City of Belleville
Transportation Master Plan




Final Report – April 22, 2014

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1. INTRODUCTION

1.1 Purpose of the Transportation Plan

The Transportation Master Plan is an important planning document that helps the City identify, prioritize, and implement changes to the transportation network to meet existing and future travel needs.

The Belleville Transportation Master Plan is intended to guide the provision of transportation infrastructure and services within the city over the next 20 years. The Plan examines deficiencies, develops recommendations, and sets strategic directions for creating a sustainable, accessible, and livable community. Recommendations arising from the study will guide the establishment of infrastructure improvement priorities and support the development of the City's Capital Construction Plan

The Transportation Plan represents a shift in thinking about how people travel. Traditionally, transportation planning studies have focused on the needs of drivers. Today, there is growing interest in creating a more balanced transportation system that offers a range of travel choices. Modes such as walking, cycling, and transit not only have environmental benefits, but also support important health, social, and equity objectives. At the same time, driving continues to be the preferred mode of travel for many residents, and businesses rely on an efficient road network for the movement of raw materials and goods.

Moving forward, a multi-modal approach is required which addresses pedestrian, cycling, and vehicular needs. To support this effort, the Transportation Plan recognizes the importance of creating an integrated transportation system which accommodates all travel modes safely, with a high quality of service. Recommendations are made to enhance the walking and cycling environment, and several road network improvements are proposed to ensure that traffic continues to flow well, with minimal traffic congestion and delay. The following sections of this report describe the process that was undertaken in preparing the Transportation Plan and outline the key policy and

infrastructure recommendations for achieving the City's vision of a safe, equitable, and sustainable transportation system.

1.2 How was the Plan Prepared?

Development of the Transportation Master Plan involved six key steps, as outlined in Figure 1. The project was overseen by staff in the C ity of Belleville Engineering and Development Services department with input from Technical and Stakeholder Advisory Committees.

- The **Technical Advisory Committee** was comprised of staff from different City departments, ensuring that the plan is sensitive to the needs and constraints of the various operating entities responsible for providing City services.

- The **Stakeholder Advisory Committee** included representatives from community organizations with an interest in transportation, including Belleville on Bikes, Loyalist College, the Hastings & Prince Edward Counties Health Unit, and the Belleville & District Chamber of Commerce. The Stakeholder Advisory Committee also included members of the general public who were selected from a pool of applicants at the outset of the study. This approach was adopted to ensure the plan reflects the views of a broad cross-section of Belleville residents with different needs and priorities.

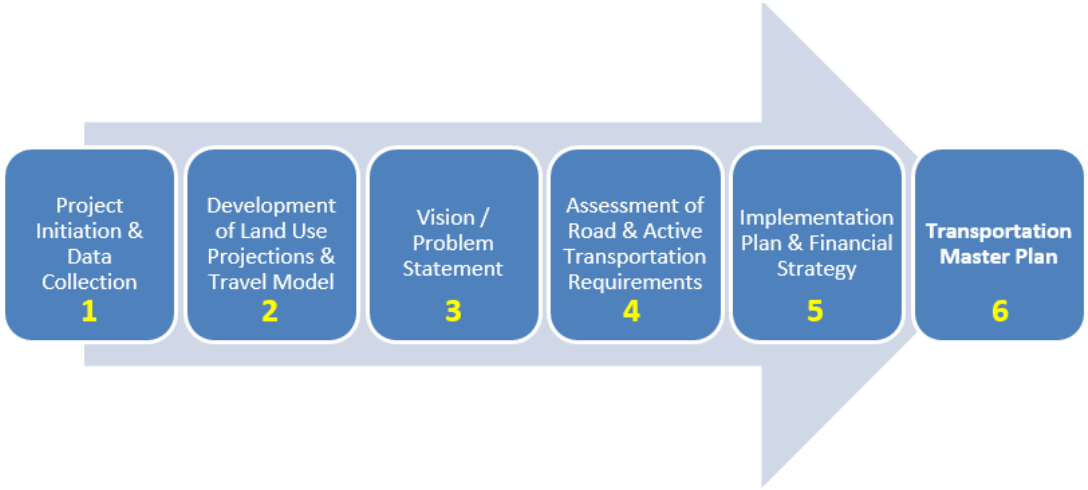


Figure 1 -Study Process

The Transportation Master Plan was prepared in accordance with the Municipal Class Environmental Assessment (EA) Process, which is an approved process under the Ontario Environmental Assessment Act. The Class EA process seeks to minimize the impact of projects on the environment – which is broadly defined to include natural, social, cultural, and economic assets.

The Class EA process includes five phases, as illustrated in Figure 2 – Overview of the Municipal Class EA Planning and Design Process. Transportation Master Plans are required to comply with the first two "need and justification" phases of the process,

which include an analysis of existing conditions, identification of problems and opportunities, and evaluation of alternative solutions. After approval of the Transportation Master Plan, individual roadway projects may proceed to Phase 3 of the Class EA Process at which time more detailed environmental evaluations and design work is undertaken.

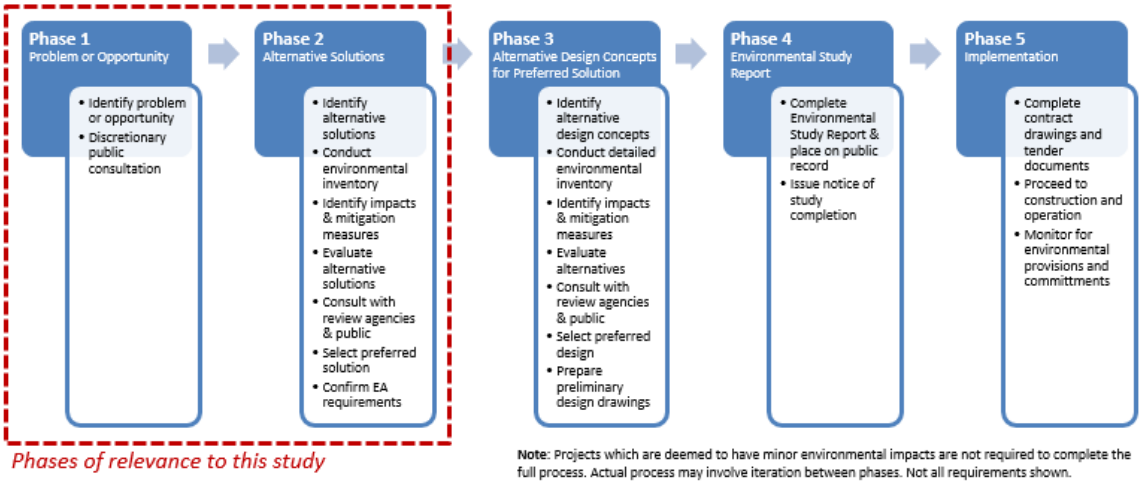
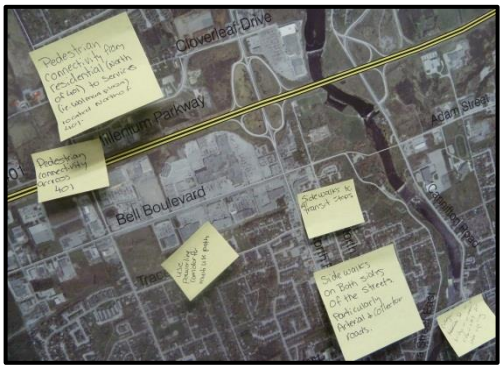


Figure 2 - Overview of the Municipal Class EA Planning and Design Process

1.3 Public and Stakeholder Input

Public consultation is an integral component of the master planning process. In addition to meetings with the Technical and Stakeholder Advisory Committees, three Public Open Houses were held throughout the study process. These events represented significant points of consultation where opinions were sought from members of the community, and progress on the study was presented



The first Open House provided a chance for residents to identify issues and opportunities associated with the City's transportation system. At the second Open House, four road network scenarios were presented along with a preliminary version of the cycling network, allowing residents to provide feedback on the various proposals The draft Transportation Master Plan was presented at the third Open House, providing a final opportunity for input before finalizing the Plan and presenting it to City Council.

All the events were advertised in advance in the local newspaper as well as via social media. To increase participation, the second and third Open Houses were moved from City Hall to the Quinte Sports and Wellness Centre, and the start time was adjusted to allow more people to attend. Material from the Public Open Houses was also made available on the City's website for the project, providing an additional mechanism for people to participate in the study.

In addition to consultation with the public, letters were sent out to agencies to solicit input on the project, including:

- Quinte Conservation
- Trans-Northern Pipelines Inc.
- Ministry of Transportation of Ontario (MTO)

As the study progressed, it became apparent that improvements would likely be needed to provincial transportation facilities to meet mobility needs in the Belleville area. Given the potential impacts to provincial infrastructure, a meeting was held with the Ministry of Transportation on May 15, 2013 to: inform MTO staff of the key study findings; obtain insight on Ministry plans and priorities; and seek opportunities to engage the Ministry as the Plan moves into the implementation phase.

A summary of the key consultation milestones is provided in Figure 3. Additional details on the consultation process can be found in the Appendices:

- **Appendix A**: Notice of Study Commencement
- **Appendix B**: Agency letter and responses
- **Appendix C, D, and E**: Public Open House materials (newspaper ad, display boards, summary of findings)

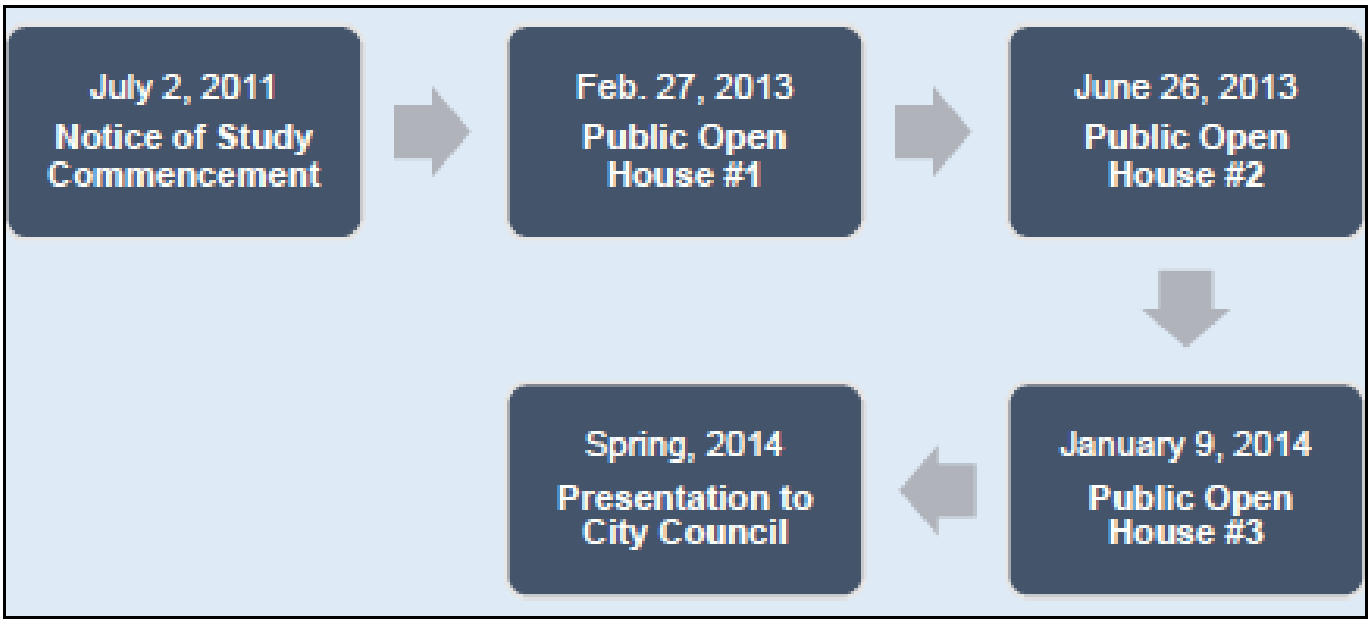


Figure 3 - Key Consultation Milestones

2. BELLEVILLE TODAY

2.1 Community Profile

Belleville is located on the shores of the Bay of Quinte, approximately halfway between Toronto and Ottawa along the Highway 401 corridor. It serves as the regional centre for the Bay of Quinte region. This region consists of the southern portions of Hastings and Lennox and Addington Counties, all of Prince Edward County, and the eastern portion of Northumberland County.

The city has grown to approximately 50,000 residents, based on the 2011 Census. Belleville has a strong industrial base, and today, major employment generators in the city are manufacturing, packaging, food processing, distribution, and logistics.

Canadian Forces Base Trenton which is located to the west of Belleville in Quinte West is a major part of the regional economy that also impacts growth in Belleville. The continuous built-up urban area of Belleville is situated along the Bay of Quinte and extends to just north of the 401. Approximately two-thirds of the municipal land base is rural in character, largely in the northern and eastern portions of the city.

2.2 How Do People Travel?

Presently in Belleville, most residents drive to meet their travel needs. However, comments from the second Public Open House suggest that there is interest in using alternative modes more frequently, particularly cycling

Based on findings from the public consultation, residents appear to be most satisfied with the road network in Belleville, and least satisfied with the cycling network.

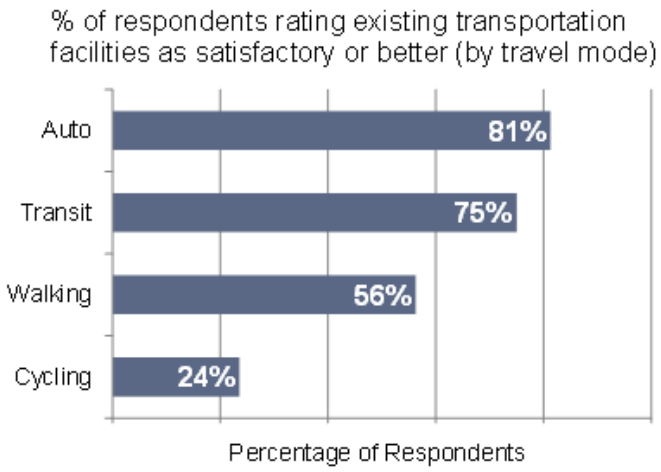


Figure 4 illustrates the current modal share for the journey to work based on the 2011 National Household Survey conducted by Statistics Canada. As this figure shows, roughly 78% of Belleville residents drive to work. Transit accounts for 4% of trips, while 10% of trips occur by active modes such as walking or cycling.

In terms of trip distribution, just over half of the jobs in Belleville (54%) are held by Belleville residents, suggesting a substantial flow of commuters into and out of the community each day, with most of these workers living in either Quinte West (17%) or Prince Edward County (9%).[1]

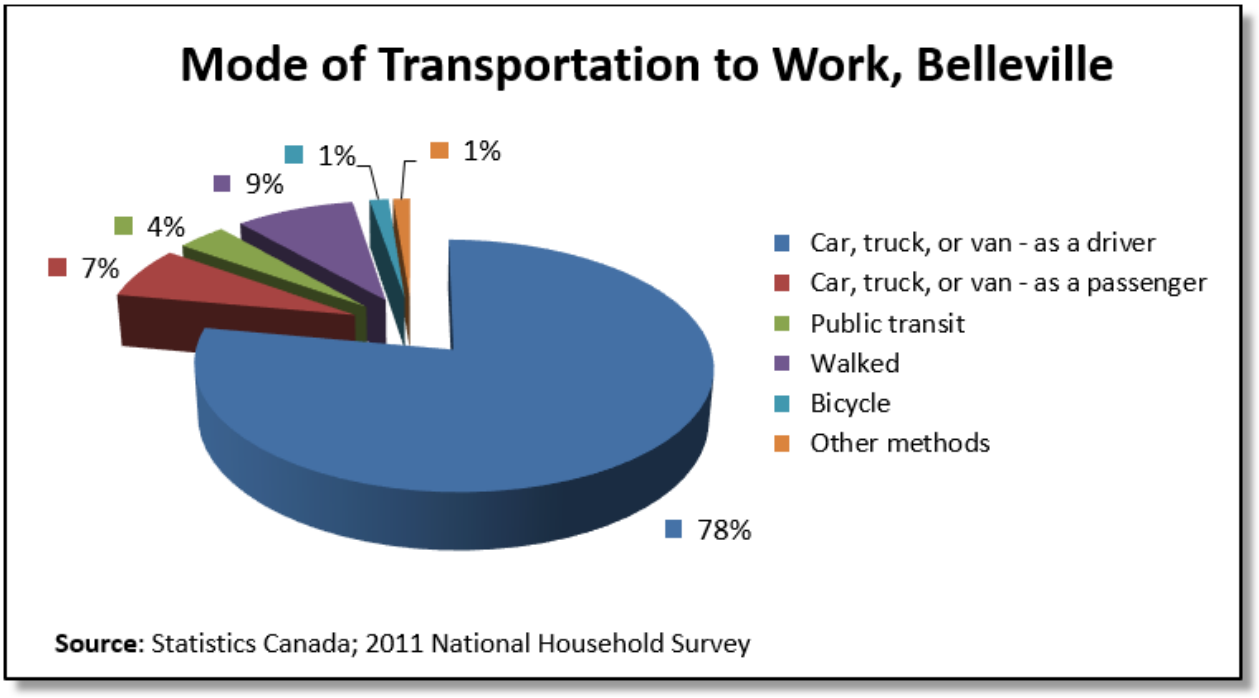


Figure 4 -Mode of Transportation to Work

2.3 Existing Infrastructure

2.3.1 Roads

Belleville's road network is made up of freeways, highways, arterial roads, collector roads and local roads, each serving an integral function in the road network. Higher order roads such as arterials are primarily intended to serve a mobility function, while lower order roads provide access to adjacent properties. A description of the City's functional road classification system is provided in the Official Plan and summarized in Table 1 below.

[1] Based on 2006 Statistics Canada Data.

Table 1 Belleville Road Classification System

Class	Description	Example
Arterial	These roads typically carry high volumes of traffic, and act as the transportation links between different areas of the City. Arterial roads also provide access to the provincial highway network, including Highway 401.	 *Bell Boulevard*
Major Collector	Major collectors are intended to carry moderate to high volumes of traffic, linking neighbourhoods to arterial roads.	 *Church Street*
Minor Collector	Minor collectors typically carry moderate volumes of traffic linking neighbourhoods to major collector and arterial roads.	 *Leland Drive*
Local	Local roads typically carry low volumes of traffic from individual properties within neighbourhoods to minor collectors, major collectors, and arterials.	 *Lexington Crescent*

Based on modelling work undertaken as part of the planning process (refer to Section 3.6.2), the road network in Belleville currently operates at an acceptable level of service in the morning peak hour, with a few localized issues. Planning studies recently completed or currently underway include the extension of College Street East and improvements to Bay Bridge Road and Dundas Street West, including:

- Intersection improvements at Bay Bridge Road & Dundas Street West
- Widening of the CP overhead on Bay Bridge Road to 5 lanes (to allow for a second northbound left turn lane)
- Addition of a centre two-way left turn lane between Coleman Street & Bay Bridge Road
- Provision of a 3 m off-road path between Bay Bridge Road and the Moira River

The last comprehensive review of the Belleville road network was undertaken in 1990 as part of the *Hastings-Belleville Transportation Planning Study*. As a result, there is a need to develop a new updated plan for the City's road network that reflects both existing and future travel needs.

2.3.2 Transit

Belleville Transit currently provides service on 9 routes throughout the city. The transit service is accessible, with 15 buses carrying over 3000 riders daily. Most routes start from the Robert E. Ladoucier Transit Centre located downtown at 165 Pinnacle Street. Buses run seven days a week, with half-hour service on weekdays between 5:00 a.m. and 6:30 p.m.

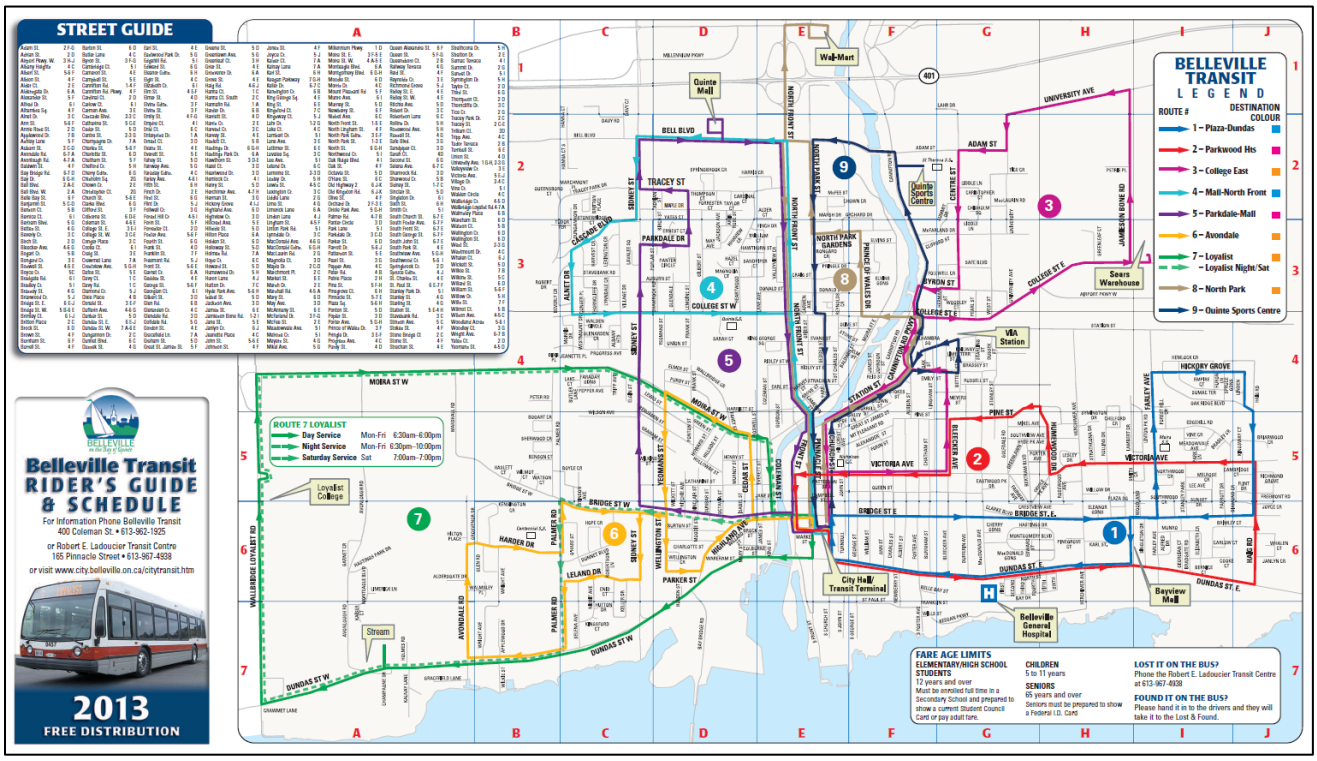


Figure 5 Belleville Transit Route Map

2.3.3 Walking and Cycling

- At present, the City of Belleville maintains a network of sidewalks throughout the city, although there are several missing gaps which make it difficult for pedestrians to access certain destinations. The City also maintains multi-use trails along the Bay of Quinte and Moira River – facilities that are well-used and appreciated by residents. A map of the existing trail network is provided in Figure 6. As this figure shows, there is opportunity to improve the connectivity of the off-road trail system by better integrating the various routes. The City currently has no on-road cycling facilities; however, cycling stakeholders have been strongly advocating for a comprehensive cycling network to improve safety and encourage cycling activity.

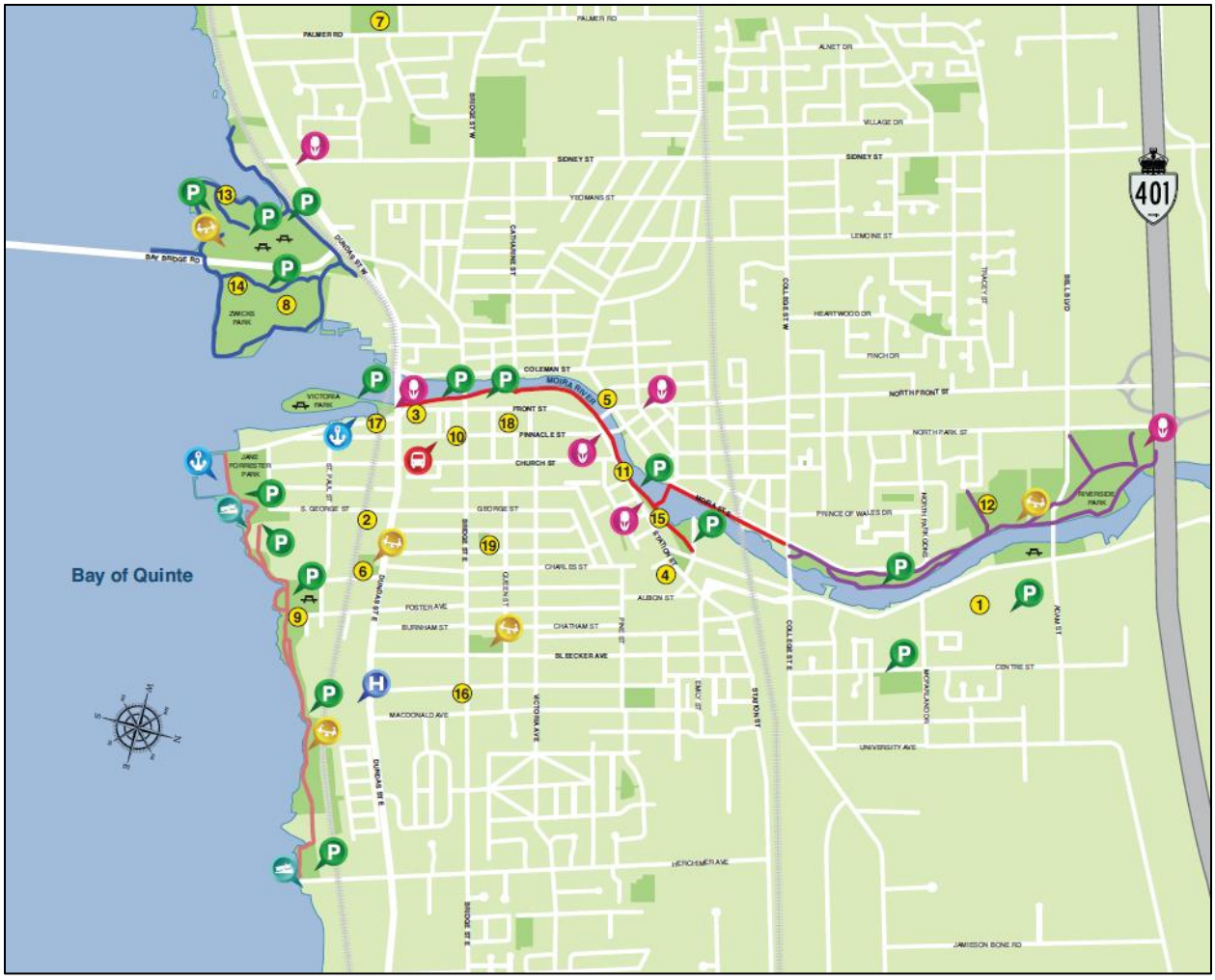


Figure 6 - City of Belleville Trail Map

From an active transportation perspective, the City of Belleville is blessed with several advantages, including an attractive waterfront area, relatively flat terrain, and small urban size. The latter tends to reduce trip lengths, making walking and cycling more feasible. However, Belleville also has several physical and man-made barriers which impede travel, such as the Moira River, Highway 401, and various rail corridors – all of which present a significant challenge to network connectivity.

At the second Public Open House, residents were asked to rank cycling issues according to importance. This information was later used to set priorities for the proposed cycling network. From the responses received, the greatest area of concern is the lack of on-road cycling lanes, followed by crossings over Highway 401 (refer to Figure 7).

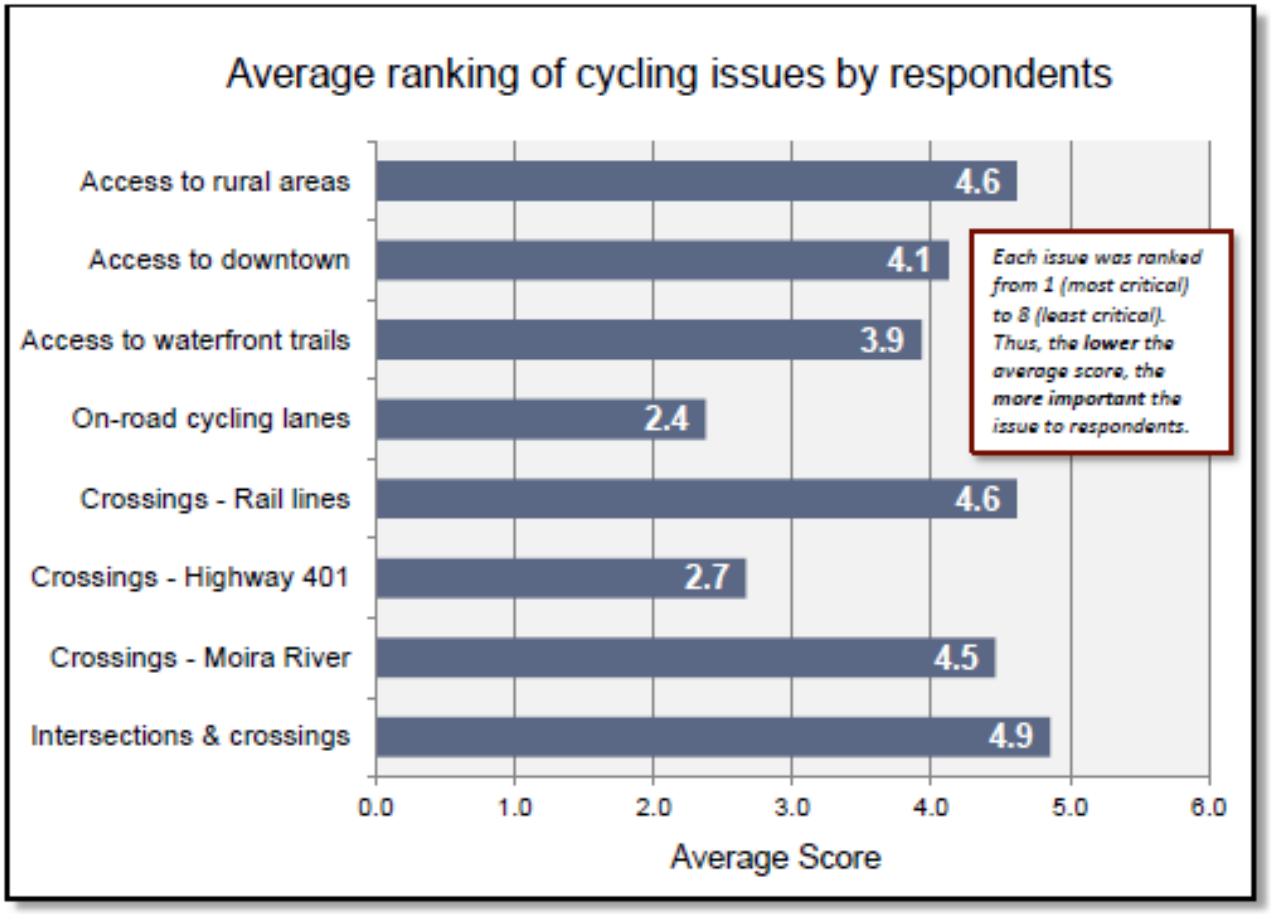


Figure 7 - Feedback on Cycling Issues

3 BELLEVILLE IN 2031

3.1 Demographic Trends

According to a recent Municipal Comprehensive Review by Watson and Associates Economists Ltd. (June 27, 2013), population growth in Belleville has been the result of net migration of persons over the age of 55. In addition, Belleville's population is older than the provincial average, and is aging at a faster rate than the provincial average. By 2036, the 55+ age group will represent 47% of Belleville's population.[2] From a transportation perspective, the implications of this demographic shift are far-reaching:[3]

- Data consistently shows that people aged 65 and older make fewer trips per day than their younger counterparts. However, recent evidence suggests that the rate of decrease in trip making is declining. Trip rates for tomorrow's seniors are expected to be higher than today as more seniors continue to work after the age of 65 (be it on a full- or part-time basis) and pursue more active lifestyles.

- Once retired, seniors have different travel needs. Some trips will be virtually eliminated, such as work trips, reducing demand on the road network when traffic tends to be greatest. Other trip types may increase. Trip origin and destination patterns will likewise be affected.

- Information from a 2005 Edmonton travel survey shows a change in travel mode as residents age. Interestingly, the proportion of travel by walking and transit by residents 65 years and older was generally similar to residents in the 45 to 65-year age category. However, the proportion of trips made by driving was noticeably lower, with a corresponding increase in the proportion of trips made as a car passenger. Such findings imply that seniors continue to enjoy active modes of transportation as they age but may be less comfortable driving a vehicle – a task which requires visual, cognitive, and physical acuity.

[2] *Belleville Comprehensive Review*, Watson & Associates Economists Ltd., June 27, 2013, pages 5-7.

[3] The material in this section has been adapted from work prepared previously by Morrison Hershfield for other urban areas in Canada.

- For those seniors who continue to drive, route choice decisions may be affected, for example, avoiding busy corridors in favour of lower-volume roads. Since seniors often have more flexibility than other residents, they may also choose to travel during less congested times.

- As people age, they are more likely to suffer from health issues that impact physical mobility. As a result, an increase in the seniors' population may result in greater demand for accessible transportation services, including fully accessible conventional transit and more specialized Mobility Bus services.

Transportation allows seniors to participate in society; for those seniors dependent on a car, isolation and loss of independence are a real concern if the ability to drive is lost. In Ontario, all drivers over the age of 80 are required to renew their driver's license every two years, a process which may include a road test. Seniors who fail to meet these requirements have their driver's license revoked, significantly impacting their mobility.

To ensure seniors maintain a high level of mobility as they age, it is important to consider both the needs and abilities of older residents.

- As more people require mobility aids, accessibility becomes a key consideration, influencing all aspects of the transportation system from design of parking facilities to sidewalks.

- Pedestrian timing at signalized intersections may need to be adjusted to reflect slower walking speeds.

- Benches on trails will become more important to allow for convenient rest stops.

- Given the physical limitations of older drivers, improvements to signage and wayfinding may be necessary to improve legibility.

- To ensure equitable access to transportation, transit service is critical for seniors who are no longer able (or willing) to drive. For such service to be effective, route adjustments may be needed to better serve seniors' destinations.

Moving beyond transportation, it will be important to develop urban design and land use policies that address the needs of older residents. In particular, policies are needed that encourage compact, mixed-use, walkable communities. Seniors housing should be located in close proximity to shops and services, and well-served by transit.

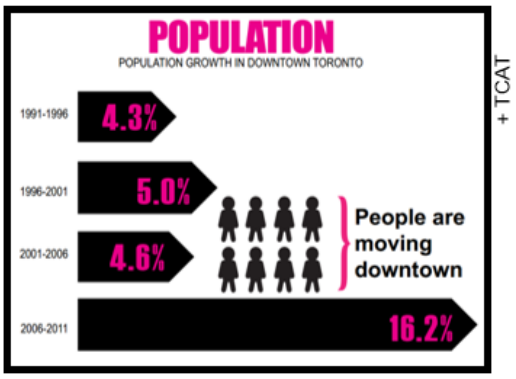
3.2 Social Trends

Today's teenagers and younger adults aged 16 to 34 are making less trips and shorter trips than their similarly aged counterparts in the past. They are also shifting to alternative travel modes – in 2009, US youth biked 24% more, walked 16% more, and travelled 40%

more distance by transit than their counterparts in 2001.[4] In parallel with this shift, today's younger generations are also less likely to have a driver's license.

There are many factors which may be contributing to this change in travel patterns. External factors such as greater restrictions for licensing and increasing fuel prices may influence travel choices, but do not appear to be the primary motivating factors.[5]

Instead, the younger generation appears to be motivated by a desire for a different kind of lifestyle. For example, a large percent (45%) of this age group 'have consciously made an effort to replace driving with transportation alternatives' according to surveys.[5] Studies show that young people are the generation most likely to prefer to live in smart growth communities with access to transportation alternatives and nearby shops and restaurants.[5] This trend is reflected in the increasing shift of populations moving back downtown. For example, in Toronto, downtown population growth between 2006 and 2011 was 16.2%, outpacing a trend of around 5% growth over the three previous five-year periods.[6] Technology may also be impacting travel among youth, allowing greater ability for online connections through social media.



These trends are likely to continue and may have significant impact on future travel patterns. Since 'Gen Y' will make up 50% of the workforce by 2020[7], travel during the peak periods may be significantly impacted by the preferences of this generation.

3.3 Vehicles & Technology

Long-term plans must always have an element of stretch to them, as trends – be they technological, social or economic – can develop or accelerate over time in an unforeseen manner. What appears to be impossible or unlikely today can become a reality within one or two decades.

Two of the technological trends of relevance to this Plan include e-bikes and electric vehicles.

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[4] Davis, B., T. Dutzik, and P. Baxandall. 2012. *Transportation and the New Generation*. Frontier Group & U.S.PIRG Education Fund.

[5] Davis, B., T. Dutzik, and P. Baxandall. 2012. Transportation and the New Generation. Frontier Group & U.S.PIRG Education Fund.

[6] Keesmaat, J. 2013. *The Big Shift: And What it Means for Movement.* Presented at TCAT's Complete Streets Forum 2013.

[7] Williams, R. 2013. *Like it or not, Millenials will change the workplace*. Financial Post. Available online: http://business.financialpost.com/2013/09/16/like-it-or-not-millennials-will-change-the-workplace/

E-Bikes

E-bikes are becoming an increasingly common sight on roads and trails across Ontario. E-bikes produce fewer emissions and have a smaller parking footprint than motor vehicles, and also help to reduce congestion. They extend the range of conventional bicycles and bring cycling to an audience that might not otherwise consider it. E-bikes also enhance mobility for those with physical impairments or reduced mobility.

While e-bikes have yet to be widely adopted, their use is expected to increase in the future. In Ontario, e-bikes can weigh up to 120 kilograms and reach top speeds of 32 kilometers per hour. Such operational characteristics have prompted safety concerns for pedestrians and cyclists on shared-use facilities. As a result, some municipalities have enacted bylaws restricting e-bike use.

In the future, manufacturers of e-bikes may target different market segments, for example, by reducing the weight and/or top speed of e-bikes in an effort to make them more affordable. Such changes would also help to overcome some of the resistance encountered in permitting e-bikes on trails and cycling lanes.

Source: Ontario Ministry of Transportation

Electric Vehicles

In recent years, several vehicle manufacturers have introduced electric cars. The Globe and Mail reports that while sales of electric vehicles are growing, they still represent less than 0.2% of overall vehicle purchases based on sales figures from August, 2013.[8] In a 2011 report by the Polaris Institute on the prospects for an electric car industry in Canada, several key challenges are noted which must be overcome before electric vehicles "emerge as a viable alternative for consumers".[9] Key issues include affordability, lack of charging infrastructure, battery technology, and range.

Best Western Belleville Highway 401
Electric Vehicle Charging Station

[8] Cato, Jeremy. 2013. "Can you guess how many Canadians bought plug-in cars last month?" *The Globe and Mail*. September 6, 2013.

[9] Girard, Richard. 2011. *Electric Car Report: What are the Prospects for an Electric Car Industry in Canada and is this a Real or False Solution for Climate Change*? Polaris Institute, Ottawa.

While the current penetration of electric vehicles is low, there is potential for more widespread adoption in the future, particularly if manufacturers are successful at reducing costs and improving battery technology. As a result, it is recommended that the City of Belleville monitor the evolution of electric vehicles and the need for charging infrastructure within the Belleville area.

3.4 Sustainability & Climate Change

Climate change is considered by some to be one of the most pressing issues of the day. From a transportation perspective, changing climate patterns pose two major challenges:

1. Transportation infrastructure must be able to withstand climate changes that are already underway

2. Greenhouse gas emissions from transportation must be reduced to avert further climate impacts

The first challenge will require upgrading existing infrastructure where necessary and adopting new design standards and practices to ensure that roads, bridges, and culverts can withstand projected temperature changes and storm events that are more frequent and severe. The second challenge will require a host of strategies targeting vehicle fuel efficiency and travel behaviour.

In response to the climate change challenge and other social and environmental issues that have come to the forefront in recent years, there is a growing awareness of the negative impacts of automobile use and the importance of sustainability, prompting a change in social values. Such change is evidenced by the much greater attention being given to alternative travel modes in municipalities across North America. Indeed, the 1990 *Hastings-Belleville Transportation Planning Study* focused almost exclusively on the auto vehicle mode; the vision for the current plan calls for a sustainable transportation system that accommodates all modes. Whether this shift in thinking becomes more widespread and reflective of the population at large remains to be seen, but changes are already underway in the way we plan and use our transportation systems.

3.5 Land Use

Over time, the City of Belleville is expected to attract new residents and new jobs, resulting in a gradual shift in land use as new sites are developed and existing sites are redeveloped to support new activities.

Population & employment forecasts were developed in collaboration with the City of Belleville planning section (refer to Appendix F). Overall, population is predicted to grow by roughly 24% between 2011 and 2031, while employment is expected to increase by roughly 32% (refer to Table 2). Figure 8 illustrates the anticipated change in population and employment in different areas of the city, as well as the resultant land use density:

- Areas with the most dots are expected to see the most growth between 2011 and 2031
- Areas with the darkest shading are expected to have the highest concentration of people and jobs once growth has occurred

As shown in Figure 8, much of the projected growth is expected to be focused in a few key areas, impacting transportation requirements:

- Significant population growth is predicted to occur in the Loyalist development area (on the west side of the city)
- Significant employment growth is predicted to occur in the industrial expansion area (on the east side of the city)

With major development occurring in opposite corners of the urban area, there is likely to be increased pressure on both east-west and north-south routes within the city.

In developing the employment projections, it was assumed that the growth in employment would keep pace with the growth in population, resulting in a relatively constant jobs per capita ratio over time. Such an assumption implies that the proportion of Belleville jobs held by residents living outside the city will also remain relatively constant moving forward.

While the employment projections call for roughly 10,000 jobs to be created in Belleville over the next twenty years, employment lands within the city can support more than twice this growth. As a result, it is assumed that not all employment lands will be developed within the study horizon. Should development of these lands occur more quickly than anticipated, exceeding the pace of residential development, a greater proportion of the new jobs will be held by people living in neighbouring jurisdictions, putting additional pressure on transportation facilities leading into and out of the city.

Table 2 Population and Employment Projects

Details	2011	2031	Growth Rate (2011 to 2031)
Population	50,990	63,450	24%
Employment	31,670	41,870	32%
Jobs / Capita	0.62	0.66	-

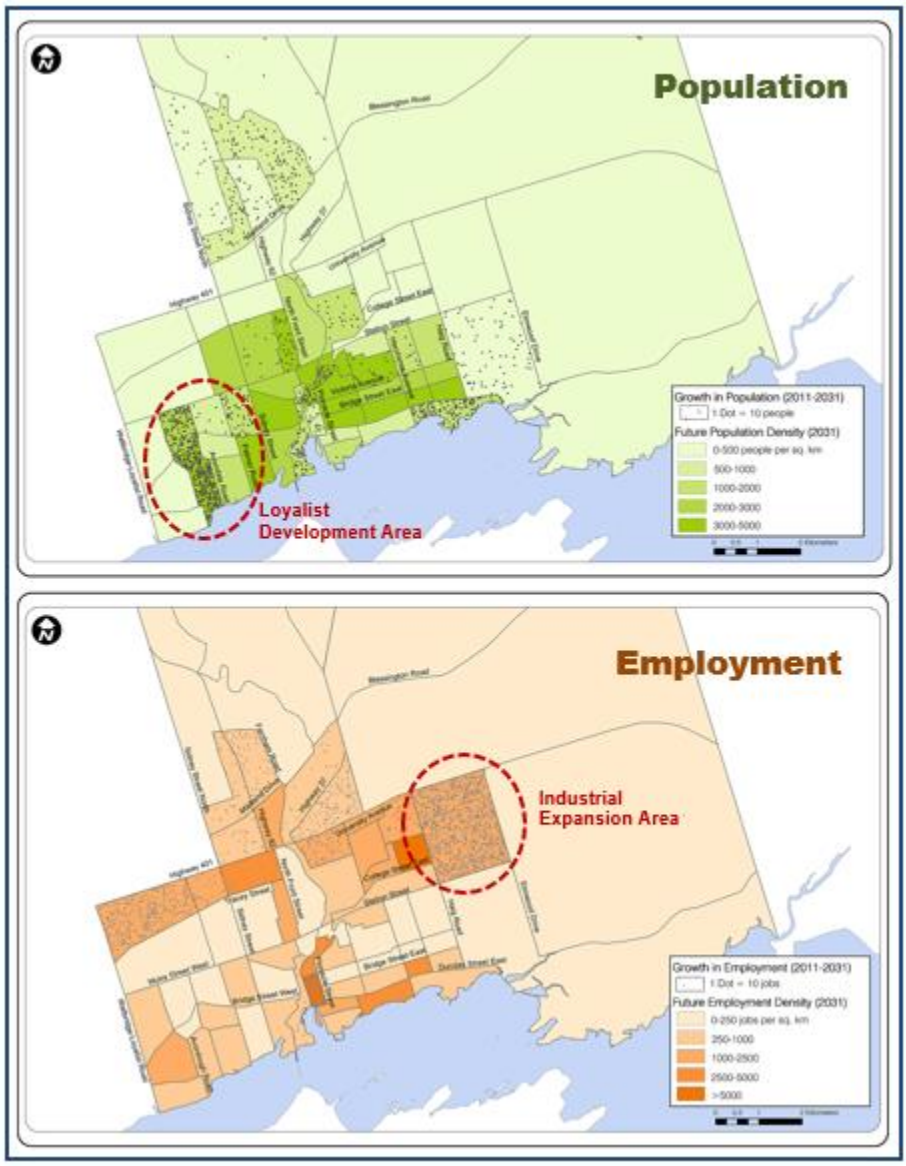


Figure 8 - Land Use Projections

3.6 Road Network Performance

3.6.1 Factors Influencing Travel Activity

The discussion in the previous sections has alluded to many of the factors that will influence travel activity in the coming years:

- **Demographic trends and the aging of the population** will influence how, when, and where residents travel.

- **Growth in population and employment** will place increasing pressure on the City's transportation system as people travel for work, school, and a myriad of other reasons to meet their day-to-day needs.

Other key factors that affect travel activity include the cost of travel and modal choice.

- **Cost of Travel** – The cost of travel has a significant impact on travel behaviour. An increase in transit fares typically causes transit ridership to decline. Likewise, an increase in the cost of driving tends to reduce the amount of travel on the road network. While some cost elements are within the City's control, others are based on external factors.

  In the case of motorists, vehicle insurance and registration fees, parking rates, and fuel prices all impact the cost of owning and operating a vehicle. Of these costs, the price of fuel is of particular interest given the magnitude of the potential change. While fuel price predictions are subject to considerable uncertainty, there is a general expectation that fuel will continue to become more expensive over time. Changes in the provincial or federal fuel tax regime or the introduction of a carbon tax may likewise have a significant impact on the price that motorists pay at the pump. Studies have shown that a 10% increase in fuel price reduces vehicular travel in the order of 0.5 to 1% in the short term, and 1.5 to 3% in the long term, suggesting that any major price fluctuations could have a noticeable impact on traffic volumes.[10]

- **Modal Choice** – As alternative travel modes become more popular, the proportion of trips made by driving will decline, reducing pressure on the road network. The extent of modal shift will depend on a number of factors, including the relative cost of each travel mode, and the investment made by the City of Belleville in promoting walking, cycling, car-pooling, and transit as viable, attractive travel choices.

  For the Transportation Master Plan, a transit mode share target of 4.5% was adopted for the journey-to-work, implying that by 2031, 4.5% of the city's labour force will take the bus to work each day. This target represents a 13% increase over the current transit mode share of 4%.

Given the uncertainty surrounding demographic impacts, the cost of travel, and the extent of future modal shift, only changes in land use were considered when developing the

[10] Litman, Todd. 2012. *Understanding Transport Demands and Elasticities: How Prices and Other Factors Affect Travel Behaviour*, Victoria Transport Policy Institute.

traffic projections described in the following section. This approach is considered to be conservative; if demographic trends cause a reduction in travel during peak periods, if the cost of travel discourages motorists from driving, or if the City is successful at encouraging greater use of transit, the volume of traffic on the road network will be less than predicted.

3.6.2 Traffic Projections & Anticipated Road Network Deficiencies

Models are used to predict growth in travel activity over time, allowing the City to identify future congestion points in the road network and plan for future needs.

To predict the amount of traffic on the road network in the future, special transportation models are needed. These models are able to forecast travel activity as a function of land use. Typically, such models consider four key questions, as illustrated in Figure 9.

Figure 9 - Major Elements of Travel

In general, the model inputs consist of land use data for each residential / business area within the city; and network data that describe the physical characteristics of the road links that connect these areas. The model outputs include an estimate of the traffic volume on each major road in the city and the average time for a vehicle to travel each road section.

As part of the planning process, a transportation model was developed for the City of Belleville using the software EMME, a popular tool for transportation modelling and analysis. The model has a base year of 2011 and considers passenger vehicle travel during the morning peak hour. Details of the model development and calibration can be found in Appendix G.

Once the accuracy of the model was deemed to be acceptable, it was used to estimate future traffic volumes based on the land use projections described in Section 3.5. Such estimates of future travel activity provide the basis for assessing network deficiencies – locations where the travel demand is expected to exceed the road capacity.

It should be noted that the transportation model only considers failures at a "link level" and is not intended to capture failures at individual intersections. Such localized failures are typically addressed by modifying the intersection design or signal timing, without the need for extensive network modifications. In contrast, by considering traffic flow at a corridor or network level, the transportation model helps to identify where major improvements may be needed, such as road widening or the construction of new roads.

Figure 10 shows the 2011 and 2031 traffic forecasts for the morning peak hour as estimated by the EMME model. The results suggest that there is limited traffic congestion in Belleville at present, and that traffic generally moves well, with the exception of Adam Street and University Avenue leading into the Northeast Industrial Park.

By 2031, traffic volumes have increased, putting even greater pressure on the roads used to access the industrial area. Congestion is also expected on the Norris Whitney Bridge, as well as sections of Wallbridge Loyalist Road. At the same time, the model suggests that traffic will be approaching capacity on sections of Sidney Street and Moira Street West.[11]

In technical terms, road performance is measured using the volume-to-capacity (v/c) ratio. The v/c ratio is obtained by dividing the volume of traffic using a particular road by the road capacity. If the volume exceeds the capacity, the v/c ratio will be greater than 1.0, indicating that the road is experiencing traffic congestion. The "target" v/c ratio is generally taken to be 0.9. Once the v/c ratio exceeds 0.9, road network improvements are deemed to be warranted. In Figure 10, red links have a v/c ratio ≥ 1.0, yellow links have a v/c ratio of 0.9 to 1.0, and green links have a v/c ratio < 0.9.

[11] These results assume no investment in additional road capacity, other than projects that the City has already committed to constructing. These "committed projects" include:

- Extension of College Street East
- Connection of Station Street and Haig Road
- Roads shown in the Loyalist Secondary Plan

Although the transportation model only considers traffic conditions during the morning peak hour, an effort was also made to strategically examine travel conditions during the afternoon peak hour. A summary of this analysis is provided in Appendix H. From this review, a number of additional issues were identified. In particular, it was determined that capacity over Highway 401 will be an issue in the future, and that failures can be expected on Bell Boulevard between Sidney Street and Wallbridge Loyalist Road, as well as on the northbound section of Sidney Street between Bridge Street and south of Wilkins Street. Safety and operational conditions are also expected to deteriorate on North Front Street between Bell Boulevard and College Street unless the road is upgraded to include a raised median or two-way left turn lane to address access issues along the corridor (refer to Appendix J).

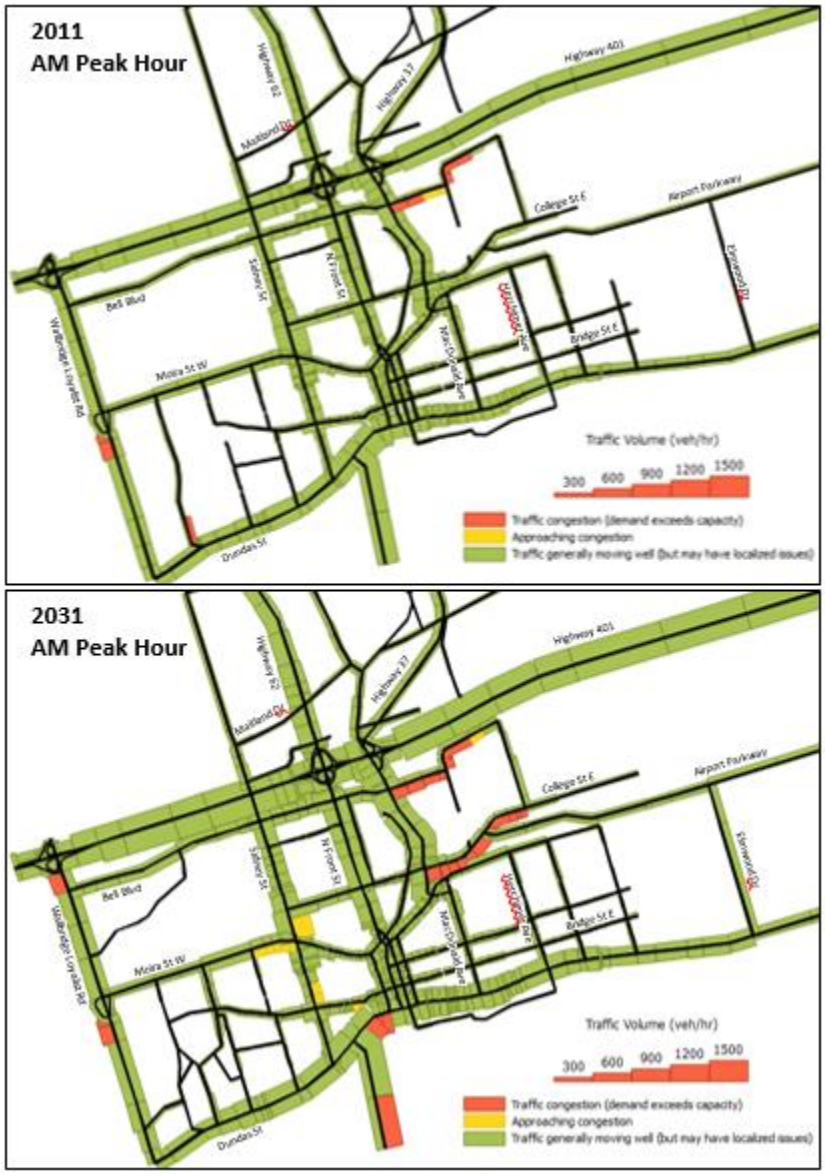


Figure 10 - Existing and Future Traffic Volumes

3.6.3 Review of At-Grade Railway Crossings

The City of Belleville has a large number of at-grade railway crossings, particularly along the CP rail corridor which travels through the city's south end. Conflicts at these crossings are expected to intensify over time due to an increase in both train traffic as well as the number of vehicles crossing the rail corridor.

Where the cross-product of the daily road and train traffic exceeds 200,000, consideration should be given to grade separation; by building an over- or underpass at the rail corridor, the potential for conflicts is eliminated. Given the significant cost of such structures, a cursory review was carried out to identify locations where grade separation may be required in the future. The results of this analysis are provided in Appendix I.

Based on the traffic projections and anticipated train frequency, two locations in particular should be monitored closely: the CP rail crossing with Dundas Street East and Wallbridge Loyalist Road, both of which are expected to exceed the cross-product threshold within the planning horizon. Should grade separation not be pursued due to financial or other reasons, other safety improvement measures should be considered, such as increasing the lead time between the lowering of gates and train arrival; installing upstream warning signs in sync with the drop down gates; reducing the posted speed on the roads approaching the crossing; and/or reducing the rail operating speed.

4 VISION FOR TRANPORTATION

4.1 Vision Statement

The Vision Statement for the Transportation Master Plan articulates the City's aspirations for the future and is intended to guide the City in its efforts to meet current and future travel needs.

Members of the Stakeholder Advisory Committee were requested to share their vision for transportation in Belleville. From a review of the input received, a number of words were found to resonate strongly with committee members. These words are depicted graphically below, with the font size proportional to the number of times the word was mentioned.

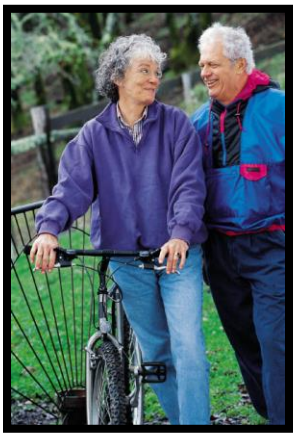
From this exercise, the following Vision Statement was developed to guide the planning effort:

The City of Belleville has a safe, equitable, and sustainable transportation system that achieves a balance between all travel modes, supporting a vibrant economy and healthy, livable communities while recognizing the importance of social and fiscal responsibility.

4.2 Key Principles

The Vision Statement for the Transportation Master Plan is supported by several key principles.

Sustainability & Equity



The City of Belleville embraces and supports **active and sustainable modes of travel** as a way to reduce environmental impacts, encourage healthy lifestyles, and create a more equitable transportation system.

Transit service is affordable and convenient, with amenities such as signage, benches, and shelters provided at major stops. Sidewalks are continuous and connect to key destinations, providing a **safe walking environment** for children to senior citizens. **Cycling facilities** are present along key cycling corridors, augmenting the existing off-road trail system. The cycling network is well-connected and attracts riders of varying fitness, skill, and comfort in traffic. Options such as telework and car-pooling are supported within the community and **accessibility** for persons with disabilities is a priority.

Goods Movement & Economic Prosperity

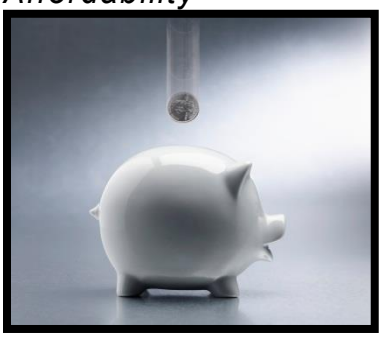
The City of Belleville's transportation network provides a **high level of mobility** which **supports the local economy** and **attracts new investment**. Connections to major regional and provincial transportation facilities are convenient and well maintained, with seamless intermodal transfers. Traffic moves smoothly with minimal delay, **reducing transportation costs**. Improvements to the walking and cycling environment support a high quality of life for **attracting new employees**, and commercial businesses benefit from attractive streetscapes that encourage residents and tourists to visit.

Downtown & Waterfront Vitality

The City of Belleville's transportation network enriches the downtown core and adjacent waterfront area, **supporting intensification and redevelopment**. Pedestrian and cycling connections across the Moira River are enhanced, particularly at the waterfront. Gateway promenades which invite pedestrian activity are complemented by an **attractive public realm**. Through adoption of **Complete Streets** principles, roads are designed to function as public spaces – travel lanes are maintained, but landscaping and other amenities are introduced to create places where people want to socialize and interact.

Parking is well-managed and convenient; **delivery vehicles** are accommodated efficiently and unobtrusively, and **wayfinding** is improved through the provision of signage and maps. There is ample bicycle parking, transit stops are well-located, and benches provide frequent resting points. People feel safe at all times of day, and special events are encouraged to animate the area and attract visitors.

Affordability



The City of Belleville recognizes the importance of investing in transportation infrastructure and services as a key element of city-building. Such expenditures are made within the City's **affordability envelope**, ensuring that investment in transportation does not come at the expense of other essential services.

The City seeks **innovative strategies** for funding transportation initiatives. Development charges are equitable and based on a clear understanding of future infrastructure needs. The City **develops partnerships** with local businesses and organizations with similar objectives and **works collaboratively with other levels of government** to fund infrastructure projects.

5 PROBLEM STATEMENT

The Problem Statement summarizes the issues and opportunities to be addressed in the Transportation Master Plan. Through a process of consultation and analysis, the following Problem Statement was developed to guide the planning.

With **population and employment projected to grow by 24% and 32%** respectively by 2031, the level of service on the road network is expected to decline, **resulting in reduced mobility with higher delays**. In particular, accessibility to the proposed industrial expansion area is expected to become an issue in the future as this area develops.

Transit and active forms of transportation currently comprise 13.5% of the journey to work travel market, which **falls short of the potential for these modes**. Opportunities to enhance the attractiveness and safety of these modes need to be continually identified and pursued in order to **reap the environmental, health, and social benefits** as well as accommodate population and employment growth.

The **equity** of the transportation system also needs to be improved by providing a **well-connected multi-modal network** that is **accessible to all residents regardless of age, income, or physical ability**. Such considerations are particularly relevant given the city's **aging population**, which currently has a higher proportion of residents aged 65 and older than the province as a whole.

The City of Belleville has a **large number of physical barriers that impede travel**, particularly with respect to active modes and the provision of emergency services. To improve accessibility, there is a need to provide high quality, well-maintained roads, sidewalks, transit corridors, and pathways connecting different areas of the city.

The expected **growth in passenger train activity** through the City of Belleville will increase the risk of **conflicts at at-grade crossings** with the road network. Such risks need to be mitigated and options to leverage the **opportunities associated with improved rail service should be explored**.

6 MOVING FORWARDS

6.1 Strategies for Meeting Travel Needs

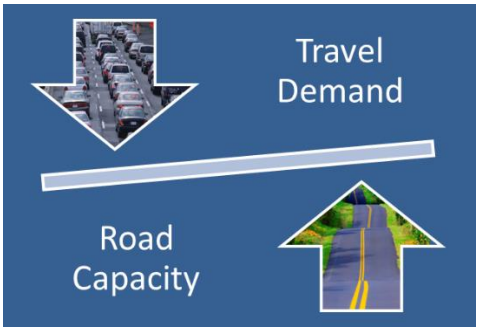
The Problem Statement in Section 5 outlines a number of issues that must be addressed to achieve the City's vision of safe, equitable, and sustainable transportation system that meets existing and future travel needs.

Historically, the approach has been to focus exclusively on the auto vehicle mode. Where congestion is expected, measures are taken to increase the road capacity, either through road widening or the construction of new roads.

Today, there is growing recognition of the need for a new approach – an approach which addresses the needs of all road users, including pedestrians, cyclists, and transit riders. Rather than simply increasing the "supply" of roads – a practice that is becoming increasingly unsustainable from financial, social, and environmental perspectives – efforts are also being made to manage the demand for travel by offering residents a range of travel choices.

This shift in thinking does not imply that road improvements are not required or desirable, only that such improvements should be complemented by measures to reduce vehicle traffic, particularly during peak periods. Examples of such "transportation demand management" strategies include shifting the mode or time of travel, combining trips, or working from home.

To address the various transportation issues facing the City of Belleville, a balanced approach is required, in which measures to increase road capacity are complemented by efforts to manage travel demand and enhance travel choices



The new multi-modal approach to transportation planning is reflected in the Complete Streets movement, which requires that all modes be accommodated within the road cross-section. However, to effectively influence travel behaviour, it will be necessary to go beyond the cross-section improvements required for Complete Streets and also adopt supporting policies and programs.

The following sections outline the actions, policies and infrastructure improvements that will be needed by the City of Belleville to achieve the transportation vision. These actions, policies, and improvement measures reflect the new approach to transportation planning described above, and include recommendations for:

- Land Use Policies (Section 7);
- Promoting Sustainable Options (Section 8);
- Complete Streets (Section 9);
- Active Transportation (Section 10);
- Transit (Section 11);
- Road Network Improvements (Section 12);
- Traffic Management (Section 13);
- Parking (Section 14); and
- Goods Movement (Section 15).

While policies and plans are provided for each mode independently, it is important to recognize the potential for interaction and the need for an integrated system. Though a combination of road network improvements and investment in other modes, a safe, equitable, and sustainable transportation system can be developed that supports the movement of people and goods, minimizes traffic congestion, and enhances quality of life.

7 ROLE OF LAND USE PLANNING

7.1 Interaction between Transportation & Land Use

Our streets not only support movement of goods through the city, they also serve an important functional role of connecting people to land uses and destinations. Land use locational criteria are directly related to the road classification hierarchy and the types and volumes of traffic that travel along each type of road. The interaction between transportation and land use becomes particularly important as future forecasts for growth are identified, whether residential or employment, and evaluation is made of how our transportation network will accommodate this growth.

Land use also plays an important role in influencing how people travel. Certain land use forms are more supportive of walking, cycling, and transit than others. Development patterns influence the proximity of travel destinations, and the connectivity of the routes for accessing those destinations. The built environment impacts people's impressions of public spaces, and the ability of those spaces to attract pedestrian and cycling activity. As a result, land use policies are often identified as a key strategy for promoting the use of sustainable travel modes.

Given the significant interaction between transportation and land use, it is important to adopt land use policies that support the transportation vision. Some supportive land use planning principles are outlined below in Section 7.2.

7.2 Planning Principles

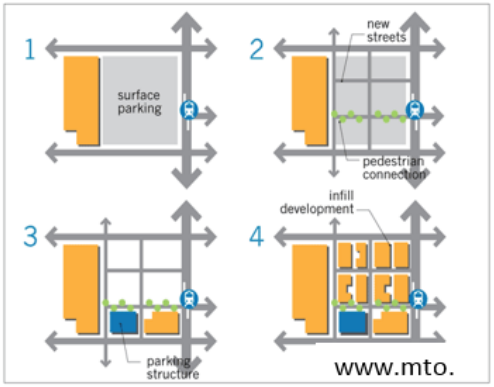
7.2.1 Urban Intensification

Intensification allows the city to provide transportation infrastructure and services more efficiently and promotes more vibrant communities. However, to be successful, intensification should be sensitive to surrounding land uses and respect the existing local character. The Provincial Policy Statement identifies intensification as an important direction in Ontario:

- Section 1.1.3.3 obligates the City to identify and promote opportunities for intensification and redevelopment where it can be accommodated
- Section 1.1.3.4 provides policy direction for development standards for intensification

- Section 1.1.3.4 provides policy direction for development standards for intensification
- Section 1.1.3.5 deals with minimum intensification targets within built-up areas
- Section 1.1.3.6 provides information for implementing intensification and redevelopment phasing policies

The Official Plan Amendment for the City Centre Planning Area (OPA 23) provides a strategic plan of the built-up area of the city with intensification targets and design guidelines. A similar approach could be applied to the City's main arterial streets and major nodes. This may need to be completed prior to moving forward with certain projects outlined in the Preferred Road Network to ensure future demand projections of underground services are designed into a project. Through Official Plan policies and zoning provisions, suitable building heights, surrounding character, and intensification targets can be established for these areas



7.2.2 Mixed Use Development

A general planning principle is to locate service and day-to-day uses closer to residential areas to encourage walking and active transportation and de-emphasize vehicle use. A number of supporting policies are outlined below:

- Increase emphasis on siting multiple uses in closer proximity or within a single development proposal.

- Encourage the development of "mobility catchment areas" encouraging people to live, work, shop, and play within a 5 to 10-minute walk or bike ride.

- A range of building types, densities and uses should be provided throughout the City, especially on major streets.

- Higher density residential uses should be concentrated around neighbourhood or district focal points that include commercial and employment areas, schools, community facilities, parks and transit stops.

- A transition in height should be created from taller buildings to adjacent lower buildings, particularly when connecting to a contiguous development or neighbourhood.

- Land uses requiring large lots (including medium and high density uses served by private roads or lanes) should be located along major roads to consolidate and minimize driveway connections.

- Prominent ‘landmark’ residential, commercial or mixed-use buildings should be located on corner lots where collector roads intersect other major roads and along major collector and arterials roads.

7.2.3 Transit-Supportive Corridors

It is recommended that the City of Belleville identify corridors for promoting transit-supportive development to guide strategic planning of infrastructure and public services. This will ensure that development within these areas meets intensification targets.

Key factors in determining transit-supportive corridors are land use, roads with existing multiple transit routes, and availability of lands for intensification or redevelopment.

7.2.4 Urban Design Standards

The City of Belleville should adopt development design standards that animate the public realm and support walking, cycling and transit. Best practices are briefly discussed below.

A general design principle should be to locate development and main entrances as close to the public road as possible and promote active façade design/activity.

- Consideration can be given to establish minimum and maximum building heights.

- Off-street parking generally shall be located at the side or rear of the development except in the case of low-density residential development where parking in front of the unit is acceptable. Placing off-street parking in areas of low visibility contributes to a higher quality public realm and increase the walkability of a development by supporting shorter distances between main entrances and the public sidewalk and mitigates conflicts between pedestrians, cyclists, and motor vehicles.

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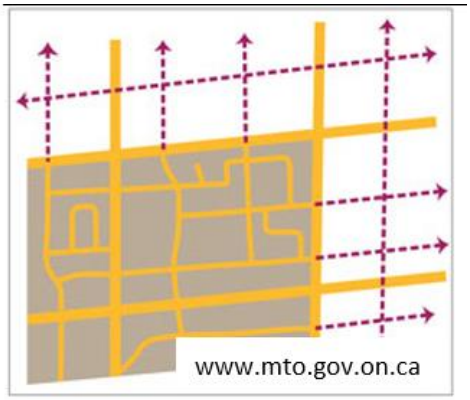
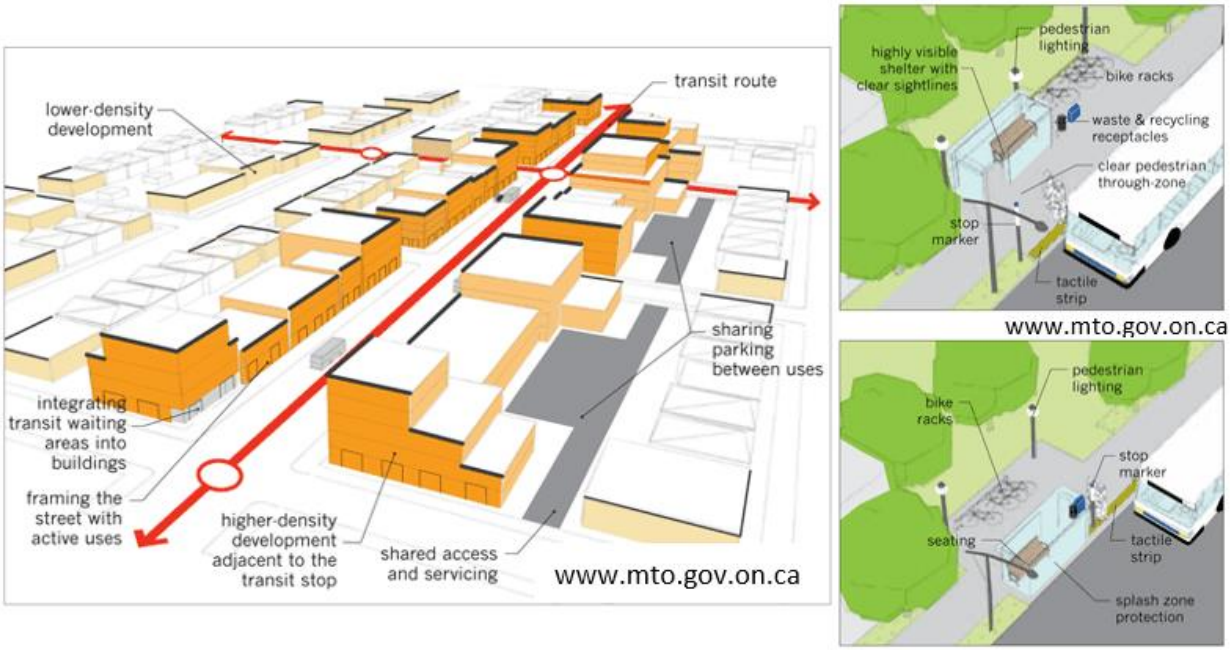
- Public streets and private laneways within new development plans must connect to existing streets and be sensitive to the surrounding urban fabric.



- Driveway widths and curb cutting should be reduced where possible to mitigate impact on the streetscape and pedestrian/cyclist crossings.

- Shared driveways should be provided for ground–oriented uses to maximize the area for trees, utilities, on-street parking, and snow storage, and to minimize the physical disruption of sidewalks along the street.

- Design standards should be developed for the integration and construction of transit stops throughout the City. Design features may include shelter placement; shelter-built form and seating; transit stop treatment and dimensions between public sidewalk and edge of pavement; and lighting

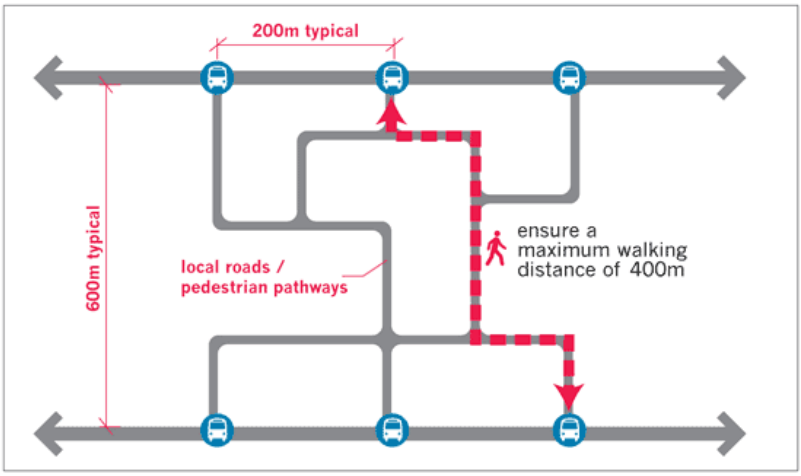


- The design of any development plan must anticipate future road connections to lands that have yet to be developed.

- New road layout for residential, commercial and employment development should have frequent connections of collector roads to arterial roads in order to increase route choices and to create large development blocks served by collector roads. These intersections should be located between 250 to 400 metres apart to enable efficient traffic flow along the arterial road; less spacing may be appropriate when collector roads form ‘T’ intersections at arterial roads.

- The layout of collector streets should be direct and continuous through a development in order to route multi-purpose trails for cycling and pedestrians, parks and transit stops.

- A network of street and block patterns with relatively frequent local road intersections with collector roads is encouraged to promote accessibility and connectivity to the collector road. Local streets that are designed in blocks that have intersecting side streets every 150 and 250 metres along the collector road are ideal.



- Buildings on corner lots should be sited and designed so that both the front and the side of the building are oriented to the street and are detailed with similar quality and style. Porches, patios and other such features should be wrapped around the building façade of corner units where applicable.

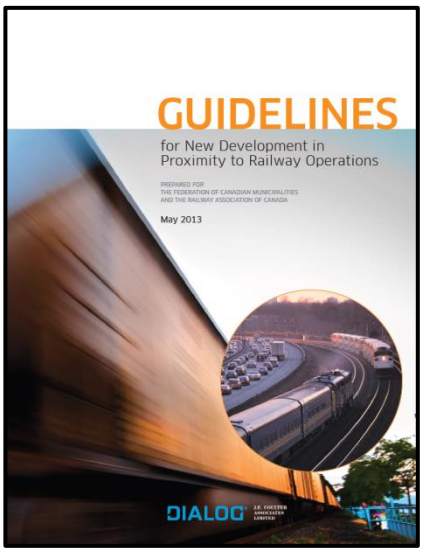
- Residential buildings should be designed so that garages do not dominate the width of the front façade and do not project past the front wall. Driveways should be designed so that they are not wider than the garage.

- Locating street townhomes and narrow-lot detached homes with front yard driveways along collector roads should be avoided to prevent an excessive number of driveways and turning movements on major traffic-carrying thoroughfares.

- Rear yard amenity areas should be oriented away from major roads. Use of single loaded streets or rear access streets to access these properties is a preferred alternative. A landscaped buffer can be provided between the arterial road and the local street where single loaded streets are adjacent to arterial streets.

7.2.5 Development in Proximity to Railways

As the City of Belleville continues to urbanize, and as it places greater emphasis on curbing urban sprawl, demand for new forms of infill development will grow, including development on sites in proximity to railway corridors. To ensure the success of such initiatives, the City of Belleville should consider adopting the recently released national *Guidelines for New Development in Proximity to Railway Operations*. The guidelines were released in May 2013 by the Railway Association of Canada (RAC) and the Federation of Canadian Municipalities (FCM) with the aim of promoting best practices and awareness about the issues associated with developments near railway operations. The new guidelines will assist municipal governments and railways in reviewing and determining general planning policies and provisions for development or conversion of lands in proximity to rail operations, addressing such issues as noise, vibration, emissions, safety, and development design. Areas in proximity to railway operations are challenging settings for new development, and in particular, for residential development. It is often difficult to reconcile the expectation and concerns of residents with railway operations. For this reason, developments must be carefully planned so as not to unduly expose residents to railway activities or interfere with the continued operation of the corridor (or the potential for future expansion), as railways play an important economic role in society that must be safeguarded.



Moving forward, the City of Belleville should take a proactive approach to identifying and planning for potential conflicts between rail operations and new developments in proximity to railway corridors.

7.3 Recommendations

The following recommendations are put forward to ensure the adoption of mutually supportive transportation and land use policies that achieve the City's transportation vision.

Recommendations #1	**Adopt land use policies that support the transportation vision details**
1.1	**Encourage urban intensification through infill development and redevelopment of existing sites.** Intensification allows the city to provide transportation infrastructure and services more efficiently and promotes more vibrant communities. However, to be successful, intensification should be sensitive to surrounding land uses and respect the existing local character.
1.2	**Promote a mix of land uses and building types in residential, employment, and downtown areas**, creating “mobility catchment areas” that allow people to live, work, shop, and play within a 5 to 10-minute walk or bike ride.
1.3	**Explore the feasibility and merit of encouraging transit-supportive development in Belleville.**
1.4	**Adopt development design standards that animate the public realm and support walking, cycling, and transit.** For example, encourage “connected” street patterns in new residential neighbourhoods to reduce walking distances and improve connectivity to neighbourhood destinations.

8 PROMOTING SUSTAINABLE OPTIONS

8.1 Why Are Active & Sustainable Modes Important?

"Sustainable transportation is the result of a continuous decision-making process that seeks to achieve a context-specific balance between environmental integrity, social equity, and economic opportunity both within and among transportation systems, now and in the future."

Transportation Association of Canada's Guiding Statement on Sustainable Transportation

The sustainability of a community is inextricably tied to the sustainability of its transportation system. Transportation meets important mobility needs yet can also create significant social and environmental impacts. At the community level, sustainable transportation typically centers around the use of alternative travel modes – walking, cycling and public transit. Walking and cycling are also active modes, fuelled by human power.

The same elements that make a transportation system sustainable contribute to quality of life and livability objectives. Modes such as walking, cycling, and transit support healthy communities, and ensure that all residents are able to move safely and efficiently around the city regardless of age, income, or level of mobility. From an infrastructure perspective, sustainable modes are more efficient; one vehicle parking space can accommodate 20 bicycles, a fully loaded bus is equivalent to removing over 30 cars from the road network. A shift to alternative modes can relieve demand on existing roads, reducing the need for new or expanded infrastructure.

As shown in Table 3, the reasons for investing in active and sustainable modes are numerous, yet until recently, little consideration was given to promoting and enhancing sustainable options. As a result, walking, cycling, and transit remain under-utilized, and there is considerable scope for improvement.

The way people move within a city is linked to the identity of its population. The role of walking, cycling, and transit will continue to evolve to reflect changing needs, attitudes, and social values. To achieve the City's vision for the future, a number of actions are needed to encourage a shift towards more sustainable and active travel choices.

Table 3 Benefits of Active and Sustainable Modes

Type	Image	Details
Health		Walking and cycling increase physical activity, resulting in a healthier community with less strain on the health care system. Research has shown that every hour spent in a car per day is associated with a 6% increase in the likelihood of obesity, while each kilometer walked per day is associated with a 4.8% reduction in the likelihood of obesity.[1] In another example, researchers found that people who commute at least 30 minutes daily by active modes have a 35% lower risk of developing diabetes.[2]
Equity		Transit and active transportation modes serve all ages and mobility levels, ensuring that all residents have access to transportation. Such modes enable an aging community to maintain independence and autonomy without the use of a vehicle and provide an affordable alternative to driving for those on a limited income.
Environment		Active and sustainable transportation modes result in fewer emissions, fresher air, and healthier communities. According to Environment Canada, road transportation accounts for roughly 20% of the country's total greenhouse gas emissions[3]; the shift towards more sustainable modes is thus an important strategy for taking action on climate change. Light-duty vehicles also account for 8% of nitrogen oxide emissions and 37% of carbon monoxide emissions[4] – two of the major contributors to air pollution. In Ontario, the economic cost of air pollution is expected to exceed $4 billion annually by 2015, accounting for lost productivity, healthcare costs, pain & suffering, and loss of life.[5]
Liveability		Active transportation encourages people to get outside in their community, promoting social interaction and creating a sense of ownership and pride. People who commute by active modes are more likely to enjoy their commute, refuting the idea that active transportation is less desirable than driving.[6] Research has also shown that people are willing to pay more for homes in pedestrian-friendly communities.[7,8]
Economy		Active modes of transportation are good for business, and can help revitalize the downtown. In Fort Worth, Texas, restaurant business on Magnolia Street increased by nearly 200% with the installation of bike parking and conversion of two traffic lanes to bike lanes.[9] Pedestrians and cyclists destined to Bloor Street in Toronto spend more money per month and visit more often than those who arrive by car.[10] Bicycle tourists in Niagara spent $164 million in 2002. Most of the region's cycle tourists stay for at least one night, and spend more money per day than other tourists.[11]

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2. Environment Canada. 2013. *National Inventory Report 1990-2011: Greenhouse Gas Sources and Sinks in Canada*.
3. Statistics Canada. 2012. “Waste management in Canada.” *Human Activity and the Environment*.
4. Canadian Medical Association. 2008. *No Breathing Room: National Illness Costs of Air Pollution*.
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7. Cited in: Local Government Commission Center for Livable Communities. *The Economic Benefits of Walkable Communities*.
8. Blue, Elly. 2011. “Bikenomics: The Economic Case for On-Street Bike Parking”. *Grist Magazine*.
9. The Clean Air Partnership. 2009. *Bike Lanes, On-Street Parking and Business: A Study of Bloor Street in Toronto’s Annex Neighbourhood*.

Healthy Living Niagara. *Economic Value: Active Transportation and Tourism*. Fact Sheet.

8.2 Role of Travel Demand Management

The transition to a more sustainable transportation system will require investment in walking, cycling, and transit as more sustainable travel modes. Opportunities for enhancing active modes are discussed in Section 10, while Section 11 deals with transit. To realize the full potential of this investment, there are a number of additional actions that can be taken by the City of Belleville to promote alternative modes. Such actions typically fall under the umbrella of Travel Demand Management (TDM).

Travel Demand Management is aimed at changing travel behaviour in order to improve the efficiency of the transportation system and reduce environmental impacts. It includes strategies that encourage auto drivers to:

- Shift travel modes (to more sustainable options such as walking, cycling, carpooling, or transit);
- Reduce the number and length of trips (by changing the trip destination, consolidating trips, or substituting telework for physical travel); or
- Opt for less congested routes and times.

Green Africa Directory

While sustainable modes are a key element of TDM, TDM also addresses broader aspects of transportation sustainability by seeking to minimize the negative impacts of auto vehicle use while still ensuring a safe and efficient road network in support of social and economic objectives.

The benefits of TDM include a reduction in greenhouse gas emissions and improved air quality. TDM strategies also play an important role in addressing traffic congestion. By reducing the demand for auto vehicle travel, particularly during peak periods, TDM provides an alternative to road expansion.

For the City of Belleville, it is anticipated that TDM efforts will largely focus on the promotion of active and sustainable travel modes. Potential TDM measures that may be appropriate for Belleville are described in Table 4.

Table 4 - Potential TDM Strategies for Belleville

Related Image	Details
 www.pedbikeimages.org/DanBurden	**Transit Incentives** *The provision of transit incentives can help to build ridership over time.* Potential Strategies (also refer to Section 11) • Provide a discounted summer transit pass targeted at youth to increase ridership during periods of lower demand • Implement a student transit pass agreement with Loyalist College which would allow students full access to the transit system at a reduced rate, paid for through student fees • Implement a transit pass program for large employers by offering discounted transit passes for bulk purchases Explore opportunities to expand transit service to rural areas
 City of Edmonton	**Ridesharing Program** *Ridesharing (or carpooling) encourages residents to drive together to work/school, increasing the average vehicle occupancy.* Potential Strategies • Develop a ride-share website for connecting passengers and drivers Encourage businesses to provide preferential parking for carpool vehicles, such as the program recently implemented at Loyalist College
 Active & safe Routes to School	**Safe Routes to School** *For parents to allow their children to walk or cycle to school, it is important to address both real and perceived safety concerns.* Potential Strategies • Work with the local school boards and other community stakeholders such as the Hastings & Prince Edward Counties Health Unit to promote walking and cycling to school. Initiatives that have proven successful elsewhere include: – Developing walking route maps to educate parents and children on safe routes to school – Establishing “car free days” where children are encouraged to walk or cycle – Holding school contests with prizes for the most “travel smart” class – Providing workshops to teach younger students about road safety or how to use the bus – Establishing “walking school buses” where groups of students travel to school together under the supervision of an adult – Address safety issues in and around school zones, e.g., by providing sidewalks, prohibiting parking, or hiring school crossing guards

Related Image	Details
 www.pedbikeimages.org/Mike Cynecki	**Cyclist Training** *Many residents lack the confidence and skill to safely cycle in traffic. A cyclist training course addresses this barrier.* Potential Strategies Offer an evidence-based, best practice cyclist training course in collaboration with community partners
 Twin Cities Metropolitan Council	**Land Use Polices** *Land use policies influence the proximity between trip origins and destinations, and also impact the viability and attractiveness of alternative modes.* Potential Strategies – Refer to Section 7
 Cycle Toronto	**Special Events & Workplace Programs** *TDM is often most effective when targeted at specific areas, such as special events or the workplace.* Potential Strategies • Encourage the use of alternative modes to concerts, festivals, and other special events, for example, by providing a bike valet service, priority carpool parking, or special transit shuttles • Work with large employers to implement TDM in the workplace, for example, by adopting flexible working hours, allowing employees to work from home (telework), or providing bicycle racks and change rooms for employees who commute by active modes Lead by example by implementing TDM at City offices and buildings
Commuter Challenge	**Marketing of TDM** *Marketing is needed to educate residents and increase awareness of travel choices.* Potential Strategies • Develop a city website with links to cycling and transit resources (maps, schedules, etc.) Work with the Hastings & Prince Edward Counties Health Unit to promote and expand “The Commuter Challenge”

The measures in Table 4 are largely centred around the *promotion* of alternative modes. However, to be effective, efforts to promote alternative modes must be accompanied by improvements to those modes to ensure they represent an attractive and viable alternative to residents. While such improvements also fall within the domain of TDM, they represent key strategies in their own right and are presented separately in Sections 10 and 11 for active transportation and transit respectively.

Given the diversity of TDM strategies included in Recommendations 2, it will be important for the City to build **partnerships** with local organizations. Such organizations bring knowledge, resources, and enthusiasm to the task of promoting TDM, and represent a valuable asset in building a more sustainable transportation system.

8.3 Recommendations

While many of the TDM strategies presented in Recommendation 2 hold promise for the City of Belleville, the following recommendations are considered key to achieving the City's transportation vision. As the City moves forward in its efforts to promote active and sustainable modes, the proposals in Recommendation 2 should be re-visited in greater detail to assess their feasibility and effectiveness.

Recommendation #2	**Promote active and sustainable travel modes**
2.1	**Develop partnerships with community stakeholders**, such as the Hastings & Prince Edward Counties Health Unit, Loyalist College, Belleville & District Chamber of Commerce, Belleville Downtown Improvement Area, Sir James Whitney School for the Deaf, and others, to promote active and sustainable travel options.
2.2	**Offer an evidence-based, best practice cyclist training course in collaboration with community partners, including potentially the Hastings & Prince Edward Counties Health Unit and/or Belleville Police Services**
2.3	**Explore opportunities to promote cycle tourism within Belleville.**
2.4	**Work with the Hastings & Prince Edward Counties District School Board, the Algonquin Lakeshore Catholic District School Board, and community stakeholders such as the Hastings & Prince Edward Counties Health Unit to promote walking and cycling to school and improve safety in and around school zones.**
2.5	**Create a map showing existing cycling routes and barriers** (such as hills, high volume intersections, etc.) which can be posted on the City's website to assist residents and visitors navigate the city by bicycle.

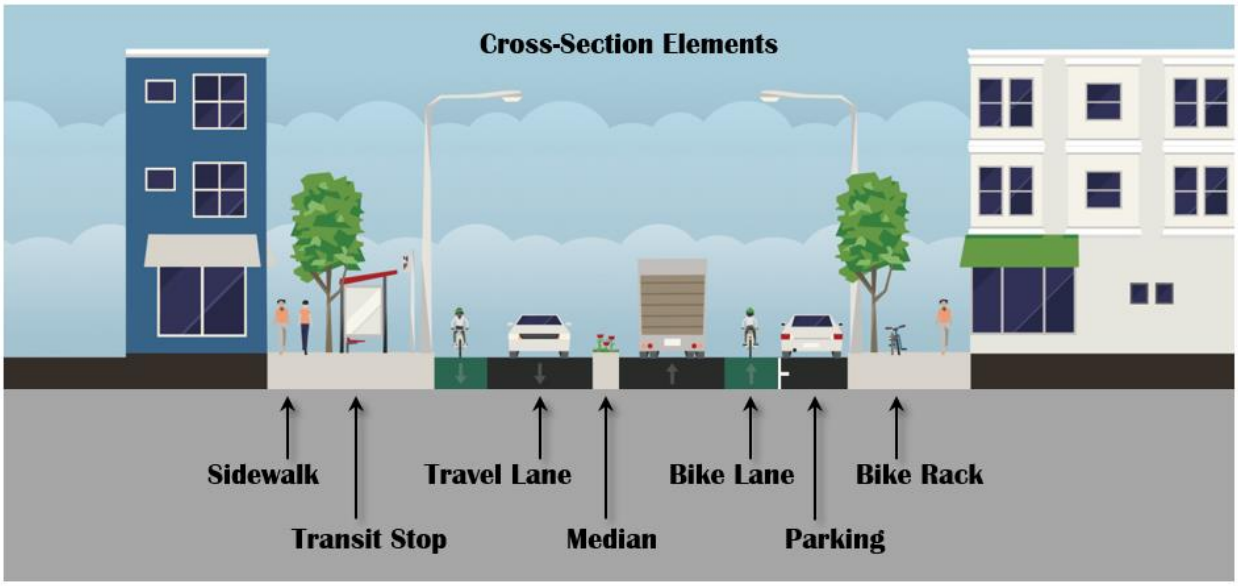
9 COMPLETE STREETS

9.1 What Are Complete Streets?

"A Complete Street is designed for all ages, abilities, and modes of travel. On Complete Streets, safe and comfortable access for pedestrians, bicycles, transit users and the mobility-impaired is not an afterthought, but an integral planning feature." Complete Streets for Canada"

Complete Streets are streets that are designed for all road users – pedestrians, cyclists, transit, and vehicles. A cornerstone of Complete Streets is designing for the most vulnerable users of the transportation system, including the elderly, those with disabilities, and children. Complete Streets create places for people and support the development of a vibrant, animated public realm.

From a planning and design perspective, Complete Streets deal with the road cross-section, and more specifically, the combination of roadway elements that make up the cross-section. Such elements include sidewalks, cycling facilities, parking lanes, travel lanes, boulevards, and transit stops. How these elements come together to create integrated travel corridors determines the road form – the look and feel of the corridor. The road form in turn is influenced by the road function – how the road is intended to work. Complete Streets respect the function of road corridors within the overall network of pedestrian, cycling, transit, and road facilities.



Source: Streetmix.net

Figure 11 - Elements of a Complete Street

When implementing Complete Streets, the road and the adjacent built environment are designed to complement each other, creating attractive spaces that serve multiple functions. In this respect, Complete Streets are sensitive to the surrounding land use context and respect the relationship between the road and its environment.

Complete streets are also green, and incorporate innovative stormwater management techniques, recycled materials, and landscaping treatments that augment the urban forest. These measures help to minimize the environmental footprint of the corridor and create welcoming green spaces for accommodating travel.

Why are Complete Streets important?

Streets that are designed for all users, that are attractive and full of activity, are an important element of livable communities. Such streets are equitable and ensure that all residents are able to fully participate in society. By improving conditions for pedestrians and cyclists, such streets also support healthy lifestyles and provide a safer environment for active modes.

Complete Streets accomplish all of the above. They enhance the public realm, and provide significant social, economic, and environmental benefits. Complete Street 'makeovers' can also help to revitalize corridors and are thus expected to play a key role in downtown renewal as Belleville moves forward with redevelopment of its city centre.

Figure 12 below illustrates what Complete Streets could look like in Belleville taking Coleman Street as an example. By allocating space more efficiently within the right-of-way, sidewalks and cycling lanes are added, yet the mobility function of the corridor is maintained.

Figure 12 - Coleman Street in Belleville Re-Imagined as a Complete Street

9.2 A Complete Streets Policy for Belleville

Given the importance of Complete Streets in creating a balanced, sustainable transportation system one of the key recommendations of the Transportation Master Plan is to develop and adopt a Complete Streets policy for Belleville. Such a policy will confirm the City's commitment to providing roads for all users in an efficient, safe, and equitable manner.

A Complete Streets policy describes how Complete Streets are to be implemented in the planning, design, operation, and maintenance of the road network. Typically, such policies require that Complete Streets be considered in all road construction and reconstruction projects but allow flexibility to address financial and right-of-way constraints. This type of incremental approach allows Complete Streets to be implemented gradually as new roads are built and existing roads are reconstructed, providing a cost-effective way to gradually transition to a more multi-modal network. However, in certain cases, it may also be beneficial to identify "priority" Complete Street projects, for example, roads that are part of downtown redevelopment or that fall within the cycling network.

The adoption of Complete Streets principles does not imply that improvements to walking, cycling, and transit occur at the expense of traffic flow, although trade-offs may be necessary in certain cases where the right-of-way is constrained. While it is important to accommodate all people and all modes, it also important that traffic continue to move well to support the local economy, accommodate emergency services, and enhance the quality of life enjoyed by residents.

9.3 Recommendations

Complete Streets help to balance the needs of all road users and are considered a key element in achieving the City's transportation vision. Given the significant benefits associated with Complete Streets, the following recommendations are put forward:

Recommendation #3	**Adopt a "Complete Streets" approach to transportation planning that considers all road users in the planning, design, and operation of the transportation network**
3.1	**Develop a Complete Streets Policy for the City of Belleville** that sets out guiding principles for the accommodation of pedestrians, cyclists, transit riders, passenger vehicles, and trucks in the construction of new roads and re-construction of existing roads.
3.2	**Adopt Complete Streets as a key element of downtown redevelopment.**
3.3	**Provide aesthetically pleasing streetscapes which enhance the quality of the public realm and create spaces where people want to be**
3.4	**Give preference to road design alternatives that provide dedicated space for pedestrians and cyclists, where warranted by traffic speed and volume**

Complete Streets require the accommodation of all travel modes, but do not indicate where new roads (or road widening) may be needed to address capacity concerns or provide implementation priorities. Complete Streets deal with road cross-sections - how corridors look. The following chapters deal with how corridors fit together to create pedestrian, cycling, and vehicular networks for travel within the city

10 ACTIVE TRANSPORTATION

10.1 Pedestrian Network

"Walkers are 'practitioners of the city', for the city is made to be walked. A city is a language, a repository of possibilities, and walking is the act of speaking that language, of selecting from those possibilities." Rebecca Solnit

Walking is perhaps the most important mode of transportation. Not only does the presence of pedestrians contribute to a more vibrant community, walking also has important health, environmental, and social benefits. All trips, regardless of mode, begin as a pedestrian. Despite this importance, walking is an often overlooked and undervalued component of the transportation system.

While pedestrians tend to be persistent, overcoming obstacles and carving new paths for themselves, it is important for the City of Belleville to encourage and value walking as a mode of transportation through the provision of appropriate infrastructure, programs, and policies.

In support of this goal, it is recommended that the current pedestrian policy for the provision of sidewalks be reviewed to determine the effectiveness of the policy in accommodating walking. In addition, it is recommended that the City of Belleville develop a sidewalk strategy which documents existing sidewalk facilities and ranks and prioritizes missing links.

The City of Peterborough's *Sidewalk Strategic Plan* provides an excellent example of the ranking process, and some of the factors used in the evaluation. Such factors may include the road classification, posted speed limit, and proximity to schools, transit stops, parks, and trails.

10.1.1 Meeting Accessibility Needs

One of the primary considerations in reviewing the pedestrian network should be improving the built environment for persons with disabilities or mobility impairments. Beyond the traditional requirements of considering curb cuts and wheelchair ramps (which are still critically important), there are additional considerations related to transportation provision for the visually or hearing impaired, persons who require mobility aids other than wheelchairs (such as canes or walkers), and others requiring special accommodation. Treatments such as audible pedestrian signals, tactile warning strips, and other measures are important for ensuring an accessible transportation system.

10.2 Cycling Network

"The bicycle is the noblest invention of mankind." William Saroyan

Cycling is a growing mode of transportation in Belleville. There is significant interest and support from residents who see the potential to make Belleville an excellent cycling city. Much of the population lives within a 5 km radius of the downtown, which is within ideal cycling distance. However, the lack of cycling infrastructure represents a key obstacle to increased cycling activity. There are many natural and man-made barriers which are difficult to cross, and streets which are not designed to comfortably accommodate cyclists. As a result, there is a need to invest in cycling infrastructure. In doing so, proper network planning is essential.[12] For example:

- Each additional turn on a route is equal to adding 7% of the trip distance – This implies a need to create continuous routes free of extraneous turns and jogs
- Cyclists will detour from their non-commute trip by 72% to avoid uphill slopes of 2 to 4% – This implies the need to address topography and local conditions when developing a network
- Cyclists will detour 16% of their trip to avoid a left turn at a busy intersection with no traffic signal – This implies the need to consider the appropriateness of potential routes with respect to the crossing facilities that can be provided

Section 0 outlines the process that was followed to develop a cycling network for Belleville.

10.2.1 Network Development Process

The cycling network developed for Belleville draws on work carried out for a number of previous studies including the following:

[12] Dill, J., & Gliebe, J. P. (2008). Understanding and measuring bicycling behavior: A focus on travel time and route choice (No. OTREC-RR-08-03).

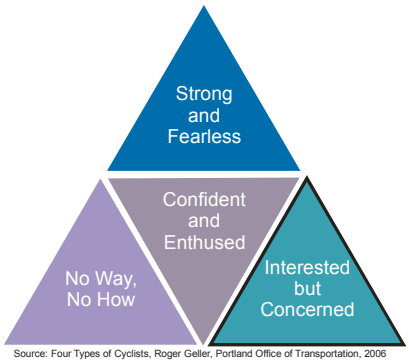
- Downtown Master Plan (2006)
- Waterfront Master Plan (2006)
- Bicycle Planning Study (1993)

In addition, a proposed network was provided by the former Belleville Cyclist's Advisory Group (now Belleville on Bikes) at the outset of the study. Many discussions were held with the Technical and Stakeholder Steering Committees to gather input on proposed routes for the cycling network. Additional comments were received from members of the public, Belleville on Bikes, and other recreational and utilitarian cyclists at the public open houses held throughout the study process.

Ultimately, the cycling network was developed by considering **where** to establish routes based on **who** would be using them and **what destinations** they would be trying to reach.

Who are we planning for?

In developing a cycling network, it is important to balance the needs of both recreational and utilitarian cyclists, accommodating a diverse group of users with varying fitness, skill, and comfort in traffic.



Source: Four Types of Cyclists, Roger Geller, Portland Office of Transportation, 2006

The target market for this Master Plan is the "Interested but Concerned" group of cyclists - those who may not currently cycle but who are willing and interested in cycling if safe facilities are provided. Since these individuals are interested in cycling, but are not currently doing so, this is the group with the greatest potential for increasing cycling activity.

It is important to note that improved cycling facilities has benefits for all residents, including those who currently cycle (increasing the likelihood they will continue to cycle, or even extend their cycling season), as well as residents who are not interested in cycling (but who may become interested in cycling as they see more cyclists within the community).

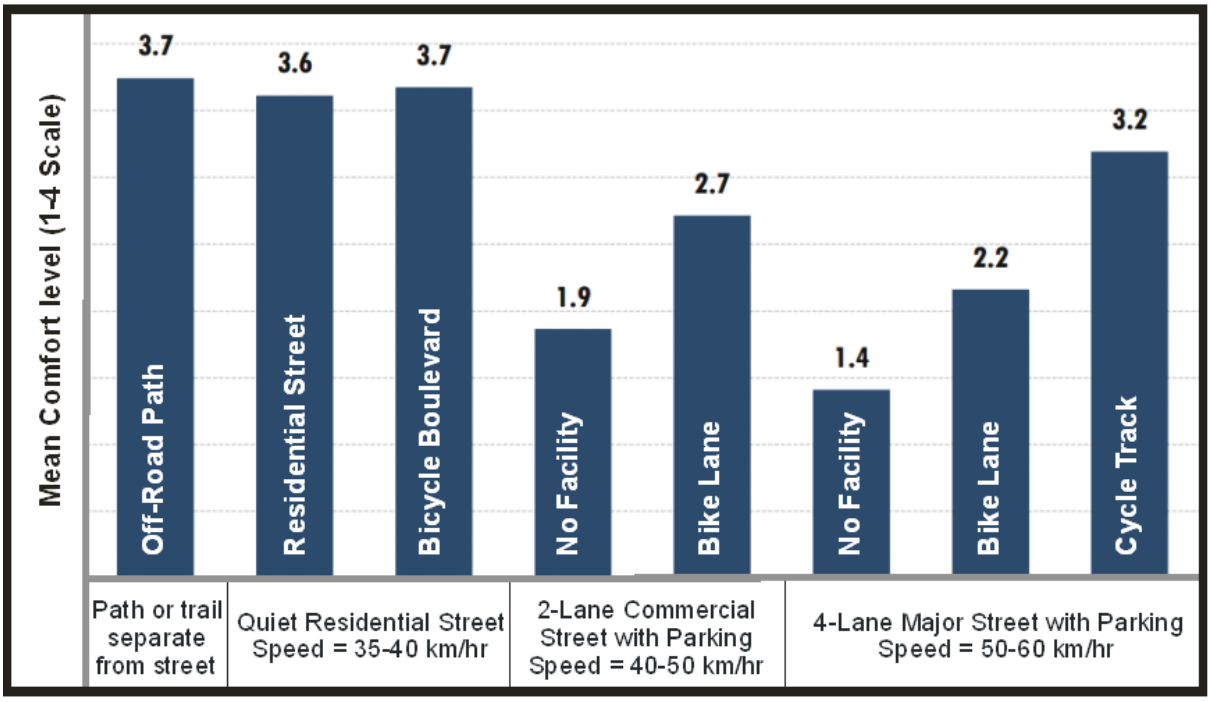


Figure 13 - The Impact of Facility Type on Cyclist Comfort Level

How do we know that infrastructure makes a difference? Figure 13 illustrates research from Portland State University which suggests that "Interested but Concerned" cyclists feel much more comfortable when dedicated facilities are provided.[13] Facilities also help to improve the visibility and awareness of cycling, which in turn can improve safety.

How do we determine which routes to include in the network?

The cycling network was developed through an iterative process with stakeholders and staff, taking into account the cornerstones of cycle network planning:

The network was designed to provide access to key destinations within the city (e.g. educational institutions, community centres, employment areas, etc.). In addition to community destinations and desire lines, the network development process considered the following issues and constraints:

[13] Four Types of Cyclists?, Dill & McNeil, Portland State University, August 2012

- Corridor spacing
- Growth plans
- Physical limitations (e.g., topography)
- Implementation challenges (e.g., property)
- Opportunities for protected crossings

The approach for Belleville's proposed cycling network was to identify a number of key spine routes which would form the major travel corridors and build out the network from there. Although many of these routes are higher cost, and may see a longer implementation period, it is important to develop this base as a starting point.

10.2.2 Recommended Network

The ultimate cycling network is illustrated in Figure 14 below. The network is composed of major east-west and north-south cycling arteries, supplemented by lower order neighbourhood connections. In many cases, the major arteries were selected in relation to major constraining elements such as bridge crossings.

One particular issue explored in detail was a crossing of Highway 401, since the issue of safe cycling access across this major highway was raised by many stakeholders as a primary concern. Several options were considered, as explored in more detail in Appendix K. Ultimately, an underpass below the Highway 401 Moira River Bridge was identified as the highest priority due to its central location and connectivity with the existing trail system. However, the feasibility of this crossing requires more detailed assessment. Should the proposed crossing prove to be technically or financially impracticable, it is recommended that a multi-use path be provided on the west side of Cannifton Road between Adam Street and Farnham Road as an alternative. Other Highway 401 crossings shown in the cycling network include plans for cycling facilities to be incorporated into the proposed Sidney Street road project (refer to Section 12.2) and the opportunity to develop facilities beneath the 401 on the east side of the Moira River within the CPR right-of-way.

Another key issue for cyclists in Belleville is east-west connectivity, which necessarily includes provisions for a Moira River crossing. Bridge Street was identified as an ideal route for a higher order cycling facility due to its connectivity across most of the City and access to the downtown and Loyalist College. Although in the long term it is preferable to provide facilities along the Bridge Street connection over the river, it is not feasible in the short term. Instead, interim facilities are proposed along the Catherine Street footbridge, which is scheduled to be rehabilitated in the near term (refer to Appendix K for more details on the evaluation of alternatives).

Overall, the ultimate cycling network will serve community destinations well and provide attractive routes across most of the city. Since this is Belleville's first comprehensive cycling plan, it will need to evolve and change as new opportunities emerge and infrastructure is provided.

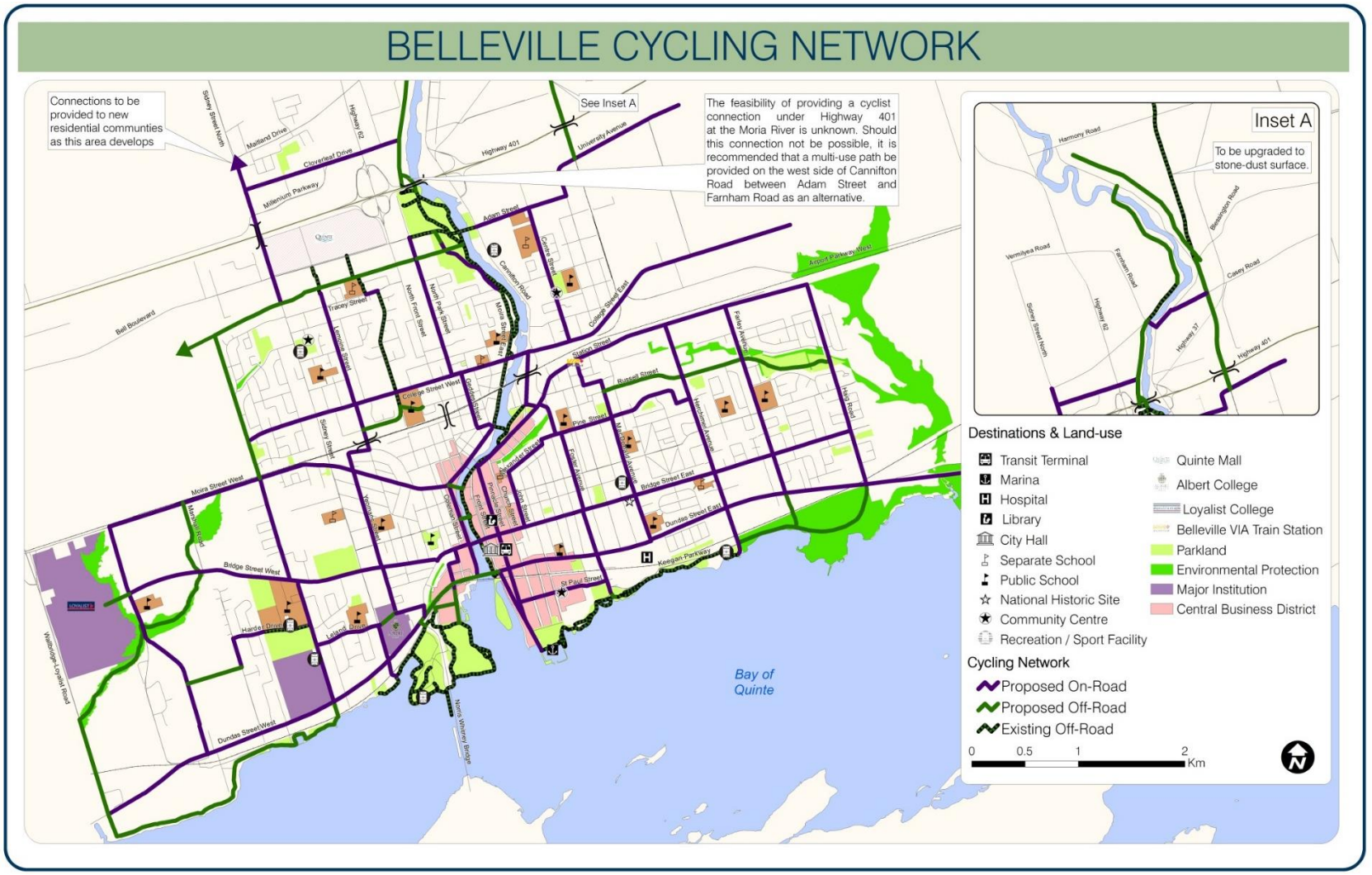


Figure 14 - Recommended Cycle Network

10.2.3 Facility Types

The cycling network identifies both on- and off-road facilities. For the on-road network, the type of facility will be determined at the time of implementation, allowing for flexibility and ensuring sensitivity to the specific site context. A description of the various types of on-road facilities is provided in Table 4, and illustrated in Figure 15.

For on-road infrastructure, facility types are determined based on a number of factors such as road type, traffic volume, speed of traffic, access density, and land use. The cycling network identifies key corridors of demand, with the intent that high quality infrastructure appropriate to the street is provided. The degree of separation from traffic will largely depend on the corridor where the route is located, keeping in mind the general preferences of the target market for separated facilities. For example, a major arterial may require a higher order facility such as a cycling track, while a local neighbourhood route with low volume may only require signage.

Recognizing that each street has different characteristics and needs, it is recommended that the City of Belleville develop cycling facility design guidelines to assist in selecting and designing appropriate cycling infrastructure.

Table 5 - Overview of Cycling Facility Types

Type of	Description
In-Boulevard Multi-Use Trail	▪ Trail located within the road right-of-way which may be shared with pedestrians ▪ Completely separated from the road by a grass or paved boulevard
Cycle Track	▪ Similar to a bicycle lane but physically separated from traffic by bollards or concrete barriers ▪ Physical separation may also be achieved by elevating the bicycle lane slightly above the adjacent traffic lanes
Bicycle Lane / Paved Shoulder	▪ Painted lane of standard width providing dedicated space solely for cyclist use, typically adjacent to the curb ▪ Paved shoulder is applicable in rural settings
Bicycle Boulevard	▪ Local street or lower-order collector road optimized for bicycle use ▪ May incorporate traffic calming measures such as limited access points for vehicles or horizontal and vertical deflections intended to slow traffic
Shared Wide Curb Lane	▪ An outer lane that is wide enough for a cyclist and vehicle to comfortably operate side by side

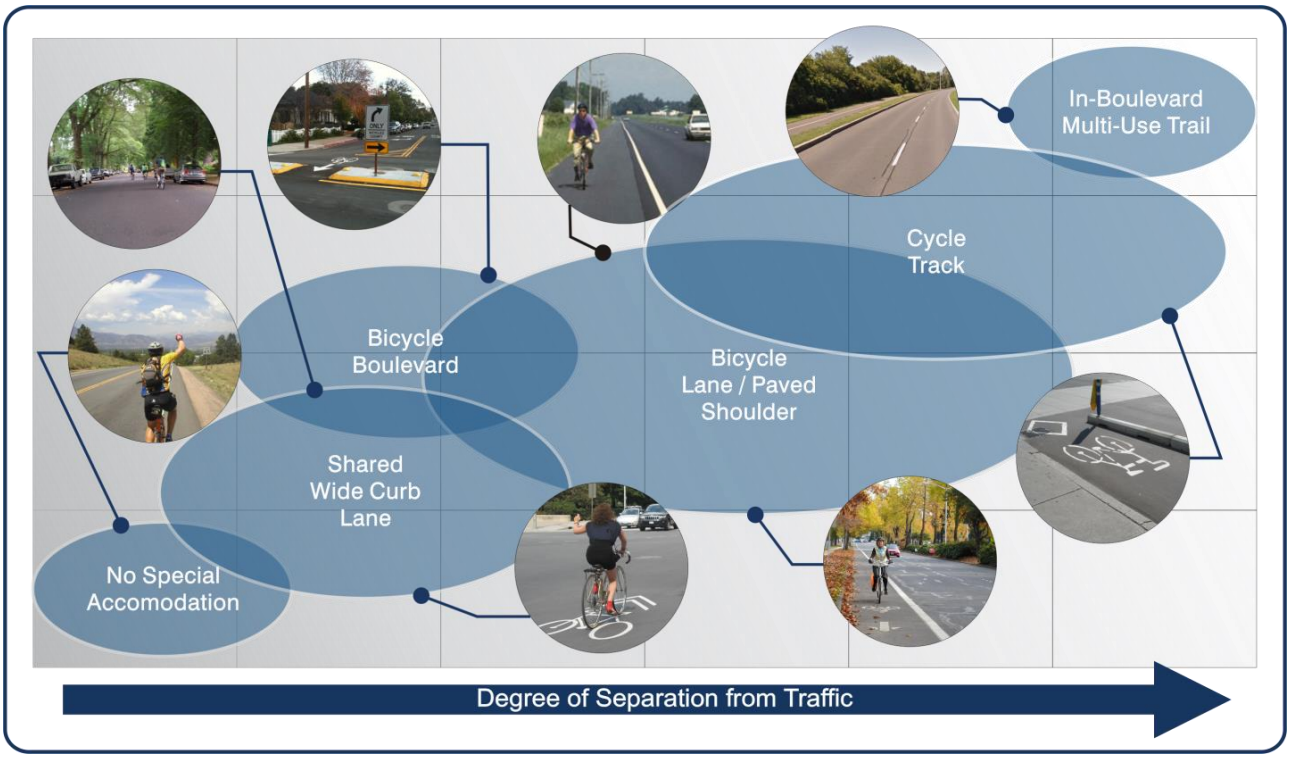


Figure 15- On-Road Facility Types by Increasing Separation from Traffic

10.2.4 Implementation Priorities & Financial Implications

In order to provide a manageable implementation strategy for the cycling network, each project was assigned to a phase (refer to Table 6). The assignment of cycling routes to phases was based on a number of considerations, including:

- Network coverage & spacing
- Gaps in the existing network
- Stakeholder and public feedback
- Linkages to key destinations
- Ease of implementation
- Timing of road projects

In implementing the cycling network, a flexible approach is needed. The cost of implementing cycling infrastructure is generally lower when undertaken in conjunction with other infrastructure projects. As a result, it may be necessary to adjust the timing and priority of cycling projects to take advantage of opportunities that arise.

The ultimate cycling network as presented in Section 10.2.2 is expected to cost between $41 and $47 million dollars to implement in its entirety (refer to Table 6). Although this cost is significant, there are many health, social, and economic benefits associated with cycling as detailed in Section 8.1. In some cases, the provision of cycling infrastructure is also cost-effective.

In 2009, Grey County (pop: 92,568) approved a policy to provide paved shoulders on all reconstructed rural arterials. This came about as a result of a study that was carried out "illustrating that over a period of fifteen (15) years, paved road shoulders are less costly to install and maintain than gravel shoulders" and are also safer for the travelling public.[14]

Table 6 - Cycling Network Implementation Plan

Facility Type		Existing Network (km)	Proposed Network Additions					Ultimate Network (km)
			Phase A[1,2]	Phase B[3]	Phase C	With Development	Total	
On-Road	Length (km)	0	32.8	22.7	8.4	3.8	67.7	67.7
	Cost ($M)		$7.9 to $10.3	$5.7 to $7.4	$2.2 to $2.9	$1.0 to $1.3	$16.7 to $21.9	
Off-Road	Length (km)	27.6	5.3	9.2	4.2	9.0	27.7	55.3
	Cost ($M)		$1.5 to $1.8	$1.8 to $2.3	$0.8 to $1.1	$1.8 to $2.3	$6.0 to $7.4	
Major Crossings	No.	N/A	3	2	4	0	9	N/A
	Cost ($M)		$8.5	$0.2	$9.1	$0	$17.8	
Total	Length (km)	27.6	38.1	31.9	12.6	12.8	95.4	123
	Cost ($M)		$17.9 to $20.6	$7.7 to $9.9	$12.1 to $13.0	$2.8 to $3.5	$40.5 to $47.1	

[1] Includes the cost of upgrading the existing Trans Canada trail to a stone dust surface, which may be eligible for cost-sharing with the Trail Association.

[2] Excludes the cost of providing cycling facilities on Adam/University (2.4 km), as these have been included in the cost of the road network.

[3] Excludes the cost of providing cycling facilities on Sidney between Bell & Millennium (0.9 km), as these have been included in the cost of the road network.

[14] Grey County Paved Shoulder Policy. 2009. Available online: http://www.greycounty.ca/files/pagecontent/policy-raods-01-09-paved-shoul.pdf

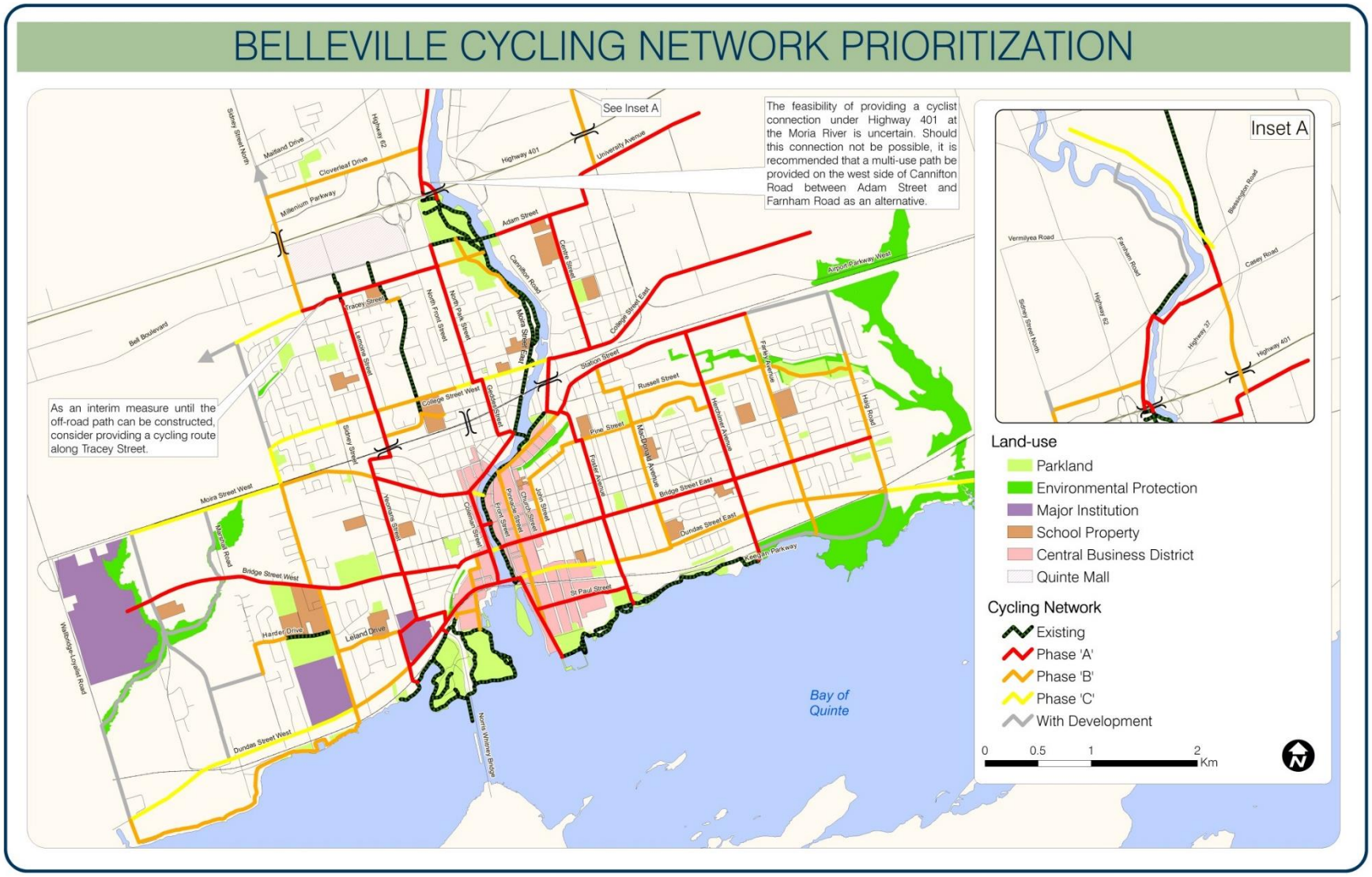


Figure 16- Recommended Ultimate Cycling Network by Implementation Phase

10.3 Beyond the Network – Creating a Supportive Environment

While providing high quality infrastructure is essential for encouraging walking and cycling, it is also important to create an attractive environment for active modes. General strategies for encouraging walking and cycling beyond network development are discussed below.

- **End-of-Trip Facilities & Amenities** – Since each walking or cycling trip ends at a destination, it is important to consider the needs of users once the trip ends. A cyclist requires safe and convenient bike storage and may also need shower or change room facilities. Long term storage options (offering covered/secure parking such as bike lockers) are important at workplaces and schools, while short term options (bike racks, post-and-rings) may be used for commercial areas. To ensure an appropriate amount of short- and long-term parking, requirements for end-of-trip facilities should be defined in the City of Belleville Zoning By-law. Such requirements should address both the type and amount of bicycle parking to be provided as a function of the development type, size, and location.

In addition to end-of-trip facilities, it is also important to consider conditions along the travel route. Pedestrians, particularly those with mobility impairments, may benefit from the provision of benches, shade trees, water fountains and similar amenities to enhance the journey. It is particularly important to provide these amenities at transit stops and other major pedestrian generators. Wayfinding should also be addressed to assist residents and visitors in navigating the city, and to support ongoing efforts at promoting bicycle tourism

- **Putting Active Transportation on the Agenda** – Walking and cycling needs must to be routinely considered on an ongoing basis in order to gain momentum moving forward with this plan. For example, new development should incorporate walking and cycling connections, and studies addressing the transportation requirements of these developments should speak to these modes. Opportunities to incorporate cycling facilities or sidewalks into road repair or reconstruction projects should be regularly considered. Special government funding sources earmarked for active transportation projects or partnerships with local businesses/clubs should be explored to assist with the funding of facilities

- **Safety & Enforcement** – As part of the ongoing effort to improve active transportation in Belleville, regular enforcement should seek to educate drivers,

cyclists and pedestrians on the rules of road in a proactive and meaningful way. Where necessary, intersection treatments may be implemented to improve the safety of crossings (refer to Appendix L). On-going feedback should be used to address safety concerns. One of the particular areas of interest for the City of Belleville relates to the use of e-bikes on pedestrian and cycling infrastructure such as trails and bike lanes. In general, it is recommended that e-bikes be accommodated on new on-road cycling infrastructure but be excluded from the trail network (refer to Appendix M).

10.4 Recommendations

The recommendations for active transportation have been divided into two groups: investment in active transportation infrastructure and creating a supportive environment for active transportation modes.

Recommendation # 4	**Invest in pedestrian and bicycle infrastructure.**
4.1	**Review the City's pedestrian policy and update as necessary to ensure pedestrians are appropriately accommodated on all road types.** The pedestrian policy sets requirements for sidewalks along arterial, collector, and local roads, and applies to new road construction as well as reconstruction of existing roads.
4.2	**Develop policies and related guidelines to meet the legislative requirements of the Accessibility for Ontarians with Disabilities Act, 2005** Examples of accessibility treatments include curb cuts at intersections, audible pedestrian signals, and tactile warning strips at road crossings.
4.3	**Develop a sidewalk strategy for addressing gaps in the existing pedestrian network.** To support the strategy, a prioritization process should be developed to establish investment priorities, and funding for sidewalk improvements should be allocated as part of the City's annual budgeting process.
4.4	**Develop cycling facility design guidelines** which provide guidance on the selection and implementation of cycling facilities under different road conditions.
4.5	**Implement the cycling network plan shown in Figure 15 of this report** In some cases, deviations from the illustrated cycling routes may be necessary to address constraints, and will be considered acceptable as long as an alternative route is provided which meets the cycling demand.
4.6	**Encourage the Ontario Ministry of Transportation to provide cycling facilities on the Norris Whitney Bridge over the Bay of Quinte, and work with the Ministry to improve cycling connections over Highway 401.**
4.7	**Pursue alternative funding sources for transportation infrastructure.** In addition to government programs, many communities have been successful at encouraging local service clubs and businesses to support transportation initiatives, such as the construction of off-road paths.

Recommendation # 5	**Create a safe and attractive environment for walking and cycling.**
5.1	**Modify the requirements for Traffic Impact Assessments to include consideration of all travel modes.** Traffic Impact Assessments are routinely undertaken for new developments to mitigate traffic impacts. As part of these assessments, access and on-site circulation should be reviewed to ensure that development both accommodates and encourages walking, cycling, and transit.
5.2	**Require developers to provide convenient, high-quality connections to the City's pedestrian and cycling network as part of the development approval process.**
5.3	**Update the City of Belleville Zoning Bylaw to include requirements for bicycle parking and related amenities (showers, change rooms, etc.).**
5.4	**Conduct an audit of City facilities (arenas, libraries, parks, etc.) and identify requirements for additional cyclist and pedestrian amenities.**
5.5	**Encourage existing businesses to install bicycle facilities through incentive programs and other means.**
5.6	**Seek opportunities to provide secure bicycle storage at strategic locations throughout the city** (i.e. downtown, Loyalist College, etc.).
5.7	**Conduct an audit of existing transit stops, and identify opportunities to provide benches, shelters, information signage, and improved access for pedestrians and people with disabilities.**
5.8	**Identify opportunities to improve pedestrian and cyclist safety at intersections and road crossings.** As part of this effort, consideration should be given to the use of innovative pedestrian and cyclist treatments, including those shown in the pedestrian and cyclist intersection toolkit provided in Appendix L.
5.9	**Develop a way-finding strategy and provide information signage along trails and other popular walking/cycling routes**
5.10	**Carry out on-going enforcement** by Belleville Police Services with the primary goal of educating drivers, cyclists, and pedestrians of the "rules of the road".
5.11	**Maintain the existing restrictions in the Traffic Bylaw which prohibit anyone older than 12 from cycling on the sidewalk.**
5.12	**Modify the Traffic Bylaw to prohibit e-bikes on trails and review this policy in 3 to 5 years as e-bike technology changes. Continue to allow e-bikes to operate on-road similar to regular bicycles, and by extension, allow e-bikes in cycling lanes as the City moves forward with construction of its on-road cycling network.**

11 TRANSIT

11.1 Transit Operations Review

A Transit Operations Review is planned to identify opportunities to improve transit service. This review will ensure that transit is an attractive and viable travel option both now and in the future.

Transit plays an important role in the transportation system. Not only does transit meet important mobility needs, but it does so in a way that enhances equity. Transit allows residents to participate in society regardless of age, income, or physical ability, providing access to shops and services, employment, and recreational opportunities.

Based on data from the 2011 National Household Survey conducted by Statistics Canada, roughly 4% of Belleville residents take the bus to work, a figure which is essentially unchanged from 2006. Historically, annual transit ridership in the city has been growing by just over 3.5% per year (refer to Figure 17). In light of these statistics, a 2031 transit mode share target of 4.5% was established for the journey to work. Achieving this target will require an increase in transit ridership of roughly 35% over current levels

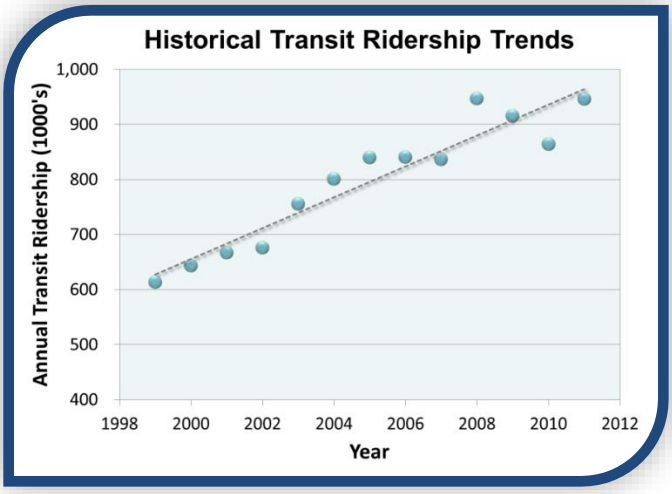


Figure 17 - Historical Growth in Transit Ridership

The City of Belleville is planning to undertake a separate Transit Operations Review to investigate opportunities to improve transit service within the city. Major areas of focus are expected to include the following:

- Service standards and performance results
- Route scheduling (frequency of service / hours of operation)
- Service area and coverage (including opportunities to expand service to rural areas)
- Transit routing, with the goal of maximizing coverage, reducing walking distances, improving route directness, reducing transfer requirements, minimizing delay, avoiding duplication of service, reducing operating costs, and increasing ridership
- Fleet operational and maintenance requirements
- Opportunities for transit priority treatments. Transit priority allows buses to "jump the queue" at signalized intersections or receive other special treatment in order to reduce delay and improve service reliability
- Improvements to Mobility Bus services
- Transit fare structure
- Strategies to increase ridership (such as the adoption of a universal transit pass for Loyalist College students)

Since the Transit Operations Review is intended to supplement the Transportation Master Plan, transit was not examined as part of the current study.

11.2 Recommendations

The following recommendations are made for transit:

Recommendation # 6	**Provide convenient transit service that offers a viable alternative to the automobile while supporting important equity objectives.**
6.1	**Undertake a Transit Operations Study to optimize transit routing and scheduling within the City.** As part of the Transit Operations Study, examine potential opportunities for expanding transit service to rural areas.

12 ROAD NETWORK NEEDS

12.1 How Were Network Needs Assessed

To accommodate future population and employment growth, modifications to the road network are often needed. Such modifications ensure that sufficient road network capacity is available to meet mobility needs. Options for increasing road capacity include building new roads, widening roads, or upgrading existing roads to handle more traffic. To identify future road network requirements, a multi-step process was followed, as summarized in Figure 18.

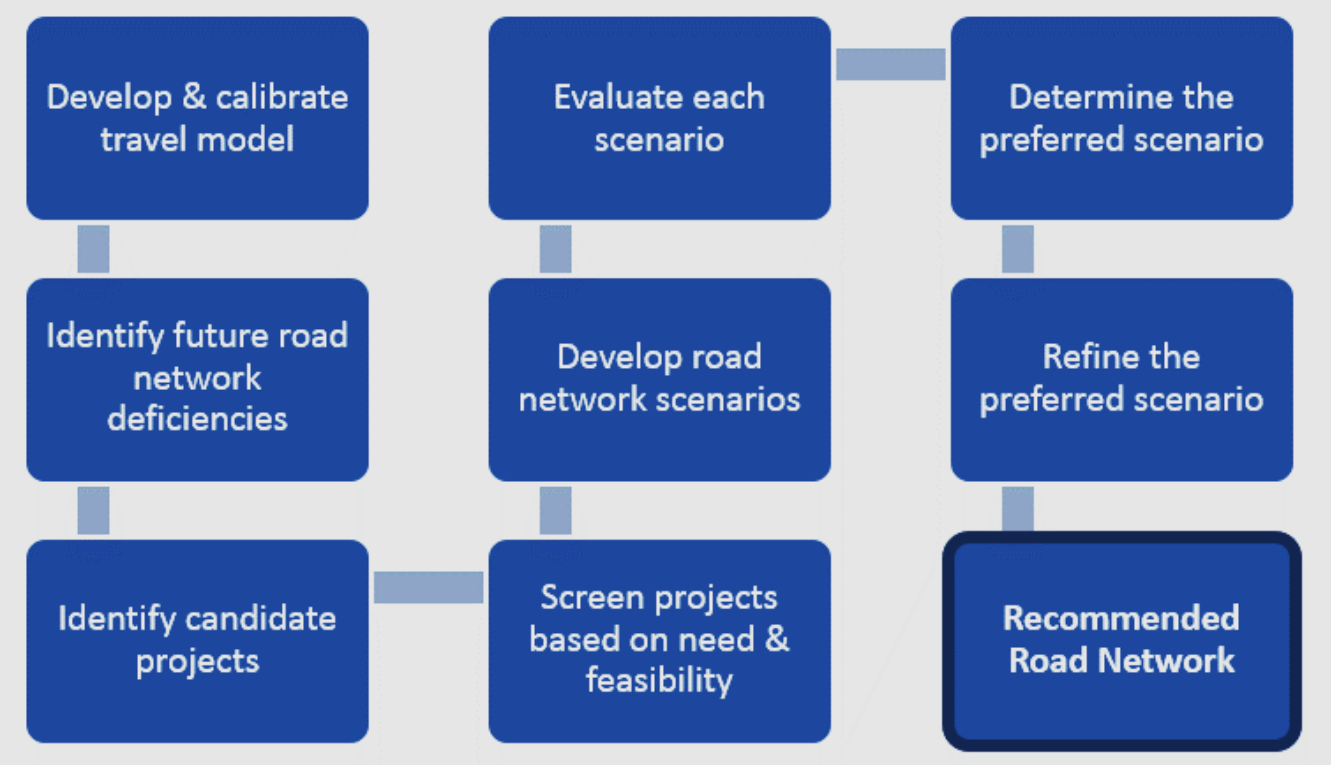


Figure 18 - Road Network Development Process

The process in Figure 18 builds on the modelling and identification of road network deficiencies described in Section 3.6. To address the issues noted in Section 3.6, several road network scenarios were developed and tested in the transportation model. The evaluation of scenarios was carried out using a multi-criteria evaluation framework that included the following three objectives:

1. Accommodate the movement of people and goods effectively and efficiently
2. Minimize cost
3. Provide support for other City investments & priorities

Based on the results of the evaluation process, a preferred road network scenario was identified. This scenario was then refined to address issues not captured in the transportation model, such as emergency vehicle access and safety at at-grade railway crossings.

A more detailed overview of the network development process can be found in Appendix N.

12.2 Recommended Network

The recommended road network for the City of Belleville is presented in Figure 19, while a description of each project is provided in Table 7. This network is expected to meet the City's transportation needs over the 2031 horizon, and includes projects to increase road capacity, improve emergency vehicle access, and address safety issues at at-grade railway crossings.

It should be noted that the recommended network does not include "committed projects" that the City has already committed to building, in particular:

- Extension of College Street East
- Connection of Station Street and Haig Road
- **Roads shown in the Loyalist Secondary Plan**

The recommended network also excludes the widening of the Norris Whitney Bridge. Although it is anticipated that this facility will experience traffic failure by as early as 2026, it falls under the jurisdiction of the Ontario Ministry of Transportation. Accordingly, it is recommended that the City work with the Ministry to review the capacity requirements for the Norris Whitney Bridge to ensure an acceptable level of mobility is maintained on this important access route into the community.

No.	Project	Rationale / Need
1.	Widen/upgrade **Adam Street** and **University Avenue**	Improves access to the Northeast Industrial Park.
2.	Construct a **new 2-lane north-south arterial road** on the east end of Belleville between Highway 37 and the Airport Parkway, including a new interchange with Highway 401.	Improves access to the Northeast Industrial Park and provides a new connection to Belleville from Highway 401. Eventually, it is envisioned that this corridor would extend to Dundas Street, essentially creating an east-end by-pass of the city. Although this extension is not considered to be warranted within the 2031 horizon, it is desirable to protect for the future option of building this extension as this area of the city develops.
3.	Widen **Wallbridge Loyalist Road** between Loyalist College and Highway 401	Addresses pressure on Wallbridge Loyalist Road. With the provision of a new interchange on Highway 401 leading to the Northeast Industrial Park, the model predicts that residents living in the southwest part of Belleville will travel along Wallbridge Loyalist Road and Highway 401 to access the Industrial Park, rather than cutting through the city.
4.	Widen **Sidney Street** from 2 to 4 lanes between Bell Boulevard and Millennium Parkway (over Highway 401)	Addresses capacity deficiencies over Highway 401 during the afternoon peak hour.
5.	Provide an additional northbound lane on **Sidney Street** between Bridge Street and south of Wilkins Street	Increases capacity along this section of Sidney Street, improves lane continuity, and gives equal priority to northbound and southbound traffic by ensuring a similar number of lanes in each direction. As part of this project, it is recommended that the intersection of Sidney Street and Bridge Street be upgraded to include left turn lanes.
6.	Upgrade **North Front Street** to a major arterial between Bell Boulevard and College Street (by adding either a two-way left turn lane or raised median)	Improves traffic operations and safety along North Front Street. The preferred cross-section treatment (raised median or two-way left turn lane) will be confirmed during the Environmental Assessment process.

No.	Project	Rationale / Need
7.	Widen **Bell Boulevard** from 2 to 4 lanes between Sidney Street and Wallbridge Loyalist Road	Addresses capacity deficiencies along this corridor during the afternoon peak hour and improves access to adjacent properties that are slated for development.
8.	Extend **Keegan Parkway** to Dundas Street	Improves emergency vehicle access to the lands south of the CP rail corridor by mitigating the risk that all railway crossings will be blocked by a disabled train. The provision of grade separation at Dundas Street as described below would further improve access in the event of an emergency. Note that this extension may be designed to accommodate emergency vehicles only, or could function as a public road to improve access to the Bakelite lands which are planned for redevelopment.
9.	Monitor the need for **grade separation** at the CP rail crossing of Dundas Street East and Wallbridge Loyalist Road	As discussed in Section 3.6.3, it is anticipated that these crossings will meet the warrants for grade separation within the planning horizon. Should grade separation not be pursued due to financial or other reasons, consideration should be given to other safety measures such as increasing the lead time between the lowering of the gates and train arrival; installing upstream warning signs in sync with the drop down gates; reducing the posted speed limit; and/or reducing train operating speeds.

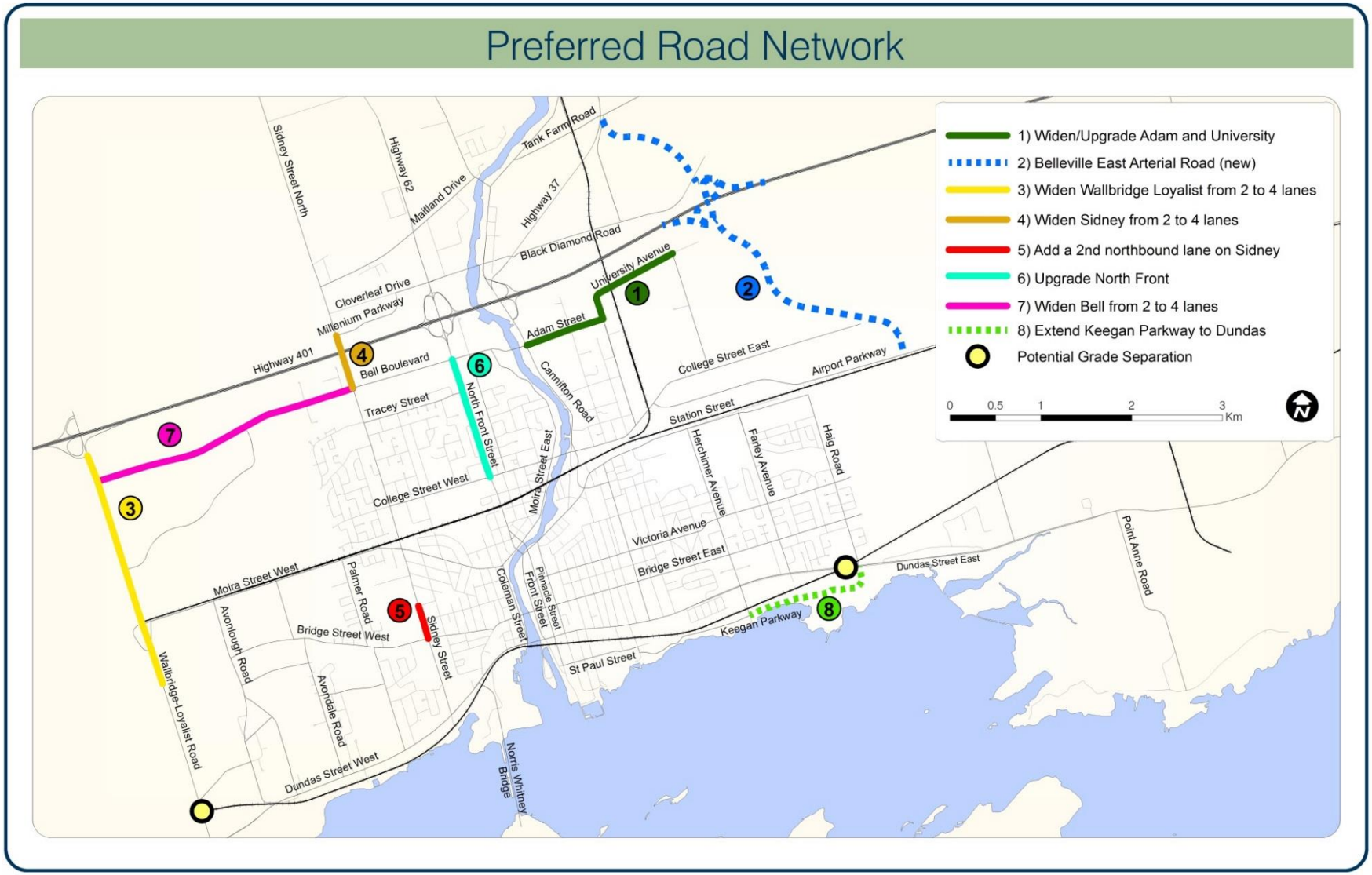


Figure 19 - Recommended Road Network

12.2.1 The Belleville East Arterial Road

A key element of the recommended network is the construction of a new 2-lane arterial road on the east end of Belleville between Highway 37 and the Airport Parkway. This corridor, known as the Belleville East Arterial Road (BEAR), has been discussed for many years.

In the mid 1990's, the City of Belleville, former Township of Thurlow and the Ministry of Transportation initiated an Environmental Assessment (EA) study to assess the need, and develop a functional design, for a new interchange with Highway 401 and a new arterial road on the east side of Belleville. An Environmental Study Report (ESR), which was undertaken in accordance with the Class EA for Municipal Road Projects (Schedule "C"), was issued in June 1996. A bump-up was requested by an area resident but was subsequently denied by the Ministry of the Environment.

The City of Belleville Official Plan (OP), issued in February 2002, incorporates the recommendation arising from the above-mentioned study and presents the alignment and limits of the Belleville East Side Arterial Route (BEAR) together with its associated interchange with Highway 401. The corridor is defined as a 2-lane arterial roadway and generally skirts to the west of the Bell Creek Wetland, which is designated as provincially significant (refer to Appendix O).

An EA addendum that was subsequently undertaken in September 2003 brought into question the recommended design that was put forward in the 1996 ESR, due to conflicts with proposed land development plans by Proctor and Gamble and potential impacts to the Bell Creek Wetland. In light of these difficulties, the EA addendum was halted, and the City was advised to consider alternatives further to the east of the Bell Creek Wetlands.

Interest in the BEAR corridor has continued to grow over the years, particularly with the expansion of the Northeast Industrial Park in the east end of the city, which currently offers approximately 200 acres of serviced land ready for development under the first phase of a multi-phase land development initiative that boasts a total land mass of 900 acres.

Travel demand modelling efforts undertaken as part of the Transportation Master Plan exercise confirmed the need for the northern segment of the BEAR corridor (i.e., north of Airport Parkway). In particular, the modelling effort confirmed the following:

- A significant number of commuters destined to the Northeast Industrial Park are expected to arrive via Highway 401, in part because a large portion of the job pool in Belleville is held by residents outside of Belleville (e.g., Trenton and Napanee, among others).

- To unlock the full value of the BEAR corridor, a connection to Highway 37 is important.

- If a new interchange with Highway 401 is provided, it should be coupled with the widening of Wallbridge Loyalist Road.

- If the BEAR interchange and extension to Highway 37 are provided in concert, they would cause pressure on a 2-lane BEAR facility (particularly for the section between Highway 401 and the Northeast Industrial Park), necessitating the provision of a 3-lane overpass.

- In scenarios where a BEAR overpass (but not an interchange) is provided, a large portion of traffic using the overpass also makes use of the Highway 401 / Cannifton Road interchange. Two-thirds of this traffic would come from Highway 401 west and one-third would come from Highway 401 east. The former would exacerbate the weaving conditions in the westbound direction on Highway 401, while the latter would exacerbate the level of service at the ramp terminal intersections and further extend the queue length on the Cannifton Road overpass associated with the southbound left turn movement at the south ramp terminal intersection.

From a provincial network perspective, it is generally acknowledged that the addition of an interchange on Highway 401 may necessitate a corridor operational review. Such a review may identify opportunities for improvements to the corridor, but is not expected to raise any operational issues, as the proposed interchange is roughly 2.5 kilometers from the nearest interchange in place today.

From an alignment perspective, it is generally acknowledged that shifting the alignment of the BEAR corridor further to the east (roughly 1.4 kilometers) of the Bell Creek Wetland is not favorable as it would reduce the utilization of the corridor.

From a land constraints perspective, there is potential for property impacts as well as impacts to the adjacent Provincially Significant Wetland (depicted in Appendix O). The latter may require the use of a modified Parclo A-4 interchange configuration, including the removal of the free flow south-east on-ramp and the addition of a short leg to the north-east on-loop to permit vehicles traveling northbound on the BEAR corridor to head east on Highway 401.

12.3 Project Timing & Cost Estimates

The allocation of projects to different time horizons was primarily based on an assessment of need – in other words, how soon would a particular project be needed to address the anticipated capacity deficiencies? Consideration was also given to the distribution of capital expenditures to ensure a reasonable balance over time. From this assessment, projects were assigned to three phases.

Figure 20 illustrates the proposed implementation plan, while Table 8 shows the associated cost implications. In all cases, the actual timing of projects will depend on funding availability and Council approval. Projects may also be deferred or moved forward depending on how rapidly development occurs and the associated growth in traffic.

It is important to emphasize that for a project to be constructed in a particular phase, the planning process for the project must be initiated much earlier. For each project, an environmental assessment study will be required, as well as preliminary and detail design – a process that can take several years to complete.

For projects to be constructed in accordance with the proposed implementation timing, the planning process must begin several years in advance.

Table 7- Road Network Phasing & Cost Estimates

Phases	Capital Cost (2013 dollars)
Phase 1: 2013 to 2021[1]	**$18.5M**
1.1 Widen/upgrade **Adam Street** and **University Avenue**[2]	$8M
1.2 Upgrade **North Front Street** between Bell Boulevard and College Street	$6M
1.3 Add second northbound lane on **Sidney Street** (Bridge Street to south of Wilkins Street) and upgrade the intersection of Sidney Street and Bridge Street	$4.5M
Phase 2: 2021 to 2026	**$48M**
2.1 Widen **Sidney Street** from 2 to 4 lanes over Highway 401	$10M
2.2 **Belleville East Arterial Road** (Highway 401 to Airport Parkway, incl. interchange)[3]	$27M
2.3 Widen **Bell Boulevard** from 2 to 4 lanes (Sidney Street to Wallbridge Loyalist)[4]	$11M
Phase 3: 2026 to 2031	**$16.5M**
3.1 Extend the **Belleville East Arterial Road** north to Highway 37	$4.5M
3.2 Widen **Wallbridge Loyalist Road** between Loyalist College and Highway 401[5]	$12M
TOTAL CAPITAL BUDGET:[6]	**$83M**

Notes:

1. While the first phase of road construction extends to 2021, the need for several of the Phase 1 projects actually falls towards the beginning of the phase. It is therefore recommended that Projects 1.1, 1.2, and 1.3 be considered for implementation within the first half of this time period if financial resources permit (i.e. by 2017)
2. Assumes a rural cross-section on University Avenue with paved shoulders and no sidewalks
3. The actual cost to be borne by the City for the BEAR interchange at Highway 401 may be less than shown due to opportunities for cost-sharing with the province
4. Assumes a rural cross-section. Cost would increase to $20M for an urban cross-section with sidewalks and a raised median
5. Assumes a rural cross-section. The actual cost to be borne by the City may be less than shown due to opportunities for cost-sharing with Quinte West
6. Does not make allowance for any road-rail grade separations which may be required (i.e. at Dundas Street East or Wallbridge Loyalist Road). Such grade separations can be expected to cost in the order of $7 million to $10 million per location

The extension of Keegan Parkway to Dundas Street is not shown in Table 8 or Figure 20. This project (estimated at $4 million) is considered to be high priority since it improves emergency service access to the lands south of the CP rail corridor. However, timing for the

project is uncertain, and is dependent on the clean-up and redevelopment of the Bakelite lands.

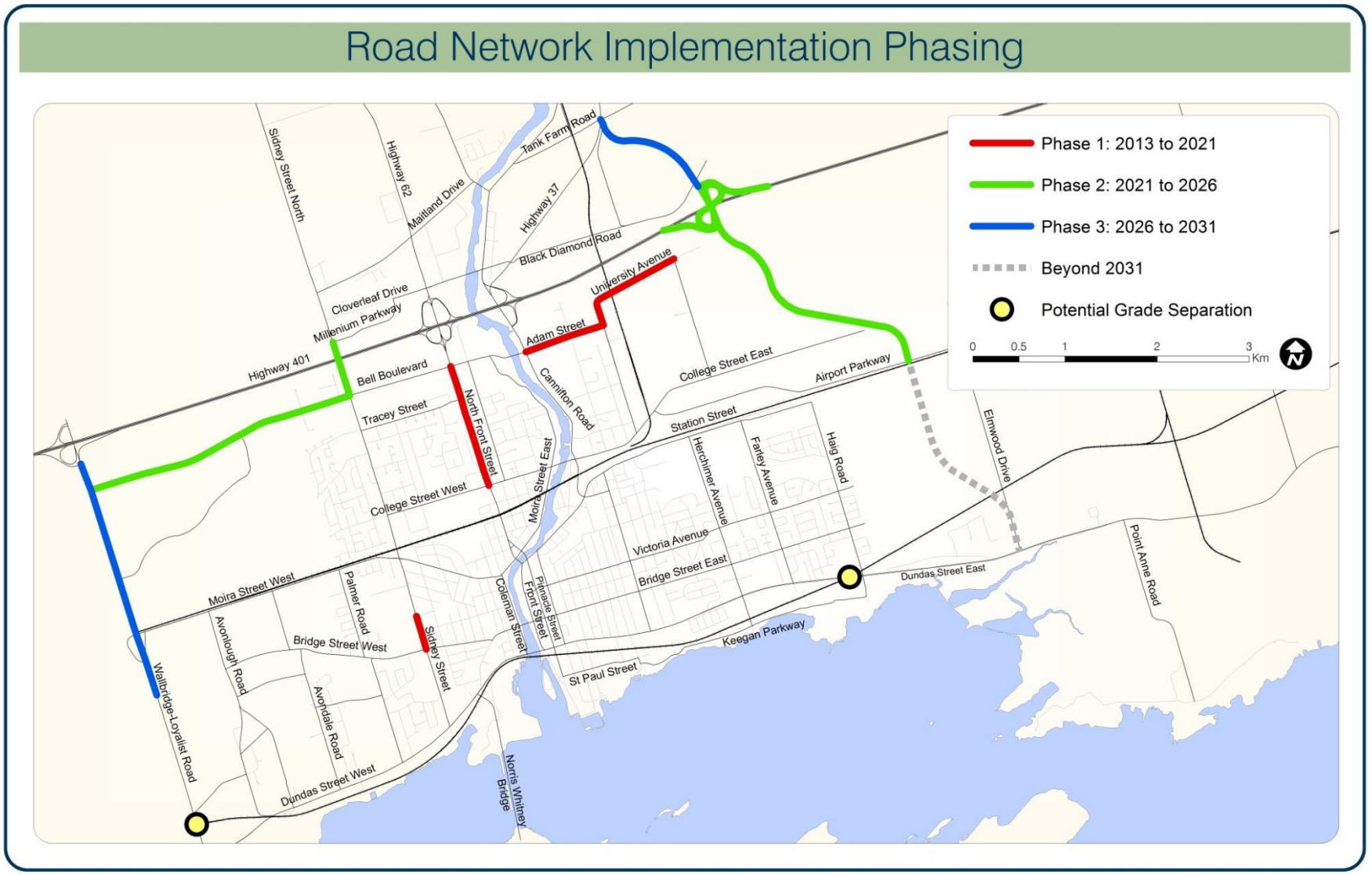


Figure 20 - Road Projects by Horizon

12.4 Recommendations

Based on the assessment of road network needs, the following recommendations are made:

Recommendation # 7	**Provide a safe and efficient road network**
7.1	**Implement the road network improvements shown in Figure 19 of this report.** While implementation priorities are outlined in Section 12.3, the timing for each project will ultimately depend on the location and pace of new development.
7.2	**Continue to work with the Ontario Ministry of Transportation to review the capacity requirements for the Norris Whitney Bridge; pursue the opportunity to undertake a joint Highway 401 Operational Assessment Study; and seek provincial funding support for a new interchange on Highway 401 with the Belleville East Arterial Road.**
7.3	**Carry out railway crossing safety assessments in accordance with Transport Canada regulations, and monitor the need for grade separation as traffic volumes increase over time** The top two locations that should be monitored closely include the CP rail crossings at Dundas Street East and Wallbridge Loyalist Road, both of which are expected to exceed the warrant for grade separation within the planning horizon.

The above recommendations speak to requirements for large-scale infrastructure projects. The following section addresses the role of traffic management in ensuring the City's road network is operating as safely and efficiently as possible.

13 TRAFFIC MANAGEMENT

13.1 What is Traffic Management?

By efficiently managing the flow of traffic on the road network, congestion and delay can be reduced.

Traffic management is all about managing the flow of traffic on the road network to minimize congestion and delay. Traffic management ensures that existing infrastructure is used as efficiently as possible by optimizing the signal timing, controlling vehicle access, and implementing localized improvements such as intersection turning lanes. Traffic management also helps to reduce cut-through traffic in residential areas by improving operating conditions on major corridors.

To be effective, traffic management requires:

- On-going monitoring of the transportation system to identify safety and operational deficiencies
- A process for reporting, tracking, and responding to residents' concerns
- A process for initiating traffic studies and implementing the recommended improvements
- Regular review & updating of traffic signal timing
- Assessment & mitigation of development-related impacts (typically identified during the site plan approval process by requiring developers to submit a Traffic Impact Study for the new development)
- Appropriate policies and guidelines, including:
  - Warrants for determining which traffic control devices to use in different situations (signals, stop signs, etc.)
  - Operational policies for snow-clearing, maintenance, and incident response[15] so that traffic conditions return to normal as soon as possible

[15] Incidents may include collisions, vehicle breakdowns, or any other event that disrupts the flow of traffic temporarily.

- Access management guidelines which limit the number of driveways allowed on major roads to reduce the friction caused by turning vehicles and enhance mobility.

Traffic management strategies can also be employed during construction conditions to better manage the flow of traffic through and around construction work zones.

13.2 Emergency Detour Routes

An important part of traffic management is dealing with traffic incidents. Such incidents may occur on both municipal roads as well as provincial facilities. In the case of Highway 401 (which is under the jurisdiction of the Ontario Ministry of Transportation), incidents can have a significant impact on City roads as traffic diverts around the incident area. It is therefore important to have Emergency Detour Routes in place to handle the diverted traffic.

Emergency Detour Routes (EDRs) are designed to provide drivers with an effective pre-determined route of travel when the highway is closed due to an incident or emergency. In doing so, EDRs alleviate the impact of rerouted traffic on local roads, ease congestion and reduce driver frustration. More importantly, EDRs allow police, paramedics and fire services to do their jobs - responding to emergencies rather than directing traffic.

EDRs should be established with due regard to the guidelines and best practices set by the Ontario Ministry of Transportation, Ontario Good Roads Association and Ontario Provincial Police. In designating routes, several factors are typically considered, including travel time, ease of navigation, road condition (for accommodating heavy vehicles), impacts to adjacent properties, and ability to efficiently accommodate increased traffic volumes.

13.3 Roundabouts

"…roundabouts have demonstrated substantial safety and operational benefits compared to most other intersection forms and controls, with especially significant reductions in fatal and injury crashes." FHWA

In 2012, the U.S. Federal Highway Administration identified roundabouts as one of nine "proven safety countermeasures" that should be incorporated in roadway design. Roundabouts offer a number of advantages over conventional stop and signal-controlled intersections, as illustrated in Figure 21.

Figure 21 - Benefits of Roundabouts

Although roundabouts have the potential to improve both safety and traffic operations, they may not be appropriate in all situations. Where roundabouts are deemed to be the preferred alternative, proper design is essential to ensure the roundabout is accessible to all road users, including pedestrians and cyclists, as well as larger trucks.

Given the potential safety and operational benefits associated with roundabouts, the use of roundabouts should be considered on all new road construction and reconstruction projects. Roundabouts should also be considered when modifying existing intersections to address major safety or operational concerns.

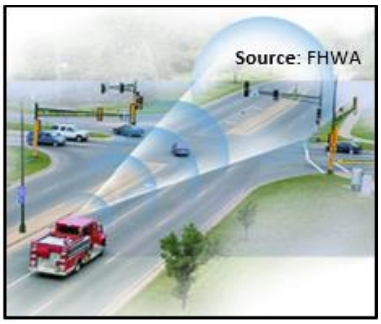
In moving forward with roundabout implementation, it is important to carefully select the initial site locations to ensure the necessary success factors are in place to garner public support. In particular, it may be prudent to start with a simple single-lane roundabout rather than proceeding directly to a more complicated multi-lane configuration. Since roundabouts are relatively new to the Belleville area, it may also be necessary to undertake a driver education program to instruct drivers on how roundabouts work.

13.4 Use of Advanced Technology

Intelligent Transportation Systems involve "the application of advanced and emerging technologies … in transportation to save lives, time, money, energy and the environment." ITS Canada

Intelligent Transportation Systems, or ITS, involve the use of advanced technologies in the operation and management of the transportation system. By employing technologies such as computers, sensors, and communications systems, ITS enables more efficient use of existing infrastructure, and furthers important safety, environmental, and social objectives. ITS supports and enhances the dynamic interaction between the driver, the vehicle, and infrastructure, interaction which is facilitated through application of advanced communications technology. However, ITS is not restricted to the auto vehicle mode – ITS technologies are also used to support transit, goods movement, and emergency services, among other applications.

In the case of Belleville, there are several new technologies that may have merit. Examples include:



- **Emergency vehicle pre-emption at traffic signals** – Automatically triggers the signal timing to give emergency vehicles the right-of-way
- **Transit signal priority** – Adjusts the signal timing at intersections to give additional priority to buses (for example, by providing a separate "queue jump" phase which allows buses to proceed ahead of other stopped traffic)
- **Variable message signs** – An effective tool for informing drivers of road closures, detours, or emergency situations while en route to their destination
- **On-line traveler information system** – Provides a convenient "one-stop" solution for obtaining travel-related information, such as transit routes and schedules, cycling maps, road closures, parking locations, etc., with links to provincial traveler information systems

The above list is not intended to be comprehensive, and it is anticipated that other opportunities may arise as new technologies are developed and adapted for use in transportation. While there is little value in implementing technology for technology's sake, the City should continue to keep an open mind when seeking solutions to transportation problems by exploring innovative new technologies where appropriate. In adopting any new technology, it is recommended that the City carry out a detailed feasibility assessment and consult with other municipalities who have implemented similar measures to identify implementation challenges and success factors. In some cases, a pilot project may be warranted before proceeding to full implementation.

13.5 Recommendations

The following recommendations are made for improving traffic management within the City of Belleville. These recommendations are a continuation of Recommendation #7, which centers around the provision of a safe and efficient road network.

Recommendation #7	**Provide a safe and efficient road network [CONTINUED]**
7.4	**Explore opportunities to employ new technologies in the operation and management of the transportation system.** Examples include emergency vehicle pre-emption at traffic signals, transit signal priority, variable message signs, and on-line traveler information.
7.5	**Consider the use of roundabouts in all road and intersection projects.** Roundabouts offer a number of advantages over traditional forms of traffic control, including lower delay, improved safety, and reduced operating costs. The preferred type of intersection control will depend on several factors, including the availability of property and anticipated traffic demand.
7.6	**Continue to apply the access management guidelines outlined in the Official Plan.** By controlling the number of accesses provided on higher order roads such as arterials, the mobility function of these roads is enhanced.
7.7	**Establish Emergency Detour Routes (EDRs) in cooperation with the Ministry of Transportation of Ontario and the police.** Such routes are designed to provide drivers with an effective pre-determined travel route when a highway is closed due to an emergency.

14 PARKING

14.1 Role of Parking

While cars are used for a variety of trip purposes, for most of the day they are parked. Indeed, every car that is on the road needs a place to park at both the trip origin and destination. As a result, many parking spaces are needed for every vehicle – at home, at work, at the grocery store, and more.

A parked car requires approximately 8 square meters and often the same again in maneuvering space. This is a large amount of land to give up that could be used for other economic or recreational purposes. At the same time, businesses rely on convenient parking to attract customers. Given these competing pressures, the management of parking through regulations, pricing, and other mechanisms is critically important if the City is to have a sustainable and efficient transportation system that meets the needs of local businesses.

14.2 The Parking Toolbox

The City has two means for managing parking. First is the development and operation of City-owned public parking facilities, both on- and off-street. Second is the City's Zoning Bylaw which regulates parking in new development. The latter should be guided by the need to support sustainable transportation modes while minimizing parking spill-over to adjacent roads. The former should be guided by the need to balance parking supply and demand. In commercial areas, this implies adjusting parking regulations (hours, fees) to achieve the desired occupancy level: parking is busy and well-utilized, yet customers have a reasonable expectation of finding a parking space within a reasonable walking distance of their destination. A well-managed parking system also implies sufficient availability of on-street parking for residential purposes.

A parking system that satisfies the above objectives can be achieved by monitoring and management of on-street parking supply, and ensuring that off-street supply standards are flexible (e.g., include cash-in lieu and shared parking provisions) and balanced (i.e., don't create an oversupply problem, and cater for trip end needs for all modes of transport including bicycles).

A Parking Toolbox is provided in Appendix P with a number of strategies that can be implemented to influence the availability of parking. These strategies address both parking management and supply and show the range of options available to the City to address existing and future parking needs.

14.3 Parking Needs in the City Centre

The City Centre Intensification Plan and Official Plan Amendment No. 23 confirm the extent of population and employment growth envisioned for the City Centre. The growth in employment is particularly noteworthy. The area bounded by Pinnacle Street to the east, the Moira River to the west, the CP rail corridor to the south and Victoria Street to the north is expected to accommodate roughly 1,800 jobs in the future, an increase of 500 jobs over 2011 employment levels.
The anticipated growth in activity in the City Centre will undoubtedly increase the demand for parking. At the same time, parking supply is expected to decline as existing parking lots are redeveloped.

In addition to the potential loss in off-street parking spaces, streetscaping improvements undertaken as part of the current Revitalization and Redevelopment Project for downtown Belleville may reduce the number of on-street parking spaces. Loss of on-street parking may also be required to accommodate cycling lanes through the downtown (for example, along Bridge Street).

In light of the above, a comprehensive parking study is needed to assess on- and off-street parking capacity in relation to demand; identify appropriate strategies to manage parking activity; and confirm the need for additional parking supply. Should a structured parking facility be required, candidate sites on Pinnacle Street should be considered as identified in the Official Plan, and the potential for integrating such parking into the fabric of the downtown should be explored, for example, by introducing a retail component on the ground floor.

14.4 Recommendations

Given the above discussion, the following recommendation is made with respect to parking:

Recommendation # 8	**Manage the demand and supply for parking.**
8.1	**Undertake a Comprehensive Parking Assessment Study for the City Centre to identify short and long term needs.** Intensification of the downtown will increase the demand for parking, while at the same time decreasing the parking supply as surface parking lots are redeveloped. As a result, a parking study is needed to identify appropriate strategies to manage parking demand and assess the need for new parking facilities.

15 GOODS MOVEMENT

15.1 Overview

The movement of commercial goods is vital to Belleville's economy. Industrial businesses rely on the City's rail and road network to obtain materials and transport products to market. Commercial businesses likewise depend on an efficient system of goods movement to meet customer demands.

The Transportation Master Plan identifies a number of initiatives that will help to improve traffic flow, supporting goods movement in the city and helping to make Belleville an attractive place to invest. In particular, the Belleville East Arterial Road will improve access to the Northeast Industrial Park from Highway 401, providing a convenient route for trucks to enter and exit the industrial area. Proposed improvements to Adam Street and University Avenue will likewise support industrial development in this area of the city.

In addition to addressing road capacity needs, the Transportation Master Plan also includes a number of proposals to improve the walking and cycling environment and create more attractive streets that enhance the public realm. Such proposals are expected to have a positive impact on local businesses by supporting the development of vibrant commercial districts, boosting tourism, and creating a community where people want to live. Indeed, surveys of the local business community have shown that one of the greatest advantages of doing business in Belleville is the quality of life, which helps to attract employees.

By adopting the recommendations in this Transportation Master Plan, the necessary infrastructure elements will be put in place to support economic development through efficient goods movement and improved quality of life.

15.2 Truck Access & Routing

The accommodation of trucks and heavy vehicles within the urban area requires a careful balance: trucks require convenient access to local businesses but are often undesirable in residential areas due to noise, air quality, and safety concerns. It is thus important to ensure that goods can move safely and efficiently through the city, with policies in place to mitigate negative impacts.

The approach taken in Belleville has been to designate specific roads where trucks are prohibited. Such prohibitions are generally intended to minimize impacts to residential properties in areas with high truck traffic while allowing access elsewhere in the network. This approach works well as long as only a small number of roads are subject to truck restrictions and these roads can be easily communicated to truck operators.

If, in the future, truck impacts increase and the City finds itself prohibiting trucks from more and more roads, it may be necessary to take a different approach and instead identify roads where trucks are *allowed*. Under this approach, trucks would not be permitted on any road which is not part of the designated truck route network, but would instead be limited to roads specifically identified for truck use, until such time as the operator needs to:

- Make a delivery to premises not abutting a truck route;
- Perform services requiring the truck at premises not abutting a truck route;
- House, store, or have the truck repaired at a garage or other premises not abutting a truck route;
- Perform service for the City of Belleville.

Related to the issue of truck access is the accommodation of extra-long trucks. In August 2009, the Province of Ontario launched the Long Combination Vehicle (LCV) Pilot Program as part of its harmonization efforts with Quebec to allow shippers and manufacturers to move goods more efficiently across provincial borders. LCVs are made up of a tractor pulling two full-length semi-trailers and can extend up to 40 metres in length. LCVs are not allowed to carry any more weight than a single tractor-trailer which limits their use to extremely light, bulky freight that is not well suited to other transport modes. Results to date suggest that the pilot program has staying power, as the safety record has been acceptable and the economic benefits to carriers and shippers has been significant due to savings in driver, fuel, and vehicle maintenance costs. The continued success of the LCV Program coupled with Belleville's central location make the city a prime candidate for manufacturers and shippers to locate their distribution centers. As such, it is recommended that the City of Belleville identify appropriate access routes for LCVs to key industrial areas and upgrade these routes as necessary to accommodate extra-long trucks. Moreover, the City should consider:

- Adopting land use policies that support the introduction of new distribution centers.
- Taking an active role in the careful monitoring of LCV operations, and reporting any concerns, or violations of the program restrictions, to the Ministry of Transportation of Ontario.

- Undertaking, or directing landowners/developers to undertake, engineering assessments for any new LCV routes that may be required to service new development as part of the approval process.
- Providing carriers with advanced notice of any construction plans that could affect LCV operations.
- Adopting best practices for dealing with LCVs during road closures or traffic incidents.

Moving forward, it is recommended that the City of Belleville continue to monitor goods movement trends. With time, it may become necessary to undertake a detailed goods movement study to identify opportunities to better manage truck traffic and associated impacts to the road network.

15.3 Dangerous Goods

In the City of Belleville, dangerous goods move by both road and rail. Information on such movement is now increasingly available to municipalities. With this information, the City has a responsibility to act to protect both residents as well as City staff who work as first responders.

Given the above, it is recommended that the City of Belleville undertake a risk assessment for dangerous goods movement in keeping with the *Emergency Management and Civil Protection Act*, R.S.O., 1990 (Chapter E9), last amended in 2009. This risk assessment should address dangerous goods movement by trucks as well as rail vehicles. Such an assessment would inform the development of municipal emergency response measures, and may require the input of shippers, carriers and other risk-sensitive stakeholders.

The Ministry of Transportation of Ontario provides municipalities with information relating to hazardous goods movement through their areas of jurisdiction, based on data collected from the Commercial Vehicle Survey (CVS). This information covers a diverse cross-section of carriers and shippers and identifies the highways used, time of travel, and quantities in each truck.

On November 20, 2013, Transport Canada issued a Protective Direction directing rail companies to share with municipalities aggregate information on the nature and volume of dangerous goods being transported through their communities. This Protective Direction was issued in response to requests from the Federation of Canadian Municipalities and its members for more information on the dangerous goods being transported by rail through their communities. The Protective Direction was issued pursuant to section 32 of the *Transportation of Dangerous Goods Act*, 1992 and will remain in effect for three years, or until cancelled by the Minister, in order to allow the department sufficient time to develop appropriate permanent regulations. Given the numerous freight lines that run through the City of Belleville, the City should consider the following, as information from this Protective Direction becomes available:

- Assessing training and equipment needs for municipal first responders, so they can deal appropriately with rail emergencies;
- Tracking rail safety and emergency response costs to guard against the downloading of such costs onto the local tax base; and

Identifying and communicating any safety concerns to the Federation of Canadian Municipalities, federal government, rail authorities, or industries, as appropriate.

15.4 Recommendations

To support the movement of goods within the City of Belleville, the following recommendations are put forward:

Recommendation # 9	**Provide an efficient system of goods movement that supports the local economy while minimizing impacts to residents.**
9.1	**Ensure priority industrial areas can accommodate trucks with longer trailers and double trailer combinations by identifying appropriate access routes and upgrading these routes as necessary.**
9.2	**Work with Fire Services to undertake risk assessment for dangerous goods movement in keeping with the Emergency Management and Civil Protection Act, R.S.O., 1990 (Chapter E9) last amended in 2009.** Such an assessment would be useful in developing municipal emergency response measures, and may require the input of shippers, carriers, and other risk-sensitive stakeholders.

16 IMPLEMENTING THE PLAN

16.1 Overview

The successful implementation of any plan requires commitment and monitoring, each of which can be done at various levels, as follows:

- **Commitment** – There are two types or levels of commitment. The first level of commitment is in principal (i.e. intent-based), and is best measured by the adoption of the Transportation Master Plan by Council and the incorporation of the plan recommendations into other Council-approved plans. The second level of commitment is in terms of resources (i.e. priority-based), and is best measured by the alignment in multi-year financial and capital plans with the implementation plan put forward in the Transportation Master Plan document.

- **Monitoring** – There are two types of monitoring that can be done. The first is internal, in which the City gauges its performance or progress against internally set goals and objectives. The second is external, in which the City gauges its performance against its peer municipalities.

In practice, commitments in terms of resources and timescales for implementation are difficult to make, as they typically evolve in response to internal and external changes or challenges faced by the City. Furthermore, network expansion and upgrade commitments need to be balanced against network rehabilitation and maintenance requirements, which have not been addressed in this Plan.

The importance of accounting for the lifecycle costs of new transportation infrastructure should not be understated. Protecting existing and future assets with sufficient operations, maintenance and renewal funds as part of a Long-Range Financial Plan will ensure that the City can continue to provide essential infrastructure services to residents. As such, the implementation of any measures proposed as part of this Plan should be considered as part of annual budget cycles.

Ultimately, the City must prioritize and allocate investment among many competing demands. Transportation-related investments can generally be categorized into three groups which define the extent and timing of activities, and by implication funding priorities. These groups include:

- **Public safety services and standards** – Impact the safety of pedestrians, cyclists and vehicles. These standards are generally based on provincial or federal standards.

- **Infrastructure preservation services and standards** – Reflect the City's need to protect capital assets and are financially justified by life cycle cost impacts.

Quality of life services and standards – Enhance the quality of life for Belleville residents and support the local economy. Unlike safety or infrastructure preservation, these standards offer some flexibility with regard to performance thresholds.

16.1 Consistency with the Official Plan

Official Plans serve as the blueprint for community growth and development and must be updated periodically to ensure they remain consistent with provincial legislation and policies. Changes made to provincial policies, specifically regarding agriculture and environmental issues, have triggered the need to review and update the City of Belleville's Official Plan (OP) that was adopted by Council on June 18, 2001.

The OP review and update process is in progress and should be taken as an opportunity to incorporate the recommendations arising from the Transportation Master Plan. The OP update should recognize the proposed road and bikeway networks, and supporting policy strategies described herein. In particular, "Schedule C - Road System Plan" should be amended to reflect the recommendations of the Plan.

The OP should also include a policy requiring a transportation needs assessment for any significant change in the City's fundamental land use policies, or major land use re-designation or re-zoning. The policy should further require the preparation of traffic impact studies for development proposals deemed to be significant by the City or neighbouring Townships

Required OP Updates

- *Section 6.1.5 to be updated to reflect the preferred road network*
- *Need new policy subsection in 6.1 to detail Complete Streets*
- *Section 6.2 to be amended to include explanation that Plans of Subdivision and Site Plan Approval are key mechanisms to obtain any necessary road widening for implementation of Complete Streets, including cycle lanes, sidewalk widening, central medians, green boulevards, and street tree plantings*
- *Schedule 'C' Road System Plan should be updated to reflect future road network projects*
- *New OP Schedule should be created for cycling and trail network – "Cycling and Trails Plan"*

The County of Hastings should be requested to coordinate amendments to adjacent Township Official Plans to protect the future roadway corridors recommended in the Transportation Plan from encroachments that would restrict or constrain the planning and development of potential roadway alignments. Such encroachments may involve severances, property rezoning applications, Official Plan policy amendments, or development permit approvals.

16.3 Sources of Funding

The Transportation Master Plan includes an ambitious program of cycling and road network improvements. Funding such improvements will be a key challenge for the City as it moves into the implementation phase of the Plan.

There are a number of alternative ways of funding transportation projects beyond traditional revenue sources. These options include:

- Public / private funding programs
- Development charges
- User fees

Funding is available from both the public and private sector for transportation projects via formalized funding programs. Capitalizing on this funding requires significant coordination and ongoing research, as programs are constantly evolving. Funding sources at the federal level currently include programs offered through Infrastructure Canada and Environment Canada. Within Infrastructure Canada, the Building Canada Fund, Gas Tax Fund, and Green Infrastructure fund are particularly relevant to the Belleville TMP. The EcoAction Community Funding Program offered by Environment Canada funds projects.

that address clean air, clean water, and climate change and may therefore be a potential funding source for projects that promote active and sustainable transportation.

Funding at the provincial level exists through the Infrastructure Ontario Loan Program and the Ontario Trillium Foundation program. The Infrastructure Ontario Loan Program is available to finance infrastructure renewal projects that deliver value to customers and residents. The Ontario Trillium Foundation Program supports organizations in the arts and culture, environment, human and social services, sports, and recreation sectors. Private sector funding also exists with the goal of supporting positive changes in communities, municipal sustainable development, and environmental preservation. A list of potential funding sources with links to each programs' website can be found in Appendix R.

In addition to established programs, significant funding programs occasionally get rolled out unexpectedly – be it for political reasons or in response to unfavorable economic conditions. To capitalize on such programs, it is important to be prepared. This often means having the borrowing capacity to match funding put forward by senior levels of government when the opportunity arises.

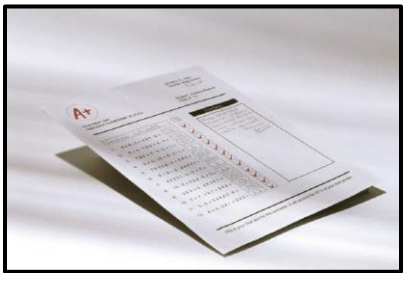
Development charges are another critical way of funding transportation infrastructure within developing parts of the City. Given that infrastructure needs are essentially triggered by development growth, it is imperative that development charges – be it for residential or commercial developments - reflect the true cost of the infrastructure modifications necessary to accommodate such growth. Development charges can also be used as a policy tool as well as a funding mechanism to encourage infill growth over traditional suburban or greenfield development.

User fees are an alternative funding approach based on the premise that those using a service (or piece of infrastructure) should be the ones to pay for it. All levels of government are looking at ways to expand user fees for transportation beyond transit fares, parking charges, vehicle licensing fees, and gas taxes. In addition to funding more of the City's transportation expenditures, user fees can also act as price signals that actively shift demand from less desirable travel behaviours to those that are more sustainable. A review of user fees would help to identify alternative user pay approaches and assess their technical feasibility as well as their impact on other goals related to equity, efficiency, economic growth, and public acceptance.

In order to capitalize on the above opportunities, the City Treasurer is encouraged to assess and pursue alternative funding sources for roads, cycling, and pedestrian facilities. The City Treasurer is also encouraged to ensure that adequate funding is available to deliver planned services and infrastructure investments—that is, a long range financial plan is in place incorporating reasonable assumptions that respect established fiscal policies, as the City must ultimately prioritize and allocate investment among many competing demands. A long-range financial plan must take into account all capital and operating costs as well as revenue sources.

16.4 Assessment of Progress

The success of long-range plans depends on the ongoing monitoring of relevant conditions, actions, and impacts. The City must remain aware of its progress toward key objectives so that it can add, modify or delete priorities as needed.



An annual "report card" can inform budget deliberations and align short-term actions and investments with long-term plans. The report card should reflect the goals and objectives of this Plan and its component strategies.

The structure of the report card, and the indicators used for tracking progress, should emphasize new areas of focus or priority to ensure that the City moves from the

current state to the desired state. For example, given the increasing emphasis on sustainable transportation in general, and cycling in particular, the City may adopt cycling-specific indicators that are supply-based (e.g. lane-kilometers of off-road or on-road cycling lanes) or outcome-based (e.g. percent of trips to work or school using bikes during the cycling season).

16.5 System Monitoring

Annual trends in transportation services, expenditures, activity levels, impacts, and other key features of the transportation system should be measured and reported upon.

On-going monitoring of the transportation system is necessary to ensure that performance standards are met, service delivery is efficient, and expectations and concerns of residents and businesses are addressed. This often requires the City to undertake travel surveys, traffic counts at key intersections and road segments, and attitudinal surveys. It also requires the City to review collision data to identify hazardous locations that require improvements and mitigation.

Conscious effort should be made to ensure that any data collection effort take into account all modes of transport. Surveys on motor vehicle activity should be combined with surveys on cycling activity and transit ridership to form a comprehensive and current picture of transportation mode patterns and trends in the city. Such information is of much value to inform the development and modification of programs and services, which can be just as important, in terms of effectiveness, as capital intensive improvements.

On-going monitoring makes it possible to compare the City's performance against similar-sized cities in Ontario to ensure the efficient operation of the transportation system. The City already prepares annual reports on the operation of its road network and transit system under the Municipal Performance Measurement Program (MPMP). These reports provide the City with the means and ability to benchmark its performance against other municipalities in Ontario. As such, these reports not only demonstrate the value that City residents receive for their tax dollars but can also be used to identify areas where improvements may be sought.

In selecting peer municipalities and interpreting results from any municipal benchmarking exercise, care should be taken due to the broad range of factors that can influence observed performance levels. Some of the key factors that can affect transit and road network performance are presented in Appendix Q, based on information from the Ontario Municipal Benchmarking Initiative (OMBI).

16.6 Updating the Transportation Master Plan

The Transportation Master Plan should be updated on a regular basis, and would ideally align with the Official Plan update cycle. The timing and extent of such reviews should remain flexible to reflect the pace of development activity, shift in municipal policy or priorities, and any emerging provincial obligations.

If any significant changes are made to the growth projections or associated land use assumptions (in terms of distribution or intensity), an update to the Plan should be undertaken. This would entail updating the City's transportation model with the new growth data, re-establishing system deficiencies, and evaluating alternative solutions.

Ideally, updates to the Plan should follow a five-year interval, but at the maximum, should not extend beyond a ten-year interval.

16.7 Recommendations

The implementation of the Transportation Master Plan is supported by the following recommendations, which will help the City to proactively manage change as Belleville grows and evolves over time.

Recommendation # 10	**Proactively manage change.**
10.1	**Update the Transportation Master Plan every 5 to 7 years** to ensure the plan is responsive to changes in land use, demographics, government policies, and technology, as well as changing attitudes and behaviours.
10.2	**Prepare an annual "report card" to assess progress made against the recommendations put forward in the Transportation Master Plan.**
10.3	**Carry out regular monitoring of the transportation system.** Such monitoring should be targeted at specific areas of concern, and may include speed surveys; review of pedestrian, cyclist, and motor vehicle collision data; and traffic counts.

17 Glossary

A

Accessibility – The extent to which persons with disabilities can navigate a facility with ease as a result of planning and design features which eliminate barriers.

Active Transportation – Active transportation is a general term for the use of non-motorized travel modes which are powered by human energy such as walking, running, cycling, manual wheelchairs and rollerblading.

Arterial – A high capacity route intended primarily to provide mobility, which is designed to accommodate large volumes of traffic moving at medium to high speeds. An example of an arterial street in Belleville is Cannifton Road.

B

Boulevard – Refers to the area between the curb of a roadway and the sidewalk (can be either grass or paved).

Built Environment – The combination of buildings, infrastructure and other fixed elements which make up the physical environment of a community or neighbourhood.

C

Capacity – The number of vehicles that can reasonably be processed along a roadway or through an intersection in a given period of time (typically hourly).

Carpool / Rideshare – Programs which encourage two or more users to travel together, reducing the number of single occupant vehicles on the road.

Cash-in-lieu of Parking – These programs allow developers to pay the City to forego part of the by-law requirements to provide parking spaces. The funds are typically used to provide parking in City lots or redirected to improve transit service or other sustainable modes.

Collector – A roadway which collects traffic from local streets to provide access to an arterial road. A collector provides a combination of mobility and land access. Tracey Street is an example of a collector street in Belleville.

Complete Streets – Complete streets are roadways designed and operated to enable safe access for all users. Pedestrians, cyclists, motorists and transit riders of all ages and abilities must be able to safely move along and across streets. **Cycling Lanes** – Cycling lanes provide a striped travel lane to provide a separate operating space for bicycle traffic and a continuous visual reminder to drivers of the presence of cyclists.

Cycling Track – A cycling track is a segregated on-street bike lane, separated from other traffic lanes by a physical barrier (can be uni-directional or bi-directional); in some cases, may consists of a raised bike lane, elevated several centimeters above the adjacent traffic lanes.

D

Delay – The additional travel time experienced by a vehicle due to congestion, traffic control devices, poor weather, or other factors.

G

Goods Movement – The transport of products by any mode (road, rail, etc.).

L

Level of Service – A concept which is used to quantify travel conditions along a given corridor or intersection. The level of service concept is most commonly used for vehicular travel however it can also be applied to non-motorized modes. For vehicular travel along a roadway, LOS 'A' is indicative of free flow conditions and LOS 'F' is indicative of congested conditions. LOS 'E' typically corresponds to a volume-to-capacity ratio of 0.9 and is often used as a threshold for identifying when modifications to the road network may be warranted.

Local Street – A low capacity, low speed roadway with the primary function of providing access to properties and destinations, rather than providing mobility for through traffic.

M

Measure of Effectiveness (MOE) – Criteria which are used to measure how well a given alternative achieves key mobility, economic, and environmental objectives for the transportation system

Mixed-Use – Neighbourhoods which are planned to combine a number of different land uses in order to improve the walkability and liveability of a community, while decreasing demand on the road network. Mixed-use may also be applied to buildings which combine multiple functions (i.e. dwelling units and ground floor commercial units).

Mode share / Mode shift – Mode share refers to the percentage of people using a particular mode of travel (i.e. transit, walking, cycling, driving, etc.). Mode shift attempts to shift users away from single occupant vehicles to more sustainable modes of transportation.

Multi-use pathways – Shared-use trails typically intended for all modes of active transportation, typically with maximum speed limits around 20 km/hr to promote pedestrian safety.

Municipal Class Environmental Assessment (EA) – The Municipal Class EA is a planning process that must be followed for meeting the requirements of the Environmental Assessment Act for specific infrastructure projects.

N

Neighbourhood Traffic Management – A program aimed at improving the safety and liveability of a neighbourhood through the implementation of a combination of strategies, tools and infrastructure changes (generally referred to as traffic calming) which reduce cut through traffic, slow speeds, and provide preferential treatment for active and sustainable modes of transportation.

P

Peak Period / Hour – The period (i.e. 6:30 AM to 9:30 AM) or hour (i.e. 8:00-9:00 AM) when the greatest number of users rely on an element of the transportation network (i.e. roadway, bus route, etc.).

R

Right of Way (ROW) – The limits of ownership along a particular corridor. In a typical street cross section, a municipality's right of way includes the roadway, sidewalks and boulevards.

S

Screenline – A screenline is a fictitious line which is used to determine the total traffic moving across certain key barriers (i.e. rivers and railways) or moving through a particular area in a city (i.e. into/out of the downtown), along a number of roads or routes. Screenlines are used in calibrating transportation models since they provide an aggregated level of travel demand.

Shared-Use – Shared-use facilities require multiple modes to operate in the same right of way. Examples include an HOV lane which allows taxis and buses to use the lane, or a traffic lane with shared operation between cyclists and vehicles.

Short Term / Long Term Parking – Short term parking typically refers to parking with durations less than two hours, with anything over this deemed to be long term parking.

Single Occupancy Vehicles (SOVs) – Trips made with only one person in a vehicle (i.e. a driver and no passengers).

T

Transit Priority Measures – Transit Priority measures are techniques employed to improve service for transit users, such as HOV lanes, transit signal priority at traffic signals, and segregated transit infrastructure.

Transportation Analysis Zone (TAZ) – A transportation analysis zone refers to a specific geographic area (neighbourhood, business park, etc.) used in the transportation

modelling process. Zones are generally defined to have similar levels of either employment or population and can therefore vary greatly in size due to variations in land use density. In establishing zones, areas with similar characteristics and land use types are grouped together, using major roads and natural features as zone boundaries.

Transportation Demand Management (TDM) - Transportation demand management (TDM) aims to create a more efficient transportation system by promoting active and sustainable modes and introducing land use policies that are conducive to these modes. TDM works by shifting trips away from single occupancy vehicles to alternatives such as walking, cycling, transit, and carpooling, shifting the time of travel to when the network is less congested, and reducing the total number and length of trips.

Transportation Master Plan – A transportation master plan is a long-range planning document which sets out recommended policies, programs, and infrastructure projects to support existing and future development within the community.

Transportation Systems Management – Includes a variety of strategies aimed at improving the overall performance of the transportation network without resorting to large-scale, expensive capital improvements.

V

Volume – Volume refers to the number of vehicles, cyclists or pedestrians along a roadway, pathway or intersection in some period of time. The most common vehicular volumes used for planning purposes include the number of vehicles per hour (vph or veh/hr), and the annual average daily traffic (AADT).

Volume-Delay Function – A formula which accounts for the delays experienced on a roadway as a result of increasing traffic volume. It determines the impact of traffic congestion on the average travel speed and is used in the trip assignment process of transportation models