CHAPTER 3

Transportation Tomorrow:

A Complete Streets Approach

Chapter 3.0 introduces the "Complete Streets" framework of transportation planning in the City of St. Catharines. As a mature City with a well-established transportation network, the existing system serves current vehicle capacity needs and is expected to serve future vehicle capacity needs, with select enhancements to the network. A well functioning network for cars and trucks provides the opportunity to shift the focus of future plans to more sustainable modes of travel to help ensure that multiple modes of travel are convenient with a reasonable travel time and cost.

Mobility improvements and a better integration of a multi-modal uses is the future of transportation in the City. The City needs to provide accessible and affordable solutions by altering how the City plans, designs and implements transportation infrastructure.

The new transportation planning approach, presented in Chapter 3.0, is intended to help shift the paradigm to be people-first, meaning the transportation network will prioritize the people that move through the system via a framework of policy guidance, reimagining the road classifications through complete streets and community-based education and engagement to promote sustainable travel behaviour.

Chapter 3.0 includes...

3.1 Shift in Approach
Introduces the concept, vision and objectives of the Complete Streets approach and how this approach will be carried out in St. Catharines.

3.2 Completing the Street
Provides a breakdown of the multi-modal considerations and classification process as well as an overview of the 10 complete streets classifications proposed for the City.

3.3 Multi-modal Integration
Provides a breakdown of specific modal improvements for walking and cycling, transit and goods movement.

3.4 Shifting Behaviour
Introduces community-based transportation demand management as a means to shift travel behaviours to be more multi-modal and sustainable.

3.5 Sustainable Future
Discusses the future of sustainable and resilient transportation in St. Catharines.

3.1. A Shift in Approach

A complete streets focused approach to transportation planning and design is embodied in the vision / opportunity statement for the TMP, which is:

*St. Catharines is looking to implement a Complete Streets approach that shifts towards a **user focused system**, placing emphasis on the **sustainable and strategic movement of people & goods**, inclusively and efficiently.*

This will require significant behaviour, systemic and process change. The contents of this section provide an overview of how the City of St. Catharines can address and integrate this shift into day-to-day practice.

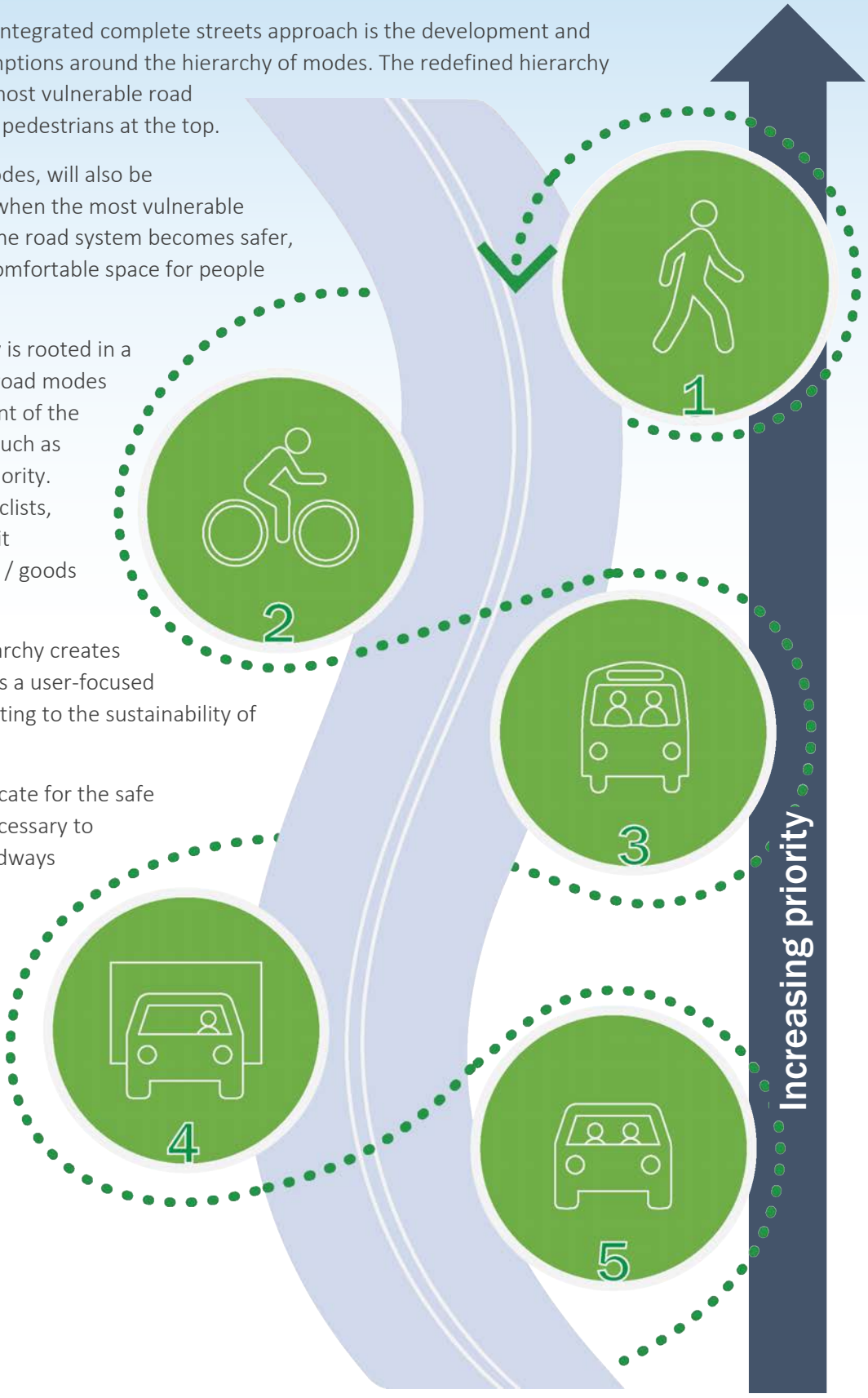
The foundation of the City's integrated complete streets approach is the development and adoption of redefined assumptions around the hierarchy of modes. The redefined hierarchy protects and prioritizes the most vulnerable road users, fundamentally placing pedestrians at the top.

Bicycles, and other active modes, will also be prioritized; recognizing that when the most vulnerable road users are planned for, the road system becomes safer, more inclusive and a more comfortable space for people to function.

Given that the new hierarchy is rooted in a people-based approach, on-road modes that emphasize the movement of the greatest number of people, such as transit, will receive higher priority. Following pedestrians and cyclists, priority will be given to transit followed by on-road trucking / goods movement and vehicles.

The new transportation hierarchy creates an environment that provides a user-focused approach while also contributing to the sustainability of the future network.

While complete streets advocate for the safe integration of modes, it is necessary to acknowledge that not all roadways are appropriate for use by all modes of travel. Complete streets is about creating an interconnected network so that people can travel safely and conveniently by whatever mode they choose.



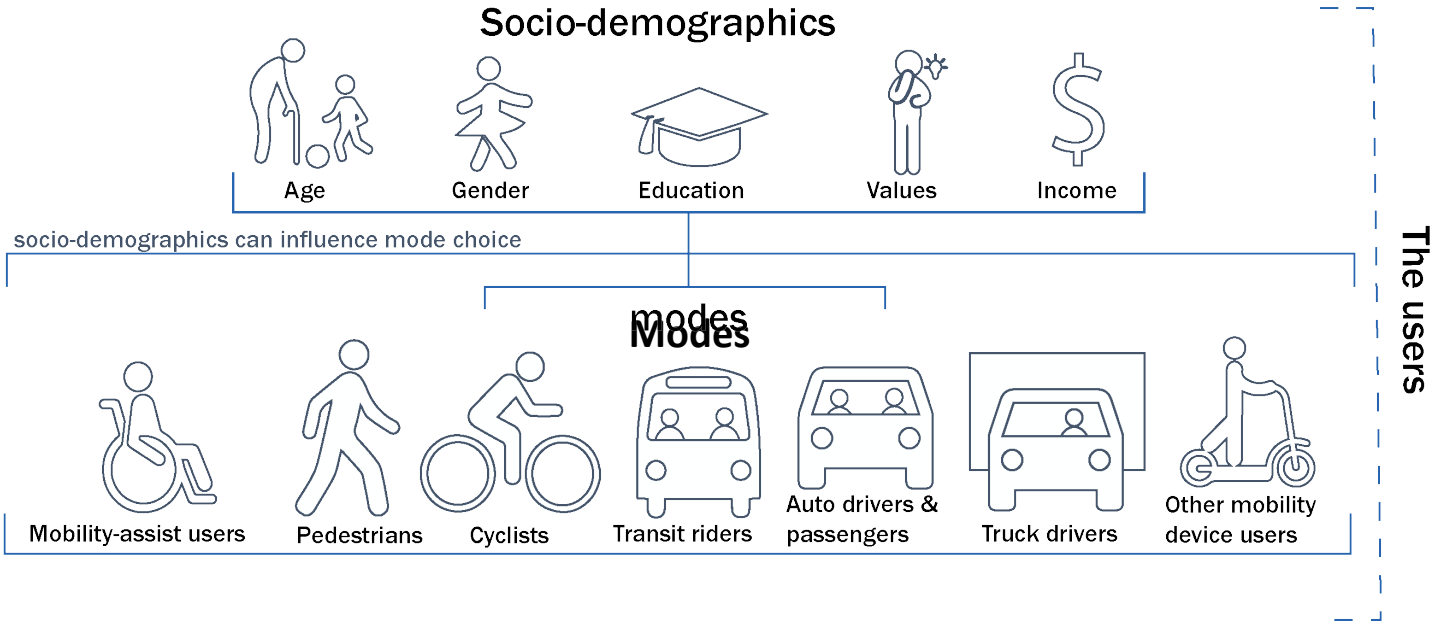
In order for complete streets to be an effective means of cultural shift, a wider definition of road user should be assumed:

> *A road user shall be defined as any demographic or mode that interacts with the public right-of-way. These include pedestrians, cyclists, public transit users and motorists (including private vehicles, freight, commercial, and emergency services). Emphasis is placed on considering vulnerable groups such as children, seniors or people with disabilities, which can be users of any or some of these modes. As a general rule, a facility that supports the mostvulnerable users will support everyone.*

however

The impact of socio-demographics on modal choice cannot be denied. Although the primary vision of this TMP is to consider and address each mode equally it also has been developed with the intent of making it accessible and attractive to all populations. To achieve this, it is important to note the strong impact socio-demographics plays in influencing the choices that we identify as our preferred modes. While there are a range of different factors which could influence modal choices and preferences, **Figure 18** illustrates some including age, gender, education, income and personal values.

Figure 18. Different socio-demographic influences on modal choices



3.1.1. The Complete Streets Framework

The complete streets framework will be the City's tool to support cohesion between the existing road network, transit routes, active transportation facilities and land-uses, while helping to achieve a more sustainable and resilient community.

The framework builds upon existing policies and guidelines that have been developed and adopted by Regional and City Council and seeks to provide the tools to realize and actualize those policies in the local context.

The framework is developed in response to a need for a systemic shift in thinking around transportation due to climate change and broader sustainability objectives.

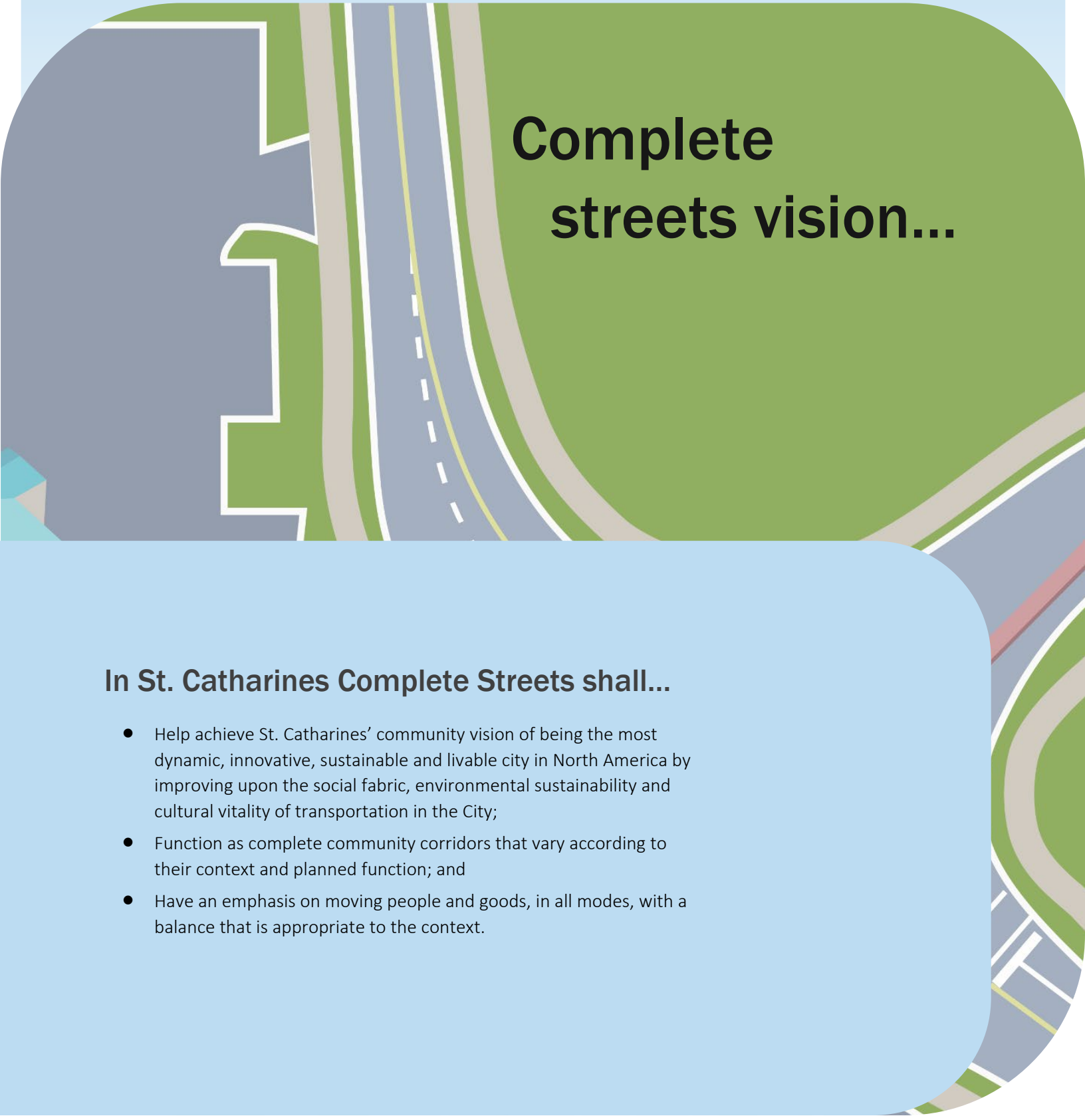
The vision and objectives are supported and realized by three key elements:

Guidance: in addition to embedding complete streets policies into the foundation of the TMP and other municipal policy documents such as the Official Plan, a new **road classification** system will be the foundation for embedding complete streets into the planning and design process;

Implementation: the new classification system should be considered and applied in the context of new road projects, road reconstruction, or retrofitting projects. A process to determine the appropriate road classification such as **classification application** for the anticipated project has been defined to support the implementation of complete streets City-wide; and

Education: how transportation users' behaviours will be shifted towards more sustainable travel patterns by community focused and audience specific **promotion tactics**, also known as transportation demand management and community based social marketing.

These three elements are fully described and presented on the following pages.

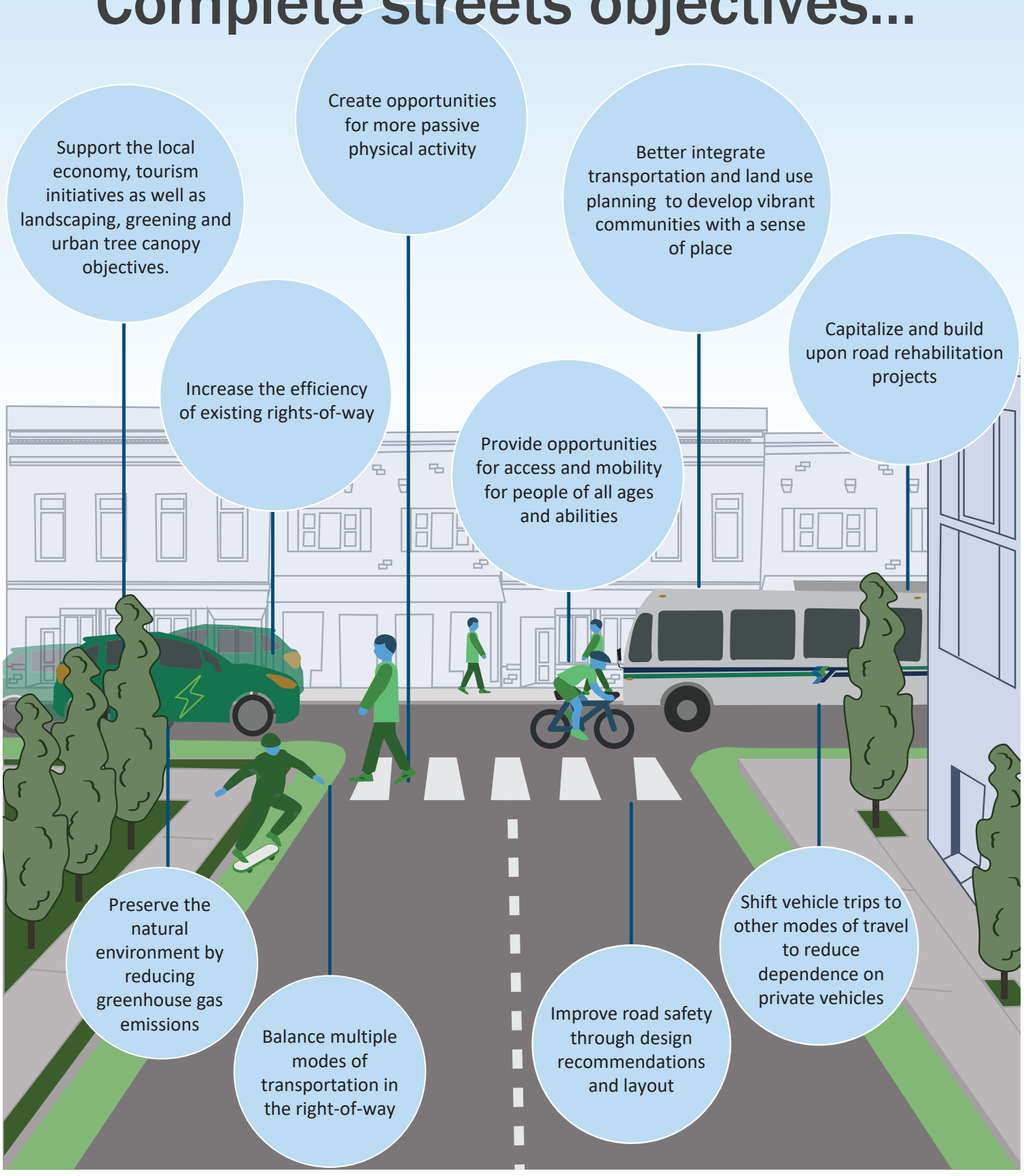


Complete streets vision...

In St. Catharines Complete Streets shall...

- Help achieve St. Catharines' community vision of being the most dynamic, innovative, sustainable and livable city in North America by improving upon the social fabric, environmental sustainability and cultural vitality of transportation in the City;
- Function as complete community corridors that vary according to their context and planned function; and
- Have an emphasis on moving people and goods, in all modes, with a balance that is appropriate to the context.

Complete streets objectives...



3.2. The Art of Completing the Street

A city's road classification informs the street characteristics and ultimately how streets are designed, such as the posted speed, number of lanes, lane width and sidewalk requirements. The road classification is the basis upon which all roadway design decisions are made. To establish a multi-modal community, changes needed to be made to the City's existing road classification typographies as well as the overall approach to planning and design.

The approach that was used to identify and define the new road classification system and the outcomes of the process are summarized in the following sections. The updated road classification system focuses on the movement of people first followed by goods with underlying principles of user comfort, safety and land-use. This plan recognizes the importance of maintaining a compact and highly connected network of streets to promote walkability, network permeability and resiliency. The City will complete gaps in the street networks where feasible and will ensure that street patterns for new development are generally based on a connected grid pattern, characterized by short blocks and a high level of connectivity with adjacent streets. New private roads will generally be limited to small infill sites. Larger redevelopment parcels should be subdivided in order to establish a connected network of public streets rather than insular enclaves. In order to achieve a more complete active transportation network, the City will require, as a condition of development approvals, the provision of walkway connections and private road sidewalks to bridge the interface between the public and private realm.

3.2.1. Multi-modal Considerations

Changing the system one mode at a time...

The existing road classification defines how the street will operate for cars by focusing on the roadway width and the volume of vehicles.

The updated classification considered each transportation mode by anticipating the function each mode will play based on the context of surrounding land-use, major destinations, and typical users.

Within each classification there are considerations for pedestrian, cyclist, buses, trucks, and private vehicles on the street; with the understanding that each road type will accommodate modes differently. The following is a high-level description of how each of the modes has been considered.

Pedestrian Consideration

It is fundamental to plan for pedestrians with the understanding that pedestrians are the most vulnerable road users. In the St. Catharines context, pedestrian facilities consist primarily of sidewalks and off-road trails. The level of usage, destination access and connectivity are considered when determining the need for expanded or enhanced pedestrian facilities. It is important to provide infrastructure that links to residential areas, urban areas and nodes of development and services such as schools, hospitals and community centres. In rural areas, where there may be low volumes of pedestrians and the cross-section is not urbanized, a sidewalk is not required. However, a trail or off-road facilities to connect other parts of rural areas could be considered along with the potential for combined pedestrian and cyclist use within a paved shoulder space. Increasingly, paved shoulders are now being promoted as both cycling and pedestrian linkages and can be signed in a way to encourage connectivity between the rural and urban areas.

Cyclist Consideration

Consistent with Ontario Traffic Manual Book 18, the appropriate cycling facility is determined by the difference in operating speed between cyclists and motorists, average annual daily traffic volume, available space, the level of existing bicycle use and anticipated users. For example, when the operating speed between the cyclists and motorists is high and there is a large volume of vehicles on the roadway (greater than 15,000 vehicles a day), a separated or designated facility is recommended where the space is signed for exclusive use by a cyclist.

Transit Consideration

Local transit is fundamental for connecting multiple destinations and communities within St. Catharines. As transit continues to expand throughout the City and Region, an increased focus will be given to providing accessible infrastructure (concrete transit stop pads) and clear signage. Transit usage is typically determined by the destination, the directness of the route (the time spent travelling) and the frequency of the service. If there is a high commuter demand for a specific route, a more direct connection along major arterial and collector roads may be appropriate. Local connectivity should be assessed based on available space relative to the need for service.

Goods Movement Consideration

Goods movement is an integral part of the transportation system. While efficient and effective goods movement is important to support economic vitality and equitable access of amenities, it is also crucial to determine appropriate routes to mitigate the impact of goods movement through St. Catharines.

3.2.2. Complete Streets Guidance

Ten new road classifications were identified which reflect the varying and unique conditions found throughout the City. The classifications were determined through extensive research and discussions with City staff. A number of inputs were considered in the reclassification of the roadway network including:

- Alignment with strategic municipal documents;
- Optimization of the transportation network;
- Overall TMP objectives;
- The City's previous road classification; and
- Overall goals for goods movement, active transportation and transit.

A total of ten typologies were identified for adoption by the City of St. Catharines. The ten typologies are further organized into five categories which were determined through the identification and consideration of criteria including annual average daily traffic, posted speed limits, rural versus urban rights-of-way design, right-of-way width, surrounding land-use, opportunities for new or planned development and the proximity to or location within the urban growth boundary.

An overview of the ten categories including detailed specifications are provided on the following pages including sample cross sections found later in this section. A map showing the City streets and their proposed road classifications is provided in **Map 5**. These specifications are meant to inform the types of infrastructure and modes that could be accommodated along the corridor, recognizing that the complete streets approach is on a network basis and does not mean that all modes can or should be accommodated along each and every road in the City.

The complete streets road classification approach that has been identified for the City of St. Catharines acknowledges and accommodates users when the conditions and contexts are appropriate, that when combined create a cohesive network for all. The urban boundary is defined by the Urban Area in the Region of Niagara Policy Plan. This area is intended to provide urban development opportunities and support the majority of the projected growth. Similarly, Niagara Region has defined the Downtown area as an Urban Growth Centre. This area fosters a sense of walkability and supports public gatherings. As the area with the highest concentration, density and variety of entertainment, housing and employment, the projected growth in this area is also higher. New streets within this urban boundary are generally to be constructed with an urban cross-section. It is City policy to only convert arterial and major collector streets to an urban cross section, however exceptions may be made for local streets that experience issues such as drainage problems. While not identified as a street type in the road classifications, rear laneways are recognized as a desirable means to promote the creation of active and pedestrian friendly streets and may be most appropriate in locations where direct street access for private driveways should be avoided.

Sample cross sections shown are intended to be an adaptable guide. Specific dimensions and elements are to be determined through detail design on a case by case basis. Notwithstanding the right-of-way widths for the road classifications described in this plan, the City may, where appropriate, waive or reduce widening requirements where a road widening would otherwise result on a development pattern detrimental to the established character of the street.

This plan recognizes the importance of streets, particularly downtown streets, in accommodating festivals and special events through temporary closures. Such closures will be generally be supported where feasible.

Local	1	a	Community Street		
Downtown	2	a	Downtown Corridor	b	Downtown Community Street
Collector	3	a	Collector Mixed-use Corridor	b	Collector Residential Corridor
Collector-Industrial	3	c	Collector Industrial Corridor		
Arterial	4	a	Main Mixed-Use Corridor	b	Main Residential Corridor
Rural	5	a	Rural Corridor	b	Rural Community Street

Map 5
St. Catharines Proposed Road Classification Map

LAKESHORE ROAD WEST
MAIN STREET
LAKEPORT ROAD
ONTARIO STREET
LINWELL ROAD
NIAGARA STREET
LAKESHORE ROAD
WELLAND CANALS PARKWAY
SCOTT STREET
BUNTING ROAD
GENEVA STREET
QUEEN ELIZABETH WAY
MARTINDALE ROAD
7TH STREET LOUTH
LAKE STREET
WELLAND AVENUE
QUEENSTON STREET
HIGHWAY 406
HARTZEL ROAD
LOUTH STREET
GLENRIDGE AVENUE
MERRITT STREET
GLENDALE AVENUE
ST PAUL STREET WEST
5TH STREET LOUTH
SIR ISAAC BROCK WAY
PELHAM ROAD

Road Classification

- Category 2a: Downtown Corridor
- Category 3a: Collector Mixed Use
- Category 3b: Collector Residentail
- Category 3c: Collector Industrial
- Category 4a: Main Mixed Use
- Category 4b: Main Residential
- Category 5a: Rural Corridor
- Community Road
- Regional Road
- Provincial Road
- Urban Boundary

1a Community Streets

1a: Community Street

Description:

Community Streets are local roads that are expected to accommodate lower traffic volumes at low-speeds. These roadways are surrounded by residential, or small residential-oriented commercial.

Right-of-way Width:	20 m
Legal Speed Limit (km/h):	40 – 50
Minimum Peak Period Lanes:	Two

Complete Streets Application:

- Sidewalk on both sides of the street. Additional pedestrian realm enhancements may be explored / considered
- Pedestrian crossings at signalized intersections or unsignalized intersections in accordance with OTM Book 15
- Preferred shared cycling facility including shared street or a bikeway boulevard where additional traffic calming and amenities / wayfinding and signage may be considered
- Limited transit
- In limited situations, on-street transit stops with accessible concrete pads
- Community traffic calming measures including on-street parking, narrowed lanes, chicanes, and signage
- Emphasis on local streetscaping including street trees
- Through trucks prohibited
- Local delivery allowed

2a Downtown Corridor

2b Downtown Community Street

2a: Downtown Corridor

Description:

Downtown corridors may accommodate moderate volumes of traffic. They represent streets that play a vital role in the neighbourhood in St. Catharines transportation network and are a high priority for pedestrians, cyclists, and transit. They are surrounded by commercial, institutional, and mixed-use development. Merritt Street between Oakdale Avenue and Glendale Avenue and the City section of Lakeport Road/Main Street in core Port Dalhousie are considered under this classification as they share similar characteristics.

Right-of-way Width:	Min 20 m
Legal Speed Limit (km/h):	40 - 50
Minimum Peak Period Lanes:	Two

Complete Streets Application:

- Sidewalks on both sides of the street
- In accordance with OTM Book 18, facilities could range from designated to separated facilities; however, the context may be appropriate for an enhanced bikeway boulevard if the posted / operating speed is lowered
- General pedestrian and cycling realm enhancements should be considered where appropriate including bicycle parking and repair stations, benches / rest areas, wayfinding and pavement markings
- Pedestrian crossings at signalized intersections or unsignalized intersections in accordance with OTM Book 15
- Where transit is required refer to OTM Book 18 for additional design considerations to prevent conflict between separated facilities and transit routes
- Transit in mixed traffic, with transit given priority where feasible
- Covered transit shelters where ROW permits
- Transit queue jump lanes
- Accessible concrete pads at transit stops
- On-street transit stops
- Emphasis on enhanced streetscaping including street furniture, lighting, street trees and shrubbery
- On-street parking encouraged
- Prioritized candidates for re-imagining on-street parking in off-peak hours
- Prioritized candidates for public art streetscape improvements
- Prioritized candidate for placemaking initiatives
- Limited through trucks and off-peak deliveries only

2b: Downtown Community Street

Description:

Downtown Community Streets may accommodate lower volumes of traffic. These roadways connect Downtown neighbourhoods to surrounding commercial areas, collector and arterial streets and are a high priority for pedestrians and cyclists.

Right-of-way Width:	Min 20 m
Legal Speed Limit (km/h):	40 - 50
Minimum Peak Period Lanes:	Two

Complete Streets Application:

- Sidewalks on both sides of the street
- Where possible, consideration for the inclusion of a multi-use pathway in place of a sidewalk and on-road cycling facility. If route provides access to a major trail a multi-use trail may be considered
- Where the ROW permits, preferred shared or designated cycling facility including bicycle lane, buffered bicycle land or advisory bike lane. For shared facilities additional signage may be considered to enhance awareness
- General pedestrian and cycling realm enhancements should be considered where appropriate including bicycle parking and repair stations, benches / rest areas, wayfinding and pavement markings
- Pedestrian crossings at signalized intersections or unsignalized intersections in accordance with OTM Book 15
- Transit in mixed traffic
- Accessible concrete pads at transit stops
- On-street transit stops
- Emphasis on enhanced streetscaping including street furniture, lighting, street trees and shrubbery
- Community traffic calming measures including on-street parking, narrowed lanes, chicanes, and signage
- On-street parking encouraged
- Limited through trucks and off-peak deliveries only

3a Collector Mixed-use Corridor

3b Collector Residential Corridor

3a: Collector Mixed-Use Corridor

Description:

These roadways are expected to carry higher volumes than Residential Collector Corridors. They are bounded by a variety of land-uses such as residential, commercial, industrial, or institutional.

Right-of-way Width:	Min 20 m
Legal Speed Limit (km/h):	40 – 50
Minimum Peak Period Lanes:	Two to Three

Complete Streets Application:

- Sidewalks on both sides of the street
- Pedestrian crossings at signalized intersections or unsignalized intersections in accordance with OTM Book 15 within appropriate context
- Implementation of cycling amenities (bike racks) within appropriate context as well as complementary signage and wayfinding
- Transit in mixed traffic
- Accessible concrete pads at transit stops
- On-street transit stops
- On-street parking permitted
- Through trucks permitted

3b: Collector Residential Corridor

Description:

Collector Residential Corridors are expected to carry a moderate volume of traffic. These roadways connect local neighbourhoods to arterial. A Collector Residential provides direct access to local residential neighbourhoods and institutions.

Right-of-way Width:	Min 20 m
Legal Speed Limit (km/h):	40 – 50
Minimum Peak Period Lanes:	Two to Three

Complete Streets Application:

- Sidewalks on both sides of the street
- If lower posted / operating speed, consider a designated operating space within appropriate context including a buffered bicycle lane in accordance with OTM Book 18
- Pedestrian crossings at signalized intersections or unsignalized intersections in accordance with OTM Book 15 within appropriate context
- Transit in mixed traffic
- Accessible concrete pads at transit stops
- On-street transit stops
- On-street parking permitted
- Limited through trucks

3c Collector Industrial

3c: Collector Industrial Corridor

Description:

Industrial corridors operate and connect industrial areas to the surrounding collector and arterial roadways. These roads carry moderate traffic, facilitating employee and heavy truck traffic movement throughout the industrial area.

Right-of-way Width:	Min 20 m
Legal Speed Limit (km/h):	50 – 60
Minimum Peak Period Lanes:	Two to Three

Complete Streets Application:

- Industrial sidewalks where required on both sides of the street
- Pedestrian crossings at signalized intersections or unsignalized intersections in accordance with OTM Book 15
- Where transit is required, refer to OTM Book 18 for additional design considerations to prevent conflict between separated facilities and transit routes
- Paved shoulders at 1.2 – 1.5m or paved shoulder with buffer 2.0 – 3.0m in accordance with OTM Book 18
- Where transit is required, refer to OTM Book 18 for additional design considerations to prevent conflict between separated facilities and transit routes
- Paved shoulders at 1.2 – 1.5m or paved shoulder with buffer 2.0 – 3.0m in accordance with OTM Book 18 or in urban areas
- Transit in mixed traffic
- Accessible concrete pads at transit stops
- On-street transit stops
- On-street-parking prohibited during peak hours
- Through trucks permitted

4a Main Mixed-Use

4b Main Residential

4a: Main Mixed-Use Corridor

Description:

Main Mixed-use Corridors are the most vital connecting roadways in the city. These roadways are expected and built to carry the highest traffic volumes. Main Mixed-Use Streets are bounded by a variety of land-uses such as residential, commercial, industrial or institutional.

Right-of-way Width:	20 – 26m
Legal Speed Limit (km/h):	40 – 60
Minimum Peak Period Lanes:	Two to Four

Complete Streets Application:

- Sidewalks on both sides of the street
- Preferred separated cycling routes in accordance with OTM Book 18 including separated bicycle lane, cycle track or multi-use path
- If lower posted / operating speed, consider a designated operating space including a buffered bicycle lane in accordance with OTM Book 18
- Pedestrian crossings at signalized intersections or unsignalized intersections in accordance with OTM Book 15
- Intersections may require additional pavement markings for cyclists, including cross rides, green pavement and guidance sharrows through the intersection
- Implementation of cycling amenities (bike racks), complementary signage and wayfinding
- Where cycling facilities and transit routes operate together, refer to OTM Book 18 for additional design considerations to prevent conflict between these modes
- Transit in mixed traffic, with transit given priority when feasible
- Covered transit shelters where ROW permits
- Transit queue jump lanes if required and if ROW permits
- Accessible concrete pads at transit stops
- Emphasis on enhanced streetscaping including street furniture, lighting, street trees where ROW permits
- On-street parking in bays or in curb lanes during off-peak
- Through trucks permitted

4B: Main Residential Corridor

Description:

Main Residential Corridors operate similar to Main Mixed-Use and Main Commercial Corridors. They can be surrounded and connect to residential neighbourhoods and institutions.

Right-of-way Width:	20 – 26 m
Legal Speed Limit (km/h):	40 – 60
Minimum Peak Period Lanes:	Two to Three

Complete Streets Application:

- Sidewalks on both sides of the street
- Separated cycling facilities including separated bicycle lane, cycle track or multi-use pathway in accordance with OTM Book 18. In select locations a parallel route may be more appropriate
- Pedestrian crossings at signalized intersections or unsignalized intersections in accordance with OTM Book 15
- Intersections may require additional pavement markings for cyclists, including cross rides, green pavement and guidance sharrows through the intersection
- Where cycling facilities and transit routes operate together, refer to OTM Book 18 for additional design considerations to prevent conflict between these modes
- Transit in mixed traffic, with transit given priority when feasible
- Covered transit shelters, where ROW permits
- Transit queue jump lanes if required and if ROW permits
- Accessible concrete pads at transit stops
- On-street parking in bays or in curb lanes during off-peak
- Emphasis on streetscaping including lighting, street trees and landscaped medians where ROW permit
- Through trucks permitted

5a Rural Corridor 5b Rural Community

5a: Rural Corridor

Description:

Rural corridors are streets that have a rural cross-section and generally are higher speed roads.

Right-of-way Width:	Min 15 m
Legal Speed Limit (km/h):	60 – 70 or 80
Minimum Peak Period Lanes:	Two

Complete Streets Application:

- Paved shoulders at 1.2 – 1.5m or paved shoulder with buffer 2.0 – 3.0m in accordance with OTM Book 18 if on the AT network or near pedestrian generator
- If available, adjacent multi-use pathway could be considered in accordance with OTM Book 18
- On-street-parking prohibited
- Through trucks permitted
- Transit typically not provided

5b: Rural Community Street

Description:

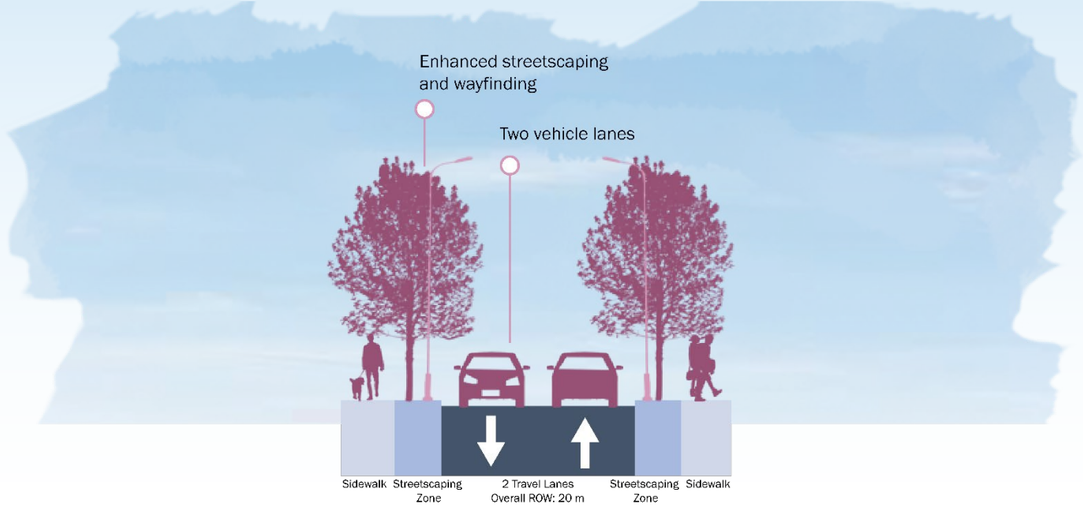
Rural Community Streets are links that generally move low volumes between rural neighbourhoods.

Right-of-way Width:	Min 15 m
Legal Speed Limit (km/h):	50 – 70
Minimum Peak Period Lanes:	Two

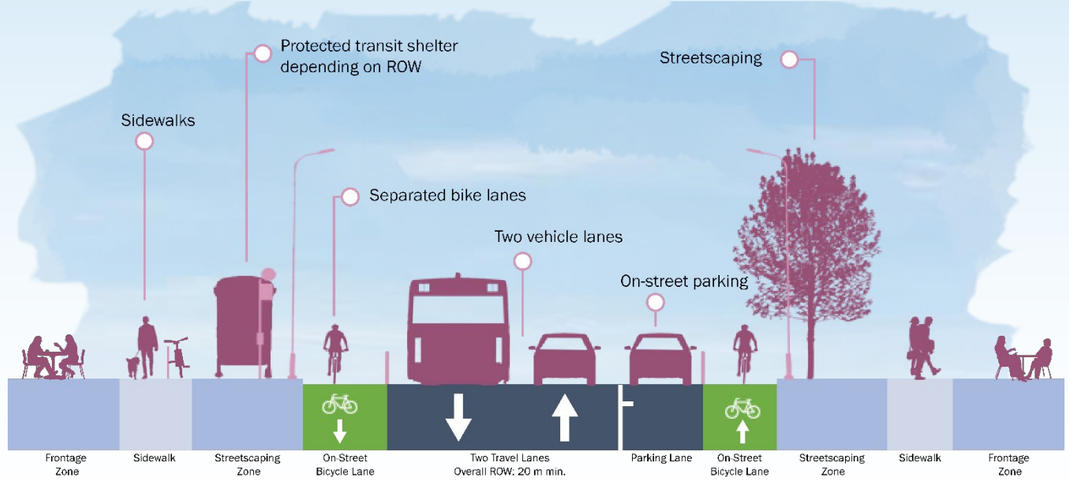
Complete Streets Application:

- Shared roadway to accommodate cyclists. Paved shoulders where feasible and based on actual operating speed and sightline conditions in accordance with Ontario Traffic Manual Book 18
- Pedestrians accommodated along parallel road or as part of the paved shoulder
- On-street parking prohibited
- Through trucks permitted
- Transit typically not provided

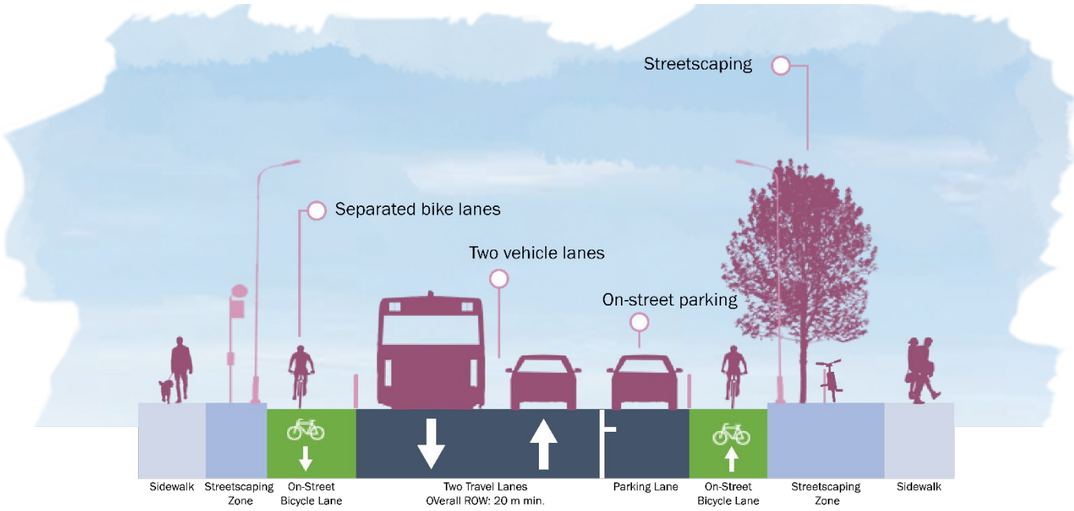
1a: Community Street



2a: Downtown Corridor



2b: Downtown Community Street

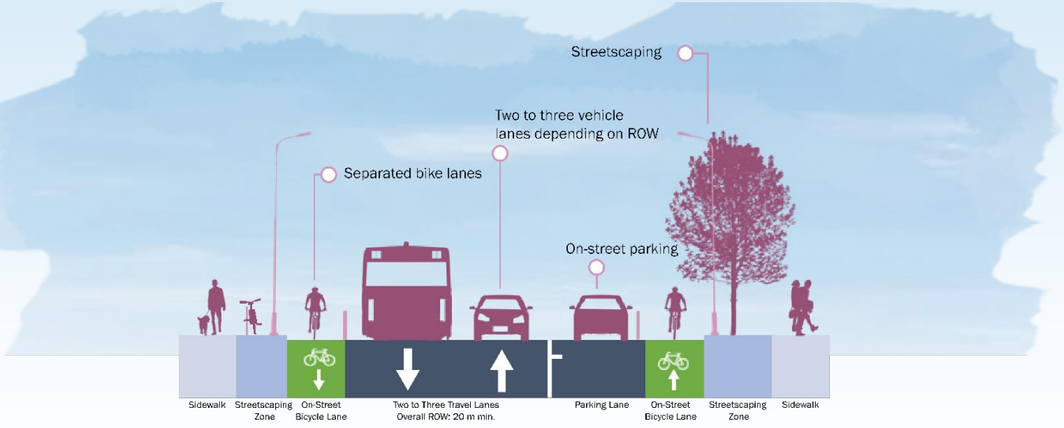


Note: On-street parking should be permitted in all urban classifications where feasible.

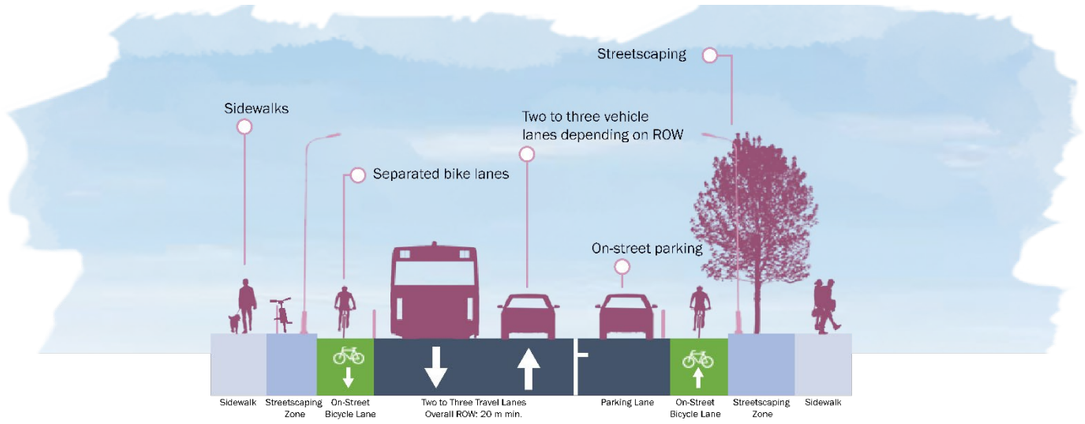
Pedestrian movement and comfort are the first priority within the downtown context.

Elements that support the use of streets for commerce (patios, sidewalk displays) are supported within the downtown context.

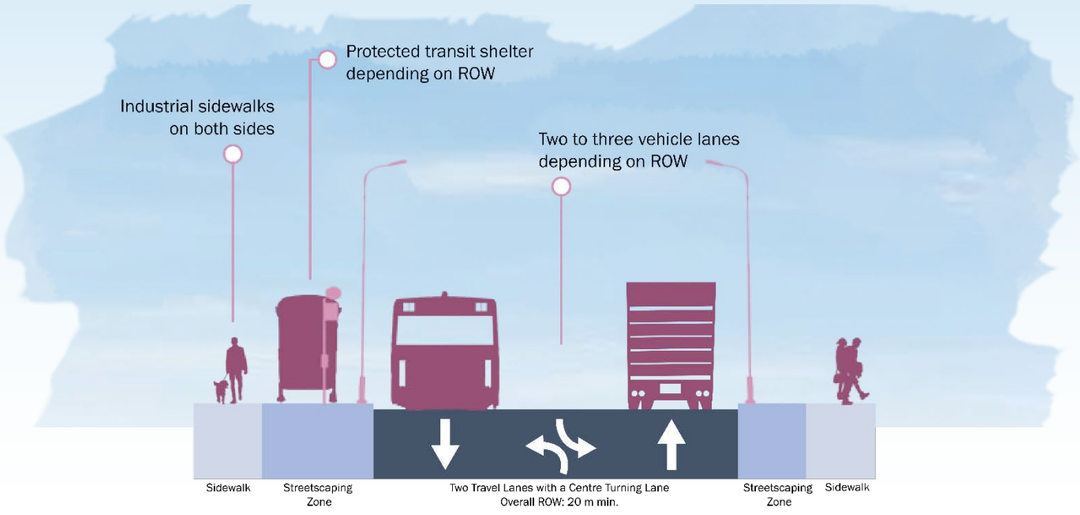
3a: Collector Mixed-use Corridor



3b: Collector Residential Corridor

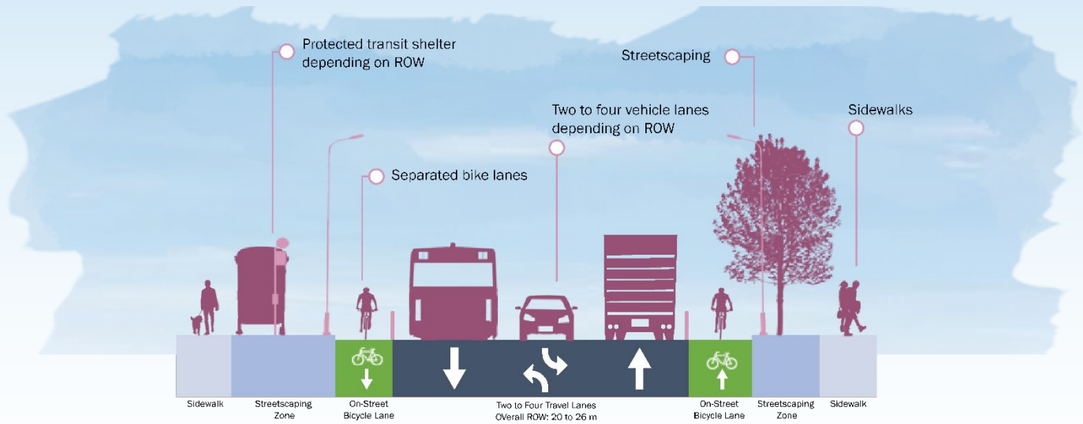


3c: Collector Industrial

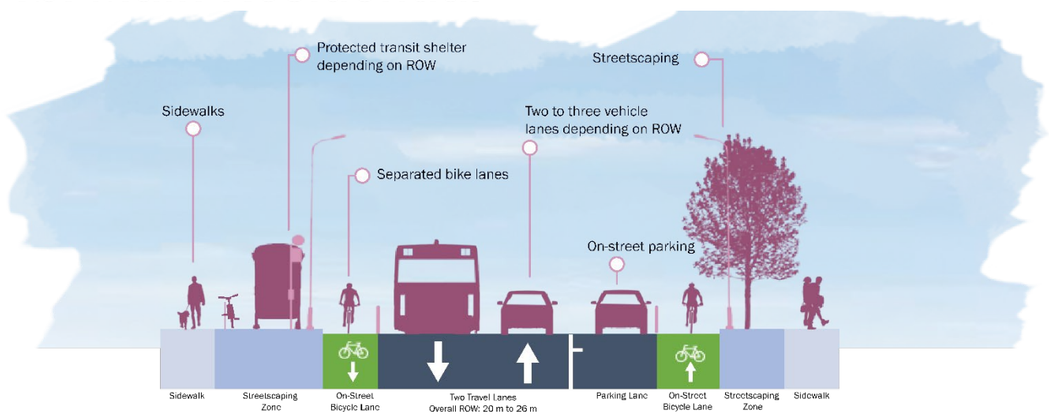


Note: On-street parking should be permitted in all urban classifications where feasible.

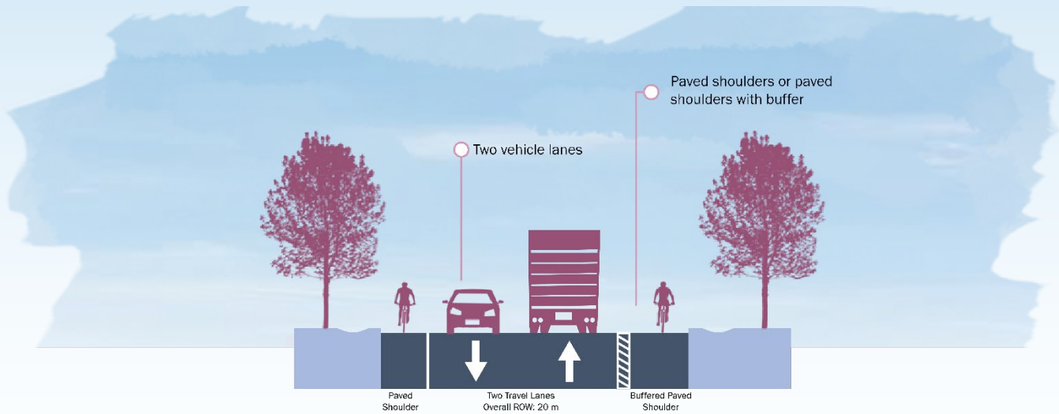
4a: Main Mixed-use



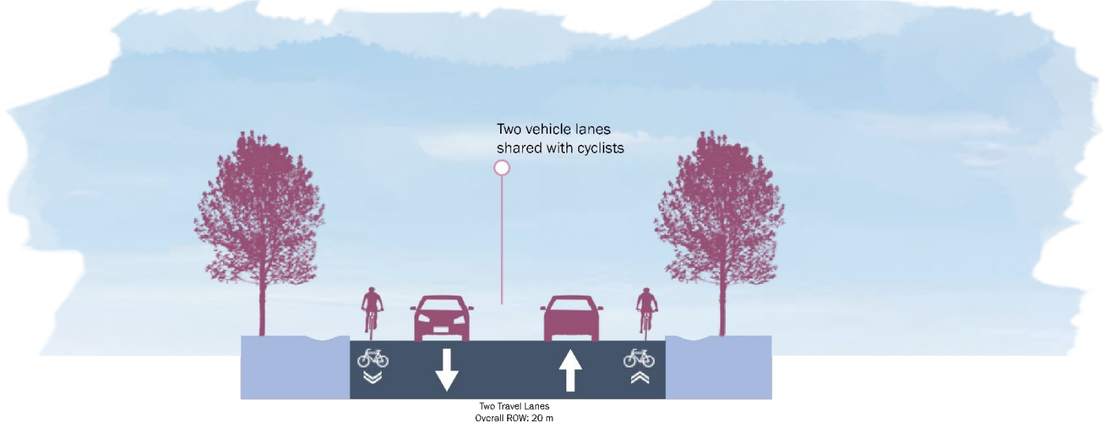
4b: Main Residential



5a: Rural Corridor



5b: Rural Community



Note: On-street parking should be permitted in all urban classifications where feasible.

3.2.3. Implementing a Complete Streets Network

The City of St. Catharines is committed to applying a complete streets lens to all new roadways or reconstruction projects. A three-stage approach was created to determine the road classification for these projects.

STEP 1

Average annual daily traffic (AADT) volumes helped to distinguish higher-order streets from local streets. Road segments with high traffic volumes could be defined with the appropriate multi-modal considerations.

STEP 2

Land-uses were used to determine the existing and future context of the road segment. In some cases, specific land-uses, such as industrial, were pivotal in classifying a road segment.

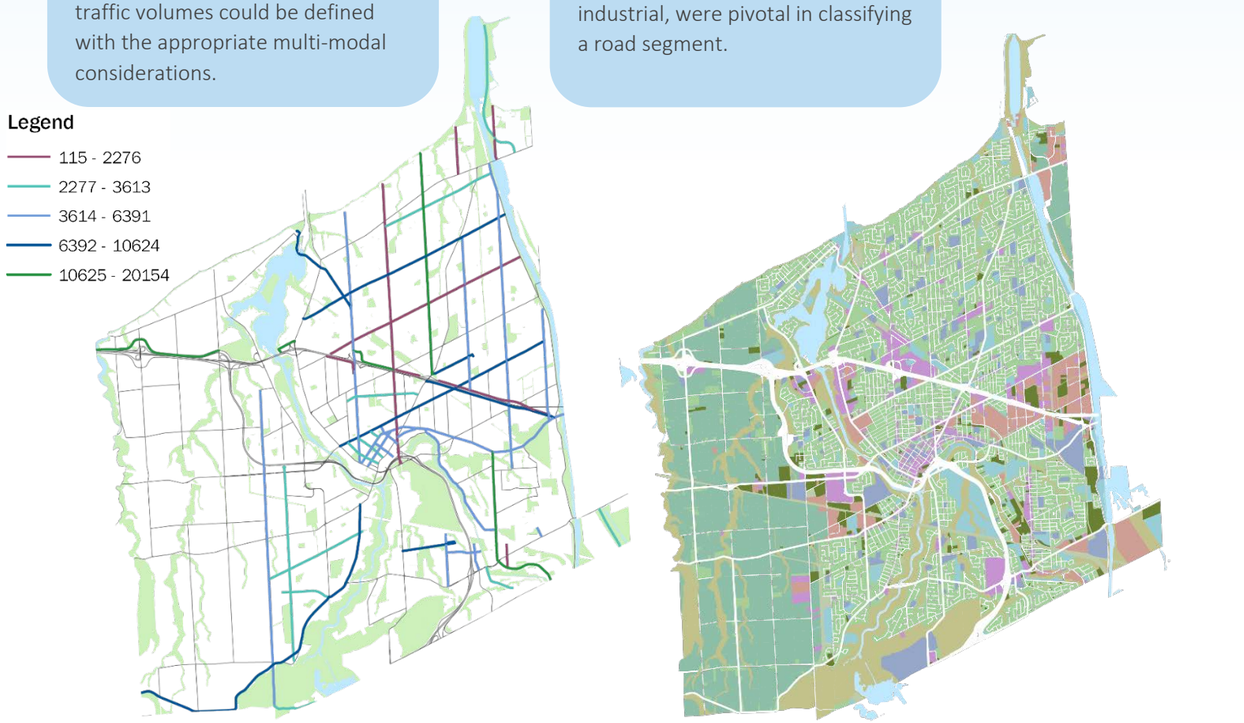


Figure 19. AADT volumes in St. Catharines

Figure 20. Land use pattern in St. Catharines

STEP 1

Road Characteristics

The annual average daily traffic and posted speed limit is the first layer of consideration for the road classification. High volume and high-speed roads are typically placed in road classifications that advise for comprehensive modal permissions (transit and goods movement supportive) with separated facilities for active modes. The urban structure and existing street connectivity influences the role of the street. The urban and rural context has a significant impact on how existing and future roadways are intended to function fluctuating in both the speed and the volume categories. A roadway that falls outside of the urban boundary would be identified as one of the rural street typologies. Further, the existing right-of-way width also helps to define the appropriate typology of a street, with wider rights-of-way receiving a higher-order than narrow rights-of-way.

STEP 2

Land-Use

Once a preliminary assessment and potential classification has been identified through Step 1, the consideration of surrounding land-uses must be assessed. The surrounding land uses informs how a street will operate, and the different modes that should be prioritized. Again, the urban and rural context will influence the potential road classification. The street typology will be further defined by the land-use designation within the Garden City Plan and further determined based on the surrounding land-uses such as residential, commercial and industrial land-uses or the planned future land-uses.

STEP 3

Confirmation of Appropriateness

Prior to implementation, a final review will need to be undertaken. Given that each new classification fits into one of the previous Garden City Official Plan categorizations, some streets may be able to transfer seamlessly without need for the methodology. For streets that are currently under or over performing within their existing classification; they could be reclassified into a new category. The confirmation of appropriateness should be completed by City staff to ensure that the classification best matches the context of the street segment and that there are no outstanding circumstances (such as environmental or accessibility concerns) that would disqualify the street from new complete streets elements. The City's unique road network may lead to adjustments at the site level. The TMP should consider the overall street pattern and connectivity at a larger scale. Additional intersection-specific treatments are to be determined on a case-by-case basis through additional studies during the detail design phase.

3.2.4. Educating: Creating Behaviour Change

A complete streets transportation planning paradigm can only do so much to influence lasting change. Travel mode choice is primarily influenced by behavioural patterns. The most crucial element of the complete streets framework is education to encourage a behavioural shift. Education and encouragement can successfully be undertaken through policies, incentives and programming, which is sometimes defined as transportation demand management (TDM).

Transportation demand management seeks to influence the way people travel to reduce single-occupant vehicle trips, lower carbon emissions, alleviate traffic congestion and decrease health-related problems due to sedentary lifestyles. The City of St. Catharines is adopting a community and individual focused approach to TDM that will introduce programming to educate and encourage the adoption of sustainable transportation in situations where they may have otherwise opted for the car.

The strategy has been developed based on five key objectives which were defined by public input and staff experience.

Objectives...

Objective #1:
Increase transit accessibility to vulnerable populations, including youth and older adults.

Objective #2:
Shift commuting behaviours to be more sustainable.

Objective #3:
Plan built environments that support multi-modal transportation options.

Objective #4:
Change perceptions of active transportation as a viable mode of transportation.

Objective #5:
Facilitate a connected network of sustainable transportation options.

A user-focused approach requires a detailed understanding of the factors which influence decisions. While there are many unique factors, three themes tend of emerge as follows:

Socio Demographics

Age, gender, education, income, and values all factor into the overall willingness of a person to try new sustainable modes.

Geographic Context

A person's location will impact how they choose to travel, whether they are a local resident, from an adjacent municipality or from outside the region.

Trip Purpose

The type of trip (commuting, destination-bound or leisure) can influence mode choice.

There are numerous best practices programming to influence behavior change. Each objective noted in Chapter 2 was reviewed to identify a set of suggested programs along with appropriate communities for implementation. An overview of these findings is provided on the following page.

Potential Complete Street Education / Promotional Programs & Pilot Areas...

Objective #1:

Increase transit accessibility to vulnerable populations including youth and older adults.

Target Audiences

- SD — Older adults and youth populations
- G — St. Catharines residents
- TP — Destination-bound trips

Potential Pilot Communities

GO Transit Station

Downtown Transit Hub

Communities with high youth/older adult populations

Potential Programs

+ Provide enhanced end of trip facilities
+ Implement accessible wayfinding and signage
+ Implement community awareness campaigns
+ Provide weather-protected waiting areas and transit stops
+ Provide transit subsidies to older adults and youth
+ Community Awareness Campaigns

Objective #2:

Shift commuting behaviours to more sustainable modes of transportation.

Audiences

- SD — All employees who work within St. Catharines
- G — St. Catharines residents, commuters from adjacent municipalities and the GTHA
- TP — Commuting trips

Potential Pilot Communities

Specific major employment bases

Downtown

Potential Programs

+ Encourage employers to provide showers and secure bicycle parking
+ Encourage employers to provide transit subsidies to employees
+ Pilot parking maximums at new office developments

Objective #3:

Plan built environments that support multi-modal transportation options.

Audiences

- SD — All socio-demographics
- G — St. Catharines residents
- TP — Commuting trips, destination-bound trips, leisure trips

Potential Pilot Communities

Brock University Campus

Specific new residential developments

Potential Programs

+ Develop a TDM for Development Checklist
+ Encourage new developments to provide end-of-trip facilities
+ Support pedestrian connections within new subdivision developments
+ Ensure that new developments connect to bicycle networks
+ Support car share parking spaces
+ Support all active transportation modes and related infrastructures such as scooters, bikeshare, motorized wheelchairs and ebikes

Objective #4:

Change perceptions of cycling as a viable mode of transportation.

Audiences

- SD — All ages and abilities of cyclists in St. Catharines
- G — St. Catharines residents, tourists
- TP — Commuting trips, destination-bound trips, leisure trips

Potential Pilot Communities

Brock University Campus

Communities with high youth/older adult populations

Employment areas

Potential Programs

+ Pilot temporary bicycle parking at key destinations
+ Community Awareness Campaigns
+ Used bicycle drives

Objective #5:

Facilitate a connected network of sustainable transportation options.

Audiences

- SD — All socio-demographics
- G — St. Catharines residents, commuters from adjacent municipalities and the GTHA, tourists
- TP — Commuting trips, destination-bound trips, leisure trips

Potential Pilot Communities

Downtown

Brock University Campus

Popular destinations

Potential Programs

+ Implement wayfinding and signage for all modes
+ Pilot an online travel planning tool

3.3. Mode Specific Integration

The complete streets road classification is the foundation upon which modal change and behavior shifts will be made. The TMP also considers some unique, mode specific aspects and elements.

The recommendations in this section intend to improve the functionality of the transportation system. Each section has a defined goal to help increase the inclusivity and functionality of that mode within the St. Catharines complete streets context.

3.3.1. Active Transportation

As noted in Chapter 2.0 of the TMP, the existing active transportation conditions provide residents and visitors with a substantial system of on and off-road walking and cycling connections, providing access to the majority of the trip generating destinations within the city. As part of the TMP, the City required future direction on where and how active transportation improvements should be considered and prioritized throughout the city.

Utilizing input received from staff, the Active Transportation Advisory Committee (now the Transportation Advisory Committee), residents, interest groups and new strategic objectives identified through the Region's TMP and other municipal planning documents, the consultant team worked through a six step network improvement process. This process was undertaken to strategically identify critical infrastructure connections supporting the active transportation objectives identified by the community. They include:

- A continuous and connected system of walking and cycling facilities;
- Improved facility designs that accommodate a wider range of users and improve the level of comfort for those who are not currently using AT, including those that are interested but have concerns, typically regarding safety;
- Develop design guidelines for trail connections;
- Develop design guidelines and implementation criteria for cycling and pedestrian amenities, including bicycle racks and water bottle filling stations, to improve end-of-trip experiences, especially at key destinations such as libraries and recreation facilities; and
- An AT system that is well communicated to the general public to ensure that sufficient information is provided for both day-to-day activities such as for commutes, and for tourism.

Goals...

- Provide direction on strategic on and off-road improvements including key missing links and additional improvements.
- Identify a minimum grid system of more separated facilities to encourage use by a wider array of cyclists.
- Provide guidance on trail design through the development and adoption of trail standards.

An overview of the six steps is presented to the right with the input and outcomes of the process documented on the following pages. The intent is for these recommendations to provide some initial guidance to the City of St. Catharines on active transportation improvements to enhance user interest and experience.

The content of the TMP is not meant to take the place of a comprehensive active transportation master plan with a focus on encouragement and education. Following the completion and adoption of the TMP, the City should proceed with the development of an active transportation specific master plan to further assess and refine the infrastructure recommendations found within the TMP and identify education, encouragement, evaluation and enforcement strategies to ensure long-term coordination and collaboration to achieve the overall AT mode shift that is directed by Council and City staff.

1 Review Consistency — Review existing AT infrastructure to determine appropriateness of facilities related to existing guidelines and standards.

2 Identify Missing Links — Identify critical on and off-road missing linkages based on field investigations and committee and resident input.

3 Confirm Connections — Evaluate potential linkages to determine the most appropriate routes to create a continuous and connected on and off-road network.

4 Determine Facilities — Utilize the three-step facility selection process identified in OTM Book 18 and the revised road classification to determine a preferred facility.

5 Identify Priorities — Identify routing priorities based on public and stakeholder input and TMP objectives.

6 Develop Guidance — Identify trail standards and bicycle parking considerations adopting existing Provincial and municipal design guidelines.

The intent of the active transportation component of the TMP is to identify strategic improvements to guide future build-out of the on and off-road system. It also provides consistent design guidelines for on and off-road facilities and other amenities. In addition to the objectives noted within Chapter 1, combined with the input from members of the public, stakeholders, staff and agencies, there are two key elements that were used to shape the active transportation recommendations – **route selection criteria** and the **facility selection process**. These two elements are typically used when developing comprehensive active transportation networks and master plans. They are shaped by best practices, guidelines and lessons learned from comparable municipalities while ensuring context sensitive considerations for the City. The route selection criteria – in addition to the objectives and input – were used to inform Steps 1 through 4 of the process noted on page 66. An overview of the purpose of these elements and how they were used is provided to the right. Should the City of St. Catharines proceed with the development of a functional active transportation master plan, the route selection criteria and the facility selection process should be considered and utilized where appropriate.

Creating a context specific set of recommendations requires a sound process, consistent set of criteria and an understanding of existing conditions. As noted in Step 2, field investigations were undertaken to document the existing conditions as well as the potential for future improvements. GPS waypoints and photos were taken documenting context specific considerations which together form a comprehensive database of graphic references. This database can be used by staff to support future implementation and as a communication tool to other staff and stakeholders when projects are discussed.

Route Selection Criteria...

What are they?

- Access & Potential Use
- Connectivity, Directness & Physical Barriers
- Environmental Sustainability and Protection
- Attractiveness
- Comfort & Safety
- Costing & Phasing
- Consideration & Accommodation for Future Use
- Consistency with Local Tourism Objectives

How were they used?

- Used in Step 2 to identify missing links which align with the overall objectives for the network and key values and principles for active transportation route design.
- Used in Step 3 to confirm the preferred routes that form part of the AT network.
- Used in Step 5 to help determine network priorities.

Facility Selection Process...

What is it?

The three-step process identified in Ontario Traffic Manual Book 18 was utilized to identify the appropriate facility for select routes. This included the selection of a level of separation based on the existing vehicle volumes and speed, an assessment of context specific factors and the review, recommendation and documentation of the outcome. The process is illustrated below.

Step 1: Pre-Selection of Facility Types (Pick One)

Shared	Designated	Separated	Off-road
Low volume and low speed roadway	Moderate volume and moderate speed roadway	High volume and high-speed roadway	High volume and high-speed roadway or natural corridor

Step 2: Examine Other Factors

On-road	Off-road
• Function of the roadway • Vehicle mix and speed • Collision history • Available space • Cost • Anticipated use • Type of improvement • On-street parking • Intersection frequency	• Connectivity • Environmental protection • Safety • Anticipated use • User experience • Topography • Barriers • Cost • Maintenance • Accessibility (AODA)

Step 3: Recommend & Document Results

How was it used?

- Used in Step 1 to review and confirm the appropriateness of the existing and previously proposed active transportation routes.
- Used in Step 4 to determine the appropriate facility for proposed on-road linkages.

Previously Proposed Routes...

With the completion of Steps 1 through 4, a proposed active transportation network was identified, which builds upon existing and previously proposed routes. Previously proposed routes and facilities were identified through several municipal sources including the City's Official Plan, the GO Transit Secondary Plan, Capital Projects identified by Niagara Region through their Capital Budget and Niagara Region's Transportation Master Plan (adopted in 2017).

Combined, the linkages identified within these documents significantly expand the active transportation on and off-road system within both the urban areas and rural corridors as well as providing access to areas of natural and cultural significance. An image illustrating the network including the previously proposed routes and their source is presented in **Figure 21**.

The TMP supports the existing routing and implementation strategies identified in the City and Regional planning documents noted above. Based on the outcomes of Step 1, no issues were identified with the existing and previously proposed facilities. No revisions are recommended to these routes / facilities.

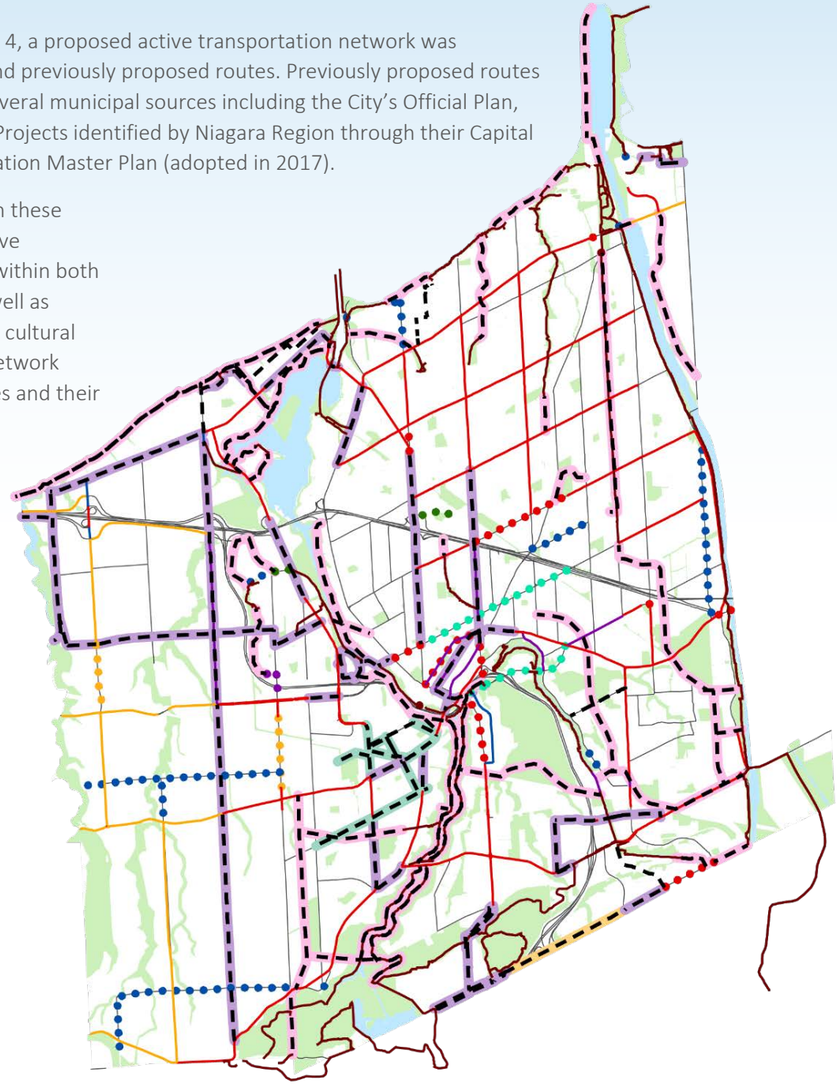


Figure 21. Previously proposed routes

Proposed Facilities & Priority Routes

Though the existing and previously proposed network provides a significant opportunity for on and off-road active transportation, there were still some missing links that needed to be added in order to achieve a fully continuous and connected City-wide network. Over the course of Steps 2 through 4, the missing links were identified and assessed based on overall network and project objectives. Next, the facility type was determined based on the proposed road classification typology and the three-step facility selection tool noted above.

The result is the proposed AT network, which is presented in **Map 6**. A summary of the existing, previously proposed and current proposed facilities by kilometre is presented in Table 2.

Table 2. Summary of proposed routes

	Previously Proposed (km)	Current Proposed (km)	Total (km)
Signed Route	12.4	13.6	26.0
Paved Shoulder	7.7	3.1	10.8
Bike Lane	21.7	19.3	41.0
Buffered Bike Lane	3.1	4.3	7.3
In Boulevard Multi-use Trail	1.8	0.8	2.6
Off-road Trail	42.7	2.8	45.5
Total	**89.4**	**43.8**	**133.2**

It is important to note that this exercise did not focus on an assessment, evaluation and identification of missing sidewalk linkages or improvements to the pedestrian realm specifically. Pedestrian improvements have been identified as part of the road classification typologies for consideration when reconstructing existing or constructing new roadways. In addition, the City should consider pursuing a more detailed pedestrian strategy including the identification and prioritization of missing sidewalk linkages as well as other pedestrian enhancements for existing or perceived barriers.

The AT network has intentionally not been phased. The City of St. Catharines should be consistent with previously developed implementation and budgeting strategies that are outlined in existing City and Regional plans. There was clear need for some direction on future active transportation priority projects which could inform annual budget discussions and strategic planning. Based on input from staff, stakeholders and the public, three priority categories were identified including critical missing links, a minimum grid system and a loop route. These priorities are illustrated on **Figure 22** and described in further detail on the following page.

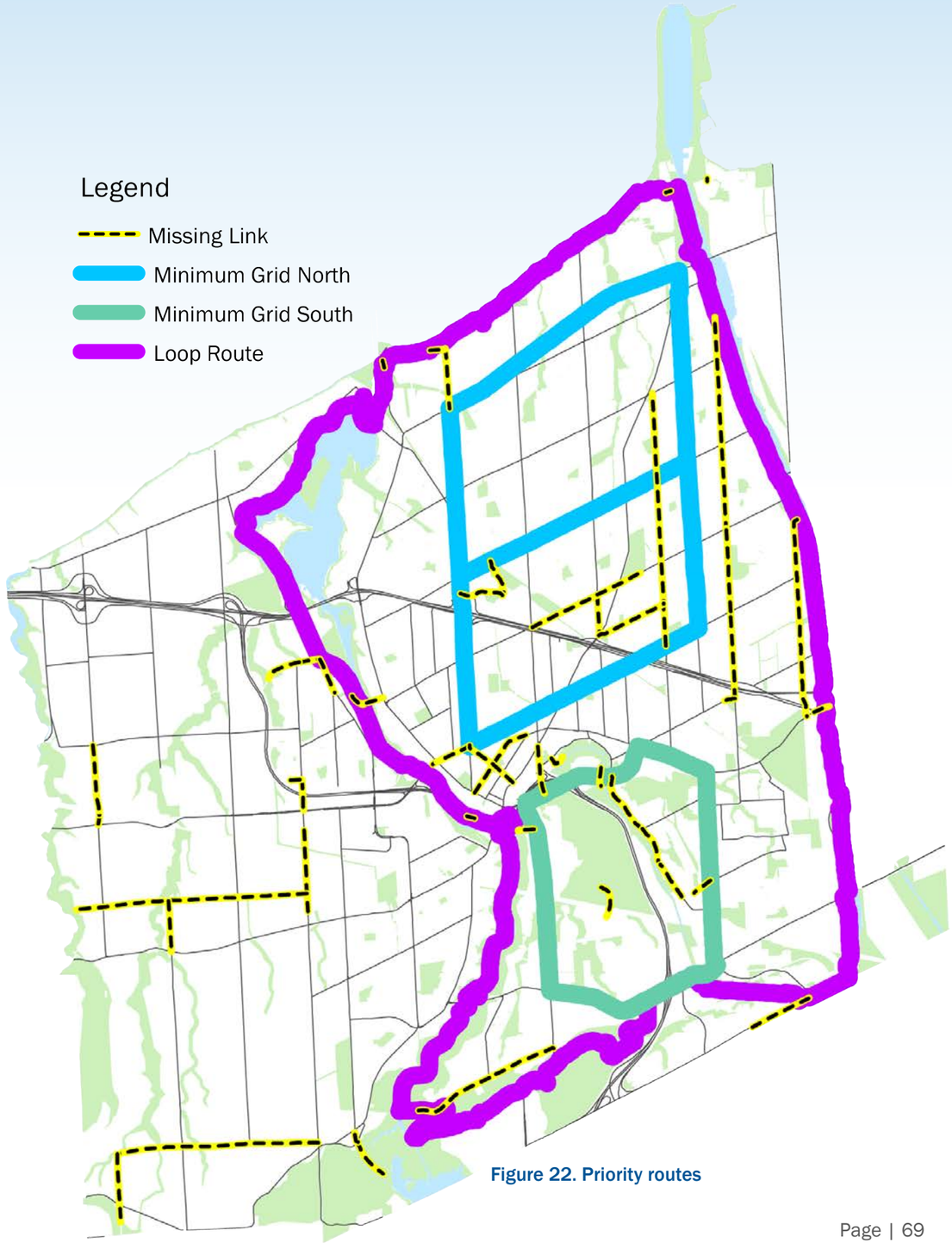


Figure 22. Priority routes

Missing Links

The missing linkages refer to those connections that will support the development of a continuously connected active transportation system. Missing linkages represent on and off-road corridors in the urban and rural areas. They have been identified based on overall network objectives.

An overview of the proposed facility types that make up the missing links priorities is provided in **Table 3**.

Table 3. Summary of missing link routes

	Total (km)
Signed Route	13.5
Paved Shoulder	2.0
Bike Lane	17.1
Buffered Bike Lane	0.0
In Boulevard Multi-use Trail	0.8
Off-road Trail	2.7
Total	36.1

City staff should consider reviewing the list of missing links on an annual basis to determine if some of these projects could be identified as part of the capital budget.

Minimum Grid Network

Based on recent Provincial design guidelines and standards, there is a shift towards the construction of separated cycling infrastructure to accommodate a wider audience of users. The largest concern of infrequent or hesitant cyclists is the lack of perceived comfort and safety and potential conflict with other vehicles.

The implementation of separated infrastructure helps to provide not only a designated space for cyclists but also includes physical or spatial separation to create a greater barrier between the cyclist and other road users. Within the built-up area of St. Catharines there are north-south and east-west existing routes that could be improved and new routes which could be constructed which establish a network of separated cycling facilities – also known as a minimum grid.

The proposed minimum grid networks found in the north and south end of the built-up area include the following existing and proposed facilities, as summarized in **Table 4**.

Table 4. Summary of minimum grid network routes

	Existing (km)	Proposed (km)	Total (km)
Signed Route	0.1	0.0	**0.1**
Paved Shoulder	0.0	0.0	**0.0**
Bike Lane	13.6	3.8	**17.4**
Buffered Bike Lane	0.0	1.7	**1.7**
In Boulevard Multi-use Trail	0.0	0.5	**0.5**
Off-road Trail	5.5	0.0	**5.5**
Total	**19.2**	**6.0**	**25.2**

Within the buffered bike lane category, the City should pursue additional separation such as a bollard, concrete precast curb or planter. Additional details on the types of separation and the rationale for implementation is provided on the right.

Roll Curb / Mountable Curb

+: Bicycle movement and turning movement, durability, greater flexibility for maintenance and minimal collision

-: May be less effective at deterring motor vehicle parking, may be expensive to install

Rubber Delineator

+: May be used in conjunction with bollards to add extra separation in specific locations

-: Less durable than concrete requiring more maintenance and may have greater exposure to damage from clearing

Flex Bollards

+: High visibility, bollards spacing may accommodate bicycle movement, waste collection, driveways. Comparatively easy to install, minimal safety risk

-: Not as durable, may not always discourage encroachment if there is a lot of separation, minimal aesthetic appeal

Buffer Zone

+: Inexpensive to implement, can be combined with strategic plants and / or flex bollards

-: Need to update markings, no physical separation

Planters

+: Aesthetic appeal, flexible spacing, high visibility

-: May reduce visibility, requires high maintenance, may need to be removed and stored in winter

Concrete Barrier

+: Very effective at preventing encroachment, low cost to maintain, high visibility, mounted planters increase aesthetics

-: May have negative impact on drainage, may reduce visibility of cyclists

Should the City pursue the design and implementation of a minimum grid system, the following should be considered:

- The review and confirmation of available space to accommodate a separated facility;
- The identification of a preferred level of separation including a potential pilot of different design treatments for different contexts;
- The development of an education and awareness campaign prior to or at the time of pilot implementation; and
- The development and implementation of appropriate promotional and directional signage to communicate the expected and anticipated location of the minimum grid system.

Loop Route

The loop route is intended to leverage the existing trails system as it relates to providing residents and visitors with access to major community destinations including natural and cultural areas and major nodes. By filling in some of the key gaps on the off-road trails network, the City could establish a City-wide loop trail network linking the north and south areas of the built-up area.

Table 5 summarizes the length of different facility types that make up the proposed loop route.

Table 5. Summary of loop routes

	Existing (km)	Proposed (km)	Total (km)
Signed Route	0.0	0.1	0.1
Paved Shoulder	0.0	0.0	0.0
Bike Lane	1.4	0.8	2.2
Buffered Bike Lane	0.0	0.0	0.0
In Boulevard Multi-use Trail	0.0	0.2	0.2
Off-road Trail	39.1	3.1	42.2
Total	**40.5**	**4.2**	44.7

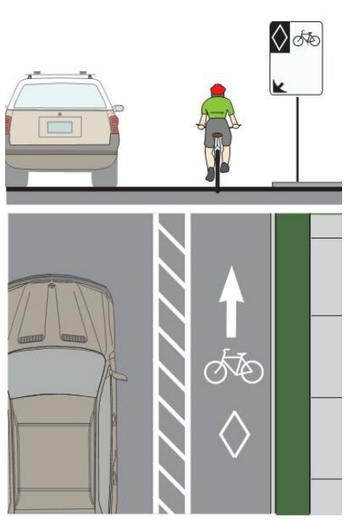
A loop route would not only include the implementation of missing infrastructure links, but would also require additional design, maintenance and promotion considerations in order for there to be a cohesive experience. These include:

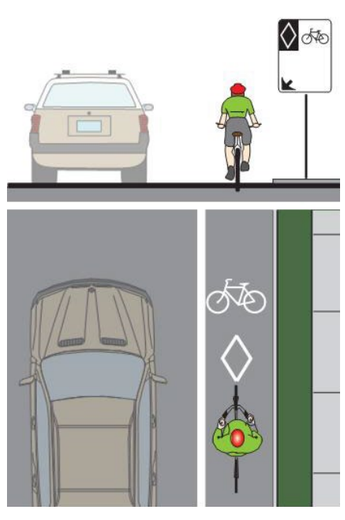
- The development and implementation of a branded wayfinding and signage strategy which builds upon the Region's wayfinding strategy as well as other regionally significant trail identification systems such as the Waterfront Trail. Consideration should also be given to preparing and implementing directional signage to identify the decision-making points where people can access major destinations;
- The development and adoption of consistent design standards and guidelines for the trail routes;
- The identification of preferred maintenance standards for seasonal maintenance of trail facilities to allow for year-round use of facilities; and
- The design of trail amenities such as benches, bicycle parking, rest areas, water fountains and waste receptacles, and the identification of locations for those amenities.

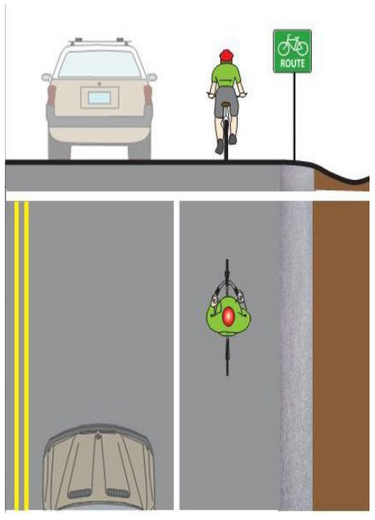
The last step in the process was establishing guidelines and standards for the design and implementation of AT facilities. There are a considerable number of on-road facility design guidelines and standards that have been adopted at the local, regional and provincial levels. There are four documents that provide the most up to date guidance for Ontario municipalities. These guidelines and standards are summarized in **Table 6** with references to the specific documents where this information was obtained. These documents also include details on the design of cycling-supportive infrastructure such as bike parking, which will also need to be reflected in the OP and Zoning By-laws. Specifics on the cycling widths and which facility is chosen will be determined in the design phase. There are trade-offs with each facility design, including the treatment of different materials or forms of separation. Cycling facilities are to be determined on a case-by-case basis to ensure that the facility is appropriate for the road and desired use and provides comfort for the users. Intersection treatments for cycling facilities are similarly determined at the design stage and should be consistent with the guidelines below.

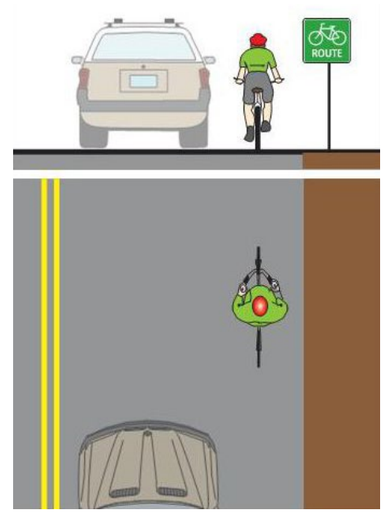
Table 6. Summary of cycling facility guidelines

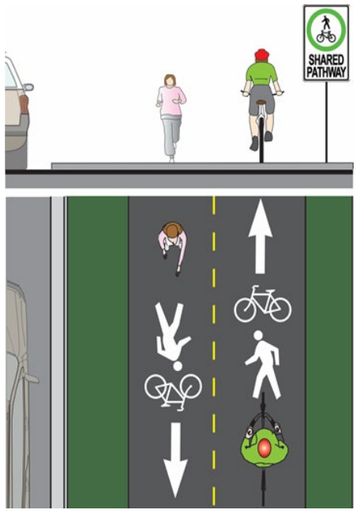
Guideline	Buffered Bike Lane	Bike Lane	Paved Shoulder	Signed Bike Route	In-Boulevard Trail
OTM Book 15: Pedestrian Crossing Treatments (2016)	n/a	n/a	n/a	n/a	n/a
OTM Book 18: Cycling Facilities (2013)	S. 2.3.1.4 (Separated Bike Lane) S. 4.2.2 (Separated Bike Lanes) S. 4.3.1 (One-way and Two-way Raised Cycle Tracks)	S. 2.3.1.3 (Conventional Bicycle Lane) S. 4.2.1 (Conventional Bicycle Lanes)	S. 2.3.1.2 (Signed Bicycle Route with Paved Shoulder) S. 4.1.2 (Signed Bicycle Route with Paved Shoulders)	S. 2.3.1.1 (Shared Roadway and Signed Bicycle Route) S. 4.1.1 (Shared Roadways and Signed Bicycle Route)	S. 2.3.2 (In-Boulevard Bicycle Facilities) S. 4.4 (In-Boulevard Facilities) S. 5.2.4 (In-Boulevard Facilities)
MTO Bikeways Design Manual (2014)	S. 4.4 (Separated Bicycle Lane)	S. 4.3 (Bicycle Lane)	S. 4.2 (Signed Bike Route with a Paved Shoulder)	S. 4.1 (Signed Bike Route)	S. 5.1 (Active Transportation Path) S. 5.2 (Off-Road Multi-Use Trail)
AODA Built Environment Standards	n/a	n/a	n/a	n/a	S. 2.2 (Recreational Trails)









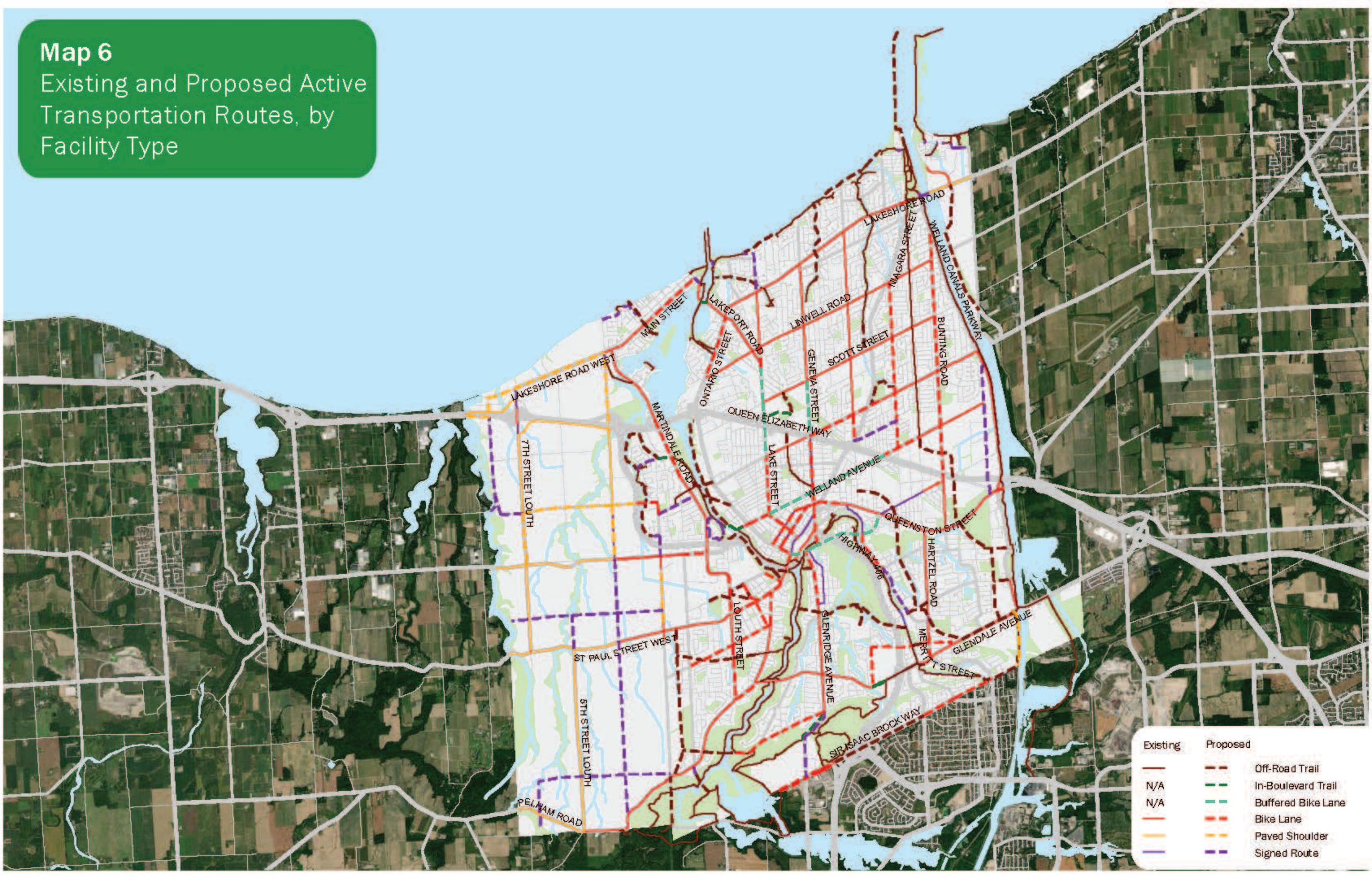


The design of off-road trail facilities can be a bit more complex and nuanced depending on the natural areas and conditions where they are being implemented. The City should consider the development and adoption of a consistent set of design standards for trail infrastructure. Typically, this is done by adopting a trail hierarchy and developing design standards that reflect that hierarchy. As part of the TMP, a preliminary trail hierarchy has been developed and is being recommended for the City's review and consideration as part of a wider active transportation strategy or an independent trails initiative.

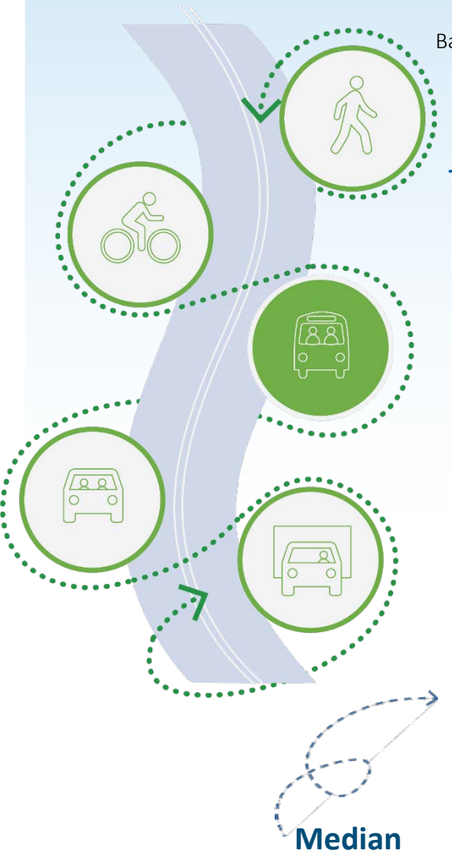
Table 7. Summary of design considerations for trails

Design Consideration	Type 1	Type 2	Type 3
General Function	Recreation, leisure and commuting functions, providing access to key destinations such as community centres, parks, key commercial areas, and schools. Includes loops in neighbourhood parks and access to park facilities, for example playgrounds	Primarily recreation and leisure. Although commuting is not a key function, secondary trails provide connections to active transportation routes	Recreation and leisure providing opportunities to 'escape' the urban environment and experience natural settings within City limits.
Location	Along the Waterfront, Utility Corridors in the Urban Area and Urban Parkland	Open Space / Natural Areas	Open Space / Natural Areas
Width	3.0m typical width (may be narrower in constrained locations such as limited property / parcel width)	2.4m typical width (may be narrower in constrained locations such as limited property / parcel width, topographic and environmental constraints)	1.0 – 2.0m (may be narrower in constrained locations such as limited property/parcel width, topographic and environmental constraints)
Surface	• Typically hard surface (asphalt, concrete) • May include granular surface in context specific locations • If current trails have granular surface consideration may be needed to upgrade select trails to hard surface depending on location and use of the trail / demand	• Granular surface (limestone screenings, granite screenings) • Granular A, clear stone, wood boardwalk in context specific locations • Limestone screenings should not be used in floodplain areas or where drainage flows directly to watercourses. In these locations trail hardening with asphalt over short distances where erosion is an ongoing issue and cannot be mitigated by re-routing and for trails within floodplain areas	• Natural surface (earthen, grass), woodchips • May include granular (limestone screenings, granite screenings, granular A, clear stone), or wood boardwalk in context specific locations
Accessibility	Meets or exceeds minimum accessibility requirements where feasible	Meets accessibility requirements where feasible. Maintaining natural heritage values takes precedence	Maintaining natural heritage values takes precedence over accessibility
Amenities	• Moderate-high frequency of amenities • Benches at key locations, trash receptacles located to be easily accessed for service vehicles	• Moderate frequency of amenities • Trash receptacles at trail entry points, seating opportunities at key locations. Seating opportunities include benches and natural materials for example flat boulders	• Moderate frequency of amenities • Trash receptacles at trail entry points, seating opportunities at key locations. Seating opportunities include benches and natural materials for example flat boulders
Lighting	Lighting may be considered where use / demand is high (such as heavily used commuter routes)	Lighting not provided	Lighting not provided
Wayfinding and Signage	• High frequency, at trail entry points, trail intersections, key decision points • At regular intervals where there are long distances between intersections • Designed to meet AODA requirements at trail entrances	• Moderate frequency, at all trail entry points, trail intersections and key decision points • Occasional markers where there are long distances between trail intersections • Designed to meet AODA requirements at trail and entrances	• Low frequency, at trail entry points and key decision points • May include occasional markers along long stretches between trail intersections (may include simple trail blazes) • Designed to meet AODA requirements at trail and entrances

Map 6
Existing and Proposed Active Transportation Routes, by Facility Type



3.3.2. Transit



Median

32.5 passenger trips/revenue hour

Based on the existing conditions analysis, transit has a great opportunity to improve its ridership through routing and timing improvements. The opportunities for improvements were analyzed through a ridership analysis where data was obtained through the passenger counter equipment, which counts boardings and alightings separately. This data was broken down in terms of annual boardings, total revenue operating hours and operating costs. Outliers in the data were removed prior to analysis (typically stemming from errors with the automated passenger counter equipment, which involve unrealistic single-stop spikes in passenger volumes). **Table 8** ranks the performance of routes based on passenger trips per revenue hour. The recommendations for improvement follow.

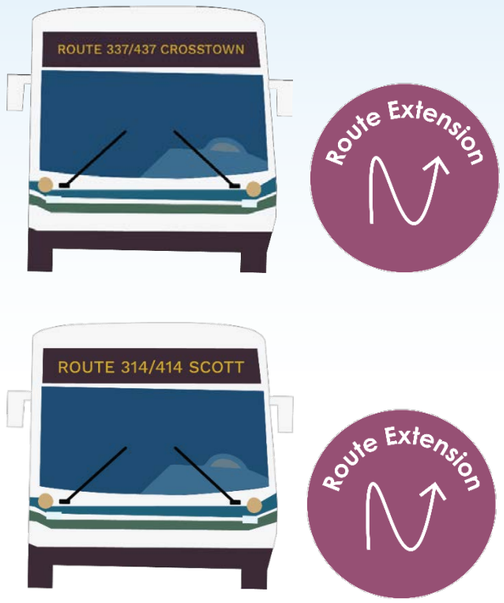
Table 8. Summary of transit route performance

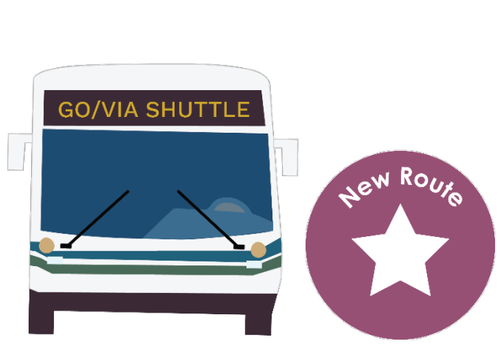
Routes		Evening Service	2018 Annual Total Boardings	2018 Annual Total Rev Hour	Passenger Trips per Revenue Hour	Cost per Passenger Trip	Rank
324	Brock-Tupper	Y	143,965	1,786.0	80.6	$1.4	1
331	Brock-Richmond	Y	163,833	2,088.2	78.5	$1.4	2
316/416	Brock-Glenridge	Y	691,713	10,885.8	63.5	$1.8	3
336/436	Brock-Glendale-Pen Centre	Y	276,541	4,541.5	60.9	$1.9	4
328	Brock-Towpath-Shuttle	-	93,204	1,578.0	59.1	$1.9	5
323	West-Brock-Commuter	Y	102,681	1,809.4	56.7	$2.0	6
335/435	Brock-Pen Centre	Y	151,857	3,004.4	50.5	$2.2	7
310/410	Glenridge-Pen Centre	Y	113,208	2,456.9	46.1	$2.5	8
321/421	Confederation-Brock	Y	95,272	2,517.5	37.8	$3.0	9
303	Pelham Rd.	-	81,038	2,235.7	36.2	$3.1	10
312/412	Vine St.	Y	170,847	4,883.3	35.0	$3.2	11
317/417	Bunting-Linwell/Bunting-Lakeshore	Y	198,607	5,968.2	33.3	$3.4	12
320/420	Thorold-Pen Centre	Y	91,187	2,743.4	33.2	$3.4	13
306/406	Lake St.-Port Dalhousie	Y	116,812	3,685.8	31.7	$3.6	14
302/402	Ontario-Lakeshore/Ontario St.	Y	127,851	4,320.4	29.6	$3.8	15
304/404	Oakdale-Pen Centre	Y	105,865	3,628.2	29.2	$3.9	16
309/409	Geneva St.	Y	143,047	4,925.7	29.0	$3.9	17
315/415	West St. Catharines	Y	167,986	5,889.2	28.5	$4.0	18
311	Hartzel Rd.	-	96,885	3,642.1	26.6	$4.2	19
318/418	Secord Woods	Y	145,877	5,613.5	26.0	$4.3	20
307	Niagara St.	-	82,180	3,248.1	25.3	$4.5	21
305	Haig-Linwell	-	114,134	5,252.2	21.7	$5.2	22
308/408	Grantham-Lakeshore/Grantham-Port Weller	Y	100,352	4,689.5	21.4	$5.3	23
314/414	Scott St.	Y	46,169	2,463.0	18.7	$6.0	24
301/401	Hospital-Port Dalhousie	Y	127,246	7,309.2	17.4	$6.5	25
337/437	Crosstown	Y	17,627	2,377.5	7.4	$15.2	26

Many of the routes that currently service Brock University make the bulk of the system's highest ridership, a function of the available university pass and funding strategy with the University's students union. However, of particular note are routes with lower ridership and high operating costs, which include routes 301/401 Hospital-Port Dalhousie and the newest route, the 337/437 Crosstown. We note that at the time of writing, the Crosstown route has not yet operated for one year, which is typically the time frame for a new route review in terms of ridership and financial performance.

Goals...

- Increase accessibility and convenience by an improved transit system throughout the City and to surrounding areas
- Improvements to routing and timing





Route Recommendations

Extend route 337/437 Crosstown

It is recommended that this route be extended to the Downtown terminal, as shown in **Map 7**, in efforts to improve the ridership on the route. Providing this link downtown will likely improve the overall utility of the route through connecting with other services. This is anticipated to add approximately 12 minutes (3 kilometres) to the route over one cycle without the need for additional vehicles to maintain the current route headway. Based on discussion with City staff, this change has been approved and implemented.

Add Downtown Connection to Route 314/414 Scott

It is recommended that this route provide bi-directional service through most of the route, as shown in **Map 7**, rather than operating unidirectionally. This will connect the route to other services and provide opportunities for reduced travel time when travelling through unidirectional sections of the route.

New GO-VIA Station shuttle

It is anticipated that in the future, GO service along the Niagara (extended Lakeshore West) line will be increased with additional trains serving the station during the a.m. and p.m. peak hours. A downtown circulator or shuttle option connecting the downtown terminal with the station should be further explored and officially recognized as part of the system map, rather than an unofficial train-meet bus. Coordination with Metrolinx is required as this is developed to ensure that GO Transit and St. Catharines Transit riders' needs are met.

New Transit Hubs

Explore improvements, alternative locations or sites at the Downtown terminal, Pen Centre transit hub and Fairview Mall transit hub.

Service Recommendations

Frequency Improvements

It is recommended to add service (improve frequencies) during the p.m. peak period (2 to 6 p.m.) on weekdays to the 301, 302, 303, 308, 309 and 312 routes. Based on the preceding analysis, ridership volumes are consistently high, resulting in a large number of standees during the p.m. peak. Layover times and running times should be adjusted accordingly. Further, it is recommended that the service hours on 300-series routes be extended, such as to 8 or 9 p.m. versus 6 to 7 p.m. This is predicated on the peaking characteristics of last trips on most routes where the loads are higher than the previous trips. This change would not require additional buses. Study should also be made into consolidating the 300 and 400-series routes to transcend the temporal boundaries currently set. Finally, depending on ridership trends, it is recommended that a minimum service frequency of 15 minutes should be applied to most 300-series routes during the afternoon peak period to reduce overcrowding. This change would require about 33 additional buses. It is suggested that most of this additional fleet requirement would be articulated buses to accommodate increasing ridership.

Operations and Maintenance Facility Needs Assessment

As the fleet expands, additional maintenance room (for example, hoists and bays) and storage room will be needed. An architectural review is being completed to see what can be completed within the envelope of the current site; however, with the above recommendations indicating a need for many more vehicles, a full assessment should be completed.

Potential Operational Improvements

Transit signal priority, signal coordination on transit corridors and queue jump lanes are potential improvements for transit operations. These should be placed strategically at locations with high delays to transit.

Future Ready Transit

Continue Review of Electric and Hybrid Bus Feasibility

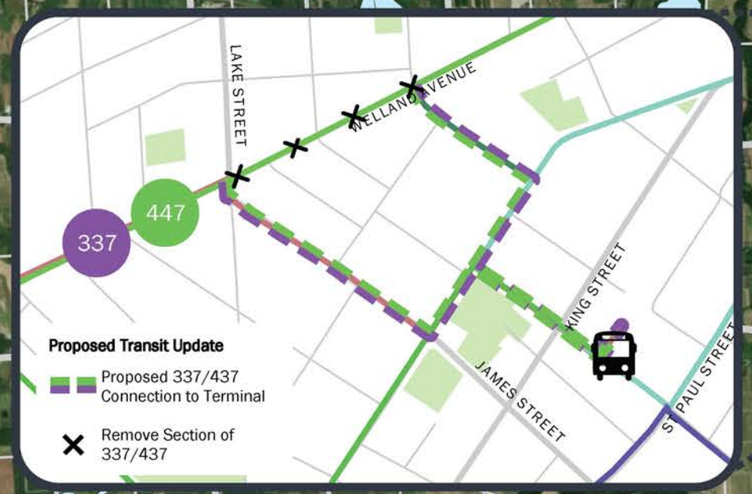
The Toronto Transit Commission and the Montreal Transit Corporation (Société de Transport de Montréal) have both entered into long term electric bus tests, which should be monitored by SCTC to determine the financial and operational feasibility, endurance and longevity of new electric buses in Canadian climates. Electric buses offer many operational advantages, such as quicker acceleration and increased hill-climbing ability, in addition to having a lower environmental impact compared to conventional buses.

Ferry Routes Feasibility

The possibility of using ferries to travel across Lake Ontario to destinations like Toronto has been discussed in preliminary stages. Looking to the future, the City should consider cost and time competitiveness and likely passengers (people, cargo, or both). Ferries could serve transportation needs for tourists or commuters. The City should not preclude the establishment of a ferry service and should be an active participant in any discussions to study and possibly implement such service. Ferry terminals will need to be linked to existing transit and active transportation facilities to increase their accessibility and utility.

Map 7
Proposed Transit Improvements

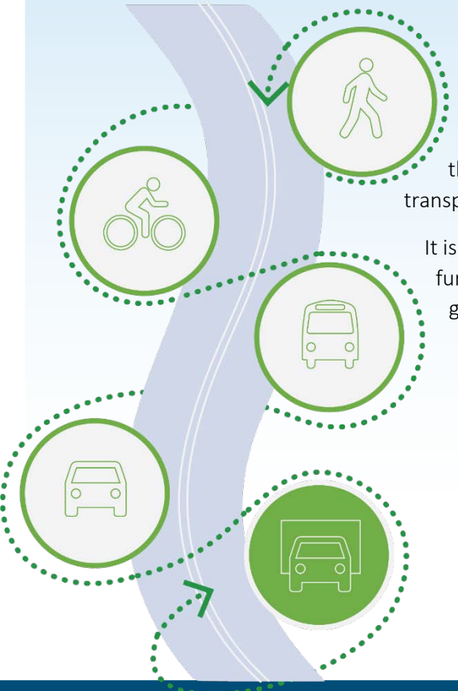
LAKESHORE ROAD WEST
MAIN STREET
LAKEPORT ROAD
ONTARIO STREET
LINWELL ROAD
309
GENEVA STREET
SCOTT STREET
312
LAKESHORE ROAD
NIAGARA STREET
WELLAND CANALS PARKWAY
BUNTING ROAD
308
301
MARTINDALE ROAD
QUEEN ELIZABETH WAY
7TH STREET LOUTH
302
LAKE STREET
WELLAND AVENUE
QUEENSTON STREET
HIGHWAY 406
HARTZEL ROAD
303
LOUTH STREET
GLENRIDGE AVENUE
MERRITT STREET
GLENDALE AVENUE
ST PAUL STREET WEST
5TH STREET LOUTH
SIR ISAAC BROCK WAY
PELHAM ROAD



Proposed Realignment of Bus Routes (St. Catharines Transit Commission)

- 301 Hospital - Dalhousie
- 302 Ontario Lakeshore
- 303 Pelham Rd
- 308 Grantham - Lakeshore
- 309 Geneva St
- 312 Vine St
- 337 Crosstown
- 437 Crosstown

3.3.3. Goods Movement



The fundamental goal of goods movement planning in St. Catharines is to make it more efficient. The recommendations are based in policy directives that reflect a holistic approach to goods movement that will guide its integration into the larger transportation network and community.

It is recommended that goods movement be further planned within a comprehensive goods movement strategy.

Goals...

- Establish an efficient and sustainable goods movement network for internal and external goods movement trips
- Focus on forward thinking goods movement integration which accounts for the regional and local context

Integrate Goods Movement into Complete Streets

Goods movement should be considered as an element of the overall roadway system, with proper provisions and prohibitions depending on the street context. Each of these provisions would be subject to a confirmation of appropriateness. **Map 8** shows a conceptual goods movement network.

Introduce and Plan for Freight-Supportive Land-Uses

Freight-supportive land-uses help to prioritize goods movement routes, avoid modal conflicts, and retain employment uses within the City. Industrial areas could be considered key destinations for trucking and freight movement and should be prioritized for key truck routes. When confirming the appropriateness of different road classifications, careful attention should be given to the land-use characteristics and whether the street will need a higher order of goods movement.

Adopt the Niagara to Greater Toronto Area (NGTA) East Supportive Policy

Continue to support the Region in advocating the provincial and federal governments to advance the Niagara-Hamilton Trade Corridor and NGTA East Corridor, providing an efficient trade route connecting Niagara Region to the GTHA and USA. In the shorter term, it is recommended that the City encourage the Region to actively work with MTO for continuing improvements to the QEW and undertake a role and function study for Highway 20 / Regional Road 20 as an alternate provincial route that can accommodate longer-distance and interregional goods movement.

Continue Downtown Goods Movement Planning

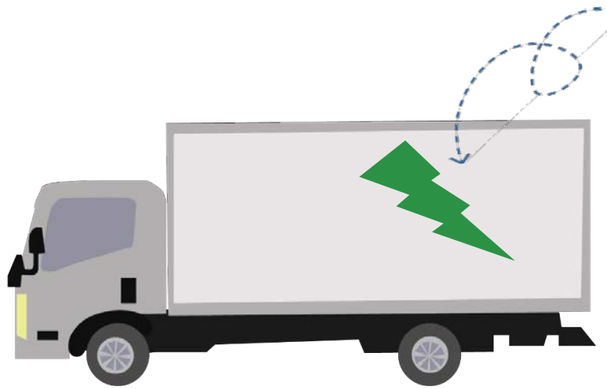
Goods movement is vital to the economic success of the downtown. The St. Catharines Downtown Creative Cluster Master Plan identifies the following policies for goods movement. These policies support the vision of goods movement in St. Catharines and should be upheld within the TMP.

- Eliminate current delivery practices (for example “double parking”) on St. Paul Street;
- Encourage rear access via alleyways and rear roadways or through established off-street parking areas. This will improve safety, traffic circulation and the general aesthetics of the streetscape from both the road user and pedestrian point of view;
- Establish loading zones of sufficient length to allow parallel vehicle access to as large a number of businesses in the area as possible, where curb zones are needed to provide space for the loading and unloading of commercial vehicles (when alleyway and off-street loading areas are inadequate or unavailable, and frequency of loading and unloading operations, and general curb-parking conditions might result in truck double-parking); and
- Install proper signage to enforce restrictions, identify on-street loading zones.

Future-Ready Goods Movement

In addition to preparing policies that can support the integration of existing goods movement, the City of St. Catharines is also looking towards the future of goods movement through identifying future trends. It is recommended that each of these areas be further explored in additional research white papers:

- 3D Printing;
- Commercial Drone Delivery;
- Electric Freight Vehicles;
- Cargo Bikes and Small Vehicles;
- Freight on Transit; and
- Autonomous and Connected Trucking.



The opportunity for connected and automated trucking was identified within the Niagara Region TMP. These initiatives have the potential to improve road safety by removing human error. Although still early in the development process, the freight and logistics industry is poised to be an early adopter. Niagara Region recommended within their TMP that the Region support this emerging market via testing these vehicles and maintaining the Region’s infrastructure, such as pavement markings and signage, at a level that ensures the effective operation of these vehicles. This support can be continued at the municipal level in St. Catharines.

Map 8
Proposed Goods Movement Network

LAKESHORE ROAD
LAKESHORE ROAD WEST
MAIN STREET
LAKEPORT ROAD
ONTARIO STREET
NIAGARA STREET
WELLAND CANALS PARKWAY
LINWELL ROAD
GENEVA STREET
SCOTT STREET
BUNTING ROAD
MARTINDALE ROAD
QUEEN ELIZABETH WAY
7TH STREET LOUTH
LAKE STREET
WELLAND AVENUE
QUEENSTON STREET
HIGHWAY 406
HARTZEL ROAD
ST PAUL STREET WEST
SOUTH STREET
GLENRIDGE AVENUE
GLENDALE AVENUE
MERRITT STREET
5TH STREET LOUTH
SIR ISAAC BROCK WAY
PELHAM ROAD

Goods Movement Classification

- Through trucks permitted
- Limited through trucks permitted
- Limited through trucks and off-peak deliveries only
- Through trucks prohibited
- Regional Road
- Provincial Highway

3.4. Improving Transportation Focus Areas

City staff identified seven transportation focus areas for initial review. The locations of these areas are shown on **Map 9** . As part of the initial technical analysis and first round of engagement, stakeholders and members of the public were asked to provide their input on challenges, opportunities for improvement and modes of transportation within each of the areas. Through input and further assessment, five of the seven areas were determined to be led by others and not the City. These five were not carried forward for further study. A more detailed assessment of focus area #5: Fairview Mall Area and #7: Chestnut Street Extension were determined to be City-led initiatives and were carried forward for further analysis. These areas are popular destinations but have identified challenges with multi-modal connectivity due to missing links in the transportation network.

Focus Area #1: Third Street Interchange

The potential new interchange on Highway 406 at Third Avenue Louth would help relieve traffic at the Fourth Avenue interchange.

This project would be led by Niagara Region and would need input from the Ministry of Transportation. As it would be led by others, it was not carried forward for a detailed assessment.

Focus Area #2: Martindale Road

Martindale Road is a Regional road and road widening improvements have already been constructed. No additional input is needed from the City.

Focus Area #3: Twelve Mile Creek Crossing

An assessment of a crossing of Twelve Mile Creek will consider a multi-modal connection, which includes the potential extension of Carlton Street to Martindale Road, both of which are Regional Roads, thereby making it a Region led initiative. An active transportation connection would fall under the City's jurisdiction.

The City can support and advocate for such a crossing, which would provide great benefit to pedestrians, cyclists and transit riders, in addition to motor vehicles, as it would provide another crossing of the Creek and help avoid lengthy detours around it. Options should be further evaluated through the upcoming secondary plan study for this area.

As a Regional transportation initiative, this project was not seen as a focus of the TMP.

Focus Area #4: Rail / Road Grade Separation

The grade separation of a north/south street and the CN Rail line in the west end of St. Catharines has been previously identified as a potential benefit to facilitate uninterrupted emergency access in the area of the Hospital on Fourth Avenue. As such, the Region of Niagara, in partnership with the City, will be undertaking a Grade Separation Needs Assessment Study to confirm if a separation is required and, if so, on what street (Regional or City) it would be most beneficial and feasible to construct.

Focus Area #5: Fairview Mall Area

There is an opportunity to consider a new multi-modal connection to Scott Street from the Fairview Mall area. This would provide a formal facility for walking and cycling and would enable transit vehicles and other vehicular traffic to or from the north to avoid congested intersections on Lake Street or Geneva Street. Site observations reveal that this connection already is in use as an active transportation connection, as an informal path has been developed where grass has worn away due to pedestrian traffic. St. Catharines Transit has noted the challenges with buses accessing the mall during peak shopping periods and sees the benefit of an additional access option. The additional access for buses could also be made available for automobiles.

Focus Area #6: GO Station

As GO Transit increases service to St. Catharines and ridership grows, additional City infrastructure improvements may be considered to enhance connectivity to the station. Improvements in this area are expected to be gradual and encompass a long-term horizon.

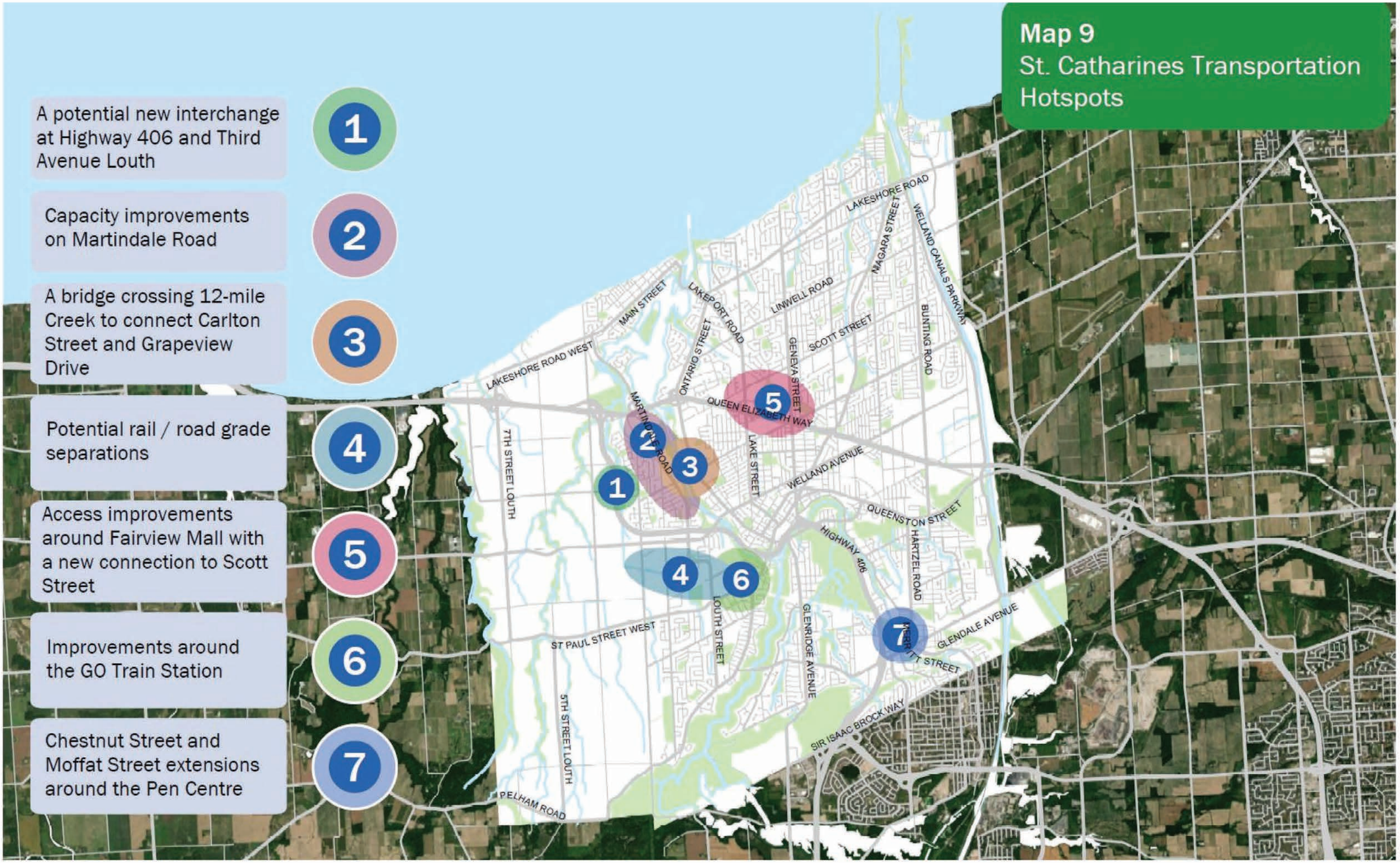
This initiative would be expected to be led by Niagara Region with input from Metrolinx and participation by the City.

Focus Area #7: Chestnut St Extension

A multi-modal connection could be considered on Chestnut Street, which would improve multi-modal connectivity by potentially serving walking, cycling, transit and vehicle traffic.

Map 9
St. Catharines Transportation Hotspots

1. A potential new interchange at Highway 406 and Third Avenue Louth
2. Capacity improvements on Martindale Road
3. A bridge crossing 12-mile Creek to connect Carlton Street and Grapeview Drive
4. Potential rail / road grade separations
5. Access improvements around Fairview Mall with a new connection to Scott Street
6. Improvements around the GO Train Station
7. Chestnut Street and Moffat Street extensions around the Pen Centre



Focus Area #5: Fairview Mall

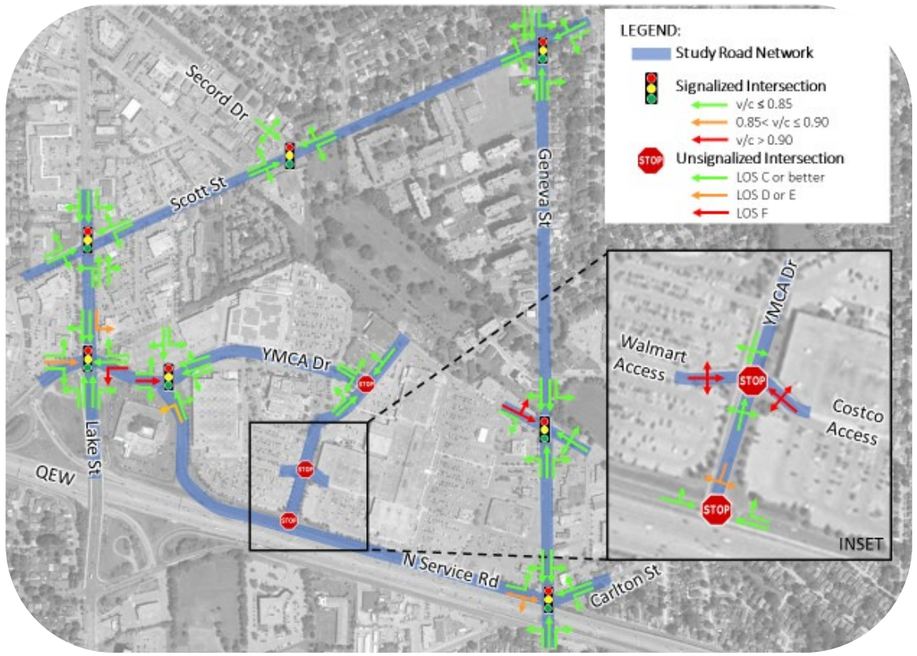
What we heard

One of the primary concerns heard was the heavy vehicle congestion on YMCA Drive and Geneva Street. Respondents noted that congestion can be attributed to traffic signals and suggested that the City promote continuous flows of traffic through synchronizing signalized intersections, adding designated turn lanes or reducing the number of signalized intersections. St. Catharines Transit Staff mentioned experiencing difficulties maneuvering buses through the parking lot and the road network due to the roadway design and congestion levels, as well as challenges with on-time performance due to vehicle congestion.

What we saw

During a field observation of the study area, a distinct worn pathway was found through John Page Park from the intersection of Scott Street and Secord Drive to Fairview Mall. The footpath indicates a desire line of travel for pedestrians and/or cyclists.

Figure 23. Traffic analysis for Fairview Mall area



Traffic Operations Assessment

The traffic analysis was conducted in accordance with Niagara Region Guidelines for Transportation Impact Studies. At signalized intersections, through and / or through-right and / or right-turn movements with a volume-to-capacity (v/c) ratio greater than 0.85 are deemed to be "critical" in terms of operations; dedicated left-turn movements with a v/c ratio greater than 0.90 are deemed to be "critical". For unsignalized intersections, movements that operate at LOS "D" or worse and / or where the estimated 95th percentile queue length exceeds the available storage length are deemed to be "critical". Movements that experience a v/c ratio noted as "critical" or greater would be considered for geometric and / or other improvement(s).

The operation of the intersections within the study area was analyzed using the Highway Capacity Manual (HCM) 2000 methodology within the Synchro 10 software. The analysis was completed for the weekday p.m. peak hour (5:00 p.m. – 6:00 p.m.) and Saturday midday peak hour (12:00 p.m. – 1:00 p.m.). Of the two, the Saturday midday peak hour was determined to be more critical; the existing operations are depicted in **Figure 23**.

The majority of the vehicle turning movements operate within capacity, however a number of critical movements were identified at the Fairview Mall accesses and surrounding intersections. Movements experiencing capacity issues are primarily movements entering and exiting the mall.

Identified Issues

Traffic volume and congestion experienced by vehicles accessing Fairview Mall impact the operations of the boundary roadways. This congestion causes delays to transit operations within and surrounding Fairview Mall. Optimizing or implementing network improvements which would provide improved level of service and / or an additional connection to the Fairview Mall should be explored.

Alternatives Analysis

Three scenarios were developed to improve operations within the study area. A new connection to Fairview Mall from Scott Street was reviewed to determine the impact to the network operations. The connection would originate from Secord Drive at Scott Street and finish at YMCA Drive east of the PetSmart. Three scenarios were considered.

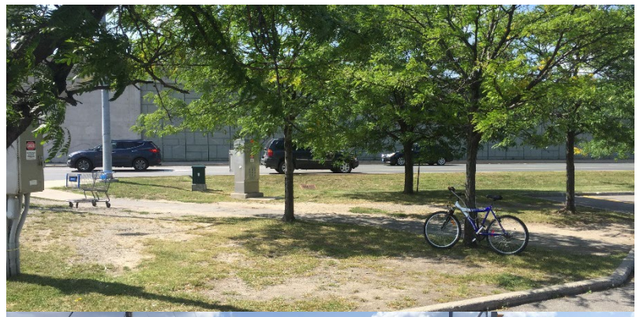


Figure 24. Potential Fairview Mall area connection

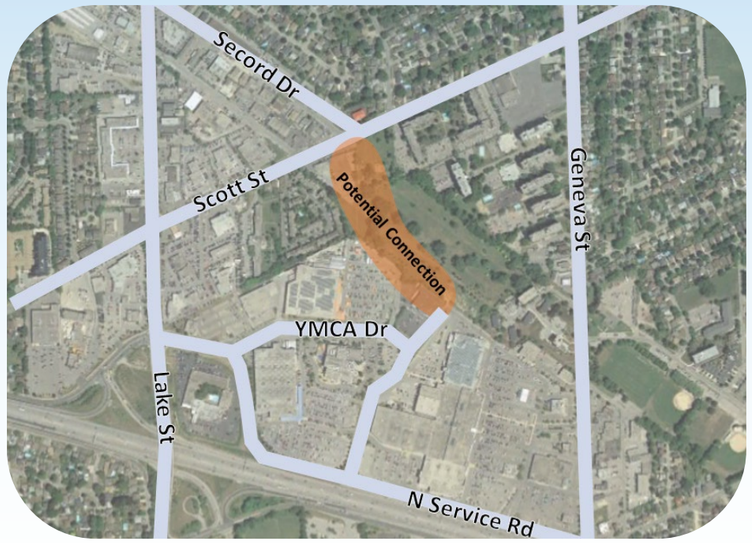
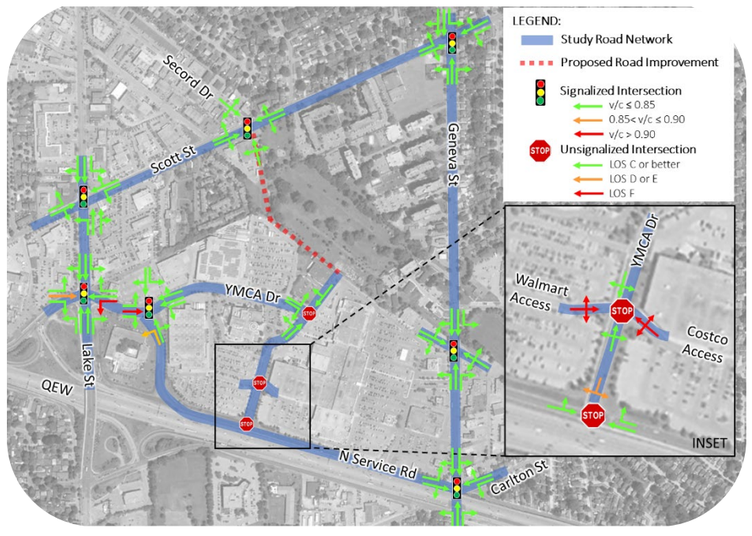


Figure 25. Future traffic analysis for Fairview Mall



Preferred Alternative

The preferred alternative is Scenario 1 – Active Transportation Link. A formal active transportation link will provide a direct connection for pedestrians and cyclists to/from the north while minimizing the impact on John Page Park. No further study is required to implement the active transportation link

Scenario 1 – Active Transportation Link

As identified in the field visit, a distinct footpath through John Page Park indicates a desire line for pedestrians and cyclists. Constructing active transportation infrastructure along this link will improve conditions for current users as well as promote active modes of travel within the area. The new link will improve the connectivity of the active transportation network and significantly increase accessibility to the mall for the residential population north of Scott Street. Furthermore, a permanent route could make active transportation a more attractive mode and in turn can help reduce vehicle congestion. In this scenario, the impacts to the natural features of John Page Park are limited while safety and comfort for active transportation users are increased.

Scenario 2 – Transit and Active Transportation Link

Currently, the Fairview transit hub is located at the mall and allows connections between various bus services, including St. Catharines Transit Commission, Niagara Region Transit, and GO Transit. By providing a dedicated transit access to the Fairview transit hub from Scott Street, it will allow transit vehicles to by-pass the congestion along Lake Street, YMCA Drive, Geneva Street and North Service Road and possibly realign routes to remove the need to travel through the Fairview Mall parking lot. The new transit roadway link can help buses maintain their schedules and improve transit service.

However, additional resources may be required by the City to maintain the transit only access. Signage will be required as well as enforcement personnel on site to ensure only transit vehicles are using the new access. As discussed in Scenario 1, the addition of active transportation facilities along this proposed roadway will provide an added benefit for pedestrians and cyclists as well as help reduce vehicle congestion.

Scenario 3 – Full Access Link

The last scenario tested was a full access link to include active transportation, transit and private vehicles. To assess the impact of the new roadway link for vehicle traffic, a Synchro analysis was conducted to compare existing conditions with projected future conditions. In order to project future conditions, a growth rate was applied to the existing midblock (average annual daily traffic volumes) and intersection (turning movement volumes) traffic counts. The projected volumes were assigned to the roadway network which included the new roadway link.

The weekday p.m. peak hour (5:00 p.m. – 6:00 p.m.) and the Saturday midday peak hour (12:00 p.m. – 1:00 p.m.) were analyzed under future conditions, with the Saturday results illustrated in Figure 25. Even with the projected growth, optimizing the signal timings along with the new connection provided an overall operational improvement.

The redistributed traffic due to the new roadway link helped to alleviate some congestion at previously critical movements. In existing conditions, the eastbound through-left movement at the Fairview Mall access to Geneva Street operates at a v/c greater than 0.90. With the proposed Scott Street connection, northbound vehicles have a second option to exit the mall, which will help improve operations at the Fairview Mall access to Geneva Street. Similarly, the southbound left movement at Lake Street and YMCA Drive improved to a v/c less than 0.85. The addition of transit and active transportation facilities along the proposed roadway will benefit all modes of transportation. The overall improvement in traffic operations will help Transit maintain their schedules. Allowing both transit and vehicle traffic will avoid the need for the City to invest in additional resources to enforce a transit-only access.

Focus Area #7: Chestnut Street Extension

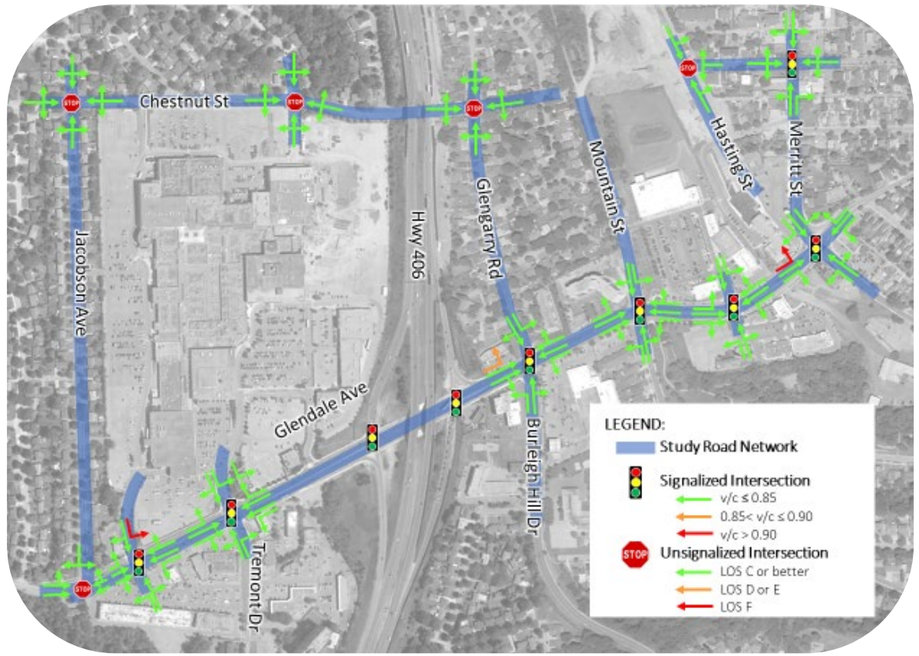
What we heard

The Chestnut Street Extension area currently experiences connectivity challenges with Highway 406 acting as a barrier to east-west travel in this part of the city. Public comments noted heavy traffic volumes on Glendale Avenue and difficulties turning onto Glendale Avenue from surrounding plazas due to insufficient distance between traffic lights. This area was also noted by transit staff to be very busy with constant construction activities reducing roadway capacity and introducing lengthy detours. The focus area is a very busy area with minimal opportunity for additional transportation connectivity.

What we saw

During a field observation of the study area, queuing and driver frustration were a common across Glendale Avenue. The intersection of Glendale Avenue and Merritt Street was of noted concern, specifically the eastbound left turn from Glendale Avenue to Merritt Street north. The missing link on Chestnut Street is a short, straight connection through City-owned land that would enhance multi-modal connectivity in this neighbourhood.

Figure 26. Traffic analysis for Chestnut Street Extension area



Traffic Operations Assessment

Similar to Fairview Mall, intersection operations were analyzed utilizing the HCM 2000 methodology within the Synchro 10 software and following the Region's Guidelines for Transportation Impact Studies. The weekday p.m. peak hour (5:00 p.m. – 6:00 p.m.) and Saturday midday peak hour (12:00 p.m. – 1:00 p.m.) were analyzed.

As shown on **Figure 26**, the majority of the vehicle turning movements operate within capacity, however a few critical movements were identified along Glendale Avenue. Turning movements experiencing capacity issues are primarily left turn movements at major intersections and at the accesses exiting the mall.

Identified Issues

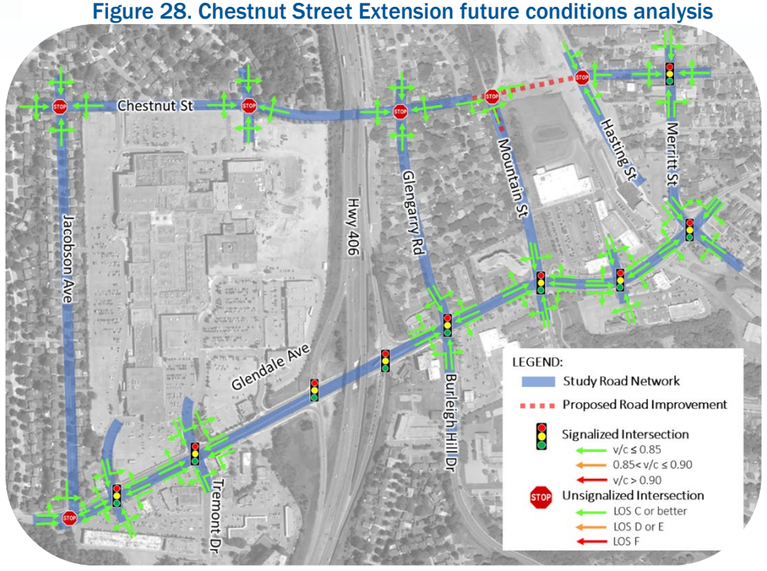
Traffic volume and congestion experienced by vehicles in this focus area impact the operations of the boundary roadways. This congestion causes delays at the Merritt Street and Glendale Avenue intersection. Optimizing or implementing network improvements which would provide improved level of service and/or an additional connection to the to the focus area should be explored.

Alternatives Analysis

Based on what we saw and heard, three scenarios were developed to improve operations within the study area. A new connection through the extension of Chestnut Street was reviewed to determine the impact to the network operations. The connection would link Chestnut Street to Merritt Street.

Figure 27. Potential Chestnut Street connection

Figure 28. Chestnut Street Extension future conditions analysis



Preferred Alternative

The preferred alternative is Scenario 3 – Full Access Link. A full access road extension of Chestnut Street from Mountain Street to Hasting Street, and the connection of Mountain Street to Chestnut Street is expected to improve traffic operations and network connectivity for all modes of travel. Further study is required to confirm the need and determine the alignment of the proposed roadway link.

Scenario 1 – Active Transportation Link

Constructing an active transportation facility along the proposed Chestnut Street extension will improve the connectivity of the active transportation network in the area. Furthermore, the extension provides pedestrians and cyclists a safer east-west route alternative to Glendale Avenue, which is an arterial roadway with high vehicle traffic volumes.

Scenario 2 – Transit and Active Transportation Link

By providing transit an additional east-west route alternative, transit vehicles can by-pass congestion on Glendale Avenue during peak periods. The new transit roadway link can help buses maintain their schedules. However, additional resources may be required by the City to enforce this transit only access. Signage will be required as well as enforcement personnel to ensure other vehicles do not use the new transit roadway.

The addition of active transportation facilities along this proposed roadway will provide the added benefit for pedestrians and cyclists as well as help reduce vehicle congestion.

Scenario 3 – Full Access Link

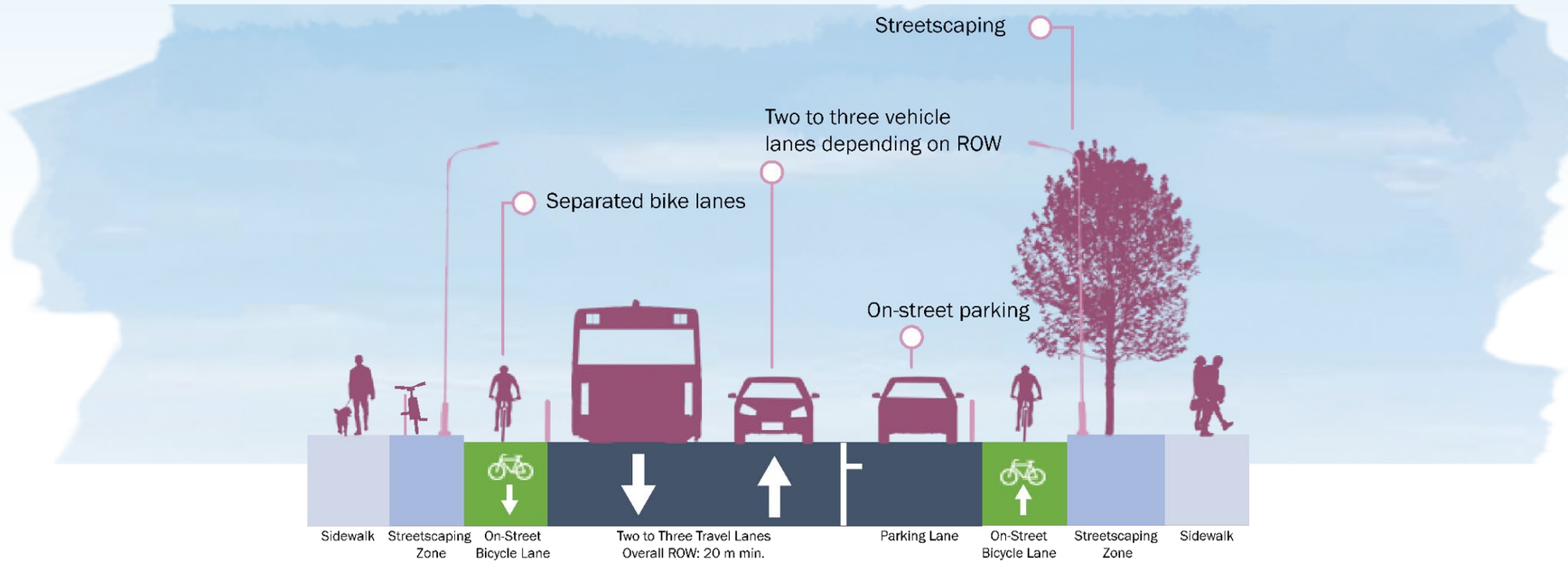
The last scenario tested was a full access link to include active transportation, transit and private vehicles. To assess the impact of the new roadway link for vehicle traffic, a Synchro analysis was conducted to compare existing conditions with projected future conditions. In order to project future conditions, a growth rate was applied to the existing midblock (average annual daily traffic volumes) and intersection (turning movement volumes) traffic counts. The projected volumes were assigned to the roadway network which included the new roadway link.

The weekday p.m. peak hour (5:00 p.m. – 6:00 p.m.) and the Saturday midday peak hour (12:00 p.m. – 1:00 p.m.) were analyzed under future conditions. Even with the projected growth, optimizing the signal timings along with the new connection resulted in all movements operating within capacity, as shown on Figure 28 Figure 26.

Reclassifying the Chestnut Street Extension...

The Chestnut Street connection is recommended to be classified as a Collector Mixed-Use Corridor. The complete street elements that could be considered for the Chestnut Street extension include:

- Sidewalks on both sides of the street;
- Where possible, consideration for the inclusion of a multi-use pathway in place of a sidewalk and on-road cycling facility. If route provides access to a major trail a multi-use trail may be considered;
- Where the ROW permits, preferred shared or designated cycling facility including bicycle lane, buffered bicycle land or advisory bike lane. For shared facilities additional signage may be considered to enhance awareness;
- Pedestrian crossings at signalized intersections or unsignalized intersections in accordance with OTM Book 15;
- Considerations for cycling amenities as well as wayfinding and signage to guide / encourage use;
- Transit in mixed traffic;
- Accessible concrete pads at transit stops;
- On-street transit stops;
- On-street parking where appropriate;
- Emphasis on enhanced streetscaping including street furniture, lighting, street trees and shrubbery;
- Limited through trucks; and
- Local delivery allowed.



3.5. Creating A Sustainable & Resilient City

This TMP recognizes that transportation planning is a dynamic exercise that needs to be flexible and adaptable to future trends. The complete streets process as well as the mode specific recommendations outlined within Chapter 3.0 were developed with the intent of establishing and supporting a sustainable and resilient future for the City of St. Catharines that accounts for:

- Environmental Trends;
- Community Trends;
- Social Trends;
- Economic Trends; and
- Technology Trends.

The premise of resilience is reinforced by the City's Official Plan and other City and Regional documents. A long-range TMP should effectively address the existing conditions and the anticipated future. This section provides an overview of some of these critical considerations and how the City can address them.

Sustainable and resilient planning decisions can be informed by several key trends within the St. Catharines context. Research shows that resiliency can be developed through a multi-faceted community focused approach which focuses on the health of five key indicators.

A resilient transportation system is no different; however, the directives should, where possible, be implementable, trackable and ambitious. There are six directives that have been identified that have been shaped by learnings from the transportation master planning process. The directives, as well as the applicable indicators, are illustrated below.

1. Adopt new approaches to transportation planning that reflect the people first hierarchy outlined within the TMP.
2. Plan for inclusive transportation infrastructure that accounts for the abilities of an aging population.
3. Support new technology advancements that can reduce environmental impacts of the transportation system.
4. Support new technology advancements that can increase the social equity and accessibility travel modes.
5. Plan for new infrastructure and modes that will support an on-demand economy.
6. Acknowledge the relationship between land-use and transportation by supporting infrastructure that connects communities sustainably and enhances an accessible and inclusive public realm.

Suggested approaches to achieve a sustainable and resilient planning process and City are identified on the following pages to support the six directives identified for the City.

New Mobility

Ride-sharing platforms, such as Uber and Lyft, offer transportation services operated by private vehicle owners. These services are accessed through smart phone and mobile applications that allow users to request pick-up and drop-off locations. In many jurisdictions, the carpool feature allows multiple passengers traveling in similar directions to ride in a single, dynamically routed vehicle providing a service that is considerably more cost competitive than a taxi, though usually less cost competitive than transit.

Electric vehicles are motor vehicles with electric engines instead of traditional combustion engines. These vehicles do not generate point source emissions and make a positive contribution toward reducing transportation emissions. These vehicles, however, require charging infrastructure, and the provision of public charging locations can encourage more motorists to consider switching to this technology.

Autonomous vehicles (AVs) use advanced sensors and artificial intelligence to perform all driving-related tasks. This technology is under development and it is not clear when it will be widely deployed. When they are introduced on a wide-scale, it is expected that AVs will improve road safety, reduce the cost of ride-sharing and enable more flexible use of time for drivers. The potential to reduce the need for vehicle ownership, reduced parking demand and greater opportunities for shared parking are among the important implications of this technology for cities like St. Catharines.

Micro-transit as defined by Metrolinx, "refers to on-demand, dynamically-routed transit services typically using smaller vehicles (such as vans) than conventional buses, supported by an online application." Examples include Chariot, which operates in several U.S. cities, and ride-share services such as UberPool, UberPool Express and LyftLine which operate in the City of Toronto and surrounding municipalities.

These companies offer a service that is generally considered to be more convenient than conventional transit and usually less expensive than a taxi. In low density areas with limited transit service, micro-transit has the potential to significantly improve mobility options for individuals who do not own a vehicle and may be a more cost-effective approach to providing conventional transit. Some municipalities, such as Innisfil, Ontario, have chosen to subsidize private micro-transit operators in specific areas. Micro-transit can also complement existing transit, particularly regional services, by making it easier for individuals to reach key terminals. In areas with moderate or extensive conventional transit service, private micro-transit operators can have the opposite effect. This complex relationship between micro-transit and conventional transit means that an effective regulatory environment is key to leveraging its potential benefits.

Micromobility includes all small human and electric powered mobility options such as e-bikes, e-scooters, hoverboards and segways. Specifically, e-bikes and e-scooters represent an important emerging sector of micromobility, especially when combined with shared mobility systems. Throughout the US, shared e-scooter and e-bike systems have introduced new means of travel and have displayed significant opportunity to address existing transportation gaps, such as the first and last mile transit dilemma.

- **E-bikes** include both bicycle-style e-bikes, which resemble traditional bicycles and scooter-style e-bikes, which resemble mopeds, but have functional pedals the rider can use to propel themselves. These different models have varying characteristics and capabilities, including their motor functioning, power and weight. Currently e-bike are regulated provincially as power-assisted bicycles and can travel up to 32km/h.
- **E-scooters** resemble traditional kick-scooters but are equipped with small electric motors. Effective January 1, 2020, the Province of Ontario has initiated a new pilot to evaluate the use and operation of e-scooters. E-scooters are permitted as part of this pilot on bicycle lanes. Where the highway is located in a tunnel or underpass, e-scooters may be operated on a sidewalk, except where prohibited by municipal by-law.

Tactile Urbanism

Tactile Urbanism refers to temporary installments that reimagine existing physical infrastructure to enhance the public realm. This can include on street-patios and public art installations in on-street parking spots, reuse of surface parking lots for events and festivals, and pedestrian-only street days.

As transportation options and the existing modal-split evolve, the impact will likely also affect the built form by redefining the needs of existing parking supply.

Safe Systems Approach

Road safety is integral to the functionality, usability and enjoyment of the overall transportation system. Deaths or serious injuries shouldn't be considered acceptable consequences of mobility. The contemporary Vision Zero / Safe Systems perspective of road safety encourages the long-term goal of eliminating road traffic deaths and serious injuries. The Vision Zero and Safe Systems Approach can work alongside the complete streets mentality to promote safety for all road users, focusing on vulnerable road users (both in modes and demographics). Generally, Vision Zero is implemented through Road Safety Action plans that guide interim road safety goals and mitigation measures. Vision Zero envisions these goals and outcomes as a shared responsibility between road users and system designers such as traffic engineers, transportation planners, land-use planners, public health professionals, police enforcement and emergency response teams. Through a mix of collaborative efforts, safe infrastructure design and policies (which account for human error and vulnerability), key directives for a Vision Zero are proposed:

- Focus in KSI (Killed-and-Serious-Injury) collision analysis;
- Design a road system that accounts for human error and vulnerability;
- Implement the safe system approach, which considers the multiple influences of road safety; and
- Understand road safety as a shared responsibility between system designers and users.

The proposed evidence-based and collaborative action items for road safety seek to enhance St. Catharines mobility systems towards a safer, healthier and more resilient future. Adopting Vision Zero requires a long, mid and short-term understanding of road safety, so that interventions that reduce (and eventually eliminate) road traffic deaths and serious injuries can be appropriately monitored and evaluated. Adaptable interventions are a key element to the longevity of Vision Zero plans. The Vision Zero Road Safety Action Plan should be contextual, flexible and contain achievable steps that will impact change in road safety.

The following summary of planning initiatives are opportunities for the City to consider in order to achieve the five key indicators for a sustainable and resilient city.

New Mobility					
Review zoning bylaw parking requirements and consider where it may be appropriate to reduce parking minimums due to potentially lower demand over the full building lifecycle; identify strategies to reduce parking demand in the interim on case- by- case basis.			✓	✓	
Implement electric charging infrastructure at public parking lots / garages for electric vehicles					✓
Consider ways that new mobility can be facilitated through design incorporation for any major construction investments.			✓	✓	
Provide as much separated cycling infrastructure on major streets as possible to mitigate future conflict between cyclists and AVs.	✓	✓	✓		
Identify areas of the City where there is an unmet need for better transit service and explore opportunities for a coordinated program with Niagara Region and a ride share provider to improve mobility options				✓	
Create a regulatory environment together with Niagara Region that integrates micro-transit and ride-sharing services in a manner that complements			✓	✓	✓
Draft a municipal by-law that defines the differences between the two e-bike typology and defines infrastructure permissions for each type.			✓	✓	✓
Undertake an e-scooter or e-bike share pilot project.	✓		✓		✓
Undertake an AVs pilot project.	✓		✓		✓
Tactile Urbanism					
Continue piloting pedestrian street programming such as “Open Streets St. Catharines”	✓	✓	✓		
Pilot artist partnerships with local artists and craftsmen to create new public art		✓	✓		
Safe Systems Approach					
Concurrently create a database of KSI collision analysis and a St. Catharines Road Safety Action Plan. Providing evidence-based collision analysis is fundamental to the informed development of Road Safety Action Plans.	✓	✓	✓		
Continue to participate in a road safety committee with the Niagara Region and local area Municipalities.	✓	✓	✓		
Coordinate efforts with Niagara Region to strengthen programs and continue to align objectives and data-collections methods.	✓	✓	✓		