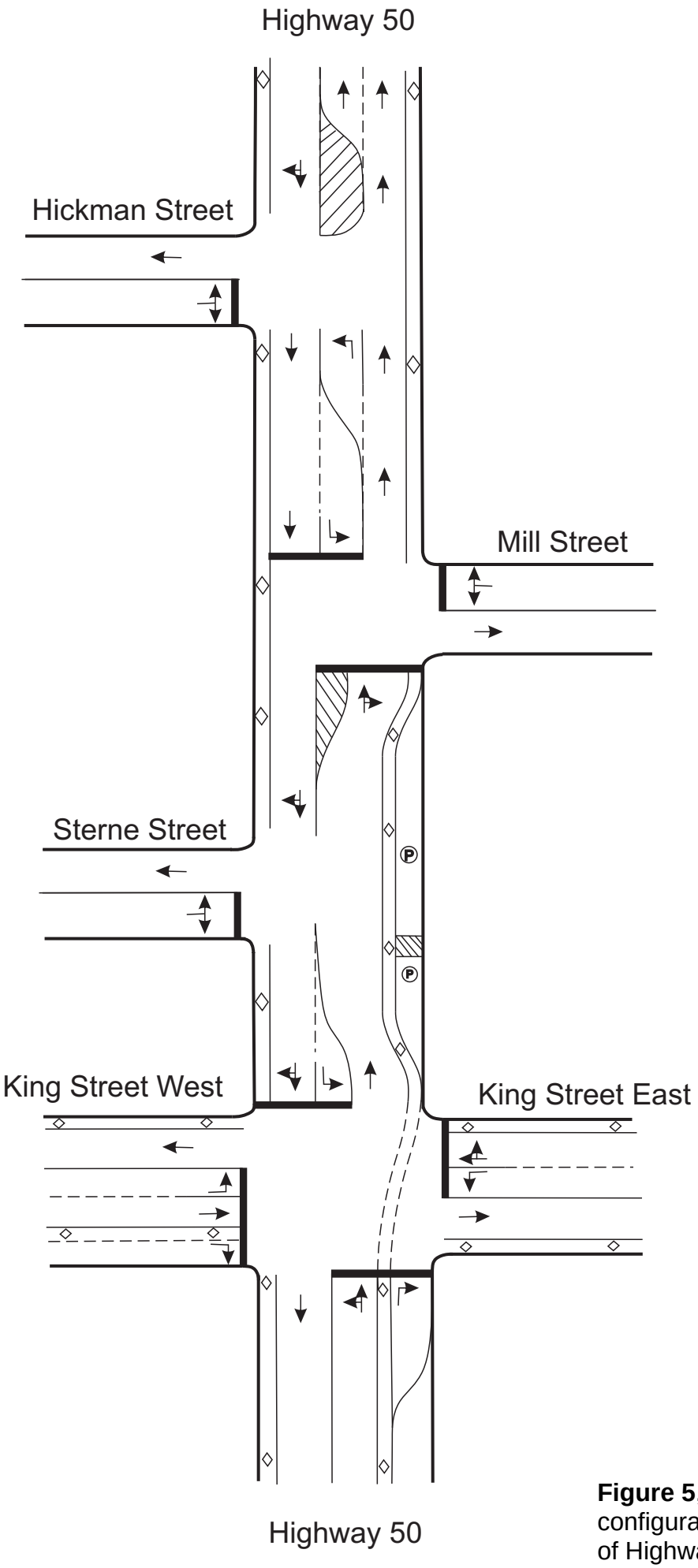


Figure 5, assumed lane configurations after narrowing of Highway 50

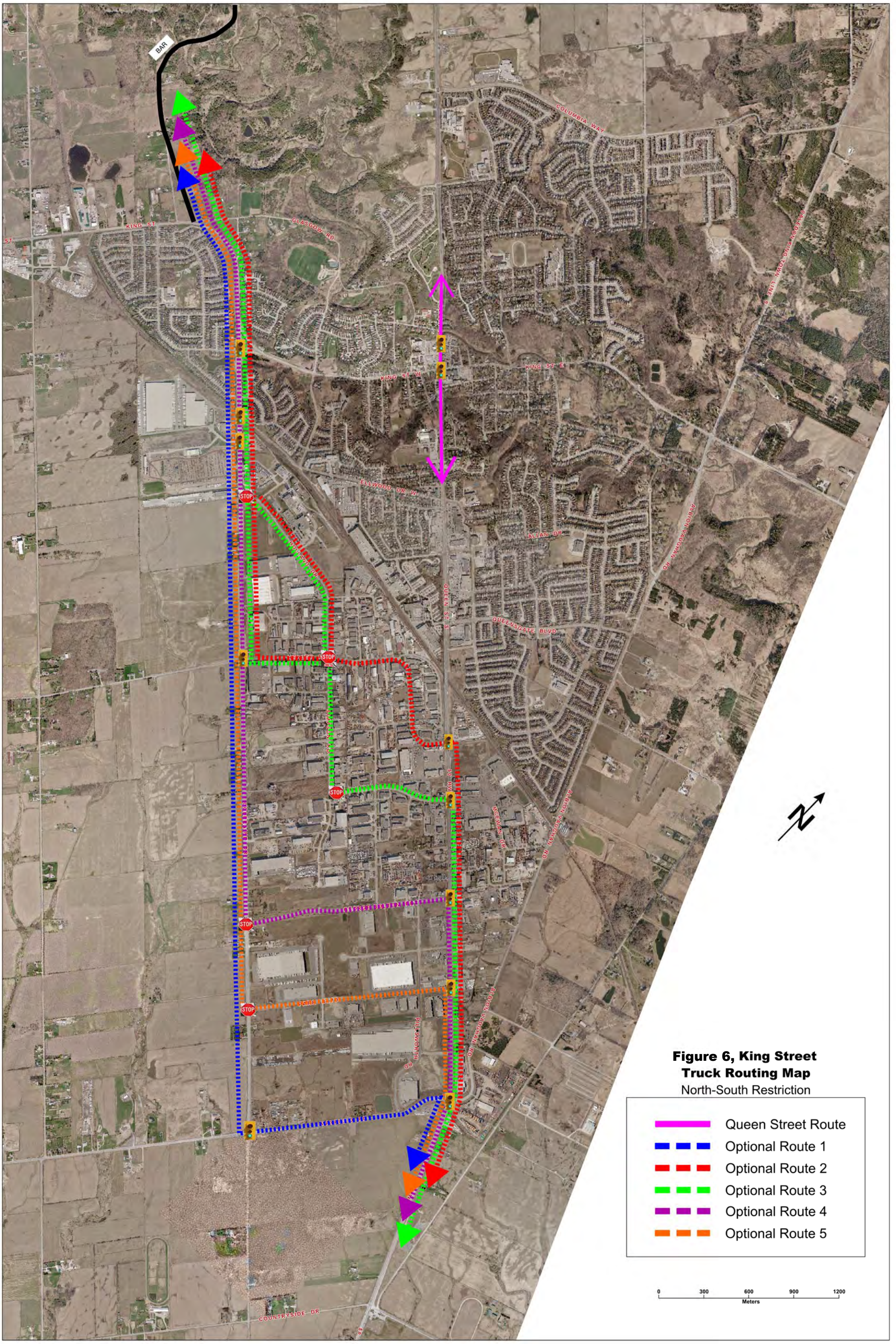


Figure 6, King Street Truck Routing Map

North-South Restriction

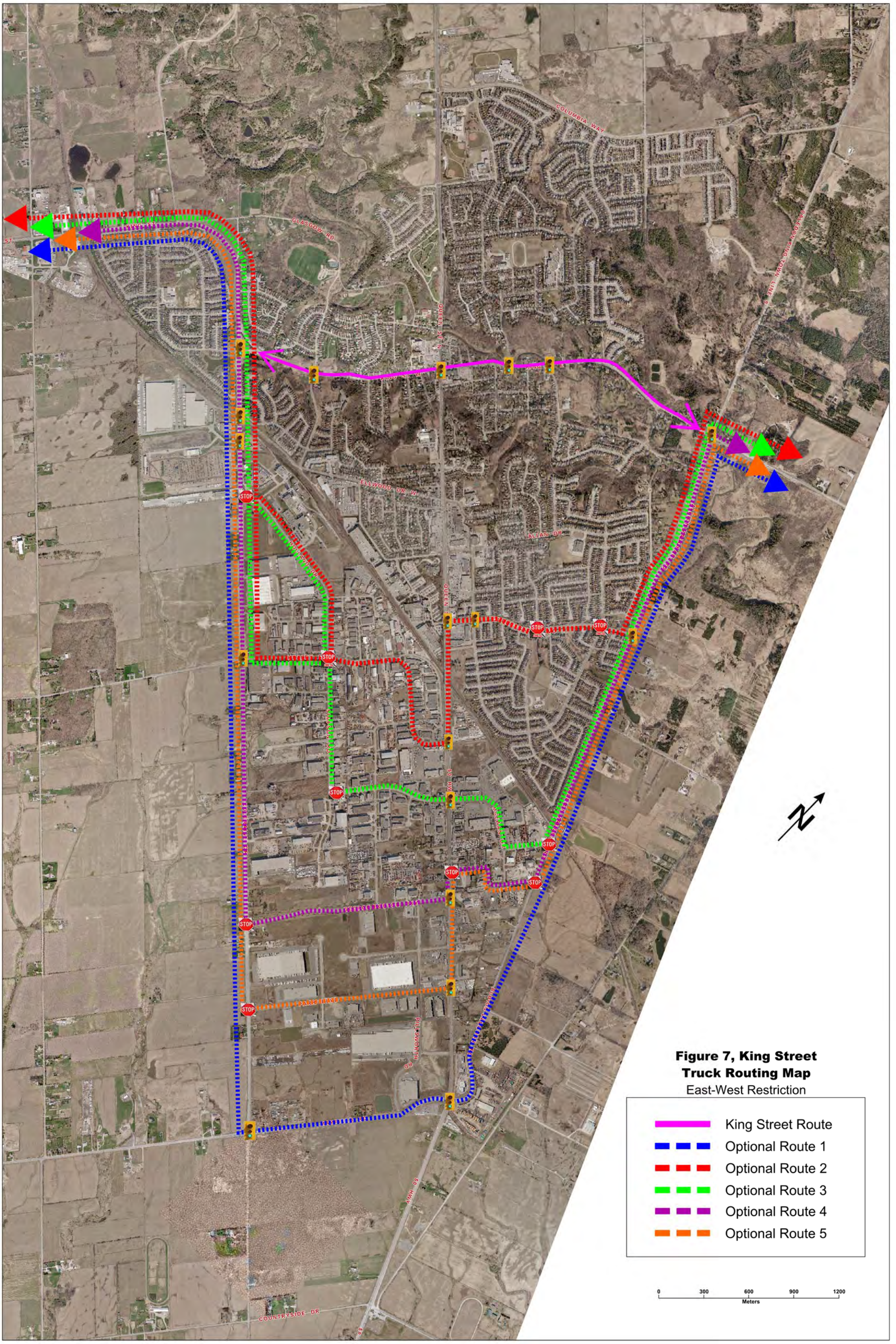


Figure 7, King Street Truck Routing Map

East-West Restriction

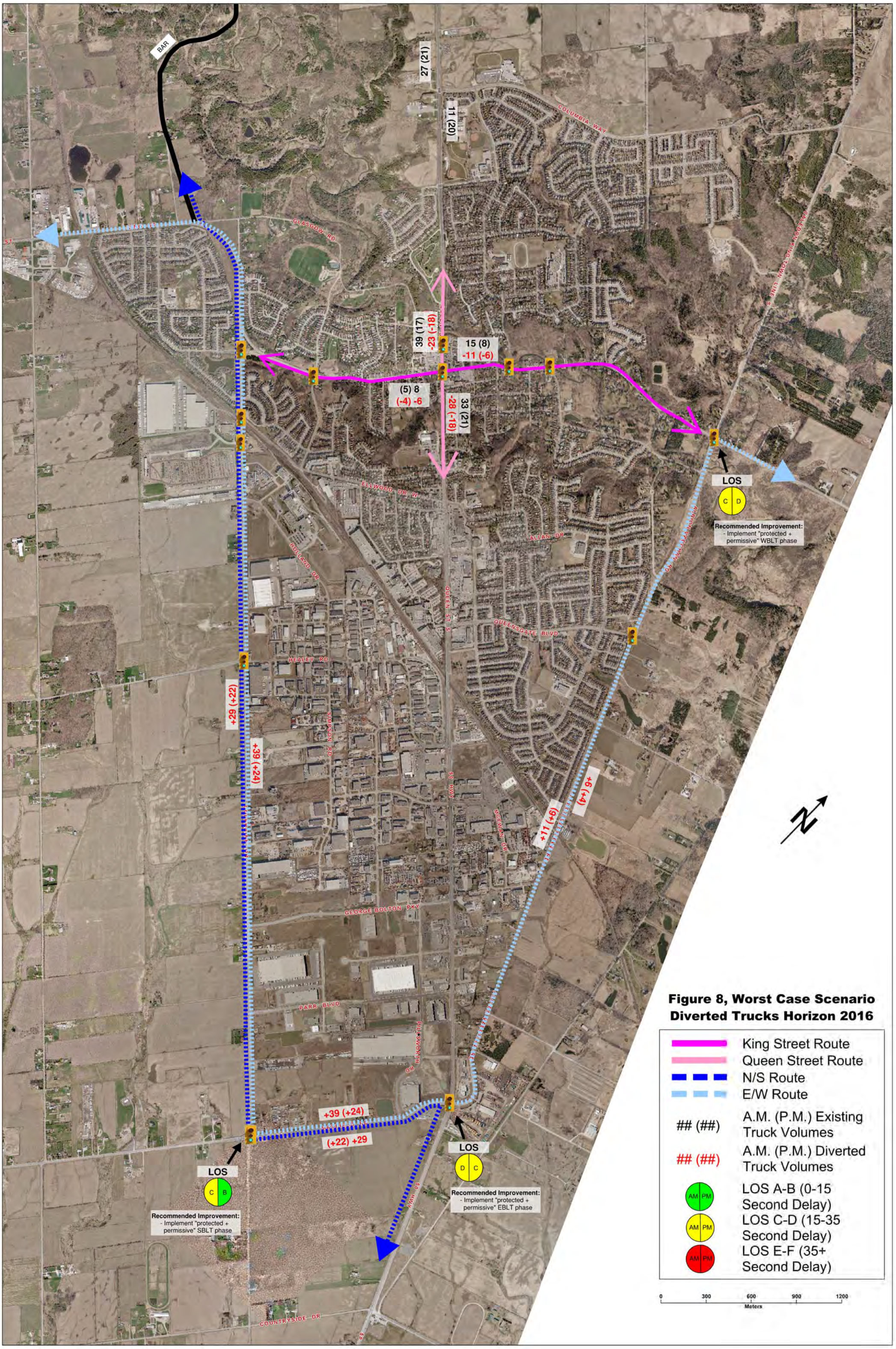


Figure 8, Worst Case Scenario
Diverted Trucks Horizon 2016

The intersection of Mayfield Road and Coleraine Drive is expected to operate within acceptable levels of service and v/c ratios. However, the southbound left turning movement experiences relatively high delays during the a.m. peak hour (the high delay is caused by heavy vehicles composing nearly 90% of the vehicles volumes). Therefore, it is suggested that a protected+permissive phase be implemented for the southbound left turn movement during the a.m. peak hour. With the protected+permissive phase in place at the intersection of Coleraine Drive and Mayfield Road, the north/south truck movement through the downtown core can be restricted because the surrounding intersections should have sufficient capacity to handle the additional truck volumes. The truck restrictions along Highway 50 can be implemented as soon as the BAR is constructed.

Currently restricting the east/west trucks on King Street through the downtown core would result in higher truck travel times due to the high northbound delays and insufficient capacity at the intersection of King Street and Albion Vaughan Road. With an exception of the intersection of King Street and Albion Vaughan Road, all intersections along potential alternative routes will have sufficient capacity to accommodate additional truck volumes. The results of the capacity analysis suggest that form the capacity perspective restricting the east/west truck movements along King Street through the downtown core should be considered after the implementation of the exclusive northbound right turn lane at the intersection of King Street and Albion Vaughan Road.

Currently trucks are allowed on Queensgate Boulevard. In the event that trucks are restricted on King Street, it is recommended to restrict trucks on Queensgate Boulevard at the same time. It is likely that Queensgate Boulevard would become an attractive alternative which is not desirable considering this road runs through a residential area and has a school crossing. Moreover, if trucks are restricted on Highway 50 between the BAR and Healey Road, that would create a scenario where the westbound trucks diverted from King Street, would be allowed to utilize Queensgate Boulevard (via Albion Vaughn Road). In that case, once these truck drivers reach Highway 50 they will have no other choice than to turn onto Highway 50 and violate the truck restrictions.

A two-stage approach was used to determine the best cross-section option for Queen Street in the downtown core and the appropriate traffic control measures to institute with the cross-section. This approach was designed to determine the best option for transportation that would help to revitalize the downtown core. The scenarios analyzed in Stage One – Cross-Section Analysis included:

- Scenario 1: Do Nothing – with the exception of prohibiting through trucks, Queen Street in the downtown core would be kept as-is. There would continue to be four travel lanes with on-street parking restrictions during the peak hours. The on-street parking stalls are not separated from the through lanes, allowing vehicles to travel in the parking lane if the space is not being utilized;
- Scenario 2: Two travel lanes (with bicycle sharrows) with all-day on-street parking on both sides of Queen Street; and
- Scenario 3: Two vehicle travel lanes, two bike lanes, and all-day on-street parking on the east side of Queen Street.

All three scenarios assumed that through trucks would be prohibited on Queen Street in the downtown core. Local deliveries would continue to be permitted.

Once the preferred scenario is determined, the cross-section will be utilized to determine the optimum traffic control plan through the downtown. Stage Two – Traffic Control Plan will examine six options:

- Option 1: No traffic control changes;
- Option 2: Maintain the traffic signal at Mill Street, install a pedestrian crossover (PXO) immediately south of Sterne Street;
- Option 3: Remove the existing traffic signal at Mill Street and install an intersection pedestrian signal (IPS) on the south side of the Sterne Street intersection;
- Option 4: Remove the existing traffic signal at Mill Street and signalize Hickman Street;

- Option 5: Remove the existing traffic signal at Mill Street, signalize Hickam Street, and install an IPS on the south side of the Sterne Street intersection; and
- Option 6: Remove the signal at Mill Street, signalize Hickman Street and install a PXO at a proposed mid-block crossing (immediately south of Sterne Street).

STAGE 1 – CROSS-SECTION ANALYSIS

This stage determines the preferred optimum cross-sectional lane configuration that will be recommended for implementation on Queen Street through the downtown core. The three Stage One scenarios were assessed using multiple criteria, including:

- On-street parking: Which scenario provides the most on-street parking?;
- Pedestrian amenities: Which scenario creates the best environment for pedestrians?;
- Travel Time: Which scenario results in better travel times?;
- Cycling facilities: Which scenario provides the most appropriate cycling facilities?;
- Public realm (creating a "complete street"): Which scenario best utilizes the right-of-way to create a "complete street" for all road users?;
- Public input: Which scenario did the public prefer?;
- Noise: Which scenario would best mitigate transportation noise; and
- Cost: How does the cost of implementation compare with the other scenarios.

For each criterion, a score of "10" was awarded to the scenario that best addressed the criterion. A score of "0" was awarded to the scenario that was least in line with the criterion. The remaining scenario was scored as a "5". At the end of the analysis, the scores were tallied in order to draw conclusions and arrive at a recommendation for the optimum cross section to proceed to stage two of the analysis.

On-Street Parking

Residents and business owners have desired all-day on-street parking on both sides of Queen Street for many years. Currently, there are time of day restrictions that govern on-street parking, with parking in the curbside southbound lane prohibited in the morning commuter peak hours and parking in the curbside northbound lane prohibited in the evening commuter peak hours. Scenario 1 would keep this arrangement. Scenario 2 would allow for all-day parking on both sides of Queen Street, with no commuter peak hour restrictions. Scenario 3 would allow all-day parking on the northbound curbside lane with no restrictions. There would be no parking on the west side of Queen Street.

Table 2: Scenario Scoring for On-street Parking Criterion

Scenario	Score
1	0
2	10
3	5

As shown in **Table 2**, Scenario 2 was awarded a "10" as this scenario is the only one that provides all-day parking on both sides of Queen Street. Scenario 1 provides parking on both sides of the street, although with a time of day restriction, resulting in an award of "0" for this criterion. Scenario 3 was awarded a "5" as it provides all-day parking, although only on one side of Queen Street

Pedestrian Amenities

Improving the pedestrian experience is one of the desired outcomes of the downtown Bolton visioning exercise. Each of the three scenarios was considered in terms of what could be done to make Queen

Street more pedestrian friendly. Actions such as reducing crossing distance to cross Queen Street and adding space for street furniture and public art were considered. The scoring for this criterion is shown in **Table 3**.

Table 3: Scenario Scoring for Pedestrian Amenities

Scenario	Score
1	0
2	10
3	10

Scenarios 2 and 3 were both scored a "10" as the reduction of travel lanes from four lanes to two lanes provides the opportunity to create bulb outs to shorten the pedestrian crossing distance across Queen Street. Instead of crossing four lanes, pedestrians would only be required to cross two lanes. The bulb outs also create new space for pedestrian furniture and public art. Scenario 1 maintains the existing conditions and offers limited opportunities to improve the pedestrian experience. Pedestrians would continue to be required to cross four lanes of traffic to cross Queen Street.

Travel Time

It is anticipated that narrowing of Queens Street and a corresponding increase in traffic control delays will result in longer travel times for drivers travelling through downtown Bolton. However, there are only three traffic signals located within this relatively short section of Queen Street with two travel lanes. Hence, traffic control delays are not expected to significantly affect travel times. Moreover, narrowing of Queen Street will result in lower volumes, lower traffic control delays and higher operating speeds along Highway 50 north and south of the "two-lane" section. Therefore, it is likely that only short trips with both an origin and a destination located very close to downtown Bolton will experience longer travel times, while longer trips (e.g. from north of the BAR to south of Mayfield Road) are expected to have comparable travel times. Additionally, longer trips diverted to the BAR will experience similar if not even shorter trips compared to the existing trips on Highway 50.

Scenario 1 is expected to maintain the most vehicle capacity and would be expected to best maintain travel times for shorter trips.. Scenario 2 and Scenario 3 are expected to have lower travel speeds and slightly longer travel times. It is anticipated that due to the shared traffic operations (no separate bike lanes) Scenario 2 will have slightly higher travel times than Scenario 3. This assessment is reflected in **Table 4**.

Table 4: Scenario Scoring for Travel Time

Scenario	Score
1	10
2	0
3	5

It should be recognized that a reduction in vehicle travel speed is not necessarily a negative impact. Reduced travel speeds can help create a more inviting environment for cyclists and pedestrians and can support the vision for downtown Bolton as a place to travel to and not only a place to travel through.

Cycling Facilities

Providing cycling facilities helps to complete the street and alerts all road users of the likely presence of cyclists and the place for cyclists to travel within the roadway. Dedicated cycling facilities may make cyclists feel more comfortable traveling in the downtown, potentially leading to an increase in the cycling mode split. The increase leads to a decrease in vehicle traffic and has the potential to improve the downtown core by reducing vehicle congestion. The scenario scoring for this criterion is provided in **Table 5**.

Table 5: Scenario Scoring for Cycling Facilities

Scenario	Score
1	0
2	5
3	10

Scenario 3 was ranked the highest as it provides dedicated bike lanes. Scenario 1 was ranked the lowest as it provides no improvements for cycling facilities. Scenario 2 was ranked in between because in this option sharrows are implemented in the centre of the lane. Cyclists and vehicles would travel single file on Queen Street through the downtown core. With the reduction of travel lanes in Scenarios 2 and 3, there is an added opportunity to increase the amount of bike parking in the downtown to encourage cyclists to visit the downtown while using their bikes.

Public Realm (creating a complete street)

A criterion was included to consider which scenario best used the right-of-way to create a "complete street" that could be used by all modes of transportation and all transportation system users. As shown in **Table 6**, Scenario 3 is seen as best embracing the concept of "complete streets" by providing facilities that can be used by pedestrians, cyclists and vehicles, be they passenger cars, local deliveries or transit vehicles.

Table 6: Scenario Scoring for Public Realm

Scenario	Score
1	0
2	5
3	10

The dedicated bike lanes give Scenario 3 the edge over the sharrows recommended in Scenario 2. With no provision for cyclists and no new provision for pedestrians, Scenario 1 received the lowest score.

Public Input

From the outset of the TMP, the public has been adamant about their desire to reclaim the downtown by removing trucks, re-instituting all-day parking and creating a people place. In all three scenarios, through trucks are assumed to be prohibited on Queen Street. Scenarios 2 and 3 were presented to the public and stakeholders at Public Information Centre #2. Both were warmly received, with more feedback in favour of Scenario 2 because it provides on-street parking all day on both sides of Queen Street and because there was some concern about the perceived low number of cyclists that would use the cycling lanes. This input is reflected in **Table 7**.

Table 7: Scenario Scoring for Public Input

Scenario	Score
1	0
2	10
3	5

Scenario 2 was presented as an interim solution and Scenario 3 was presented as an ultimate solution at the Public Information Centre. If attitudes change about the amount of on-street parking needed or about the utility of dedicated bike lanes, the ultimate solution may be considered for implementation.

Noise

Transportation noise was cited by residents and business owners as a detriment in the downtown. With fewer travel lanes and lower speeds, transportation-related noise impacts would be expected to be reduced in Scenarios 2 and 3. More travel lanes and expected higher speeds in Scenario 1 result in a score of "0" for this scenario, as indicated in **Table 8**. All three scenarios assumed that through truck traffic is prohibited on Queen Street.

Table 8: Scenario Scoring for Noise

Scenario	Score
1	0
2	10
3	10

Cost

The financial cost of implementing each of the scenarios also was considered and is summarized in **Table 9**. With no new improvements, Scenario 1 would be expected to cost the least and scored a "10." Scenarios 2 and 3 would have a similar cost to implement, and were both scored a "0". All work would be done within the existing curbs and no road widening or utility relocation would be necessary. The reduction of lanes would provide the opportunity to construct bulb outs to reduce pedestrian crossing distance and provide amenities such as street furniture and bike parking. While these improvements can be seen as positive, they would require additional financial cost.

Table 9: Scenario Scoring for Cost

Scenario	Score
1	10
2	0
3	0

Summary of Analysis for Stage One

The scores for each criterion are tabulated and summed in **Table 10**. Scenario 3 scored the highest with a score of "55", slightly higher than Scenario 2 at a score of "50". Both Scenarios 2 and 3 scored well ahead of Scenario 1.

Table 10: Summary of Stage One Analysis

Scenario	On-Street Parking	Pedestrian Amenities	Travel Time	Cycling facilities	Public Realm (creating a complete street)	Public Input	Noise	Cost	Total
1	0	0	10	0	0	0	0	10	20
2	10	10	0	5	5	10	10	0	50
3	5	10	5	10	10	5	10	0	55

Scenario 3 will be used in Stage Two of the analysis as this scenario scored the highest and is seen as the ultimate recommended solution for Queen Street in the downtown core. This scenario best embodies a complete street and will help Bolton create a destination for people in the downtown.

STAGE 2 – TRAFFIC CONTROL PLAN

Based on the preferred lane configurations, this stage will determine the optimum traffic signal control arrangements through the downtown core. The controller locations were analyzed to try and improve the safety of pedestrians and vehicles, and minimize the number of people jaywalking. As part of Stage 2 analysis the signal warrants needed to be analyzed for the various proposed traffic signal improvements. Also the traffic operations for the various options needed to be analyzed.

Signal Warrants

The 2016 8-hour total volumes on Highway 50 were established using a conservative 15% reduction in the existing 8-hour turning movement counts at the intersections. The reduction was applied to account for the traffic diverting away from Highway 50 due to the opening of the BAR and the narrowing of Highway 50 through downtown Bolton. The 8-hour pedestrian volumes were based on the data provided in the Downtown Bolton Pedestrian Study, and results of the survey are shown in **Figure 9**. To determine if the signals are warranted, OTM Book 12's justifications for pedestrian crossings and vehicle volumes needed to be satisfied.

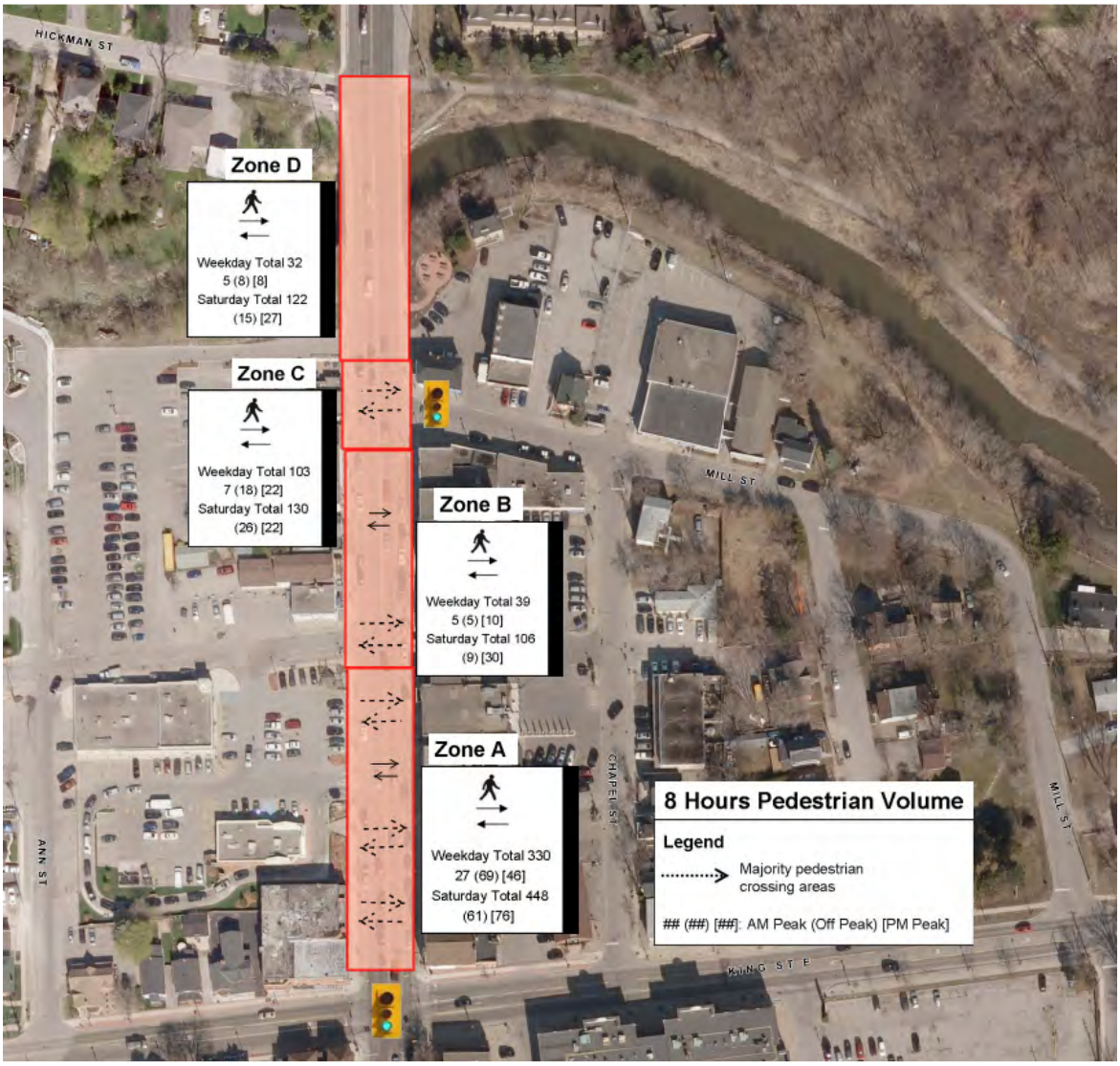


Figure 9: Downtown Bolton Pedestrian Study Results

Sterne Pedestrian Signal Warrant

The total 8-hour traffic volume counts (conducted in May 2012), with and without the 15% reduction, are shown in **Table 11**.

Table 11: Sterne Street Pedestrian Signal Warrant Traffic Counts

Northbound	Southbound	Total	Total with 15% reduction
5,852	5,208	11,060	9,400

The 8-hour pedestrian volumes assumed to be using an IPS at this intersection are composed of pedestrians in Zones A and B of the Downtown Bolton Pedestrian Study. Based on the study, the weekday total was 369 pedestrian crossings.

For a pedestrian signal to be justified at either an intersection or a mid-block location both the minimum pedestrian volume and delay criteria need to be satisfied. These criteria are summarized in **Figure 10** and **Figure 11**. To satisfy the pedestrian volume warrant the projected 8-hour pedestrian volume (369 crossings) and the 8-hour vehicle volume (9400 vehicles) need to fall within the “Justified Zone”. To

satisfy the pedestrian delay warrant the number of pedestrians delayed by more than 10 seconds, and the 8-hour pedestrian volume need to fall within the "Justified Zone". Assuming a minimal 80 second cycle length at Sterne, a split of only 25 seconds (including amber and all-red) was allocated to the east/west movement. As a result, it was conservatively assumed that at least half of the pedestrians crossing Highway 50 would experience at least a 10 second delay.

Figure 10: Sterne Street Pedestrian Volume Analysis

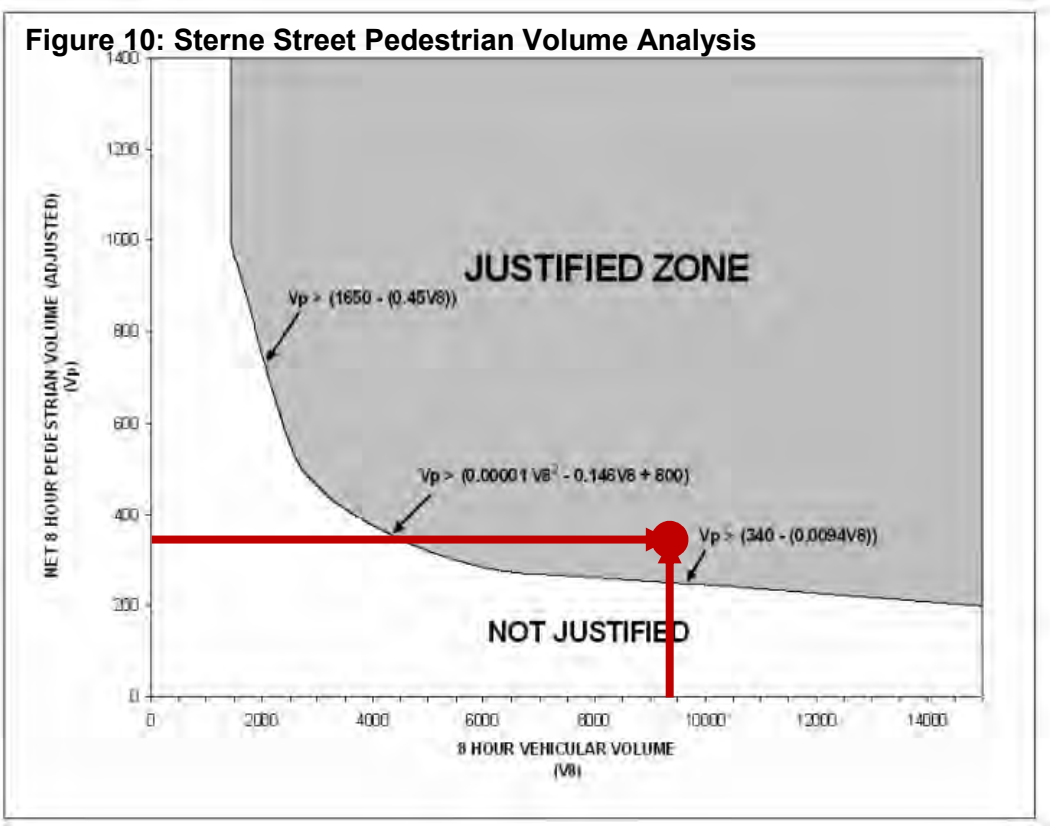
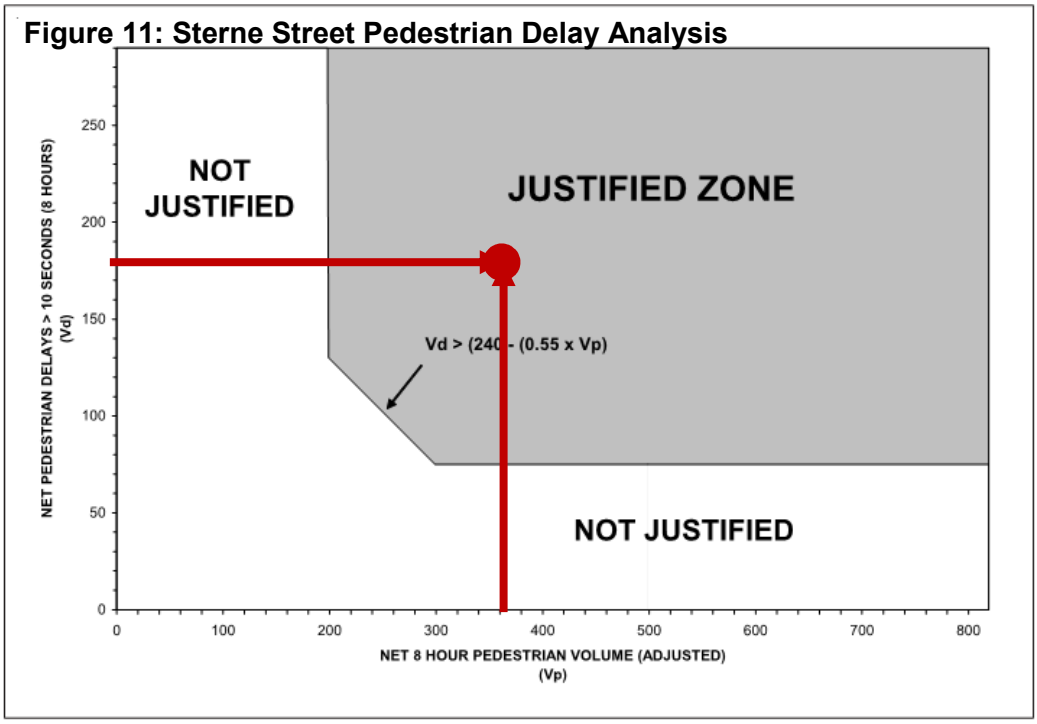


Figure 11: Sterne Street Pedestrian Delay Analysis



The above results show that Justification 6 – Pedestrian Volumes and Pedestrian Delays are both satisfied based on the net 8-hour pedestrian data.

Hickman Signal Warrant

The total 8-hour vehicle counts at the intersection of Highway 50/Hickman Street (conducted in May 2012), with and without the 15% reduction, are shown in **Table 12**.

Table 12: Hickman Street Pedestrian Signal Warrant Traffic Counts

Northbound	Southbound	Total	Total with 15% reduction
5,594	5,219	10,813	9,190

The 8-hour pedestrian volumes assumed to be using the IPS are composed of pedestrians in Zone D of the Downtown Bolton Pedestrian Study. Based on the study, during the 8-hour weekday study period, 32 pedestrians used the underpass (represented by the red line in **Figure 12** and **Figure 13**), while approximately 122 pedestrians used the underpass during the 8-hour weekend study period (represented by the blue line in the figures below). By signalizing this location, it might encourage more pedestrians/cyclists to cross the intersection at-grade, which could result in higher vehicle-pedestrian accidents. Assuming an 80 second cycle length at Hickman Street, with 25 seconds being allocated to the east/west movement, it was conservatively assumed that at least half of the pedestrians crossing Highway 50 would experience at least a 10 second delay.

Figure 12: Hickman Street Pedestrian Volume Analysis

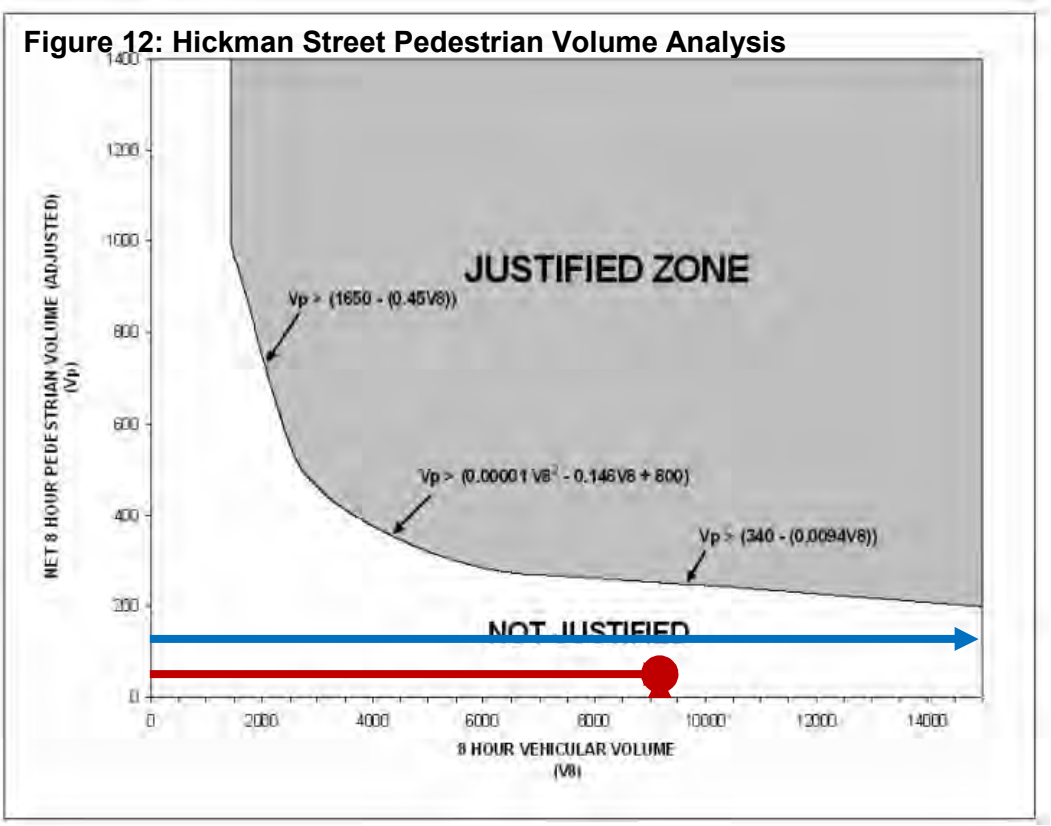
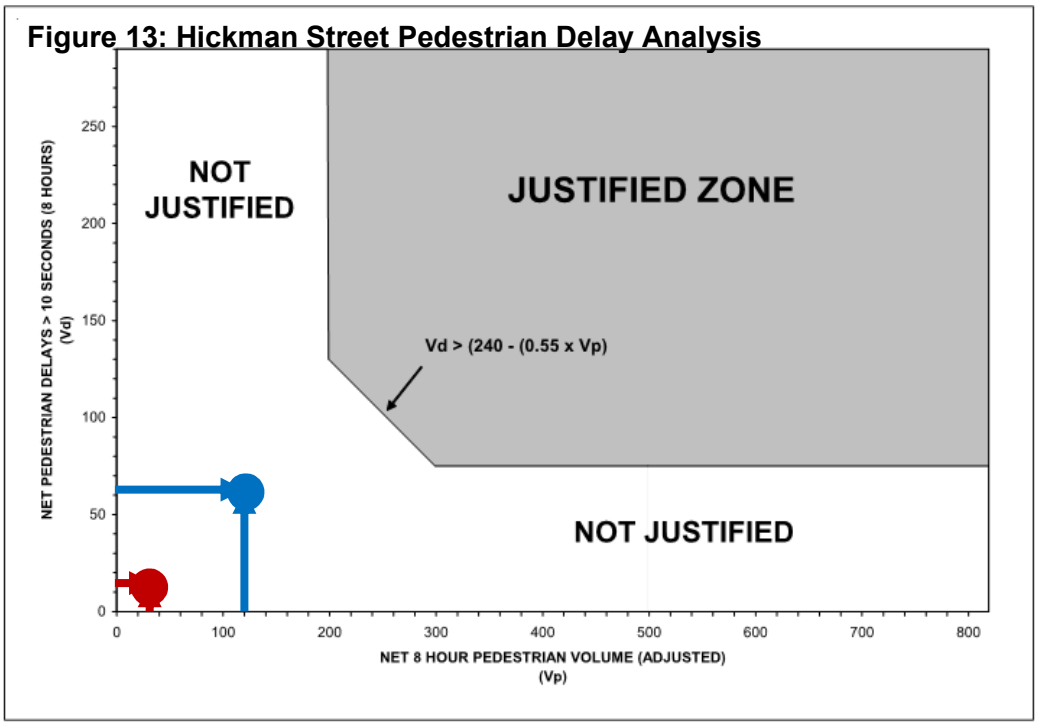


Figure 13: Hickman Street Pedestrian Delay Analysis



The results above show that Justification 6 – Pedestrian Volumes and Delay Analysis are not justified for either weekday or weekend periods. Consequently, a signal at the Highway 50/Hickman Street intersection would not be warranted by the pedestrian volumes and delays.

OTM Book 12 Traffic Signal Warrant methodology was also used to determine if a traffic signal was justified at this intersection based on traffic volumes. The need for a traffic signal must be considered if Justifications 1A, 1B, 2A and 2B are 100% fulfilled. If 1A and 1B, or 2A and 2B do not surpass 100%, but are at least 80% fulfilled, then the lesser of the two can be used in the assessment of Justification 3. The traffic signal warrant results for Hickman are summarized in **Table 13**.

Table 13: Hickman Street Traffic Signal Warrant Results

Justification		Compliance	Signal Justified?
1. Minimum Vehicular Volume	A. Total Volume	100%	No
	B. Crossing Volume	15%	
2. Delay to Cross Traffic	A. Main Road	100%	No
	B. Crossing Road	18%	
3. Combination	A. Justification 1	15%	No
	B. Justification 2	18%	

Based on the results a traffic signal at Hickman is also not justified based on traffic volume and delay warrants.

Mill Signal Warrant

The total 8-hour vehicle counts at Mill Street (conducted in May 2012), with and without the 15% reduction, are shown in **Table 14**.

Table 14: Mill Street Pedestrian Signal Warrant Traffic Counts

Northbound	Southbound	Total	Total with 15% reduction
5,110	4,933	10,043	8,535

The 8-hour pedestrian volumes assumed to be using the IPS are composed of pedestrians in Zone B and C of the Downtown Bolton Pedestrian Study. Based on the study, 142 pedestrians crossed Highway 50 during the 8-hour weekday study period (represented by the red line in the figures below), while 236 pedestrians crossed Highway 50 during the 8-hour weekend study period (represented by the blue line in **Figure 14** and **Figure 15**). Assuming an 80 second cycle length at Mill Street, with 25 seconds being allocated to the east/west movement, it was conservatively assumed that at least half of the pedestrians crossing Highway 50 would experience at least a 10 second delay.

Figure 14: Mill Street Pedestrian Volume Analysis

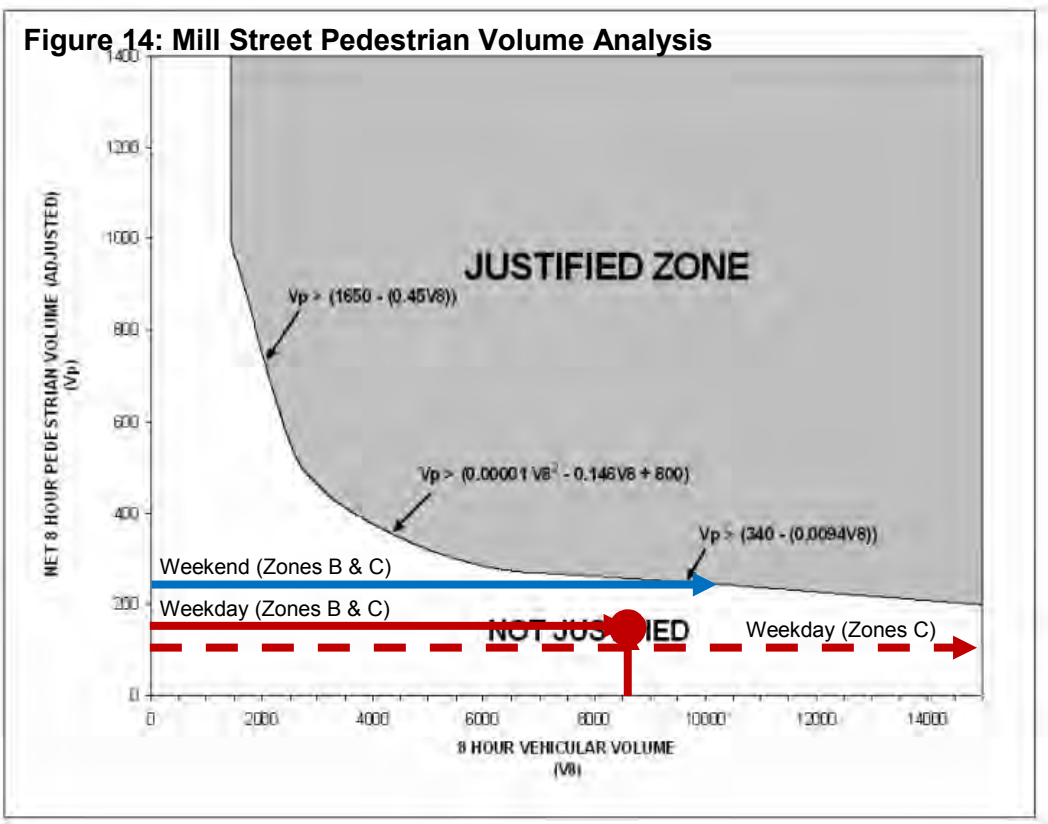
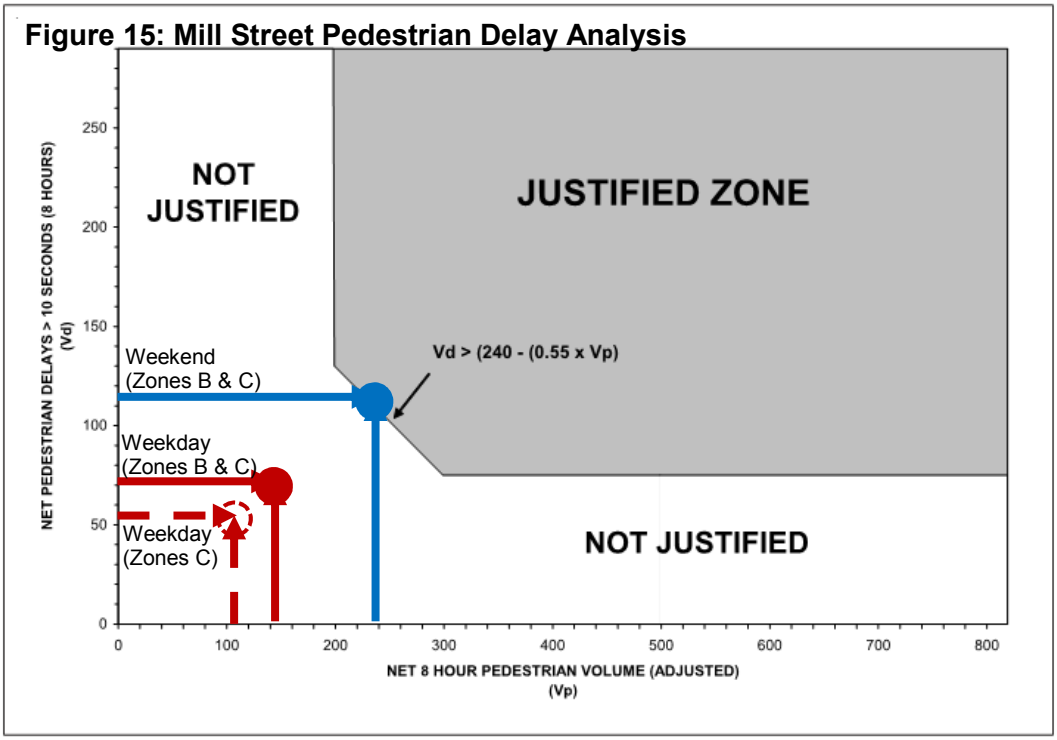


Figure 15: Mill Street Pedestrian Delay Analysis



Assuming Zone C pedestrians crossing Mill Street, the results above show that Justification 6 – Pedestrian Volumes and Delay Analysis are not justified.

Assuming both Zones B and C pedestrians cross using Mill Street, the results above show that Justification 6 – Pedestrian Volumes and Delay Analysis are still not justified using the weekday pedestrian volumes. However, the Pedestrian Delay analysis meets the warrant requirements using the weekend pedestrian crossings. Since we do not have the 8-hour weekend traffic counts at the intersection of Highway 50/Mill Street, we were unable to determine if Justification 6 – Pedestrian Volumes is satisfied. However, based on the number of pedestrians crossing in the vicinity if similar traffic volumes are present on the weekends as are on the weekdays (which is possible due to the retail stores in the area and south of King Street), then this justification might be satisfied as well.

The traffic signal warrant results for Mill Street are summarized in **Table 15**.

Table 15: Mill Street Traffic Signal Warrant Results

Justification		Compliance	Signal Justified?
1. Minimum Vehicular Volume	A. Total Volume	100%	No
	B. Crossing Volume	17%	
2. Delay to Cross Traffic	A. Main Road	100%	No
	B. Crossing Road	27%	
3. Combination	A. Justification 1	17%	No
	B. Justification 2	27%	

Based on the results a traffic signal at Mill Street is not justified based on traffic volume and delay warrants.

In conclusion, based on the pedestrian signal warrant analysis a pedestrian crossing at Hickman Street is not justified using either the weekend or weekday data. The crossing at Mill Street might be justified,

depending on the 8-hour weekend traffic volumes. Finally, the crossing at Sterne Street is justified by the pedestrian volumes.

Traffic Control Type Analysis

This section analyzes the various proposed traffic control changes through the downtown core based on the assumed 2016 traffic volumes.

Options 1 and 2

These options are:
Option 1: no traffic control changes, and
Option 2: maintain the traffic signal at Mill Street, install a pedestrian crossover (PXO) immediately south of Sterne Street.

PXOs can be activated at random times, and the vehicles can proceed once the pedestrian clears its path. Therefore, PXOs cannot be replicated in Synchro, which is why Options 1 and 2 are analyzed under the same conditions. The analysis results are shown in **Table 16**.

Table 16: Analysis of Options 1 and 2: No Traffic Control Changes or Install PXO South of Sterne Street

Intersections	Control Type	WEEKDAY A.M.			WEEKDAY P.M.		
		LOS (Delay in seconds)	Critical Movements (v/c)	Queue 50th (95th)	LOS (Delay in seconds)	Critical Movements (v/c)	Queue 50th (95th)
King Street at Highway 50	Signalized (80 second cycle length)	C (27)	WB-L (0.88) SB-TR (0.89)	NB-LT: 34(59) NB-R: 0(10) SB-L: 5(m4) SB-TR: 109(#183)	C (25)	NB-TR (0.87)	NB-LT: 112(#199) NB-R: 11(27) SB-L: 1(4) SB-TR: 15(25)
Sterne Street at Highway 50	Stop-Controlled	D (29)	--	NB-TL: --(3) SB-TR: --(0)	F (74)	EB-LR (0.64)	NB-TL: --(2) SB-TR: --(0)
Mill Street at Highway 50	Signalized (80 second cycle length)	A (8)	--	NB-TR: 17(49) SB-L: 1(5) SB-T: 60(#176)	B (10)	--	NB-TR: 30(m#212) SB-L: 4(12) SB-T: 40(67)
Hickman Street at Highway 50	Stop-Controlled	C (19)	--	NB-L: --(0) NB-T: --(0) SB-TR: --(0)	C (20)	--	NB-L: --(1) NB-T: --(0) SB-TR: --(0)

The projected delays and v/c ratios are reasonable at all the intersections except Sterne Street in the P.M. peak hour. During this time the delay for the vehicles exiting Sterne is slightly higher than desirable. However, given the low volumes, with proper signal coordination implemented along Highway 50 (resulting in platooning) and courtesy gaps, the delay at this intersection will be manageable. The 50th percentile queues are also reasonable. It is important to note: the northbound queues drastically increase when the adjacent parking, on the east side of Highway 50, was programmed into Synchro. The 95th percentile queue for the northbound movement at Mill Street increased from 55m to 210m. This is to be expected as portion of the through movement might be blocked during parallel parking manoeuvres.

As indicated above, PXO activations are random events that cannot be modeled in Synchro. However, given the number of pedestrian crossings observed between King Street and Sterne Street, it is anticipated that the PXO at Sterne Street will experience a high frequency of pedestrian calls. It is likely this will have a significant impact on traffic operations on Highway 50, and result in an extensive vehicle queuing. Increased vehicles delays might lead to an increased non-compliance of drivers expected to yield to pedestrians, which could then result in significant pedestrian safety concerns.

The Hickman Street intersection will remain unisgnalized. In order to address the existing safety concerns associated with the eastbound left turn movements, it is proposed to modify the intersection

geometry to allow for a two-stage left turn gap acceptance movement. This option is similar to existing operations at the intersection of QEW eastbound off-ramp/South Sheridan Way in the City of Mississauga where the heavy southbound left turn movements is provided with an additional receiving lane, see **Figure 16**.



Figure 16: intersection of QEW Eastbound Off-ramp / South Sheridan Way

Option 3

This option involves the removal of an existing traffic signal at Mill Street and signalization of the Sterne Street intersection (installing an intersection pedestrian signal on the south side). In this option, it was assumed that the pedestrians in Zones A, B and C were all assigned to the intersection pedestrian signal IPS at Sterne Street (south crosswalk). The results of the analysis are shown in **Table 17**.

Table 17: Analysis of Option 3: Remove Mill Street Signal and Signalize Sterne Street

Intersections	Control Type	WEEKDAY A.M.			WEEKDAY P.M.		
		LOS (Delay in seconds)	Critical Movements (v/c)	Queue 50th (95th)	LOS (Delay in seconds)	Critical Movements (v/c)	Queue 50th (95th)
King Street at Highway 50	Signalized (120 second cycle length)	D (34)	--	NB-TL: 50(83) NB-R: 3(16) SB-L: 5(m8) SB-TR: 145(#254)	C (31)	--	NB-TL: 160(#254) NB-R: 21(40) SB-L: 2(11) SB-TR: 60(90)
	Signalized (80 second cycle length)	C (29)	WB-L (0.88) SB-TR (0.89)	NB-TL: 34(59) NB-R: 0(10) SB-L: 3(m4) SB-TR: 110(#184)	C (25)	NB-TL (0.88)	NB-TL: 119(#199) NB-R: 12(27) SB-L: 0(m2) SB-TR: 7(16)
Sterne Street at Highway 50	Signalized (60 second cycle length)	C (24)	--	NB-TL: 61(#118) SB-TR: 62(#184)	D (51)	NB-TL (1.01)	NB-TL: ~241(#422) SB-TR: 22(62)
	Signalized (120 second cycle length)	B (11)	--	NB-TL: 32(44) SB-TR: 102(147)	B (12)	--	NB-TL: 61(#328) SB-TR: 37(52)
	Signalized (80 second cycle length)	B (13)	--	NB-TL: 8(39) SB-TR: 65(#194)	B (17)	NB-TL (0.93)	NB-TL: ~184(m#239) SB-TR: 50(77)

Intersections	Control Type	WEEKDAY A.M.			WEEKDAY P.M.		
		LOS (Delay in seconds)	Critical Movements (v/c)	Queue 50th (95th)	LOS (Delay in seconds)	Critical Movements (v/c)	Queue 50th (95th)
Mill Street at Highway 50	Stop-Controlled (Under 120s)	C (22)	--	NB-TR: --(0) SB-T: --(0)	F (65)	WB-LR (0.63)	NB-TR: --(0) SB-T: --(0)
Hickman Street at Highway 50	Stop-Controlled (Under 120s)	C (19)	--	NB-T: --(0) SB-TR: --(0)	C (20)	--	NB-T: --(0) SB-TR: --(0)

Three scenarios for the cycle lengths at King Street and Sterne Street intersections were tested under Option 3:

A. 120 second cycle length at King Street/Highway 50 and 60 second cycle length at Sterne Street/Highway 50;
B. 120 second cycle length at King Street/Highway 50 and 120 second cycle length at Sterne Street/Highway 50, and
C. 80 second cycle length at King Street/Highway 50 and 80 second cycle length at Sterne Street/Highway 50.

Based on the analysis, under Scenario A (120 and 60 second cycle lengths) the delays are higher at both intersections and the queues at the Sterne Street/Highway 50 intersection drastically increase. Scenario C experiences high queues during the P.M. peak hour with the northbound movement approaching capacity, due to a combination of left turns and parking maneuvers. From a traffic perspective Scenario B operates with a lower v/c ratio and better critical queue lengths. However, with a 120 second cycle length pedestrians will be waiting significantly longer (40 seconds) to cross Highway 50 than with an 80 second cycle length. Similarly with Options 1 and 2, adding the adjacent parking to the northbound movements drastically increased the queues for the northbound movements. With both 120s and 80s cycle length the queues from King Street and Sterne Street spillback and result in potential blockages at the upstream signalized intersection.

Options 4 and 6

These options are:
Option 4: Remove the traffic signal at Mill Street and signalize Hickman Street.
Option 6: Remove the signal at Mill Street, signalize Hickman Street and install a pedestrian crossover (PXO) at a proposed mid-block crossing (immediately south of Sterne Street).

The pedestrians in Zones A, B and C were assumed to jaywalk in Option 4 (because no signalized crossing was provided between King Street and Hickman Street), while in Option 6 the pedestrians were assumed to use the PXO. The pedestrians in Zone D were assumed to now use the signalized crossing at Highway 50, opposed to the underpass. This is a conservative assumption given that it is likely pedestrians will use the underpass to cross Highway 50, because it provides an unimpeded and safe crossing.

The primary problem with Option 4 is that pedestrians have nowhere to cross between King and Hickman. This might result in an increased amount of jaywalkers, which could lead to a higher number of pedestrian-vehicle accidents. As stated previously, PXOs can be activated at random, and the vehicles can proceed as soon as the pedestrian clears its path. Therefore, PXOs cannot be replicated in Synchro, which is why Options 4 and 6 are treated the same. The results of the analysis are shown in **Table 18**.

Table 18: Analysis of Options 4 and 6: Remove Traffic Signal at Mill Street and Signalize Hickman Street

Intersections	Control Type	WEEKDAY A.M.			WEEKDAY P.M.		
		LOS (Delay in seconds)	Critical Movements (v/c)	Queue 50th (95th)	LOS (Delay in seconds)	Critical Movements (v/c)	Queue 50th (95th)
King Street at Highway 50	Signalized (80 second cycle length)	C (26)	WB-L (0.88) SB-TR (0.89)	NB-TL: 34(59) NB-R: 0(10) SB-L: 5(m4) SB-TR: 110(#184)	C (25)	NB-TL (0.88)	NB-TL: 119(#199) NB-R: 12(27) SB-L: 3(10) SB-TR: 43(68)
Sterne Street at Highway 50	Stop-Controlled	D (29)	--	NB-TL: --(3) SB-TR: --(0)	F (105)	EB-LR (0.76)	NB-TL: --(2) SB-TR: --(0)
Mill Street at Highway 50	Stop-Controlled	C (22)	--	NB-TR: --(0) SB-L: --(1) SB-T: --(0)	E (44)	WB-LR (0.51)	NB-TR: --(0) SB-L: --(2) SB-T: --(0)
Hickman Street at Highway 50	Signalized (80 second cycle length)	B (11) EB-LR: B(17)	--	NB-L: 1(m2) NB-T: 38(68) SB-TR: 65(#205)	A (6) EB-LR: C(21)	--	NB-L: 1(m2) NB-T: 33(m#208) SB-TR: 14(63)

It is important to note that even though the overall intersection delay has improved at Hickman Street after it was signalized, the eastbound movements still experiences similar delays as before the signalization. Similar to Option 3, all the intersections experience reasonable delays and v/c ratios, except for Sterne Street during the P.M. peak hour. This intersection experiences even higher delays than in Option 3. Given the longer spacing between the traffic signals, the queues at the signalized intersections are not projected to spillback to the upstream signalized intersection.

Option 5

This option involves the removal of the traffic signal at Mill Street, signalizing Sterne Street (intersection pedestrian signal installed on the south side) and Hickman Street.

Pedestrians in Zones A, B and C were assigned to the IPS at Sterne Street (south crosswalk). The pedestrians in Zone D were assumed to now use the signals to cross Highway 50 opposed to using the underpass. Though we still believe people will use the underpass to cross Highway 50, since it provides an unimpeded and safe crossing, we made this assumption to be conservative. The results of the analysis are shown in **Table 19**.

Table 19: Analysis of Option 5: Remove Mill Street Signal, Signalize Sterne Street and Hickman Street

Intersections	Control Type	WEEKDAY A.M.			WEEKDAY P.M.		
		LOS (Delay in seconds)	Critical Movements (v/c)	Queue 50th (95th)	LOS (Delay in seconds)	Critical Movements (v/c)	Queue 50th (95th)
King Street at Highway 50	Signalized (80 second cycle length)	C (29)	WB-L (0.88) SB-TR (0.89)	NB-TL: 34(59) NB-R: 0(10) SB-L: 3(m4) SB-TR: 111(#184)	C (25)	NB-LT (0.88)	NB-TL: 119(#199) NB-R: 12(27) SB-L: 2(9) SB-TR: 44(67)
Sterne Street at Highway 50	Signalized (80 second cycle length)	A (9)	--	NB-TL: 8(39) SB-TR: 20(#49)	B (13)	--	NB-TL: 54(m#222) SB-TR: 37(37)
Mill Street at Highway 50	Stop-Controlled	C (20)	--	NB-TR: --(0) SB-L: --(1) SB-T: --(0)	E (44)	WB-LR (0.51)	NB-TR: --(0) SB-L: --(2) SB-T: --(0)
Hickman Street at Highway 50	Signalized (80 second cycle length)	A (9) EB-LR: B(17)	--	NB-L: 0(m1) NB-T: 12(45) SB-TR: 65(#205)	A (6) EB-LR: C(21)	--	NB-L: 1(m1) NB-T: 12(m#211) SB-TR: 14(67)

The projected delays and v/c ratios are reasonable at all intersections. The queue spillback from King Street and Sterne Street will result in the blockage of the upstream signalized intersection. Similarly to Options 4 and 6, even though the overall intersection delays have improved at Hickman Street after it was signalized, the eastbound movements still experience the same delay as they did prior to signalization.

Summary and Conclusion

Table 20 includes a summary of the pros and cons of each Option analyzed.

Table 20: Summary of Analysis of the Six Options

	Pros	Cons
Option 1	• No additional "traffic control" cost; • Longer intersection spacing (150m); • Traffic operations allows coordination of signals, resulting in lower delays and queues; • Can accommodate 50th queues on Highway 50; • Jaywalking can potentially be address by utilizing shorter cycle lengths at King Street and Mill Street intersections (minimizing delays for pedestrians).	• Mill Street signal is not warranted; • Low pedestrian utilization; • Does not address jaywalking, midblock crossings will likely continue to occur between King Street and Mill Street.
Option 2	• PXO signal warranted; • Low cost; • Will likely reduce a number of midblock crossings between King Street and Mill Street.	• 90m intersection spacing, does not meet minimal spacing (200m) required for a PXO (OTM Book 12 and 15); • Might not completely address mid-block jaywalking (PXO will be located approximately 60m from the location where the majority of midblock crossings occur. This is slightly longer distance than to the signal at King Street. If pedestrians are not willing to walk 50-60m now to the signal at King Street, it could be expected that some pedestrians will continue jaywalking); • Queue blockages and spillbacks; • Potentially low vehicle compliance to PXOs. Not as safe as IPS; • Unpredictable impact on traffic operations (cannot coordinate due to the random nature of pedestrian calls; • Loss of at least 2 parking spaces per direction (it is recommended to restrict parking within 30 meters of a PXO due to safety concerns, OTM Book 15).
Option 3	• IPS warranted on Sterne Street; • Higher pedestrian utilization of the signal, compared to Mill Street, will likely reduce the number of midblock crossings between King Street and Mill Street; • Traffic operations allow coordination of signals.	• Medium cost; • Short intersection spacing provided; • Queue blockages and spillbacks; • Might not address mid-block jaywalking (same distance to the King Street signal); • Loss of at least 2 parking spaces per direction due to IPS.

	Pros	Cons
Option 4	• Best in terms of traffic operations, due to sufficient spacing between signals; • Safer eastbound-left movement at Hickman[1].	• No pedestrian crossing between King and Hickman Street, potentially higher number of jaywalkers within this section; • Medium cost; • Hickman Street signal not warranted; • Potential increase in rear-end collisions. • By removing the signal at Mill Street an additional parking space or two can be added along the west side of Queen Street.
Option 5	• IPS warranted on Sterne Street; • Higher pedestrian utilization of the Sterne Street signal, compared to the Mill Street signal; • Safer eastbound-left movement at Hickman[1].	• High Cost; • Hickman Street signal not warranted; • Traffic operations, three closely spaced signals (increased delays and queues); • Potential increase in rear-end collisions; • Loss of at least 2 parking spaces per direction due to IPS.
Option 6	• PXO signal warranted; • Safer eastbound-left movement at Hickman[1].	• High Cost; • Hickman Street signal not warranted; • PXO results in unpredictable impact on traffic operations; • Potentially low vehicle compliance to PXOs. Not as safe as IPS; • 90m spacing, doesn't meet minimal spacing required for a PXO; • Loss of at least 2 parking spaces per direction due to PXOs.

Note:*1)The eastbound left movement can be made safer by reconfiguring the intersection to allow 2-stage left turn gap operations. The eastbound left movement can be made safer in other options by trimming/removing some of the trees in the right-of-way, improving sightlines.*

Based on the summary criteria were developed and an evaluation table was designed to determine the best control plan option. The criteria utilized were:

- **Cost:** the cost of implementing the suggested changes. 10 was given to the least expensive option while 0 was given to the most expensive;
- **Warrants:** analyzes if pedestrian/vehicle signal warrants were satisfied. A score of 10 was given to the option that meets all its warrants or is currently existing (therefore does not require warrants). 0 was given to options that met none of the warrants. Values in between are given depending on how many warrants are satisfied;
- **Pedestrian Jaywalking/Safety:** examines the level of crosswalks available for pedestrians to cross Queen Street. PXOs were deemed to be less safe than IPSs. A score of 10 was given to the highest option, while 0 to the lowest option.
- **Signal Coordination Potential/Queues:** examines the cycle lengths required at the signalized intersections and the easiness of coordinating the signal timings through the core. The easier the signals are to coordinate, the better the vehicle traffic will operate. With shorter cycle lengths, pedestrians are serviced more frequently, potentially leading to less jaywalking. Criteria ranges from 0 to 10, with 10 being the highest score with the shortest cycle lengths and easiness of coordination;
- **Parking Availability:** examines the number of available on-street parking stalls. Criteria ranges from 0 to 10, with 10 being the highest score with the most parking spaces available.

The results of the analysis are shown in **Table 21**.

Table 21: Scoring of Each Option

Option	Cost	Warrants	Pedestrian Jaywalking / Safety	Signal Coordination Potential / Queues	Parking Availability	Total
1	10	10	2	6	8	**36**
2	8	10	10	0	0	28
3	6	10	7	8	4	**35**
4	4	0	0	10	10	24
5	0	5	7	4	4	20
6	2	5	4	2	4	17

Cost

The cost was based on the amount of signals that were removed and implemented. The least expensive option was Option 1, with no changes, while the most expensive option was Option 5, with the removal of Mill St signal, implementation of Hickman St signal and an installation of the IPS at Sterne. It was deemed that an IPS costs more to implement than a PXO, which is why Option 6 was less expensive than Option 5.

Warrant

Option 1 required no warrants to be satisfied as the traffic signals were not being implemented, therefore this option scored 10. Under Options 2 and 3 the PXO and the IPS at Sterne St met the warrants, therefore these options also scored 10. Under Options 4 the signalization of Hickman St was not warranted, which is why this option scored 0. While under Options 5 and 6 the signal at Hickman St did not meet the warrants, but the PXO and IPS warrants at Sterne were met, therefore these options scored 5.

Pedestrian Jaywalking/Safety

Option 6 was ranked the lowest, with a score of 0, because it removed the existing signal at Mill St and implemented a signal at Hickman (an intersection that has an underpass for pedestrians and cyclists already), resulting in less locations for the pedestrians to cross and in turn encouraging jaywalking. Option 1 was ranked slightly higher, because it maintained the traffic signal at Mill St allowing pedestrians to cross at that location, however it did not address the existing jaywalkers. Option 2 was ranked the highest, as it covers the most crossings, allowing the pedestrians to cross Queen Street at four locations safely.

Signal Coordination Potential/Queues

Option 2 was the lowest scored, 0 points, as it has very closely spaced signals (the middle of which is a PXO, which cannot be coordinated due to the random activation). Option 4 was ranked the highest, 10 points, simply because the two signals (at King St and Hickman St) were spaced far apart, allowing for proper coordination between signals and eliminating issues with queue spillbacks. The rest of the options were ranked in between. As mentioned, due to the random nature of PXO activations, it is impossible to coordinate with PXO signals, therefore options that contained PXOs were ranked lower than similar options with IPSs.

Parking Availability

Option 4 scored the highest, because the removal of the Mill Street signal allowed slightly more parking spaces. Option 2, scored the lowest because it had both a PXO and the signal at Mill Street, which

greatly reduces the number of parking stalls that can be provided. It was assumed that PXOs require a removal of a larger number of parking stalls, than IPSs.

Based on the results of our assessment Option 1 and Option 3 are identified as preferred options. Further assessment of other alternatives is not recommended. It is our opinion that Option 1 represents the best balance in terms of improving the active transportation environment while maintain adequate traffic operations within the Bolton core. Under Option 1 the existing signal timings should be modified to run on 100 second cycle lengths, which would improve the pedestrian environment, as it would reduce the pedestrian crossing delay time by 20 seconds.

Option 3 is also recommended for consideration as a preferred option. However, under Option 3 longer traffic signal cycle lengths are required from a traffic perspective, which would increase pedestrian crossing delays and may affect pedestrian compliance. We believe that the high number of existing jaywalkers is due to the high pedestrian crossing delays at the King Street and Mill Street signals. By keeping the same cycle length at the two signals it is likely that certain pedestrians will continue to jaywalk as opposed to using the signals.

HICKMAN INTERSECTION CONCERNS

During the TMP process concerns were raised regarding the safety of vehicles ingress/egress from Hickman Street onto Highway 50. To help improve the safety of the intersection a number of suggestions were made. An exclusive northbound left turn lane would separate the left turning vehicles from the through vehicles, in the processes reducing the number of rear-end collisions. In addition, the proposed exclusive northbound left turn lane creates a shadow lane (highlighted in red in **Figure 17**). To improve the egress from Hickman Street the shadow lane can be hatched, as shown, and drivers can legally utilize it to execute a two stage merge (vehicles moved from the stop bar to the hatched area, and then accelerates northbound). With the narrowing of Highway 50 to a two lane cross-section through the downtown core, it was suggested that the southbound direction between Hickman Street and Centennial Drive be narrowed from two lanes to one lane. This creates two alternatives for improving the ingress into Hickman Street. The two alternatives considered are shown in the figures below. Alternative 1 has a shared southbound through-right lane while Alternative 2 has an exclusive southbound right and southbound through lanes. Alternative 2 requires that a portion of the southbound section between Hickman Street and Centennial Drive not be narrowed, but instead be converted to an exclusive right turn lane. The exclusive right turn lane would be used as a deceleration lane by drivers looking to make that turn. The drivers would be able to decelerate safely, away from the through vehicles and in turn minimizing the number of rear-end collisions, especially given the steep slope on Highway 50 in that area. Due to these reasons, it is suggested that Alternative 2 be implemented at the intersection of Highway 50 and Hickman Street.

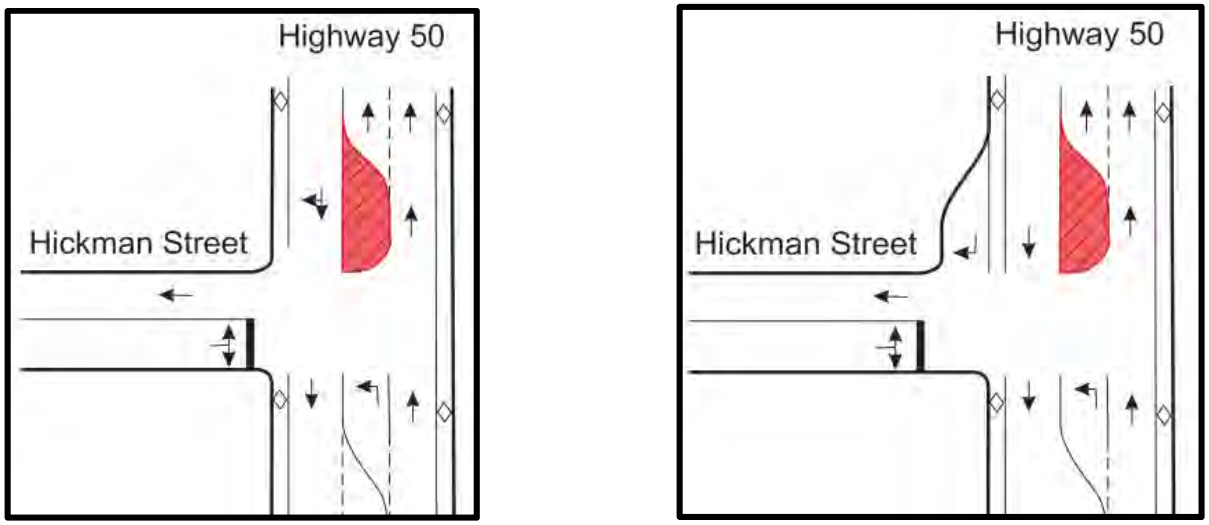


Figure 17: Hickman Street at Highway 50 Intersection Alternatives

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