



# HOW WE GO

## Niagara Region Transportation Master Plan Niagara Region's Complete Streets: Vision and Direction for a Changing Region

May 2017



IBI Group in association with  
Parsons and Brook McIlroy

NIAGARA  
2041

Fostering an environment for Economic Prosperity



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# 1 Introduction – Moving Towards Complete Streets

## 1.1 Overview and Purpose

Niagara Region's growing interest and movement towards safe, accessible and multi-modal streets is aligned with the movement towards "Complete Streets" that has been spreading across many progressive North American communities. The concept is consistent with the overarching goal of the Transportation Master Plan (TMP) which is to improve the Region's existing transportation network system. The emphasis is to enhance walking, cycling and public transit as well as accommodating automobiles and goods movement, while contributing to successful community building and a high quality of urban design.

Building off of the consultations conducted as part of the TMP, this document provides the Region's Complete Streets Vision with the supporting road/street corridor design guidelines presented in a separate document. Together these documents will form the Region's direction for Complete Streets and will guide its investments in road/street corridors while providing a helpful tool for its 12 municipalities when making their own transportation investments to year 2041 and beyond.

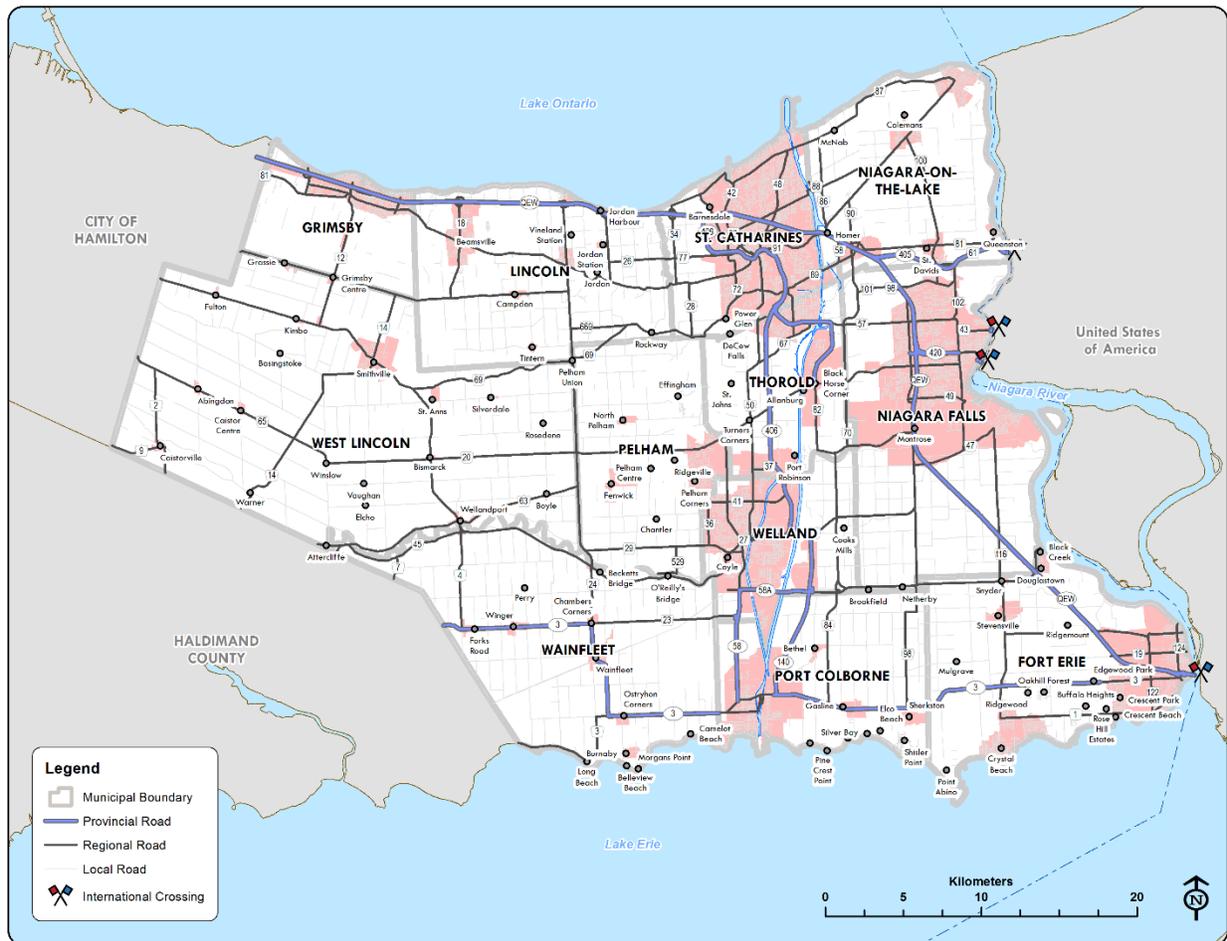
The intent is that this Complete Streets Vision document will inform the decision making process for every future Regional road/street investment, regardless of the scale of improvement.

A comprehensive Complete Streets vision provides direction on:

- How Regional roads are planned and designed;
- How Regional right-of-ways accommodate various users with an emphasis on the more vulnerable road users (children, older adults, people with disabilities);
- What physical elements form the cross-section of a Regional road;
- How road/street corridors can be designed according to their planned function and context;
- How transportation level of service can be measured and what is the design and decision making process; and
- Direction on jurisdictional responsibility for each corridor infrastructure component.

Exhibit 1 provides a map of the Regional Roads in Niagara.

Exhibit 1: Map of Regional Roads in Niagara



Incorporating Complete Streets principles into the decision-making process for infrastructure investment decisions will support not only the Region's transportation objectives, but will support the Region's goals for integrated transportation and land use planning and the aspirations for a healthy, thriving, attractive and competitive community within Ontario. The path forward for Complete Streets in Niagara requires:

- Leadership endorsement;
- Shared jurisdictional values and approaches;
- Awareness of a new set of choices;
- Guidance on how to achieve; and,
- An understanding of investment implications.

## 1.2 How to Use this Document

Niagara's Complete Street Vision is a living document. It establishes the vision for Complete Streets in the Niagara Region and provides a decision-making framework to ensure successful implementation. As it is intended to remain relevant over the years, specific direction such as those related to warrants for streetlighting or on-street parking etc. are included in the appendices and are to be updated over time.

The *Complete Streets Design Guidelines* are considered a separate document. The Official Plan could be updated in the future to include the new Complete Streets vision.

The *Complete Streets for Niagara (Model Policy Handbook)* will continue to be a tool to assist local municipalities in the development of complete streets policies and practices. The document remains an excellent resource.

## 1.3 Learning from other Jurisdictions

The movement towards Complete Streets is happening throughout North America, ranging in context from small municipalities to the largest cities, counties and regions. Most communities that are re-thinking the role of road/street corridors are enacting some combination of new policy, guidelines, or standards, and lessons can be learned that apply to Niagara's context. As learning from other jurisdictions is also an ever changing target, a sampling has been provided in Appendix A of some initiatives including the Regions of York, Waterloo, Peel and the North Carolina Department of Transportation, as well as the municipalities of Toronto, London, Calgary, and Ottawa. Valuable resources to stay current on the topic include the Toronto Centre for Active Transportation (TCAT), National Association of City Transportation Officials (NACTO), the Association of Pedestrian and Bicycle Professionals (APBP) and the National Complete Streets Coalition.

Together, the examples share many similarities in emphasizing place-based solutions, and increasing safety and mobility options of streets. The role of transportation corridors in successful community building and the opportunities for streets to inspire high quality urban design are also common themes. These examples serve to illustrate that while the general goals are very similar, each community can take a unique approach or tool to accomplish them. Niagara's result can truly be "made in Niagara".

## 1.4 Niagara's Own Initiatives

In reference to Appendix B, the Region already has completed a number of initiatives that support Complete Streets. The interest may have initially centered on the accommodation of recreation-based cycling that supports tourism. While supporting economic development opportunities that a regional, recreation based network can provide is still important, the opportunity to accommodate residents and visitors of all ages and abilities, in a wide range of types of trips, is becoming increasingly important. This is evident in Niagara's recent documents, such as the *Complete Streets Model Policy Handbook*. From a regional perspective, the initiatives indicate the importance to consider the broad range of streets that make up the Region's roadway network and recognize that planning for these streets (and their varying contexts) requires flexibility.

## 1.5 Unique to Niagara

As demonstrated by the scope and magnitude of the initiatives outlined in Section 1.4 and Appendix B, the framework is in place for the formal adoption of a Complete Streets vision in Niagara. In order to ensure the vision is truly effective for the Region, and to leverage Niagara's potential to gain a competitive edge on other municipalities in the attraction of investment and people to the Region, the vision must reflect Niagara's unique setting. Unique influences include:

- An appetite for change;
- A two-tier government context;
- The Urban, Village and Rural context;
- Geographically dispersed and diverse communities;
- Relatively modest traffic demands;
- The moderate climate;
- Demographics – the young and the old;
- Tourist-orientation;
- Cross Border influences; and
- Niagara as a destination.

A Complete Streets approach can enable Niagara to realize a fuller potential for the Region's roads by way of increasing usability and relevance to land use and to build a stronger and more prosperous Niagara. Complete Streets practices are to be seen as a tool for the Region to attract investment to the local communities by inspiring the best urban design and use of the land along Regional Roads. The investment in roads by the Region is directly related to growth and prosperity. By investing in roads the Region can play a leadership role in galvanizing public and private investment across the 12 communities, helping to attract residents and contributing to economic growth.

## 2 The Complete Streets Vision

A Vision Statement for Complete Streets in Niagara will inform future policies which could be adopted in the Official Plan or other planning policies applicable to the Region. The recommended wording is as follows:

*To support Niagara's investment in Complete Streets as the cornerstone of the Region's community development and, as a transformative measure, help to establish a new identity for the Region as a leader in community design and mobility.*

- a) Niagara's streets/roads function as complete community corridors that vary according to their context and planned function;*
- b) Niagara's streets/roads will have an emphasis on moving people, in all modes, with a balance that is appropriate to the context;*
- c) Niagara's streets/roads will accommodate all modes, but pedestrians, cyclists, and transit are truly a priority;*
- d) Niagara's streets/roads are among the most important public spaces in the region and will inspire a high quality of urban design along them; and*
- e) A strong decision-making framework will assist street designers to achieve incremental movement towards more-complete streets with every investment opportunity.*

### 2.1 Guiding Principles for Niagara's Complete Streets

Having regard for the Niagara context and the opportunity to transform the planned function and design of its Regional roads and streets, the following guiding principles will form the strategic basis for decision-making:

- **Complete Corridors:** Niagara's roads and streets will be planned and designed using a "complete corridor" approach. This approach includes not only the infrastructure within the rights-of-way but also the adjacent land use which varies along their lengths. The roads and streets will be the framework for exemplary design not only of the corridor itself, but for adjacent lands. Design excellence will be pursued throughout all corridor components from building face to building face.
- **Public Space Corridors:** Niagara's roads and streets will be recognized as providing an important public space opportunity. Planning and design decisions will balance the desire to create an inviting, livable, and inclusive public realm that is people oriented, with the functional elements and demands of transportation. They also provide an opportunity for place-making through the wise design of public elements such as bus stops, gathering spaces or meeting spots, seating, and public art. The role of these corridors as public spaces is an important part of creating healthy and sustainable communities.
- **Integrating Corridors:** Niagara's roads and streets will serve as the land use spine for the communities they serve. Although a road might travel through a rural / agricultural area or hamlet, then through a suburban area to a downtown location, the treatment of the road would be different along its length. The aim is

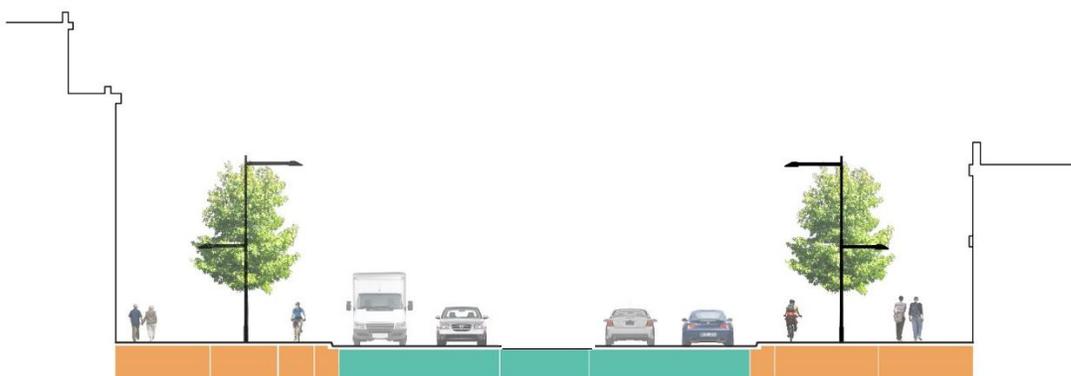
to avoid dividing communities along the way, but rather, having the road or street integrate the land uses and places along it.

- **Multi-Modal Corridors:** Niagara's Regional roads will move the largest numbers of people in the widest variety of modes along both short and long distances throughout Niagara. They will form the spine for connecting a network of municipal collector streets and local streets and in turn accommodate various modes of travel. The Region recognizes that some corridors will be "more complete" than others, depending on the emphasis on walking, cycling, and transit that may vary from urban to rural context.
- **Universally Accessible Corridors:** Niagara's roads and streets will be inclusive and comfortable to users of all abilities. They will be easy to navigate, access, and cross. Using the age 8/80 rule (and similar) to craft specific policies for "walk to school" and policies for seniors.
- **Safe and Comfortable Corridors:** Niagara's roads and streets will be and feel as safe, secure and comfortable as possible for all users with an emphasis on vulnerable road users (children, older adults, people with disabilities). There will be an emphasis on clarity and segregation of users, particularly the protection of pedestrians and cyclists from moving vehicles.
- **Servicing and Utility Corridors:** Niagara's roads and streets will provide space to accommodate the broad range of vital regional/municipal services and private utilities. Space will be provided while understanding that the competition for space is great and that trade-offs may be needed in terms of historical standards.
- **Economic Engine Corridors:** Within the context of the urban structure for Niagara, Regional Roads are engines of economic development across the Region. The urban structure works to designate certain areas and corridors as key places for urban type development that will support a hierarchy of places across Niagara. Beyond the urban structure, different roads (Regional, Provincial and Local) have different purposes – some help farmers, promote agritourism, provide access. Within this context, the economic engine function will be multi-faceted, including the provision of municipal infrastructure, property access for residents and employees, and exposure to business patrons travelling by foot, bike, transit and car within an inviting visual environment. The Region's investment in the corridors can work as a catalyst for private sector investment on adjacent lands.
- **Green and Sustainable Corridors:** Niagara's roads and streets will be recognized as forming as much as 20 to 30% of the land area in urban and suburban contexts and will be an opportunity to showcase sustainable design. Opportunities to include low-impact green technologies and methods such as pervious pavements, bioswales, rain gardens to manage stormwater and provide shade, and contemporary tree planting techniques, will be encouraged.
- **Cost Effective Corridors:** Niagara's roads and streets will be designed to manage the cost of construction, operation, maintenance, and reconstruction. Opportunities to utilize robust, enduring, and sourceable materials to reduce life cycle costs will be pursued.

### 3 The Complete Corridor Concept

The Guiding Principles lay the foundation for Niagara to plan for “Complete Corridors” that integrate communities and inspire a high quality of urban design. Each Regional road/street corridor is composed of several components, including lands adjacent to and within the rights-of-way. It is the successful design and combination of these components that create efficient and livable communities. The companion Complete Street Design Guidelines are organized in keeping with this concept, and address the Adjacent Lands, the Public Realm, and the Roadway.

Exhibit 2: The Complete Corridor Concept



#### 3.1 The Region's Family of Complete Street Corridors

Niagara is composed of a wide range of urban, hamlet, and rural contexts. Within those contexts, there is further variability in the road/street corridor characters and planned functions. Having regard for this context, six road corridor types are identified as the basis for the Region's new “family” of Complete Streets. Demonstration cross-sections are provided in Appendix C. The guidelines are presented in a manner that recognizes the need for flexibility in the implementation of the various road corridor types. There will be variations on these basic types which are established as a starting point for detailed design on a corridor by corridor basis.

The six road corridor types were developed based on existing Regional policy, for the current and future state, in conjunction with an analysis of the existing corridors as they are today. An analysis of existing roadway conditions created an opportunity to consider how existing policy and ground conditions contribute to how a roadway is designed and experienced. Variables listed in this analysis include protected and measured rights-of-way, number of vehicle lanes, pedestrian facility type, adjacent land use, bikeway master plan designation, etc. The analysis undertaken provides local context for Niagara and showcases the potential for investment in “more completeness” in the Regional road network.

Given the vast differences in settlement areas that make up the region (Hamlets, Urban, Rural), the roles and functions of Regional Roads differ between development areas, as

is reflected in the corridor analysis sheets. In urban areas such as St. Catharines and Port Colborne, Regional Roads serve as both downtown streets, as well as through-routes connecting beyond the municipality. In hamlets and rural areas, the Regional Roads also serve as through routes, but are also relied on for their local network role and contribution to community character. These create challenges in terms of vehicle access, speed and safety, and provisions for walking and cycling. The Region's new Family of Complete Street Corridor types aims to reflect the basic types which are established as a starting point for detailed design on a corridor by corridor basis. This forms the basis for the decision-making framework outlined in Section 4.

The Region's Family of Complete Street Corridor Types:

### **1. Main Street**

These roads have historically narrow rights-of-ways (20m – 26m) and are found in urban areas and hamlets, often with a mix of at-grade retail and residential uses. While there is a high potential for movement of people by all modes, the pedestrian movement is the predominant movement. The boulevard area forms an important public realm and will have an urban cross-section with an emphasis on streetscaping. Street amenities can include wide sidewalks, pedestrian oriented lighting, street trees, transit amenities and opportunities for public art. Needs for on-street parking are often high. The street is to be transit supportive with transit oriented land use. The street is also to be active transportation supportive.

In part due to the plurality of urban conditions, the Main Street typology is intended to reflect small urban type lotting configurations. For example, downtowns with buildings built close together forming a strong street wall. For areas where buildings are separated by large gaps that are either green spaces or driveways, the Urban Arterial typology may prove to be more appropriate. It is acknowledged that for those areas where there are gaps and driveways serving every lot, the potential of the streetscape to cater to pedestrians, transit users, and cyclists can be diminished relative to those Main Streets where buildings are built close together with either a few driveways or none at all.

### **2. General Urban (Narrow)**

These roads have historically narrow rights-of-ways (20m – 26m) and are found in urban areas often serving commercial retail and service businesses and/or residential uses. There is less emphasis on streetscaping; however opportunities for sustainable planting and street greening can be sought. The street is to be active transportation supportive as these streets often connect neighbourhoods within communities, and can form part of the Regional cycling network.

Breaking up the rights-of-way may create impacts that can diminish the potential for completing streets. As may also be the case with Main Streets, this can be a result of the lotting fabric. For example, driveways that are placed close together can increase the potential for conflicts between vehicles and pedestrians/cyclists, and limit streetscape enhancement such as tree planting and furniture placement and transit stop locations and treatment. A goal of this Complete Streets vision is to include an effective strategy for influencing future land use and built form and changing existing land use and built form overtime to provide better interface with

completed streets so as to improve the potential and success of this public investment.

### **3. General Urban (Wide)**

These roads generally have wide rights-of-ways (26m – 36m+) often with four or more vehicle lanes and in-corridor cycling facilities. The corridors often have wide medians and left-turn lanes at intersections. Capacity at intersections is an important design objective. These corridors often serve commercial retail and service businesses, and connect residential neighbourhoods within communities. Parking is typically provided on adjacent lands, outside of the right-of-way. Opportunities for street greening are available along the boulevards and medians, and can be embellished by landscaping on adjacent lands.

### **4. Transitioning**

These roads generally have wide rights-of-ways (26m – 36m+) with 4 or more vehicle lanes, serving semi-urban and rural areas. The corridors often play important roles in connecting communities, cross-region travel, goods movement, and international crossings. Transitioning Roads are generally located in commercial or residential areas that are transitioning to a more urbanized and mixed-use context. Generally, they are transitioning from large format retail to medium or high density residential. New development is street-oriented. Capacity at intersections is an important design objective. They provide opportunities to support regional cycling through a range of in-corridor cycling facilities, with an emphasis on separation. Pedestrians can be accommodated on sidewalks or multi-use pathways, depending on the context.

### **5. Hamlet**

These roads have historically narrow rights-of-ways (20m – 26m) and are found in hamlets serving commercial retail and service businesses and/or residential uses. These corridors can form the “heart” of Hamlets, where opportunities for streetscaping can be pursued. The street is to be active transportation supportive.

### **6. Rural**

These roads have varying right-of-ways (20m to 36m+) depending on the number of travel lanes. They serve rural areas and connect communities across the Region. The focus is vehicular movement and as a primary goods movement corridor as well as supporting rural cycling through wide, paved shoulders. Opportunities to accommodate both pedestrians and cyclists on multi-use pathways or trails along the corridor edge can be pursued as part of regional cycling and pedestrian networks.

The typologies matrix in the Complete Streets Design Guidelines provides additional information on the above-noted types.

## **3.2 Complete Streets Design Guidelines**

The Complete Street Design Guidelines are provided in a separate document and highlight a range of best practices for the planning and design of roads and streets as “complete” corridors across Niagara.

## 4 Implementation – Making Complete Street Decisions

This section includes the framework and tools to set the Region up in the most advantageous position to achieve good complete street corridor decisions.

### 4.1 The Complete Street Opportunities

Complete Street improvements come in all shapes and sizes. As noted earlier, the concept of Complete Streets isn't always about accommodating all modes of transportation on a street to the highest level of service. Rather, where significant right-of-way constraints exist, the aim is to pursue incremental improvement to a street, making it as complete as possible. As such, Complete Street improvements can be realized through a wide variety of roadway projects, from small operations to major roadway constructions.

Niagara will place a priority on pursuing completeness in the design of new or renewed roads/streets that:

- are located within existing and planned high density and mixed use area such as downtowns, hamlets, mobility hubs, schools, colleges and universities, employment nodes, retail districts, and other areas where there is high propensity to attract pedestrians, cyclists and transit users;
- serve as designated cycling routes, public transit routes, or tourist routes;
- are within special precincts such as Community Improvement Areas, Heritage Conservation Districts, or waterfronts;
- have excess vehicle capacity for current and anticipated traffic; and/or
- are experiencing safety concerns for street users.

There are a number of investment opportunities available to deliver new, complete streets, or improvements that will contribute to more-complete streets. Some of these opportunities fall under capital works projects that are candidates for local improvement charges.

To facilitate future implementation of Complete Streets, the Region should undertake a mapping exercise to cross-reference street typologies provided in this report to Regional Roads.

### 4.2 The Role of Official Plan Policy

The Regional Official Plan is the long-range, community planning document that is used to guide the physical, economic and social development of the Region. The Plan contains objectives, policies and mapping that implement the Region's approach to managing growth, growing the economy, protecting the natural environment, resources and agricultural land, and providing infrastructure. Future versions of The Official Plan could be updated to reflect the Region's vision for Complete Streets in order to re-affirm

the commitment of the Region to adopt a Complete Streets approach as a long term planning objective.

### 4.3 Rights-of-Way Protection

Regional Road corridor right-of-ways have high demands to accommodate pedestrian, bicycle and transit facilities, all vehicle lanes, utilities, snow storage, drainage, sidewalks, and landscaping. In order to ensure that the allowance is sufficient to provide these required items, Regional policies have been established in the Official Plan in order to protect and acquire needed road allowances, so that new development does not limit the provision of future services and utilities. These policies include requirements for road allowance widths, land acquisitions, road improvements, and the protection and enhancement of desired features.

The designated/protected widths for Regional Road allowances fall into five general categories: 20m; 26m; 30m; 36m; and other/variable. Very few road segments fall into the fifth category. Irregular road allowance widths may come about due to exceptional circumstances such as physical barriers or limitations (e.g., a train bridge) or the transition between different road types/sizes (e.g., from a provincial highway to regional/municipal streets).

A review of a sampling of existing current conditions of roads within each of these general categories was undertaken (i.e., corridor analysis sheets). The analysis undertaken considered the Protected Width (as per Table 9.1 of the Official Plan) as compared with the measured width. The actual measured ROW is at times different than the protected widths. For example, on Main Street East (Regional Road 81) in Grimsby (Nelles Road North to Lynwood Ave), the measured ROW is 22m while the protected ROW is 26m. When considering the creation of a new Rights-of-way protection strategy, the following questions must be addressed: whether or not the protected widths are sufficient to accommodate the vision; and how can the Official Plan inform the design process when the protected width is not available.

The Region's protected right-of-way widths are deemed appropriate for the Region to implement a Complete Street approach. Whereas there is a tendency to aspire for more space on an individual street component basis (such as wider bike facilities, more space for landscaping), there is an equal aspiration to keep corridors as narrow as possible. Space efficiency is always an important theme which creates a healthy tension. Accordingly, trade-offs are inevitable when designing complete streets. Selecting the appropriate number of vehicle lanes, and contemporary (i.e., more narrow) lane widths, helps in freeing up space for road/street completeness.

The demonstrations in Appendix C illustrate that options exist for fitting in the various elements within Niagara's protected right-of-way widths. The demonstrations represent choices for how the various elements can "fit" into the various protected rights-of-ways. They include a range of options and design parameters and are a tool to use in the discussion regarding trade-offs. Policies related to Rights-of-Way Protection are laid out in Section 9.C in the Official Plan. . It is important to acknowledge that many of Niagara's Regional roads cannot be widened due to existing constraints along the corridor edge. These may include a range of encumbrances such as buildings,

structures, valued natural or cultural features, stormwater management systems, utilities, roadside infrastructure and topography.

## 4.4 Jurisdictional Review

### Background

In Niagara, the public realm within the Regional Road right-of-ways have a complex mix of responsibility which is split between the Region, the local municipality and property owners. In the context of a Regional road, the Region is currently responsible for all elements 'between the curbs' such as the road surface, travel lanes, stormwater management, lighting, traffic calming medians and signalization. The local municipality is responsible for sidewalks, on-street parking, bike lanes, landscaping, transit facilities and street furniture.

The Region funds bicycle lanes on local roads if the road is part of the Niagara Region Bicycling Network. The Region has an agreement with the local municipalities and is in the process of assuming all streetlighting on Regional roads. The private owner is responsible for enhancements on their property, which include awnings, lighting, the building façade and signage. All of these components contribute to a street's character and a sense of place; however, the costs associated with their implementation vary significantly.

### Looking Forward

Jurisdictional issues have been identified as one of the key barriers to Complete Streets in Niagara. The elements related to road surfaces, signalization and pedestrian facilities, for example, need to be coordinated in order to successfully implement Complete Streets, yet regional and local transportation priorities do not always align.

Leadership in Complete Streets implementation is an important role for the Region. An approach should be considered where the Region fully funds the construction of the Complete Street project within the rights-of-way (when a target threshold is met for the "completeness of the Street"), including the life cycle replacement costs. The local municipalities would be responsible for operations and maintenance. The benefits of this approach include:

- The Region is in a position to lead design decision-making in regards to implementation of the Complete Streets vision for Niagara;
- This is a step towards an more ideal arrangement where one level of government is responsible for designing and constructing everything within a right-of-way;
- It will address the complexity wherein cycle tracks are not located between the curbs, and would otherwise fall into a jurisdictional grey area;
- It provides much needed clarity regarding which jurisdiction is responsible for what.

A division of responsibility by capital and operating costs allows for clear lines of jurisdiction. The Region would be responsible for the design, tender process, and

construction. Beyond warranty, the responsibility for operating costs would transfer to the local municipality. In this scenario, the Region would build a Complete Street, with local municipality input, and would own it as it is within the Regional rights-of-way, but would have an agreement in place for the local municipality to maintain it. The policy change is that the transfer of responsibility to a local municipality would be assumed and then documented. If a quality facility is what is desired then it will be maintained over time with this sense of ownership. This benefit is lost if it is only optional for a local municipality to be contracted out maintenance responsibilities.

The agreement between the Region and the local municipality would clearly define the expected maintenance requirements and level of service over the expected life span of the facility or for a defined timeframe. For example, the frequency of street sweeping operations or the re-application of pavement markings should be defined so that the local municipality can adequately budget for these operating costs during the project planning process.

### On-Street Parking

In the context of the above noted proposed framework, on-street parking would be the only non-regional function left within the ROW. Continued local responsibility for on-street parking is a positive outcome. It is a reflection of existing policy that on-street parking is not a key component of Regional Roads and, where it is provided, reflects the fact that the various local municipalities have different parking bylaws. The collection of parking revenue by local municipalities would fund enforcement and may potentially offset some of the operating costs. It also facilitates parking changes associated with special events. Clear lines of responsibility are more straightforward.

## 4.5 Costs

The National Complete Streets Coalition (NCSC) argues that Complete Streets are more cost effective than the alternative – streets designed only for cars. In some cases, Complete Streets can even help jurisdictions save money. They can prove to be long-term investments in the overall health of communities where policies and practices are adopted (i.e. safer streets, higher levels of multi-modal travel, supportive of increased economic development). This position outlined by the NCSC is based on several factors.

First, Complete Streets policies and practices ensure early multi-modal scoping, saving money by avoiding costly project delays. Without a policy or clearly defined approach, bicycle, pedestrian, and transit accommodations are often debated too late in the design process and are considered a disruption rather than necessary and beneficial project features. It is best to consider all modes early in the planning process rather than late in the design or construction phase of the project.

Second, Complete Streets projects require minimal additional funding. The careful planning encouraged by Complete Streets policies and practices helps jurisdictions accomplish many complete streets attributes at little or no extra cost. According to the NCSC, communities who adopt a Complete Streets approach commit to superior roadway planning and design in new and reconstruction projects. Executing these

designs can be less expensive than projects carried out under conventional standards and approaches. Creating Complete Streets can also reduce infrastructure costs by requiring less physical infrastructure. For example, the movement to cycle tracks behind the curbs save costs due to the reduced requirement for road subgrade and pavement structure. This results in a more affordable project to construct and reduces maintenance costs over the long-term.

Finally, an existing transportation budget can incorporate Complete Streets projects without requiring additional funding. By re-prioritizing streetscape projects and allocating funds to Complete Streets projects, a community can improve overall mobility while ensuring that municipal staff and elected officials get the most out of every dollar.

The Region is well-positioned to begin allocating funds to Complete Streets projects. This is achieved by reprioritizing the existing funds. The Region will continue to consult with the public on each infrastructure project where it will be demonstrated that funds are being allocated to improving pedestrian spaces, transit, cycling connections and the public realm; a premise gaining support in the Region. The adoption of this Complete Streets vision establishes the parameters and decision making framework for this reprioritization to occur.

### A “Made in Niagara” Approach

Monetary costs of Complete Streets can be viewed through the lens of Niagara Region's long-term vision for Regional Roads transitioning into Complete Streets over time. Transitioning to Complete Streets in Niagara will not be a binary switch, whereby existing streets swiftly become fully-realized Complete Streets. Rather, a “Made in Niagara” approach to Complete Streets requires a planned progressive transition over time. Subsurface infrastructure and streetscape surface elements that are added in progression can work as catalysts for private investment in land use along a corridor. This progression allows the Region and the municipalities to better coordinate and fund improvements and allows private investment to keep pace with the Region's Complete Streets Guiding Principles.

Niagara Region can be in a position to explain that more-complete, multi-modal streets cost little more to design and implement than a conventional street. While new Complete Streets projects and retrofits require capital expenditure, (like any infrastructure project), (source: *Complete Streets for Canada*) few of Niagara's streets actually require “radical” or expensive modifications to become more complete (source: *Complete Streets for Canada*). This unique opportunity puts the Region in an optimal position to embrace the Complete Streets approach as a means to obtain strong returns in community health and economic development.

### Capital Costs

Street level enhancements such as landscaping, walking surfaces, and public-realm oriented street lighting can represent 10-20% of the total project cost. Successful Complete Streets projects can leverage opportunities that come with integrated road, water and sewer projects with an emphasis on greater street surface investment, particularly in the places where people live, work and shop. In theory, greater

investment in certain surface streetscape enhancements will lower the need to invest in more conventional street elements.

While a Complete Street might result in the need for less asphalt (i.e., paved vehicle travel lanes), an increase could be associated with:

- Surface treatments (i.e., paving stones, concrete crosswalks, etc.);
- Green thermoplastic (i.e., cycling facility intersection crossing treatment);
- Street Furniture;
- Landscaping; and
- Traffic calming measures (speed humps / speed tables, chicanes, bump-outs).

An accumulation of such treatments is anticipated only on a limited number of segments across Niagara, with Mainstreets being the priority.

Because the emphasis on level of service to motor vehicles is reduced with a Complete Streets approach, the street can ultimately result in lesser life cycle costs because of the reduced infrastructure. Replacement / maintenance of pedestrian and cycling features on a street can have a reduced financial cost and can produce a higher net gain in other mobility modes on the street.

### Estimating Capital Costs of a Complete Street

#### ***Element 1 – Cycling Infrastructure***

Bike lane construction is typically associated with pavement markings and seen as a cheaper option to construct. However, a painted bike lane is part of the roadway and therefore requires adequate pavement structure (i.e., full depth construction). Drainage structures are also located within the bike lane area of the roadway. For new roads, the roadway pavement structure must be widened for the full width of the bikeway up to the curb. The pavement structure will need to support motor vehicle traffic since it is expected that encroachment into the bike lane is necessary while making turns at intersections, accessing driveways, and for loading at bus stops.

In order to present an indicative estimate on the cost of a painted bike lane, the following basic parameters are established: new roadway; full depth construction (i.e., asphalt pavement, granular base and sub base); 2.0 m in-road painted bike lane (i.e., without buffers or delineator posts, or concrete curb); 2.0 m concrete sidewalk and granular subbase (note: pedestrian facility included to be comparable to a multi-use pathway); and excluded items such as pavement markings, signage, drainage structures or intersection treatments.

The estimated cost of a 2.0 m wide in-road bike lane with 2.0 m wide concrete sidewalk is \$330 per linear metre.

The other typical scenario involves a retrofit project with a painted bike lane on an existing wide road. In this situation, the cost includes re-stripping the pavement markings if sufficient pavement width is available (with or without reducing the number of vehicle travel lanes). This option is less expensive per linear meter; however, with consideration for the guiding principles of this Complete Streets vision, the inclusion of

conventional painted bike lanes on an existing wide arterial road should be accompanied by higher order pavement markings, buffering, signage and intersection treatments.

The second option is an in-boulevard cycle track and concrete sidewalk. For this estimated cost, the following basic parameters are established: new roadway; 1.8 m wide in-boulevard cycle track with asphalt pavement and granular subbase; 0.2 m demarcator strip between cycling space and pedestrian space; 1.8 m concrete sidewalk and granular subbase (note: pedestrian facility included to be comparable to a multi-use pathway); and excluded items such as pavement markings, signage, drainage structures or intersection treatments. A cycle track is typically not designed to carry motor vehicle traffic and therefore requires less robust pavement structure (i.e. less excavation, granular base and asphalt pavement).

The estimated cost of a 1.8 m in-boulevard cycle track and 1.8 m sidewalk is \$315 per linear metre.

The third option is an in-boulevard multi-use pathway. For this estimated cost, the following basic parameters are established: new roadway; 3.0 m in-boulevard multi-use pathway with asphalt pavement and granular base; and excluded items such as pavement markings, signage, drainage structures or intersection treatments.

The estimated cost of a 3.0 m in-boulevard multi-use pathway is \$130 per linear metre.

The above noted indicative cost estimates provide a starting point for this discussion; however, the estimates do not quantify the appropriateness of a facility type to a specific roadway, network connections and intersection improvements. It does begin to present the case that traditional on-road bike lanes are not necessarily the most cost-effective technique for accommodating cyclists along an arterial roads considering the more robust road bed and pavement structure required and the relationship of a conventional bike lane on arterial roads to the creation of a quality facility for all ages and abilities.

### ***Element 2 - Streetscaping***

Typical streetscaping elements include planters, banners, ornamental poles and mast arms, wayfinding signs, map cases, pedestrian scale streetlighting, waste receptacles, benches, seating areas, and gateway features. The magnitude of cost of all of these examples is dependent on the finishes and material selection as well as the scale of the project (i.e., economies of scale).

A common material used in enhanced streetscapes is paving stones. Typically, paving stones are constructed over a granular base and sand bed; however, more robust bedding may be required in poor soil conditions resulting in a varying cost for installation. Material selection and the pattern of paving stone factors into the cost (i.e., more complex patterns have greater costs). An alternative to paving stones is stamped concrete or coloured concrete. The appropriateness of special concrete treatments is Niagara specific. Relevant information related to paving stones and the use of concrete treatments can be obtained by monitoring existing Complete Streets projects within the Niagara Region in order to learn what materials work specific to the Region.

Municipalities often negotiate with Business Improvements Areas (BIAs) to fund certain elements of the streetscape. For example, on Beechwood Avenue in Ottawa, the BIA paid for ornamental pedestrian scale lighting, banners on light posts, the upkeep of planter boxes, special signage and street signs. It is a common best practice to assume that a third party could fund and maintain specific streetscape elements.

### Policy Concept related to Cost Estimating

The typical process for cost estimating by municipalities involves Class A, B, C and D estimates.

A Class D estimate is appropriate at the project planning level which typically includes an assigned percentage for engineering fees, contingency, utilities, property and other soft costs.

A Class C estimate fine tunes this initial estimate with preliminary quantities based on a functional design. At all levels of estimating, the typical practice is to assume that the contingency allocation will cover costs associated with streetscaping.

The Niagara Region could consider adopting a process where a specific percentage is assigned to streetscaping. For example, a Class D estimate typically includes 50% contingency. Option 1: 40% contingency and 10% streetscaping in order to allocate a budget for streetscaping early in the process. Or, Option 2: maintain 50% for contingency as it is intended to cover unknowns and then create a new 10% streetscaping allocation for those projects with a greater emphasis on complete streets in the early planning stages. This figure of 10% is based on the fact that typically street level enhancements such as landscaping, walking surfaces, and public-realm oriented street lighting typically represent 10-20% of total project cost.

### Operating Costs

The use of enhanced treatments and dedicated spaces may imply more costly maintenance requirements (i.e., more “completeness” corresponds to more streetscape elements requiring maintenance). With this, there is great variability in street design ingredients such as street lights, street furniture and surface treatments.

Other jurisdictions are piloting innovative maintenance regimes for Complete Streets.

The City of Ottawa for example, has cited experience elsewhere showing that reorganizing existing maintenance priorities, even though it may delay service in other areas or add time and operating costs, can contribute to the safety and popularity of cycling. As such, rethinking of approaches to maintenance can be a tool to positively impact modal share. In Ottawa, spring clean-up on key cycling routes is initiated as early as possible each year. Although maintenance services in other areas may be delayed, this re-prioritization does not impact the municipality's operating costs. The City of Ottawa also allocated \$250,000 a year for four years for the winter maintenance of 40 km of cycling facilities (i.e., a designated winter cycling network).

In Hamilton, the municipality is tracking maintenance costs in order to better understand how an increase in the amount of cycling infrastructure impacts maintenance budgets

(i.e., cycling infrastructures comes with additional inspection, ploughing, anti-icing and street sweeping).

Maintenance of Complete Streets is still a relatively new concept to many municipalities; however, Niagara Region has the opportunity to be a leader in maintenance and operation of these facilities.

### **Conclusion - Framing the Discussion**

Complete Streets provide benefits to the community in many other ways, from public health to sustainability and from improved property values and economic revitalization to increased capacity and improved mobility for all (NCSC).

Implementing Complete Streets allows for an efficient and optimal use of limited resources: time, fuel, land, public health, the environment, and money.

The gains of a Complete Streets vision are best demonstrated through a lens that considers capital and operating costs in conjunction with 'revenue' for a municipality (in the form of land use, economic development, health indicators, community revitalization, etc.).

## **4.6 Multi-Modal Level of Service Tool**

Multi-Modal Level of Service (MMLOS) has been identified as a new approach to be used by the Region in determining transportation level of service along Regional Road corridors. In the past, municipalities have focused on the performance of vehicular traffic. By looking at level of service (LOS) performance measures for other modes of travel, the Region will be better able to view a street in the context of being complete and make informed decisions when considering the spatial requirements and trade-offs between cycling, walking, transit and vehicular modes. A proposed MMLOS guideline for the Region has been included in Appendix D.

## **4.7 Decision Making Framework**

Exhibit 3 illustrates a multi-step process the Region and local municipalities can employ to plan and implement Complete Streets projects.

Exhibit 3: Decision Making Framework



### 4.7.1 Plan

**STEP 1: Identify Upcoming Projects, Funding Opportunities** – Both the Region and local municipalities should identify projects of all levels as early as possible, from minor sidewalk improvements to larger road widening efforts. Through collaboration, both parties should identify priority projects, opportunities and possible partnerships. With priority projects identified, funding opportunities should be explored within both parties and among other stakeholders.

As noted in the work previously completed, Complete Street projects should be strategic and sensitive to their context within the Region. For example, in St. Catharines or Niagara Falls, additional bike lanes and transit stops could be supported by the larger populations living in the downtowns, whereas towns with more rural land like Pelham and Fort Erie may be more strategic in their project locations due to low population density and geographic separation. Streets that are enhanced in areas of interest such as around downtown, shopping areas or education institutions will have a better chance of being used to their full potential. The selection of a street to ‘complete’ should not be random or arbitrary.

**Pilot** – Where significant challenges exist in the planning and implementation of a particular Complete Street improvement, a temporary pilot may serve as an interim experiment over a permanent project. Pilot projects may range from road diets, lane reversals, on-street parking, bike lanes, and others. Evaluation and monitoring of the pilot project will be performed during and at the end of the pilot, at which point the pilot can be removed or made permanent.

**STEP 2: Define a Vision and Goals for the Corridor** – A review of the existing and future planning and policy context of the street should be performed. With this understanding, the Vision and goals of the corridor should be developed, having regard to Niagara's Guiding Principles for Complete Streets and for existing Municipal Class Environmental Assessment (MCEA) documentation. This step should include engagement with all parties that will be affected by the project so that a consistent Vision of the street is established across all stakeholders. A clear, well developed vision and set of goals will inform the entire project throughout its duration. It should be noted that in some cases, the context and vision of a street will vary over the length of the segment.

The Plan phase of the decision-making framework includes a review of the project within the context of the MCEA process. All infrastructure projects are carried out following the requirements of a Schedule 'A' through 'D' project under the Municipal Class Environmental Assessment (Municipal Engineers Association, October 2000, as amended in 2007, 2011, & 2015), an approved process under the Ontario *Environmental Assessment Act* for municipal infrastructure projects. The five phases of the EA process include: (1) Problem or Opportunity; (2) Alternative Solutions; (3) Alternative Designs; (4) Environmental Study Report; and, (5) Implementation. The MCEA process is structured so that each phase builds on the previous one and provides greater clarity and support regarding the goals of a project. While in some cases, Phases 1 and 2 are completed through the Region's TMP process, specific projects may include the re-confirmation of the project need and preferred solution for the corridor as part of the MCEA. Consideration for the needs and opportunities is in line with the need to develop an understanding of the vision and goals for the corridor related to Complete Streets.

The classification by schedule type is a defining feature of the MCEA process. For example, the criteria for a Schedule A+ project includes "streetscaping not part of another project" or reconstruction for the same purpose use and capacity. Vehicle/capacity lane reductions may trigger a Schedule C, as might new municipal service corridors not using rights-of-ways. In order to work towards Complete Street Implementation, a goal for the Region is Alternative Designs resulting from the MCEA process that are in line with Niagara's Guiding Principles for Complete Streets.

**STEP 3: Analyze Corridor Opportunities & Constraints** – With a clear vision and set of goals for the project, opportunities and constraints will be identified and analyzed. Opportunities may include high-level discussions of infrastructure types for various modes, street widening or narrowing, the provision of transit, etc. Opportunities and constraints should be identified at both the policy planning, and physical context levels.

#### 4.7.2 Design

**STEP 4: Select Typology from the Family of Types** – To select a typology, refer to the Typology Matrix in the Complete Street Design Guidelines. A street's typology is based on a number of road characteristics (land use, primary transportation function, right-of-way, number of lanes, access management, and others). It should be noted that the typology of a street may vary along the length of a segment.

**STEP 5: Evaluate Alternative(s), Community Fit** – Design alternatives will be evaluated in a number of ways (both quantitative and qualitative), and using a number of tools, including the MMLOS tool. Alternatives will also be evaluated with respect to how they fit with the community's vision and goals established for the project. Stakeholder and public engagement should be performed during this phase. Where the design does not fit the vision or meet community goals, the selected typology and design should be revisited.

**STEP 6: Design to Context Using Design Guidelines** – Design guidelines provide flexible context-sensitive solutions to guide designers in the creation of complete street concepts. Application of the guidelines will be based on the selected street typology. Where major constraints exist, consideration may be given to land acquisition, a review of the street typology, and future development setbacks. The Complete Street Demonstrations may provide a starting point for design, but are by no means meant to be cross-sectional design standards. Every street has a different context and no two street segments across Niagara are expected to be identical.

#### 4.7.3 Build and Operate

**STEP 7: Construct** – Following detailed design and during construction, the Complete Street project should be highly coordinated between the contractor, municipal and Regional staff. Impacts and a loss of access or connectivity for any mode of transportation (and particularly walking and cycling) should be avoided or minimized (through phasing and a detour plan) for the duration of the construction project.

**STEP 8: Operate & Maintain** – Operations should be monitored, particularly in the early stages to determine if any adjustments (i.e., signal timing, coordination) is necessary. Maintenance, and in particular winter maintenance will need to account for new infrastructure.

**STEP 9: Monitor & Report Back** – Consistent monitoring is critical to understanding the successes and drawbacks of the project, and informing future projects. For this, Performance Indicators should be developed using site-specific criteria that reflect the vision and goals of the project. A clear baseline understanding of the site prior to development should be collected (using data, surveys, etc.) and used for comparison purposes and monitoring once the improvement is complete. Performance Indicators/Monitoring elements may include:

- Mode split changes (at a street segment level);
- Demographics of users;
- Safety (Vehicle, Pedestrian, Cycling related collisions);
- Local business improvements (i.e. number of patrons, retail sales);
- Transit ridership;
- Travel time (for vehicles, pedestrians, cyclists, transit users);
- Adjacent property values and investments;
- Air quality, GHG emissions; and

- Qualitative data, such as perceptions of safety on the road should also be collected, if possible.

Findings should be reported back to the community, local business owners and stakeholders. Sharing results and measurable benefits is critical for gaining municipal, public and stakeholder support for ongoing and future Complete Streets initiatives.

Given the Regional approach of this Complete Streets initiative, the framework is intended to be flexible in its application. Public and Stakeholder engagement will be designed and incorporated on a case-by-case basis, but more or less should be continuous and welcomed.

## 4.8 Opportunities to Involve Stakeholders

Stakeholder involvement is critical to the success of Complete Streets projects and the ongoing success of Complete Streets as a whole. Engagement can take many forms, including: Open Houses, Workshops/Charrettes, Youth Engagement; Social Media / Internet based tools; Direct Consultation; Engagement through groups or agency outlets. This section provides some helpful guidance on ways to involve stakeholders, including local municipalities, in the planning, design, operation, and maintenance of the Region's road/street corridor network.

**Why Engage?** Complete Streets provide significant long term benefits to communities. They do however require higher up-front costs and coordination between various stakeholders, including stakeholders that are not typically involved in transportation projects. From planning to design, a broad spectrum of key stakeholders can improve the depth of the project.

For example, in planning, considering collision data alone does not necessarily yield an accurate illustration of a street, since a large portion of pedestrian and cycling incidents are not recorded in police reports. Engaging police services, as well as public health professionals and first responders will generate a much better understanding of road safety issues. In construction and operation, financial implications of Complete Street projects include potential increases in a project's capital cost, as well as ongoing maintenance, operating and future reconstruction costs. For greenfield development, Complete Street roadways may directly impact private developer cost.

In addition to informing a project, increasing stakeholder collaboration provides opportunities for funding partnerships and input on multi-jurisdictional issues, and encourages complementary initiatives.

The following table provides a list of stakeholders within 4 groupings that could be included in a Complete Street improvement project:

Exhibit 4: Complete Street Project Stakeholders

Regional Stakeholders	Municipal Stakeholders	Private Stakeholders	Public Stakeholders	Others
<ul style="list-style-type: none"> <li>• Niagara Region Public Health</li> <li>• Planning and Development Services</li> <li>• Niagara Region Public Works</li> <li>• Economic Development</li> </ul>	<ul style="list-style-type: none"> <li>• Municipal planners, engineers</li> <li>• Economic development</li> <li>• Parks, Recreation</li> <li>• Local and regional transit agencies</li> <li>• School boards</li> <li>• Niagara Parks Commission</li> <li>• Interested elected officials</li> </ul>	<ul style="list-style-type: none"> <li>• Business or property owners along corridors</li> <li>• Private utilities</li> <li>• Developers</li> </ul>	<ul style="list-style-type: none"> <li>• Local and regional active transportation, road safety, and other groups (i.e., Cycling, walking, Share the Road)</li> <li>• Youth</li> <li>• People with accessibility needs (i.e., Parents, elderly, people with limited mobility)</li> </ul>	<ul style="list-style-type: none"> <li>• Niagara Peninsula Conservation Authority</li> <li>• BIAs</li> <li>• First Responders</li> <li>• CN Rail, CP Rail</li> </ul>

**How to Engage?** Engagement can take on many forms, depending on the stage of a project, as well as who is involved. The following section discusses some of the possible engagement opportunities and their respective applications.

Exhibit 5: Recommended Engagement Opportunities for Complete Streets Process

Stage	Engagement Opportunities
<b>Planning</b>	<ul style="list-style-type: none"> <li>• Visioning workshop</li> <li>• Stakeholder site walk / bike</li> <li>• Youth engagement               <ul style="list-style-type: none"> <li>○ Youth site walk / bike</li> <li>○ Youth block building workshop</li> </ul> </li> <li>• Social Media / Websites / Stakeholder e-mail list / Local Newspaper / Signage on or near site / Resident and Business Mail Drop to promote engagement opportunities</li> <li>• On-line Engagement Software (Survey Monkey, Metro Quest, Community Remarks)</li> </ul>
<b>Design</b>	<ul style="list-style-type: none"> <li>• Co-Creation Design Workshop / Charrette</li> <li>• Open House (Display right-of-way options, Evaluation and MMLOS findings, Understand trade-offs)</li> <li>• Social Media / Websites / Stakeholder e-mail list / Local Newspaper / Signage on or near site / Resident and Business Mail Drop to promote engagement opportunities, share findings</li> <li>• On-line Engagement Software (Survey Monkey, Metro Quest, Community Remarks)</li> </ul>
<b>Construction / Maintenance</b>	<ul style="list-style-type: none"> <li>• Social Media / Websites / Stakeholder e-mail list to share evaluation, monitoring findings, benefits of Complete Streets project</li> <li>• Social Media / Websites / Stakeholder e-mail list / Signage on or near site / Resident and Business Mail Drop to indicate detours, delays caused by construction, changes, etc.</li> </ul>

#### 4.8.1 Examples of Unique Engagement Approaches

**Co-Creation Design Workshops/ Charrettes** – A workshop or charrette with all stakeholders (including municipal and Regional staff, members of the public, etc.) can provide an extremely effective way to have a productive discussion on roadway design, and work out the trade-offs of a Complete Street in person, with the people that matter. Depending on the size of the group, a workshop/charrette can include a rounded representation of stakeholders at each table, working toward street solutions. Multi-Day workshops provide opportunities for a thorough review of the planning and design portions of a Complete Street initiative. For example, Day 1 can focus on Visioning, Opportunities/Constraints, and include a Walking Tour of the site. Day 2 can focus on the design. By including Regional and municipal staff, the public and stakeholders can gain an understanding of the internal challenges and constraints in designing a Complete Street.

Multiple Complete Street projects or segments can be incorporated into a workshop, with each “team” working on a particular segment. Presentations allow for commentary from all participants. The City of Calgary recently used a similar multi-day charrette model to engage the public and stakeholders on the Green Line Southeast Transitway, which required consideration for active transportation, motor vehicles, transit, and land use. A local artist illustrated the daily dialogue and discussion of the charrettes on boards within the room. The boards encouraged interaction between charrette participants, and provided concise summaries of day’s activities, allowing for easy information dissemination online later on.

Exhibit 6: Graphic Recording in Planning



Note: Calgary artist Sam Hester illustrates the dialogue of a multi-day Green Line Southeast Transitway charrette in Calgary, Alberta.

### ➔ Ideal Application: Planning, Design

**Social Media** – Social media provides an opportunity to inform and engage with demographics that may be under-represented in in-person engagement. Popular social media outlets include Facebook, Twitter and Instagram. These outlets could be used to:

- Inform public of an upcoming event;
- Promote surveys;
- Engage with an audience; and
- Provide a platform for a dialogue.

Social media can provide a cost-effective means to target specific audiences, for example, specific age-groups, or people who live in a certain area, providing a cost-effective means of sharing information with hard-to-get-to audiences. Evaluation metrics

can also be particularly useful for a project in measuring levels of engagement, feedback, likes, positive or negative comments, etc. Care should be taken when using social media. Anonymity can in some cases, contribute to unsolicited responses, requiring constant monitoring. In addition, the Region or municipality needs staff to engage in those conversations. Time and budget should be considered when engaging using social media.

➔ **Ideal Application: Planning, Design, Construction & Operation**

**Site Walk / Bike Tour** – Walking or biking through a site is an effective way to understand the challenges and constraints, and most important, perceptions associated with an area, which may not always be evident in plan view. Whether individually or in a group, a walking or biking audit allows a better understanding of the issues that need to be addressed during design and construction by providing first-hand feedback to designers. Walking and biking tours may include Regional and municipal staff, stakeholders, or the general public.

➔ **Ideal Application: Planning, Design**

**Intercept Surveys** – Intercept surveys are in-person surveys that are performed by a surveyor who, in the case of a Complete Street initiative, could be standing at or near the improvement site. Focused engagement involving existing street users can benefit a project by providing a strong, informed understanding of the current challenges and perceptions of the street. By standing at the particular site, participants can directly speak to some of the challenges they may not recall or notice when answering a survey at home, for example. Participants can include people who have parked their cars, boarded or alighted transit, as well as pedestrians and cyclists, providing a unique multi-modal perspective of a street. By catching all road users, scoping involves a more balanced view of road users who may or may not be in support of a Complete Street improvement.

➔ **Ideal Application: Planning**

**Guest Speaker** - The Region of York recently adopted a complete streets policy. In meeting with stakeholders, agencies and local organizations, the region invited a guest speaker from California to encourage a different way of thinking about Complete Streets. As part of the discussion, a Lego designer would pick Lego pieces and create a vision for complete streets.

➔ **Ideal Application: Planning, Design**

**Comparing Trade-Offs** – A significant portion of planning and implementing Complete Streets is understanding the trade-offs. In many cases, a constrained environment will not allow for all modes of transportation to be accommodated using ideal facilities. An approach used during the Durham Region Transportation Master Plan update included a demonstration of various right-of-way widths, each providing different qualities of service, levels of separation, and ways of accommodating each mode of transportation. Participants were asked to comment on what they liked based on the trade-offs. The

model was successful in providing the project team feedback and a better understanding of the participants' priorities for street right-of-way.

The MMLOS tool also provides an excellent opportunity to provide a measurable comparison when comparing trade-offs for alternatives.

➔ **Ideal Application: Design**

**Youth Engagement** – A major goal of Complete Streets is to provide a safe and inviting means of transportation for youth. Youth under 16 years of age are a unique transportation group, in that their only means of independent transportation is active transportation. Perceived safety, lack of crosswalks, sidewalks, insufficient lighting, and other types of infrastructure are frequent barriers for youth walking or biking to school. Youth also tend to use the road differently (i.e., skateboards/long boards, places to gather, etc). Thus, learning about barriers from a youth perspective can provide insight to street issues and opportunities that may not otherwise be apparent.

The Niagara Region Public Health Department recently assigned a Health Promoter to engage schools in a program called School Travel Planning. In this program, communities work together to identify local barriers to walking or biking to school. The program includes a **walking tour** of neighbourhoods near the school. In a group, routes are walked through to identify barriers to active transportation. Ultimately, the goal of the project is to identify routes and ways to encourage youth to walk or bike to school. The program could similarly be applied to a Complete Street project to bring a youth perspective into the planning and design phase of the initiative.

**School Assignment** – Collaborating with school boards can create opportunities to incorporate transportation planning into projects. In another community, a similar project was created at an elementary school. Students participated in the development of the corridor, including how to incorporate other modes of transportation into a car-oriented corridor. The assignment lasted 6 weeks and included PowerPoint presentations, collages, and other materials. Students were able to learn about the importance of roads and complete streets.

➔ **Ideal Application: Planning, Design**

**On-line Public Engagement Software** – A variety of tools are available for various types of engagement, including mapping, visualization-based, citizen feedback, and others. Software such as MetroQuest and Community Remarks are increasingly being used by planners and government officials in the engagement process for their enhanced ability to collect data from the public. Similarly, on-line mapping tools are used by municipalities to encourage site-specific issues and opportunity mapping, including the New York Department of Transportation.

➔ **Ideal Application: Planning, Design**

*References*

Complete Streets for Niagara, Niagara Region, [www.niagararegion.ca](http://www.niagararegion.ca)

TCAT (Toronto Centre for Active Transportation), Complete Streets in the GTHA, 2012:  
<http://www2.hamilton.ca/NR/rdonlyres/B353CA3E-9289-452E-8416-61D6BC98FA44/0/4NancySmithLeaTCATCompleteStreetsinGTHA.pdf>

Complete Streets Guidelines Sneak Peak Presentation slides, TCAT Complete Streets Forum 2015: <http://www.tcat.ca/wp-content/uploads/2015/10/Ray-and-Pop-1.pdf>

**Appendix A - Learning from Other Jurisdictions**

## Appendix A

### Learning from other Jurisdictions

The movement towards Complete Streets is happening throughout Canada, from small local townships to greater regional guidelines. More than 300 jurisdictions in the U.S. alone (State and Local) have Complete Streets policies (TCAT, 2012).

Learning from other jurisdictions is important for implementing a plan that considers the full spectrum of Complete Street planning, design, and implementation. While at the cross-section level, Niagara's Complete Streets will be unique to the Region, inspiration and lessons from other jurisdictions with Complete Streets policies will help to create a more informed local approach.

This section provides a brief review of the design characteristics of Complete Streets within other jurisdictions including context sensitive designs. Review was conducted at the regional or state, as well as municipal government level, jurisdictions included the Regions of York, Waterloo, Peel and the North Carolina Department of Transportation, as well as the municipalities of Toronto, London, Calgary, and Ottawa.

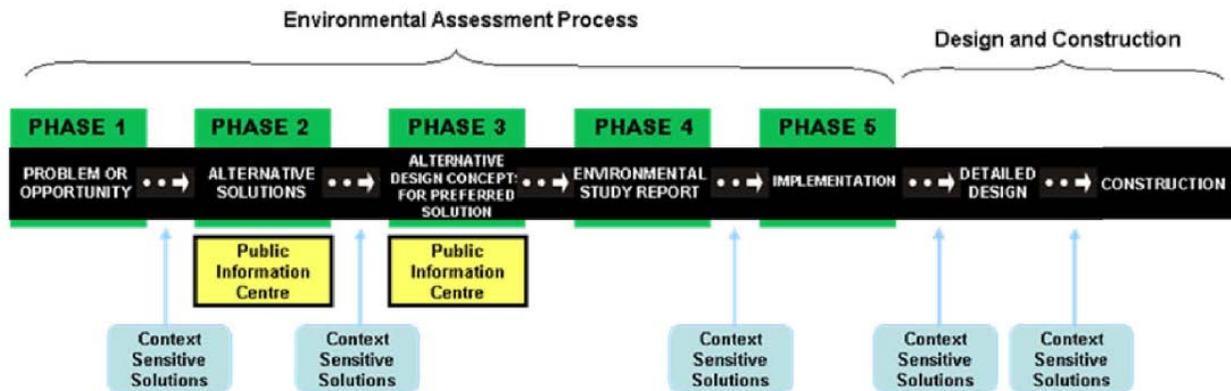
### Regional Initiatives

#### York Region Context Sensitive Solutions (CSS), 2013

In consultation with local municipalities, York Region developed a Context Sensitive Solutions (CSS) approach to implementing Complete Streets along Regional streets. The proposed street typology (replacing Urban and Rural Arterial roads) includes Urban Centre, Urban Avenue, Main Street, Connector, Rural Road, and Rural Hamlet. The intention of the document is to serve as a toolbox for road designers.

The CSS includes a decision making process to guide Regional staff through the Environmental Assessment (EA) process. The process assists in the development of alternatives and solutions during the EA, and forms the basis for the subsequent preliminary and detailed design phases. Figure A-1 shows the process for integrating the CSS with the EA process.

**Figure A-1:** Integration of CSS in the Environmental Assessment Process (York Region CSS, 2013)



A Decision Making Process was also developed to assist Region staff during design and implementation phases for CSS projects. The Decision Making Process includes the following steps:

- Context (Policy, Physical);
- Produce Objectives (Prioritization of modes; Respond to unique characteristics);
- Select Typology (Using Typology Matrix);
- Elements of a Roadway (Select using Toolbox);
- Refine Elements (if preferred/required elements do not fit);
- Develop a Section (Compile selected elements; Confirm objectives are met); and
- Intersections & Transitions (Using Intersections & Transitions guidelines).

[Region of Waterloo Context-Sensitive Regional Transportation Corridor Design Guidelines \(2010, Updated 2013\)](#)

The Region of Waterloo’s Context-Sensitive Regional Transportation Corridor Design Guidelines provide Complete Streets design standards. The document considers the two-tier government system, being the Regional Official Plan Policy and Regional Growth Management Strategy, as well as Area Municipalities, urban design, transit, and traffic planning.

The roadway classification system includes Rural and Urban Arterial Roadways. Rural Arterials include Rural Connectors, Rural Village – Main Street, Neighbourhood Connector – Main Street. Urban Arterials include Expressway, Community Connector, Neighbourhood Connector – Avenue, Neighbourhood Connector – Main Street, and Residential Connector.

The document includes a Workbook for designing and implementing roads. This workbook, titled the “Decision Making Process” uses a decision-making framework to guide the process for road constructions and reconstructions. The intention of the Workbook is to: Gather background information; Inform the decision making process; Track decisions as they are made; and Design the ultimate road section and streets.

The Workbook follows a 5 Step process, including:

1. Context (Planning, policy, physical);
2. Confirm Classification (Using Street Classification Matrix and Regional Transportation Corridor Classification Mapping);
3. Produce Objectives (Considering Step 1, 2 results, determine street objectives, recognizing opportunities and constraints. Can vary over length of street, and can be revisited later in process);
4. Street Priorities (Consider Boulevard and Street elements, establishing priority of elements within a potentially constrained ROW); and
5. Build Your Section.

For more information, refer to the following websites:

[http://www.regionofwaterloo.ca/en/doingBusiness/resources/2013\\_Context\\_Sensitive\\_Regional\\_Transportation\\_Corridor\\_Design\\_Guidelines\\_reduced\\_file\\_sz.pdf](http://www.regionofwaterloo.ca/en/doingBusiness/resources/2013_Context_Sensitive_Regional_Transportation_Corridor_Design_Guidelines_reduced_file_sz.pdf)

<http://www.regionofwaterloo.ca/en/doingBusiness/resources/Corridorworkbook.pdf>

[\*\*\*North Carolina Department of Transportation \(DOT\) Complete Streets Planning & Design Guidelines, 2012\*\*\*](#)

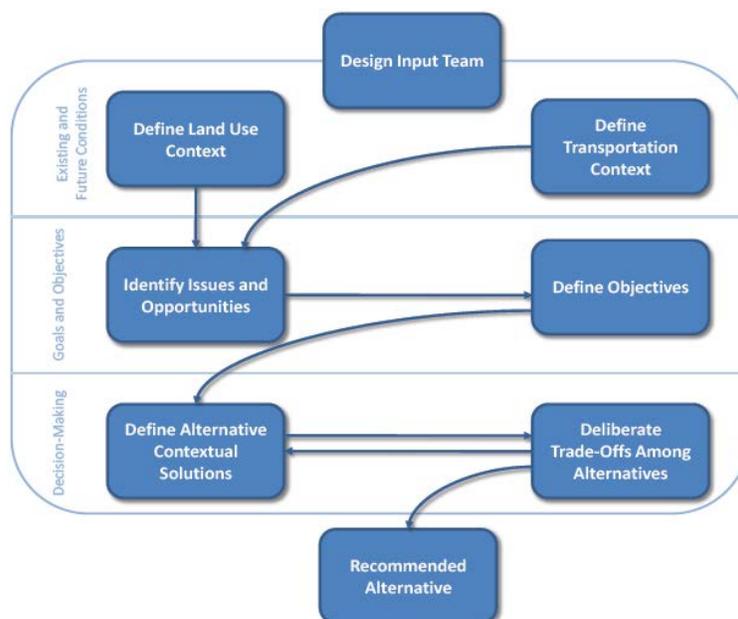
The North Carolina DOT Complete Streets Guide takes a state approach to the planning and design of Complete Streets. Adopted in 2009 by the North Carolina Board of Transportation, the Complete Streets document directs the DOT to incorporate all modes of transportation for new and existing infrastructure projects. It also emphasizes the need for partnerships and collaboration between the NCDOT, cities, towns, communities, interest groups, and the public.

The policy makes certain exceptions to implementing complete streets, including areas where low population and employment densities that do not “justify” multi-modal opportunities. Exceptions require approval of the Chief Deputy Secretary. The framework looks to work with local municipalities to identify projects early on and work with the NCDOT to understand what potential opportunities exist. Local governments are encouraged to note upcoming resurfacing (or other) projects that fall within operations and maintenance of the NCDOT. If deemed appropriate and feasible, a project will move forward and the NCDOT and local governments will evaluate existing and future conditions of the proposed street.

The guide includes the formation of a Design Input Team, which includes internal and external members. Members may vary depending on the project. The intention of such a team is to meet regularly throughout the life of a Complete Street project to support the input from each member. The project development process is shown in Figure A-2.

**Figure A-2:** Project Development Process, North Carolina Complete Streets Planning & Design Guidelines

(Source: [http://www.pedbikeinfo.org/pdf/PlanDesign\\_SamplePlans\\_CS\\_NCDOT2012.pdf](http://www.pedbikeinfo.org/pdf/PlanDesign_SamplePlans_CS_NCDOT2012.pdf))



Overall, the following are key elements within the guide:

- How to incorporate complete streets;
- Understanding context, user needs;
- Planning & design elements;
- Planning & Designing Complete Intersections;
- Designing for Transit;
- Accommodating walking and cycling on structures;
- Implementing guidelines in Maintenance and Operations; and
- Street elements (design and safety considerations).

The Guidelines offer variations based on urban, suburban and rural context streets. For intersection design, traditional Level of Service (LOS) is used for vehicles, but traditional targets (i.e. V/C ratios less than 0.90) are not intended to remain targets, but rather provide indication for “further analysis and collaborative decision making” (Page 98 in the document). Measuring bicycle and pedestrian experience at intersections is suggested through Quality of Service (QOS), which include crossing distance, conflicts with turning vehicles, motor vehicle volumes, and motor vehicle speeds.

### [Region of Peel Road Characterization Study, 2013](#)

Adopted in 2013, this study was influenced by the Complete Streets model and a context-sensitive approach to examining the objectives, needs and intended functions of arterial roads owned by the Region of Peel. The study followed a series of workshops involving municipal stakeholders and regional staff. It focused on regional roads that meet community needs by being more responsive and providing safety for modes of transportation other than motor vehicles. The study recommended defining metrics that include QOS, in

addition to LOS. Road characterization was based on land use, rural/suburban/urban setting, vision, etc. The outcomes include:

- **Road Character Map** – To be updated every 5 years or when more information on contextual changes are available. This map shows the road typologies of the region's roads (i.e. Rural Road, Rural Main Street, Urban Main Street, Suburban Connector, Commercial Connector, and Industrial Connector). The region also recommends working with Area Municipalities to align future land use maps with 15-30 year horizons to support context-sensitive regional road network planning.
- **Road Character Matrix** – details the attributes of each road character, including through lanes, context, desired operating speed, and appropriateness of pedestrian and cycling facilities.
- **Illustrative Cross-Sections**- Provide a starting point when designing roadways and include facilities for various road user types.
- **Access Control Measures & By-Law** – Access Spacing and Design was included to balance needs including mobility, commercial, and residential access. The measures and by-law consider land use character. For example, higher density areas require reduced intersection spacing, compared to rural areas.

Numerous workshops held during the course of this study resulted in a number of recommendations for engagement. These recommendations included: Engaging public and stakeholders early in the project development process, during problem and opportunity definition rather than alternative development; and, Developing a formal dispute resolution process/mechanism for developer applicants and the staff recommendations.

For more information, visit the following website:

<http://www.peelregion.ca/pw/transportation/business/pdfs/rcs-full-report.pdf>

## Municipal Initiatives

### City of Toronto

The City of Toronto is currently developing Complete Streets Guidelines. The work surrounding the future Guidelines places emphasis on the fact that streets change over time, and that there is not one way to make a street complete. The Complete Streets Guide is not intended to create any new projects or change approved projects, but rather seek a wide variety of opportunities for possible applications. Opportunities include:

- Reconstructions
- Resurfacings
- Water/Sewer/Stormwater Management
- Utility Cut Rehabilitations
- Safety/Local Improvements
- New Sidewalk Construction
- Bikeway
- Construction/Markings
- Street Furniture Installations
- Street Tree Planting/Operations
- BIA Work
- TTC/Metrolinx Projects
- Waterfront TO/PanAm Initiatives
- Private/Developer Sidewalk and Boulevard Improvements
- Environmental Assessments, Avenue Studies, etc.

(Complete Streets Guidelines Sneak Peak Presentation slides, TCAT Complete Streets Forum 2015: <http://www.tcat.ca/wp-content/uploads/2015/10/Ray-and-Pop-1.pdf>)

The proposed Guidelines emphasize that accommodating all modes of transportation is not always achievable given narrow street widths and street context. A “Link + Place” model is used to support context sensitive street design. The model measures Link Status (Transportation function, may be volume, intensity of multimodal use, or modal priorities) and Place Status (Street Context, land use and/or character, current or aspirational), resulting in 15 Toronto Street Types (refer to Figure A-3).

**Figure A-3:** 15 Toronto Street Types (Place + Link Model, Complete Streets Guidelines Sneak Peak Presentation, TCAT Complete Streets Forum, 2015)



With Phase 1 complete, Phase 2 of the Complete Streets Guide is underway.

[City of London, Ontario \(The London Plan, Second Draft, 2015\)](#)

The London Plan sets the foundation for the City’s future Complete Streets Design Manual in policy and by creating and identifying a new set of street classifications for planning and designing public right-of-way (ROW), including Provincial Highways, Expressways, Urban Thoroughfares, Civic Boulevards, Main Streets, Neighbourhood Connectors, Neighbourhood Streets, Rural Thoroughfares, and Rural Connectors. Goals and functions are listed for each street type, which are intended to guide their designs.

The streets fall within 3 types (Major, Minor and Rural Streets). Public ROW widths for each of these streets are outlined in a table, though the document notes that precise widths will be presented in the future Design Manual. The street section is divided into 4 zones (Development, Pedestrian, Vehicle and Utility), the last three of which are within the Public ROW. Infrastructure for zones (Vehicle, Pedestrian, and Development) is recommended using a relatively flexible (not absolute) scale ranging from “Encouraged” to “Conditionally Permitted” to “Not Permitted” to “Permitted”. Within the Development Zone elements, significant consideration is given to Use, Built Form, Site Layout and Vehicle access.

Policies within the plan indicate how each street class should be planned, designed and developed, as well as the degree of priority each street will give pedestrians, cyclists and transit users, versus automobiles. The future Complete Streets Design Manual is described in the plan as a document that will follow plan policies.

The plan also includes specific policies for some corridors. These corridors (or streets) are designated through Specific Policy Areas. These include Main Streets, transit corridors, etc. Specific segment policy areas are highlighted in a map. For example, Transit Village Place Types are subject to a number of specific policies elevating street functions in terms of transit, transit-supportive development, aesthetics, and others.

### [City of Calgary Complete Streets Guide, 2014](#)

In November 2014, the Complete Streets Policy and Guide was approved by Council. The guide provides Design Standards for all streets, including New Streets (i.e., Greenfield development), and Retrofit Streets (i.e., Streets already in existence).

- **New Streets** - For New Streets, the Complete Streets Guide provides ROW requirements and design concepts. The City's 2014 Design Guidelines for Subdivision Servicing (DGSS) provide detailed cross-sections, intersection designs, and surface and underground infrastructure designs that support development. Any street designs that do not conform to these guidelines are to be approved by the City's Director of Transportation Planning on the basis of topographic/natural constraints; special conditions for alternative modes of transportation; or a preferred alternative standard.
- **Retrofit Streets** – For retrofits that cannot accommodate the ROW requirements outlined in the DGSS, alternative designs and rationale for constraints preventing Complete Streets implementation must be provided and approved by the City's Director of Transportation Planning.

As part of the policy and guide implementation and alignment, revisions were made to City standards for Transportation, Planning, Water Resources, and Urban Forestry. Regular monitoring and reporting, as well as a tri-annual review of the guidelines and policy is planned. Reviews will include the development community.

The Calgary Complete Streets Guide includes a draft scoring tool for assessing the performance of complete streets. Performance is not only considered for each street, but also at the network level. The plan incorporates an education component to complement Complete Streets implementation.

### [City of Ottawa, Complete Streets Implementation Framework](#)

The 2013 Transportation Master Plan (TMP) includes an Action policy guiding the adoption of a Complete Streets policy for road design, operation and maintenance. Other Action policies within the TMP include the update of design guidelines, standards and processes, as well as the use of multi-modal levels of service to assess road design and allocate ROW.

The City of Ottawa is currently developing a Complete Streets Implementation Framework that will recommend a process for transportation projects and support a Complete Streets approach.

In addition to the Implementation Framework, the City is updating the Road Design Guidelines and a Multi-Modal Level of Service (MMLOS) tool for road designs.

The Draft MMLOS reviews LOS in two contexts - private development and road constructions. This approach supports developer-delivered transportation projects to meet the outcomes and objectives of Complete Streets. Table A-1 demonstrates minimum desirable MMLOS targets for various designations (i.e., Central Area, Developing Community, Employment Area, etc.). This approach relates MMLOS to a site.

**Table A-1: Minimum Desirable MMLOS Targets by Official Plan Policy/Designation & Road Class (City of Ottawa MMLOS Guidelines, 2015)**

OP Designation / Policy Area	Road Class	PLOS	Bicycle - BLOS				Transit - TLOS <sup>3</sup>			Truck - TrLOS		Auto - LOS <sup>4</sup>
			Cross-town Bikeway	Spine Route	Local Route	Elsewhere	Rapid Transit Corridor	TP - Continuous Lanes	TP - Isolated Measures	Truck Route	Other	
<i>Land Use Designation</i>												
Central Area	Arterial	A	A	C	B	D	A	C	D	D	E	E
	Collector	A	A	B	B	D	A	C	D	D	No target	E
	Local	A	A	B	B	D	A	C	D	E	No target	E
Developing Community	Arterial	C	B	C	B	D	B	C	D	D	No target	D
	Collector	C	B	C	B	D	B	C	D	D	No target	D
	Local	C	B	C	B	D	B	C	D	N/A	No target	D
Employment Area	Arterial	C	B	C	C	E	B	C	D	B	D	D
	Collector	C	B	C	C	E	B	C	D	B	D	D
	Local	C	B	D	C	No target	B	C	D	D	E	D
Entreprise Area	Arterial	C	B	C	B	D	B	C	D	B	E	D
	Collector	C	B	C	B	D	B	C	D	B	E	D
	Local	C	B	C	B	No target	B	C	D	D	No target	D
General Rural Area	Arterial	No target	N/A	D	D	No target	N/A	N/A	N/A	C	E	D
	Collector	No target	N/A	D	D	No target	N/A	N/A	N/A	C	No target	D
	Local	No target	N/A	D	D	No target	N/A	N/A	N/A	No target	No target	D
General Urban Area	Arterial	C	B	C	B	D	B	C	D	D	E	D
	Collector	C	B	C	B	D	B	C	D	D	No target	D
	Local	C	B	C	B	D	B	C	D	N/A	No target	D
Mixed Use Centre	Arterial	C	A	C	B	D	B	C	D	D	E	D
	Collector	C	A	B	B	D	B	C	D	D	No target	D
	Local	C	A	B	B	D	B	C	D	N/A	No target	D
Village	Arterial	C	B	C	B	D	N/A	N/A	N/A	D	No target	D
	Collector	C	B	C	B	D	N/A	N/A	N/A	D	No target	D
	Local	C	B		B	D	N/A	N/A	N/A	N/A	No target	D
Traditional Main Street	Arterial	B	A	C	C	D	B	C	D	D	E	D
	Collector	B	A	C	C	D	B	C	D	D	No target	D
Arterial Main Street	Arterial	C	B	C	D	D	B	C	D	D	E	D
All Other Designations	Arterial	D	B	C	C	D	B	C	D	D	No target	D
	Collector	D	B	C	C	D	B	C	D	D	No target	D
	Local	D	B	C	C	D	B	C	D	N/A	No target	D
<i>Policy Area<sup>5</sup></i>												
Within 600m of a rapid transit station	Arterial	A	A	C	B	D	A	C	D	D	E	E
	Collector	A	A	B	B	D	A	C	D	D	No target	E
	Local	A	A	B	B	D	A	C	D	N/A	No target	E
Within 300m of a school	Arterial	A	A	C	B	D	A	C	D	D	E	E
	Collector	A	A	B	B	D	A	C	D	D	No target	E
	Local	A	A	B	B	D	A	C	D	N/A	No target	E

1. This table indicates the minimum desirable target. Efforts should be made to exceed these minimum targets whenever possible, without negatively impacting the ability to achieve the minimum targets for other modes.
  2. Where a policy area applies to a project or area, the modal targets should reflect the policy area targets regardless of the land use designation.
  3. Transit targets are intended to be applied only for streets with a proposed or existing transit route.
  4. Auto LOS is based on the two and a half hour peak period.
  5. Minimum guidelines as dictated by City policy must be maintained, regardless of MMLOS targets.
- N/A - Not applicable

Together, the above examples, whether official called “Complete Streets” or “Context Sensitive Solutions” share many similarities in emphasizing place-based solutions, and increasing safety and mobility options of streets. These examples serve to illustrate that while the general goals of these initiatives are very similar, each region or municipality provides a unique approach or tool to accomplish these goals. Considering other jurisdictions’ initiatives alongside Niagara’s own

initiatives and context is critical in creating a successful Regional Complete Street model for Niagara.

**Appendix B – Niagara’s Own Initiatives**

## Appendix B

### Niagara's Own Initiatives

The Region already has completed a number of initiatives that support Complete Streets. The interest may have initially centered on the accommodation of recreation-based cycling that supports tourism. While supporting economic development opportunities that a regional, recreation based network can provide is still important, the opportunity to accommodate residents and visitors of all ages and abilities, in a wide range of types of trips, is becoming increasingly important. This is evident in Niagara's recent documents, such as the *Complete Streets Model Policy Handbook*. From a regional perspective, the initiatives indicate the importance to consider the broad range of streets that make up the Region's roadway network and recognize that planning for these streets (and their varying contexts) requires flexibility.

This section provides a list including brief description of relevant known Niagara-based initiatives, documents, and standards as they relate to Complete Streets.

#### *Complete Streets for Niagara (Model Policy Handbook)*

Niagara Region developed a *Complete Streets for Niagara (Model Policy Handbook)* as a tool for Niagara municipalities developing complete streets. This document results from a 2011/12 planning initiative that led to various capacity building activities and produced a discussion paper on the topic of Complete Streets for Niagara. The Handbook established the definition of and goals for Complete Streets across Niagara and provides adaptable policies for municipal official plans, secondary plans, or transportation plans. The Handbook includes:

- Model Official Plan policies;
- Model objectives and definitions;
- Performance Indicators;
- Links to information, programs and funding resources;
- Local improvement charges;
- Environmental Assessment overview process;
- Suggestions for engaging the public; and
- Examples of Niagara streets reimaged as complete streets.

“Complete Streets does not necessarily require accommodating all modes on every street, but rather accommodating more than one mode.”

(Complete Streets for Niagara - Model Policy Handbook, Niagara Region)

The document notes the importance of maintaining a flexibility around complete streets, realizing that accommodating more than one mode can be a goal in some cases. The document remains an excellent resource.

### *Niagara's Facility Accessibility Design Standards*

The Region took a significant step in 2010 and voluntarily adopted the Facility Accessibility Design Standards, which ensures that all Regional infrastructure meets the Accessibility for Ontarians with Disabilities Act (AODA) standards. Complete Streets are founded on accessibility and justly, Niagara's Facility Accessibility Design Standards are a set of standards which can help make streets accessible for all.

### *Regional Municipality of Niagara Model Urban Design Guidelines, 2005*

In support of the Region's Smart Growth initiatives, this document covers the public realm for roads, sidewalks, streetscaping, multi-use trails, as well as design principles and guidelines for building structures. The guidelines are found at <https://www.niagararegion.ca/urban-design/pdf/pdfs/final.pdf>.

The guidelines support a variety of transportation choices with emphasis on walking and promoting a sense of place in communities. The guidelines discuss Neighbourhood Structure in detail, focussing on network and neighbourhood structure and its implications on walkability and transit service. Sections include guidelines for roads, sidewalks and streetscaping, parks and open space, multi-use trails, stormwater management facilities, development guidelines for various land uses, off-street surface parking and others.

Some guidance is provided on the design of roadways. The emphasis is to balance safety, pedestrianism, and visual amenities with other road functions. The document provides guidelines for collector and local streets, as well as laneways. While the guideline cross-sections provide for motor vehicle travel lanes and sidewalks, specific infrastructure for on-street cycling and transit are not included. The guidelines highlight the need for flexibility in accommodating land uses and traffic conditions. They also remain an excellent resource.

### *Niagara Region Bikeways Master Plan, 2003*

In 2003, the Region approved the Regional Niagara Bikeways Master Plan. The vision of the plan was to develop an integrated system of bikeways across the Region, providing multi-purpose travel by bicycle (serving various purposes such as leisure, fitness and utilitarian to name a few) for residents and tourists alike. The plan proposed a bike network of both on and off-road facilities, using 3 classes of bike facilities: Class 1 (Multi-Use Trail), Class 2 (Paved Shoulder/Bike Lane), and Class 3 (Signed Route). The study determined bikeway facilities through a combination of "ground-proofing" the candidate routes and assessing them using a set of criteria.

With respect to retrofitting Regional roadways, the report notes the need for balance and that the accommodation of bicycle facilities is not always feasible. The plan recommends adopting retrofit guidelines as presented in the plan.

For rural roads, paved shoulders are recommended, while for urban roads, 1.5 m bike lanes, wide curb lanes and shared lanes are recommended. The plan also highlights the need for flexibility and the interpretation and application of the recommended bikeway facility design guidelines in order to achieve a connected network. In cases where a route cannot be accommodated, the plan suggests the implementation of a parallel route to accommodate cycling.

At the time of the study, the total existing cycling network was 236.8km. The new routes (Classes 1-3) are recommended to be added in two phases: Phase 1 (2003-2013) 712.8km; and Phase 2 (2013-2023) 414.8km. In total, the plan ultimately recommends a network of 1205.1km over 20 years. While the plan includes an ambitious target for route distance and serves as an improvement to existing conditions, of the three Classes, the focus appears to be on recreational cycling and does not necessarily provide ideal infrastructure to support cycling for all ages and abilities. Classes 2 and 3 in particular (Paved Shoulders/Bike Lanes, and Signed Route) are not necessarily deemed comfortable for the majority of “Interested but Concerned” cyclists.

The Bikeways Master Plan will be reviewed and updated as part of this Niagara TMP.

#### *Bicycle Friendly Community Designation*

The Bicycle Friendly Community Designation is a program of Share the Road. Pelham was awarded the Silver designation. Grimsby, Niagara Falls, St. Catharines, Thorold and Welland hold Bronze designations.

For more information, visit: <http://www.sharetheroad.ca/bicycle-friendly-communities-p138264>

#### *Farther, Greener, Greater: A Plan for the Next Decade for the Waterfront Regeneration Trust and Partnership*

The Plan outlines a vision, mission statement and strategic direction for the Waterfront Trail for the next decade. Documentation can be found at:

[http://www.waterfronttrail.org/images/Reports/Strategic\\_Plan/strategic\\_plan\\_web.pdf](http://www.waterfronttrail.org/images/Reports/Strategic_Plan/strategic_plan_web.pdf)

The plan places emphasis on the completeness and connectivity of the trail and working with stakeholders, including all levels of government, municipal partners, the private sector, communities and individuals. One of the plan's strategic directions included building a 460km Greenbelt Bike Route in partnership with the Greenbelt Foundation to connect to the Waterfront Trail.

#### *Niagara Wine Route & Tourism*

Tourism Niagara and the Niagara Cycling Tourism Centre promote a number of wine and tourism routes through the Niagara Region, many of which are on regional roads. Initiated by the Niagara Economic Development Corporation (NEDCORP), the Wine

Route has become a major route for the bicycle tourism and economic support of Niagara's wine region. The route sparked cycle-friendly accommodation at hotels, B&Bs, and camping sites, as well as other bicycle supportive initiatives. Recently, the Wine Route was re-routed through Downtown St. Catharines (specifically, St. Paul Street downtown St. Catharines – a Regional Road).

### *Bike Train Initiative*

The Bike Train Initiative originally started in 2007 as a partnership with VIA Rail Canada as an opportunity to increase bicycle tourism between the Toronto-Niagara Regions. The initiative promotes bicycle tourism by providing train patrons the opportunity to travel on transit comfortably and with their bicycles safely stored in a bike rack baggage car. The initiative has won numerous awards in its successful promotion of tourism. Lead organizations for this initiative include Transportation Options, Waterfront Regeneration Trust, and Niagara-on-the-Lake Chamber of Commerce. The project includes a number of other Project, Funding and Promotional Partners.

### *Toronto-Niagara Seasonal Bike Train GO Service*

During summer months and select holidays, GO Train service is provided between Toronto's Union Station, St. Catharines, and Niagara Falls Stations, among others. The train service offers train cars specifically allocated for the safe storage of bicycles (i.e., Bike Train Service). The train connection and Bike Train service are important links for those exploring Niagara's routes from other parts of Southern Ontario.

From this review it can be concluded that there is an extraordinary relevance, community interest and policy support for Complete Streets across Niagara. This Complete Streets policy will help enshrine this into the Region's policy and decision-making framework, moving forward.

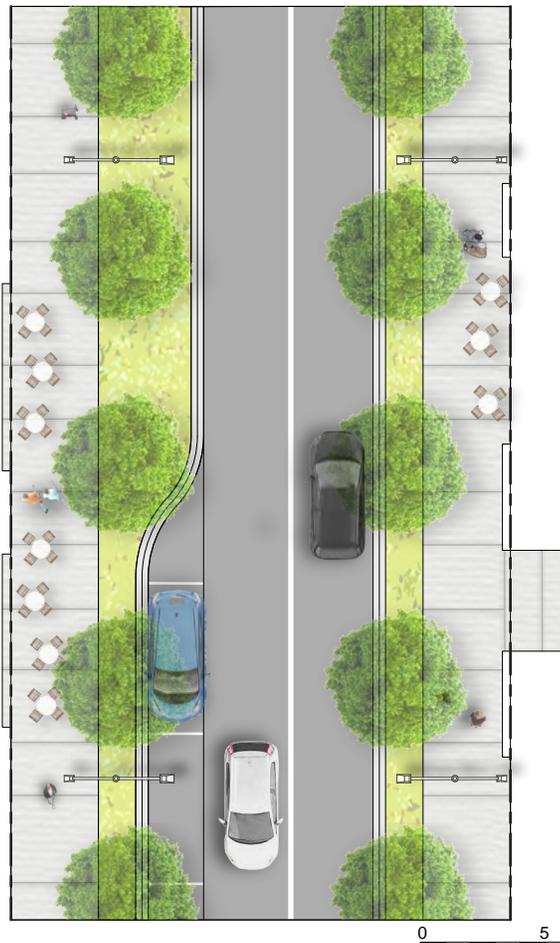
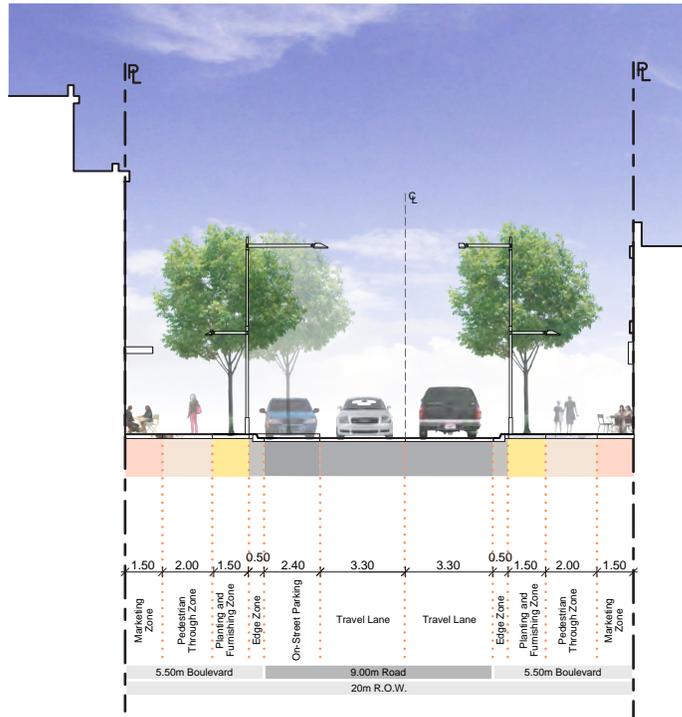
### *Niagara Go Hub and Transit Stations Study*

Niagara Region, in partnership with the municipalities of Grimsby, Lincoln, St. Catharines and Niagara Falls and in consultation with Metrolinx, is undertaking a GO Transit Hub and Transit Stations Study. The study is being undertaken to support the future introduction of two-way GO train service between Niagara Falls and Hamilton. The study will involve the preparation of detailed Secondary Plans and Transit Station Functional Plans for station sites and surrounding areas in Grimsby, Lincoln, St. Catharines and Niagara Falls to promote investment, support transit-oriented development and guide decision-making around the station areas. The Hub and Transit Station Study Area Plans will also help to support and inform a number of on-going strategic initiatives, including the Region's Growth Management Strategy - Niagara 2041, as well as the Servicing Master Plan and development charges by-law.

**Appendix C – Demonstrations**

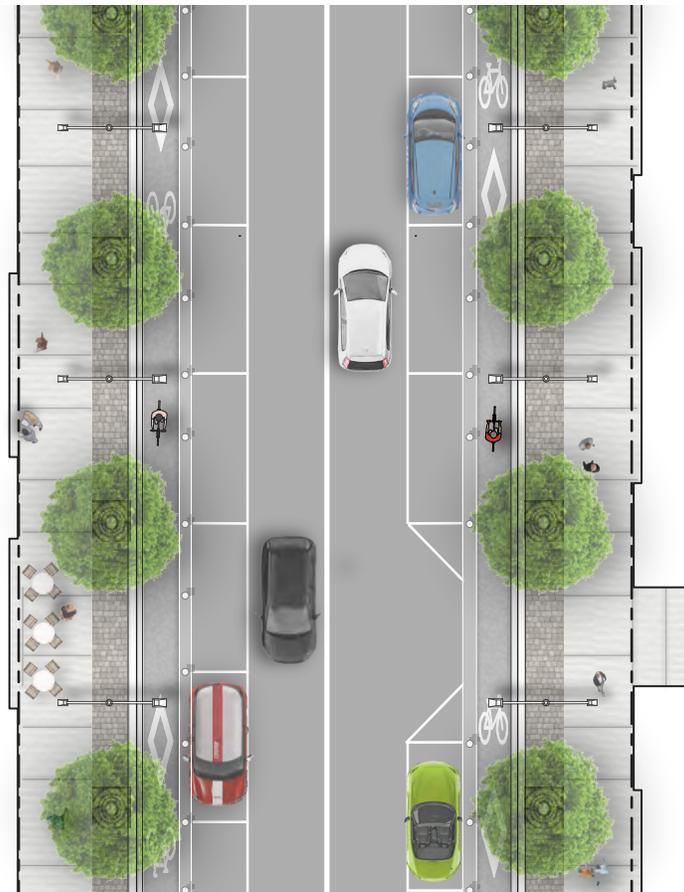
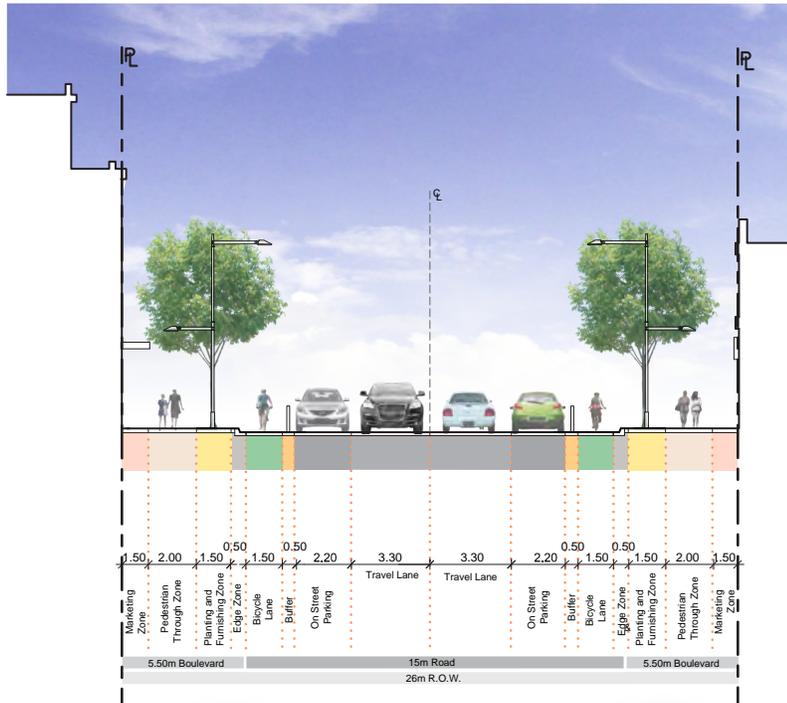
# Demonstration Plans

MAIN STREET (20m R.O.W.)

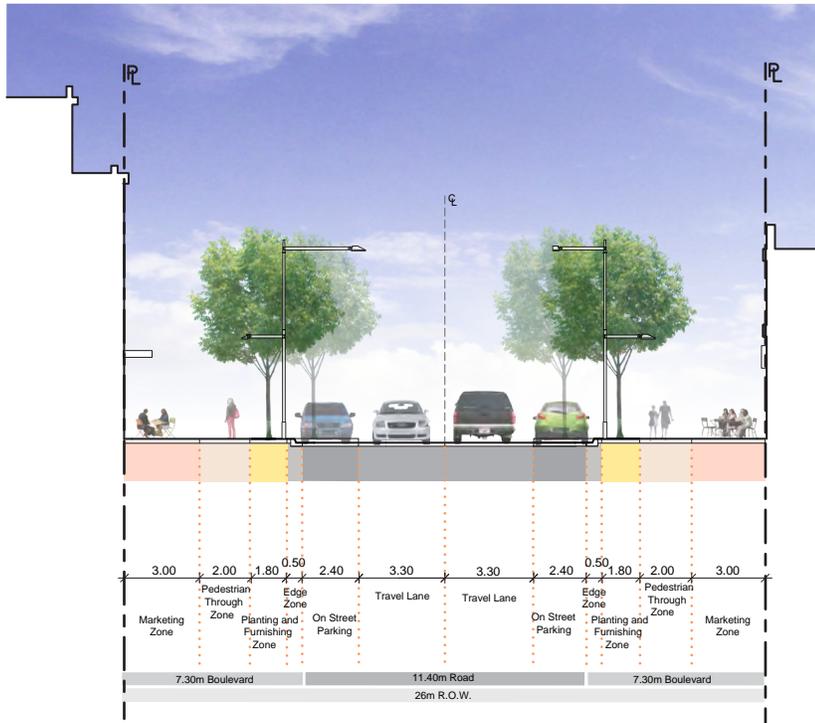


0 5 10m

MAIN STREET (26m R.O.W.)  
Option 1



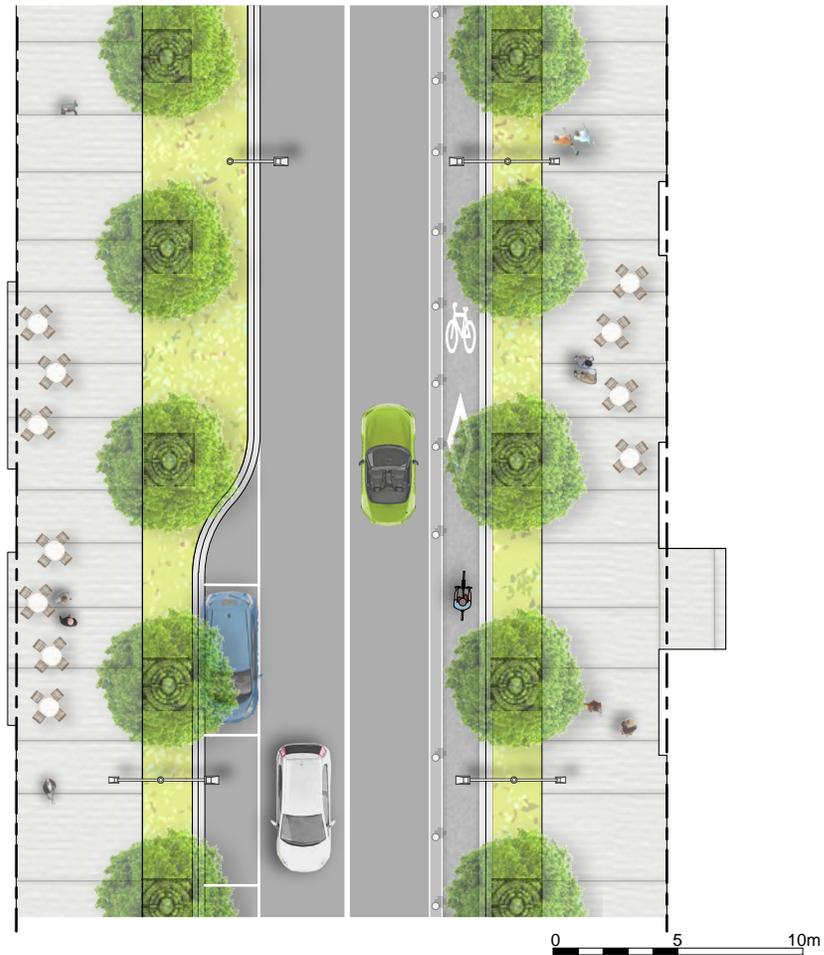
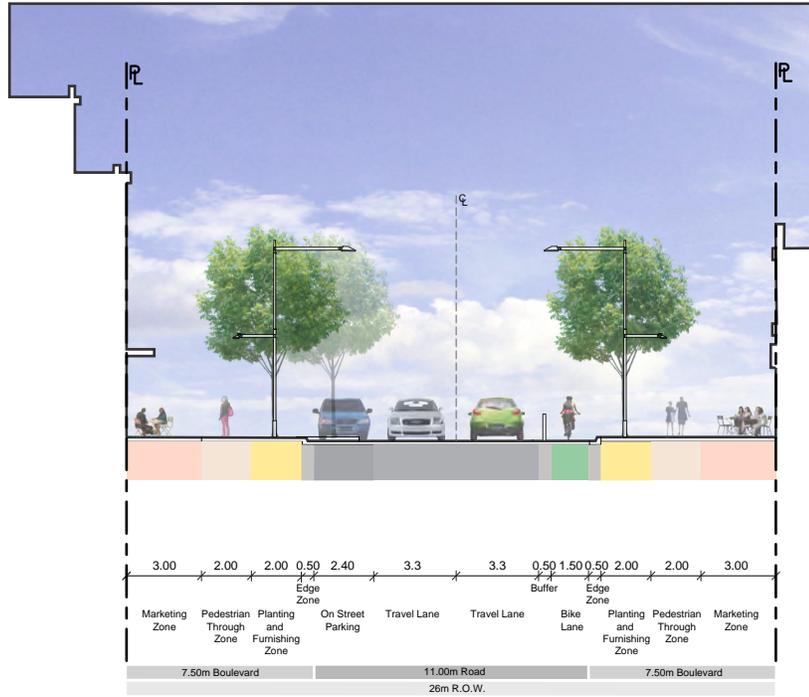
MAIN STREET (26m R.O.W.)  
Option 2



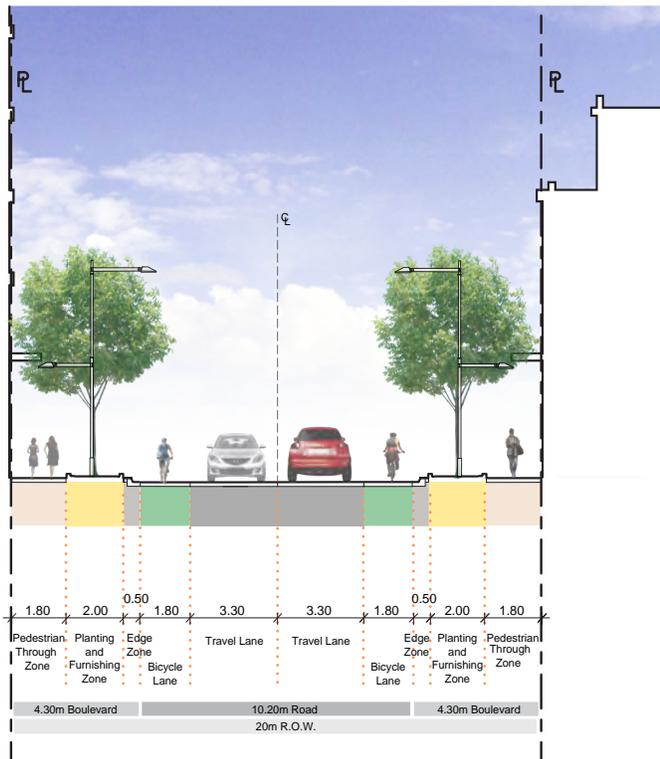
0 5 10m

# MAIN STREET (26m R.O.W.)

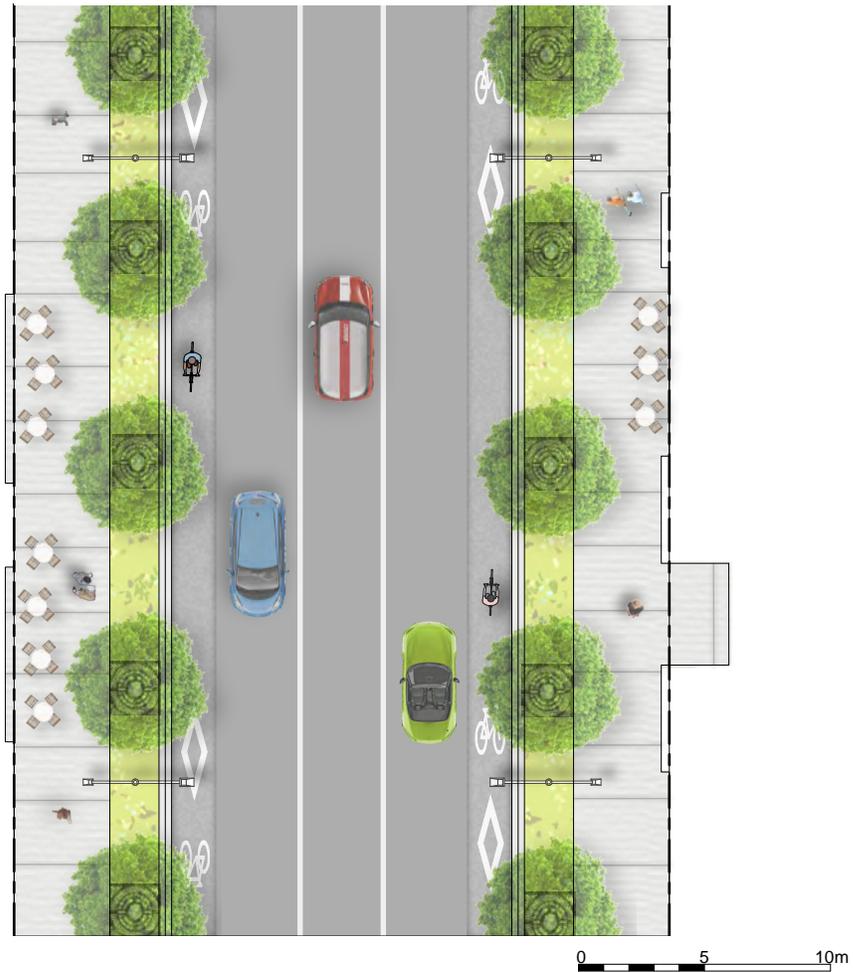
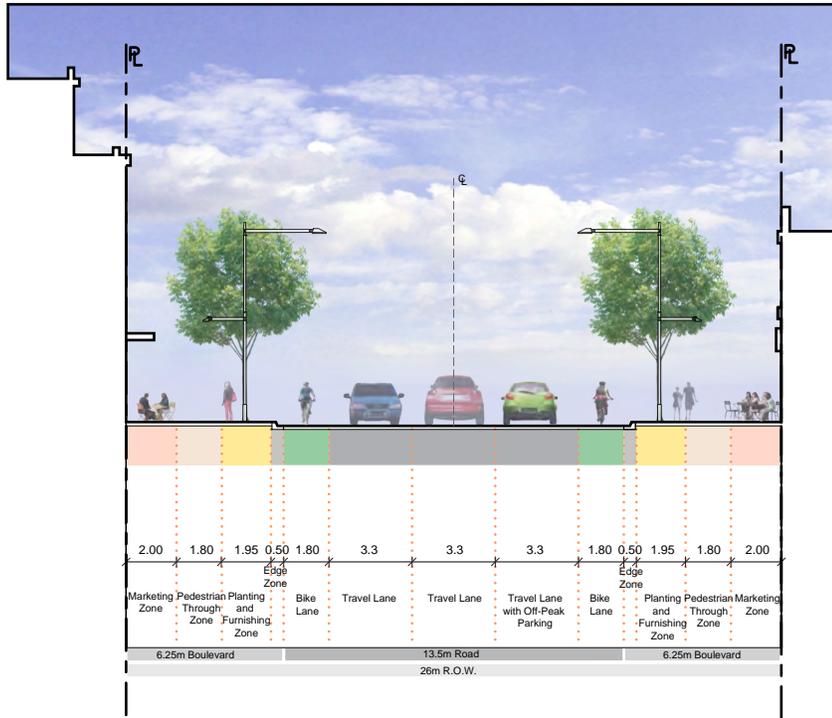
## Option 3



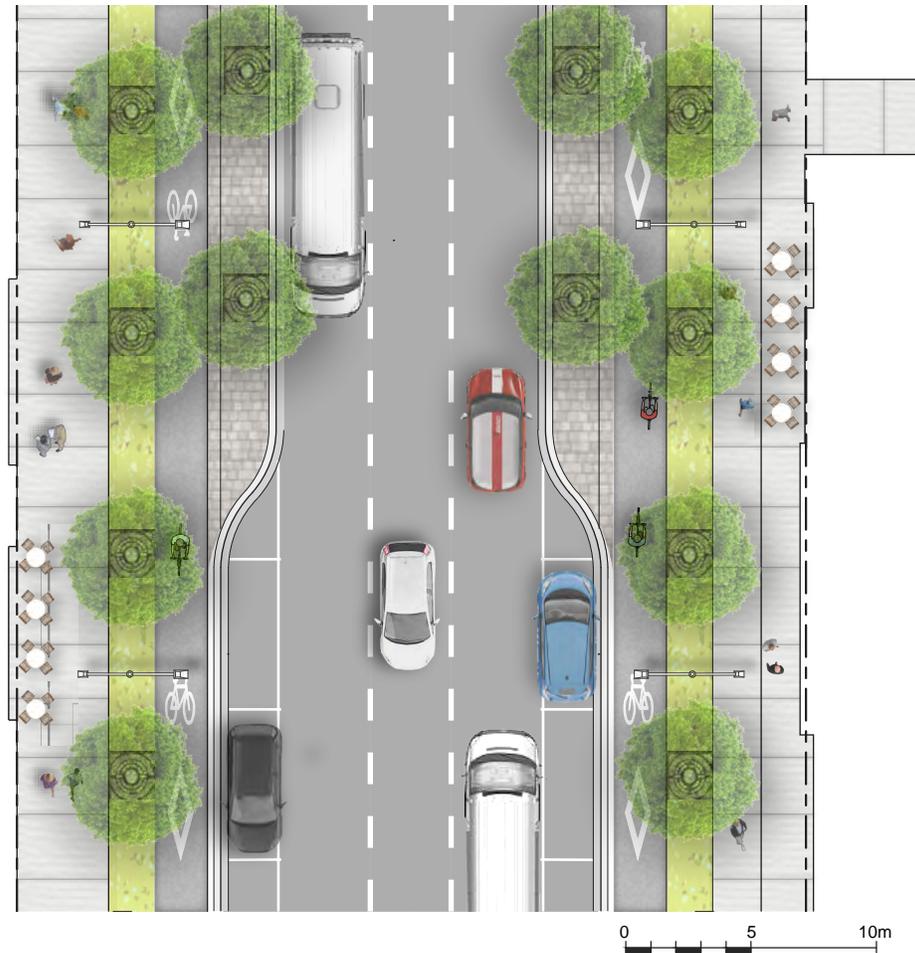
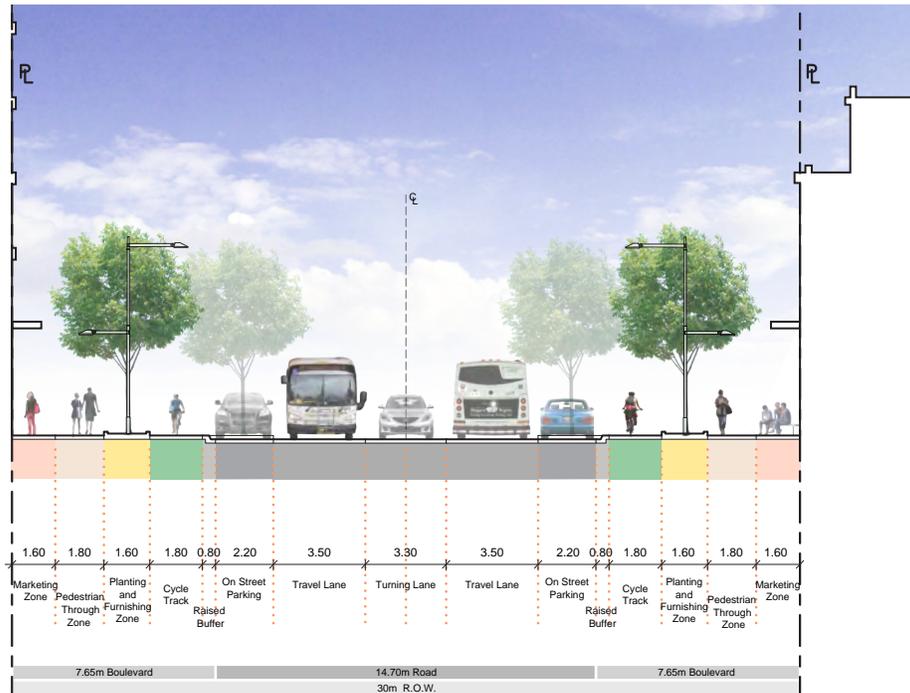
# URBAN GENERAL - NARROW (20m R.O.W.)



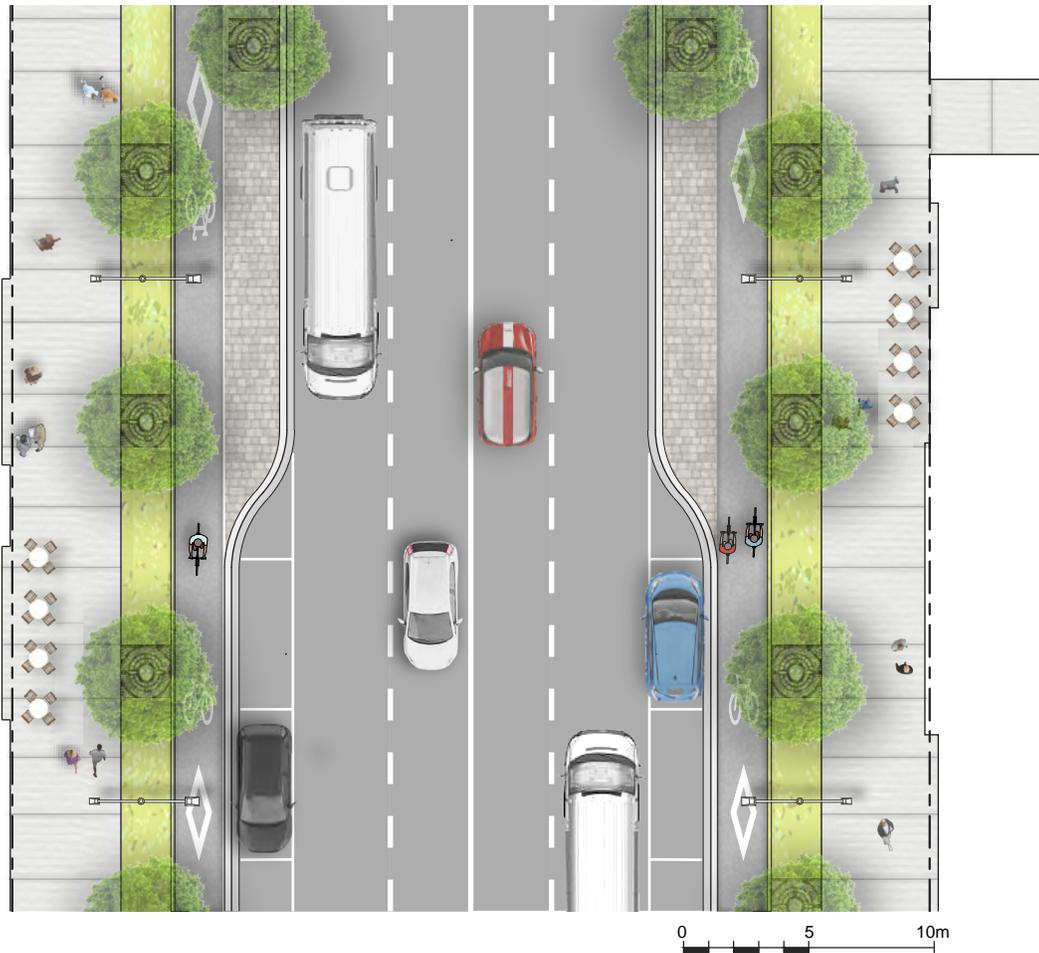
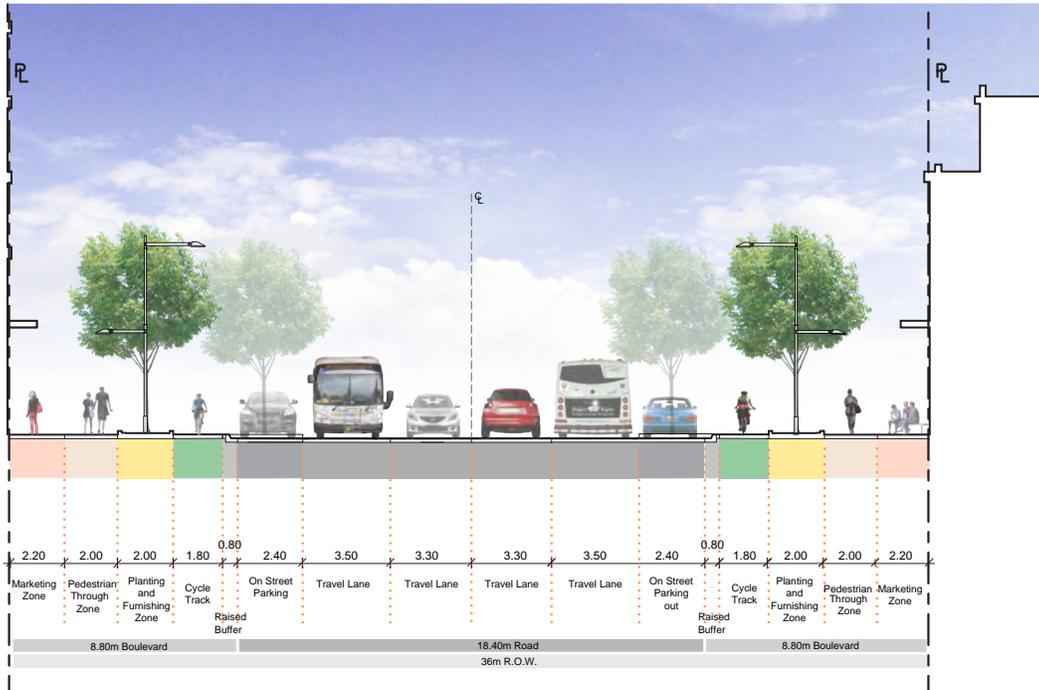
# URBAN GENERAL NARROW (26m R.O.W.)



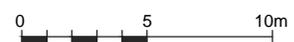
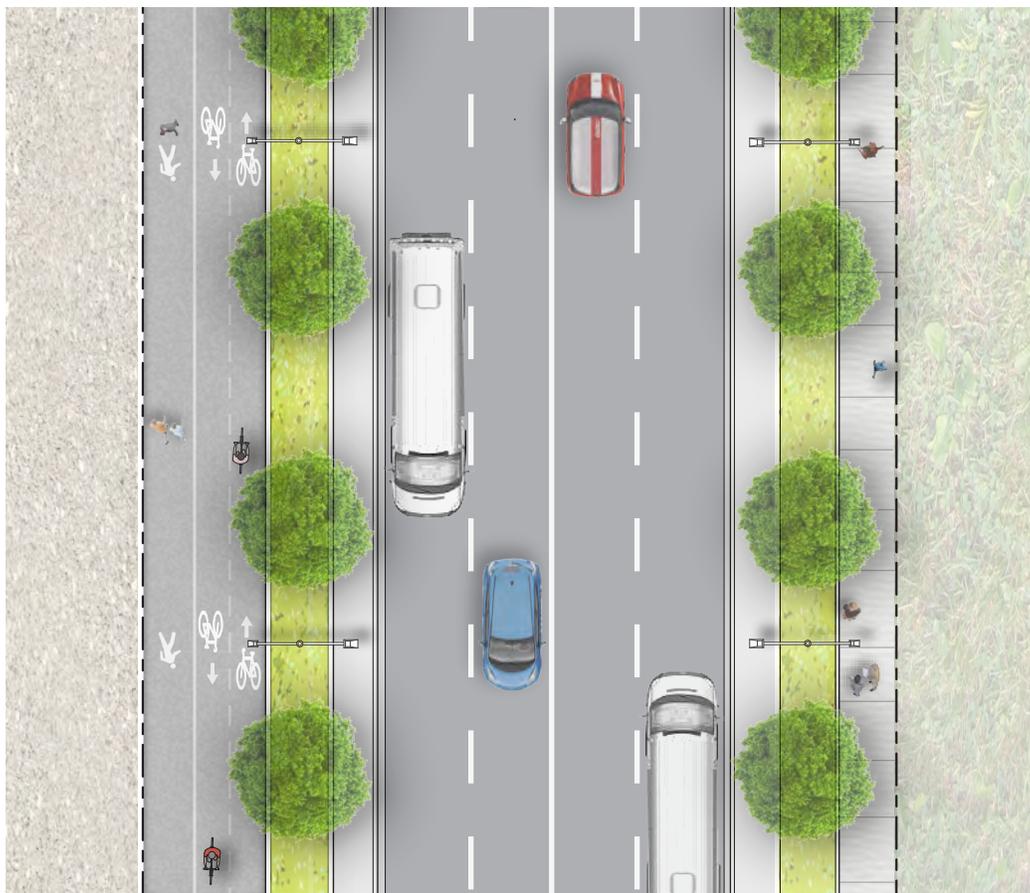
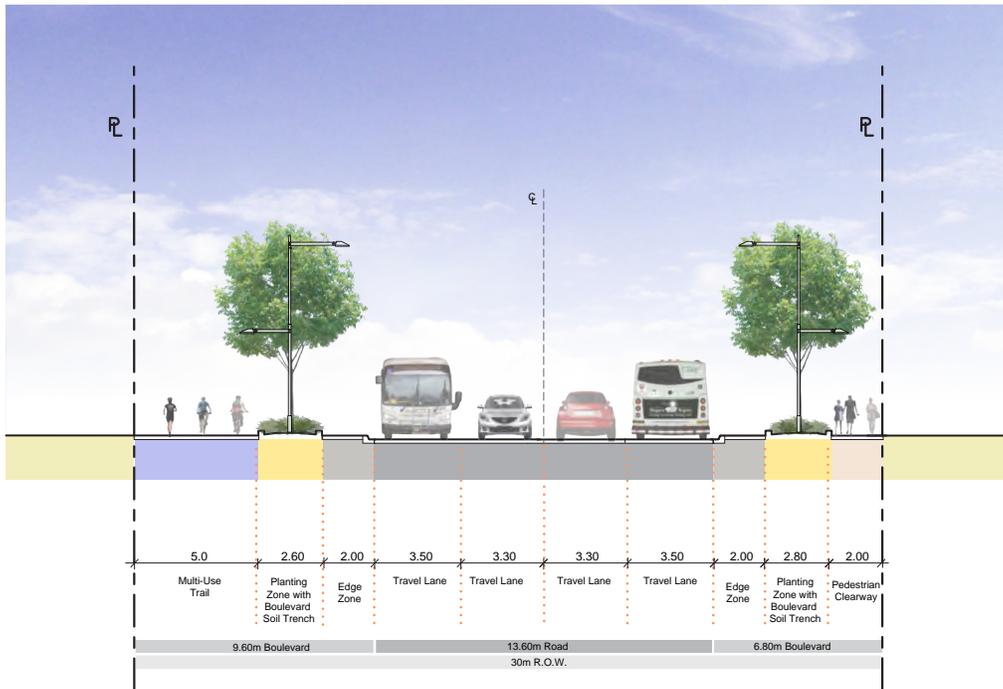
# URBAN GENERAL - WIDE (30m R.O.W.)



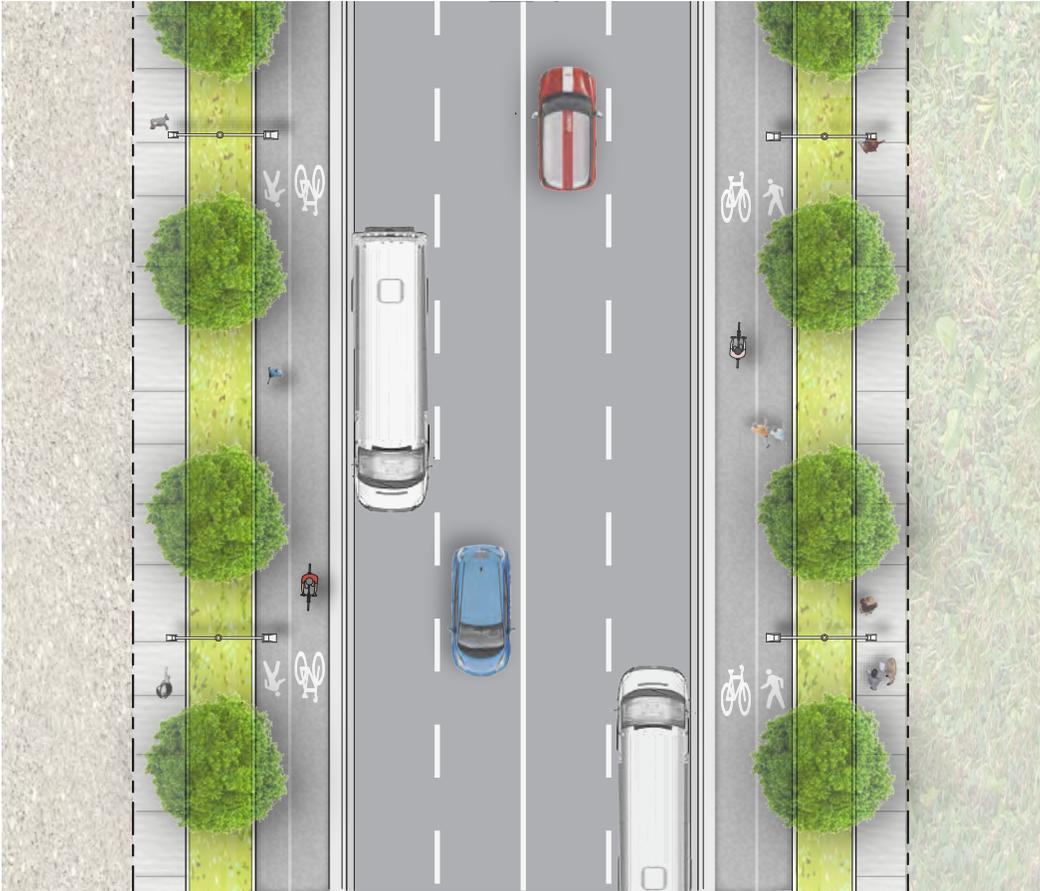
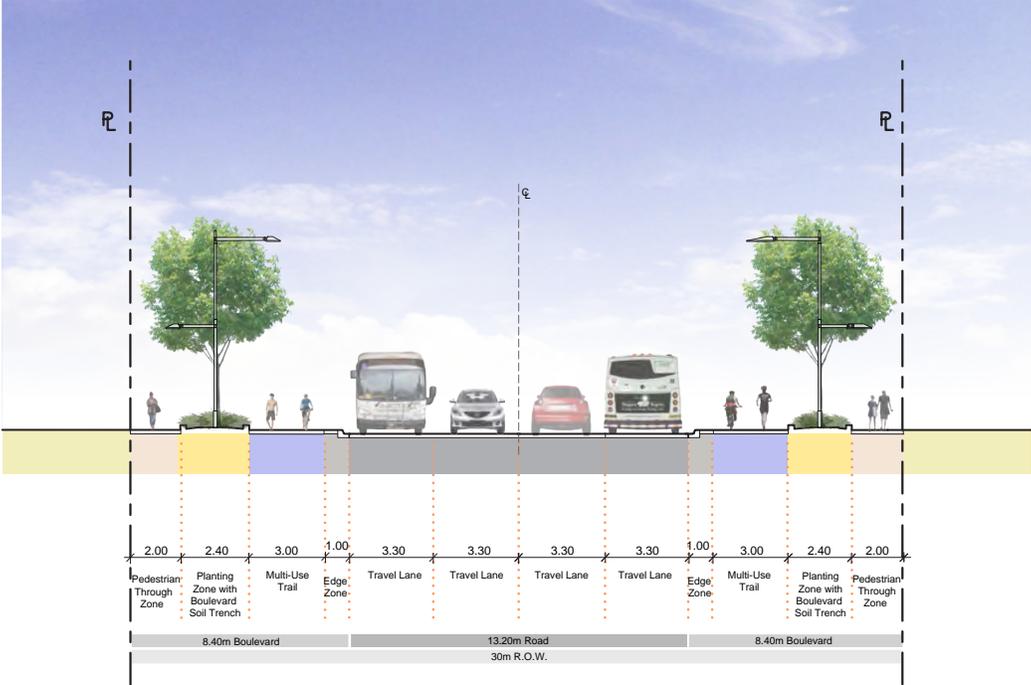
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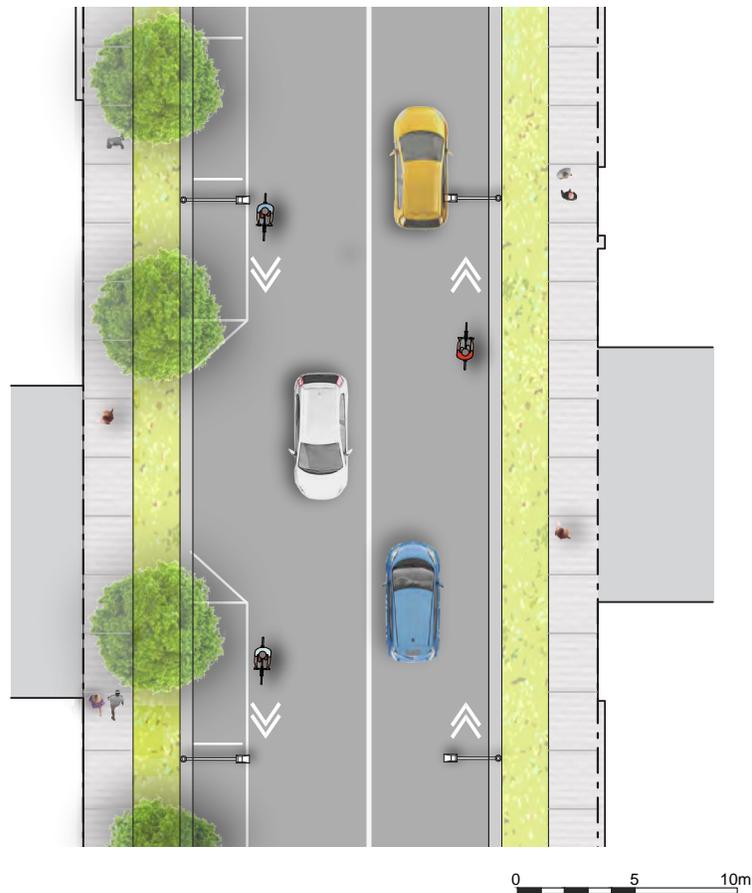
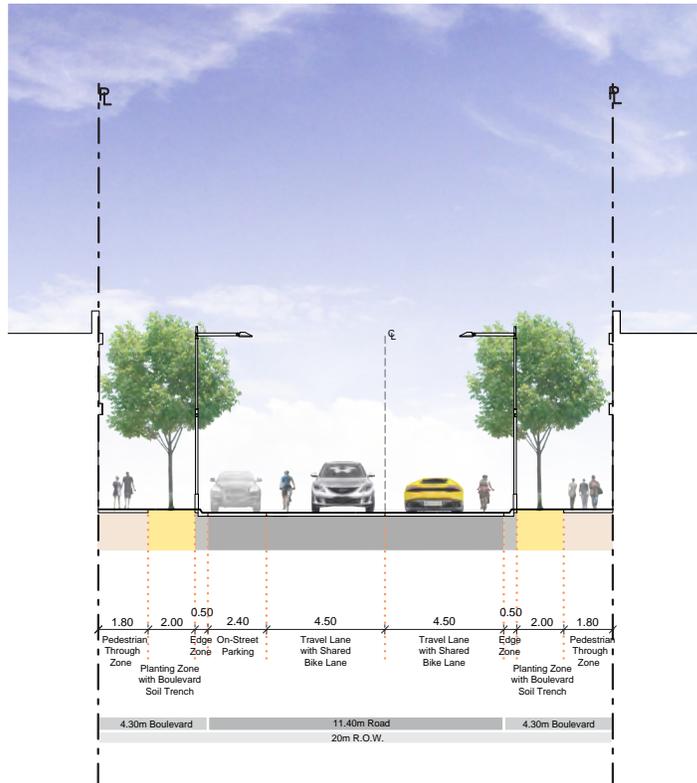
# TRANSITIONING (30m R.O.W.)



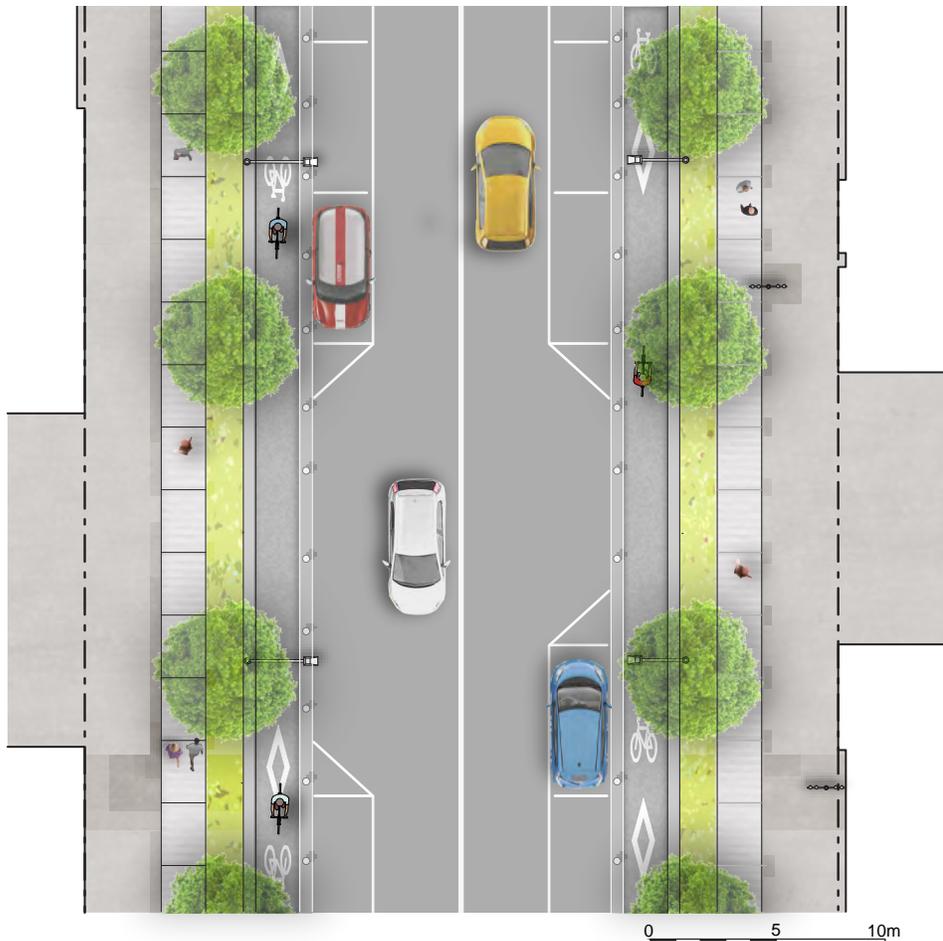
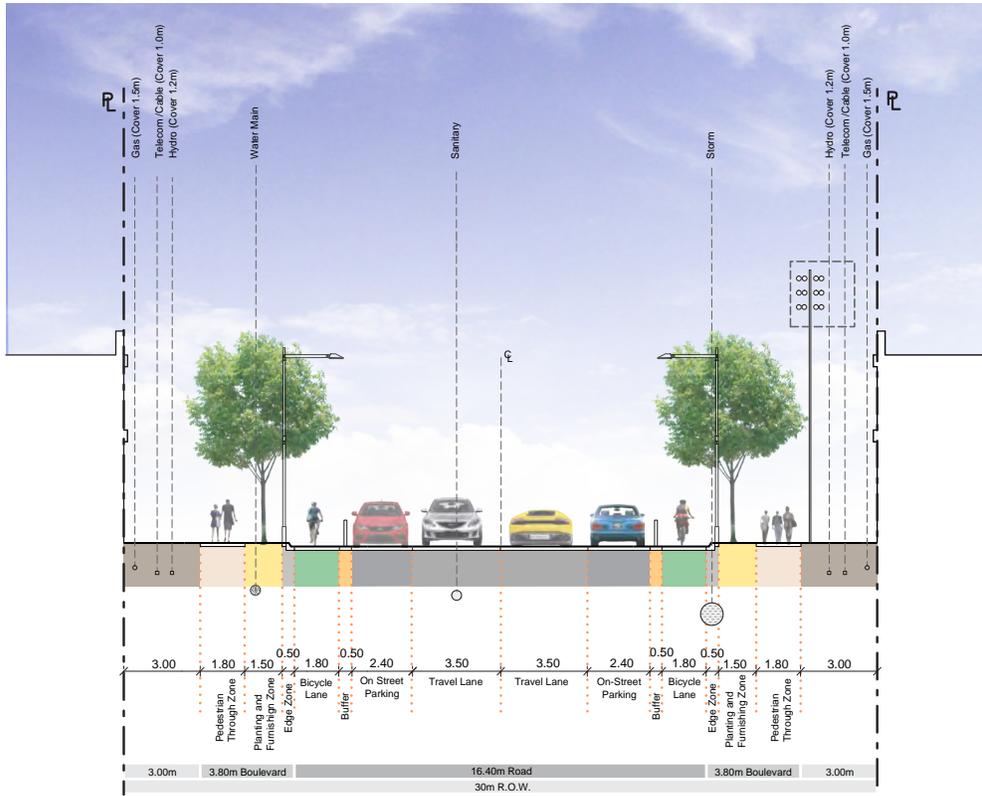
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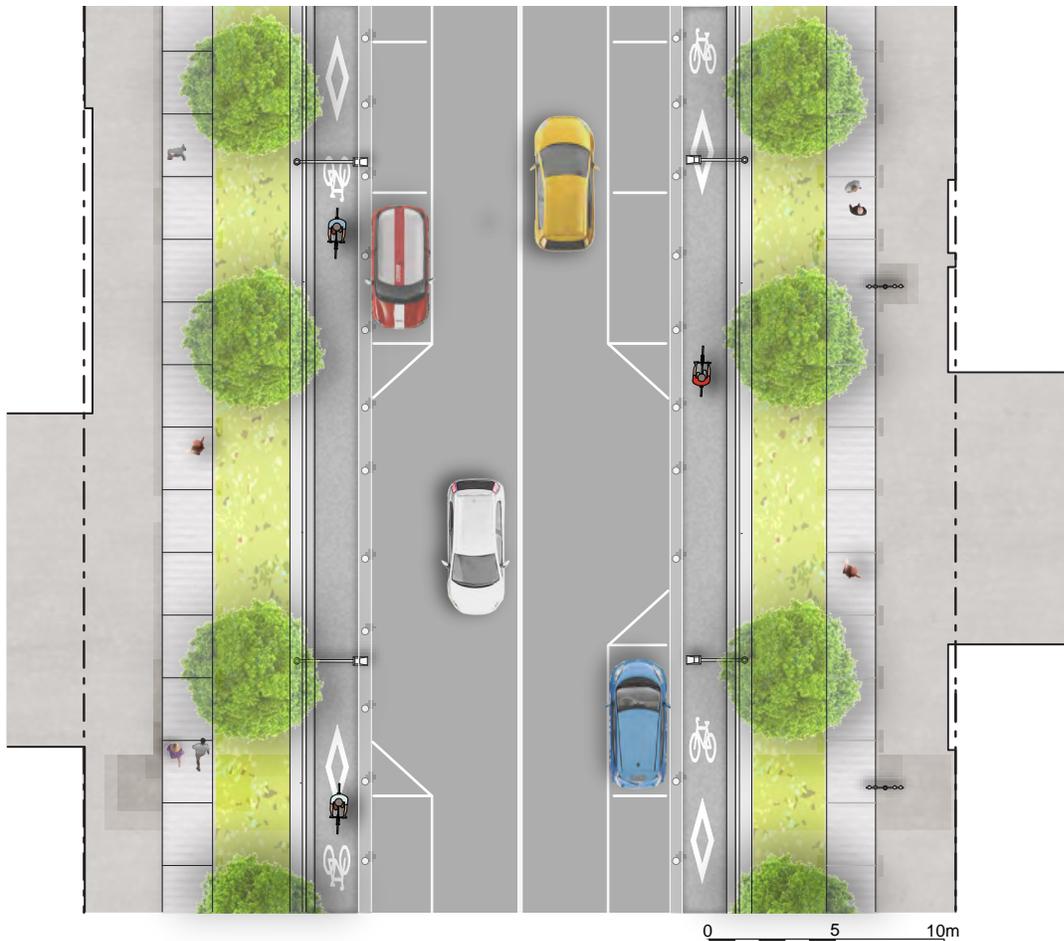
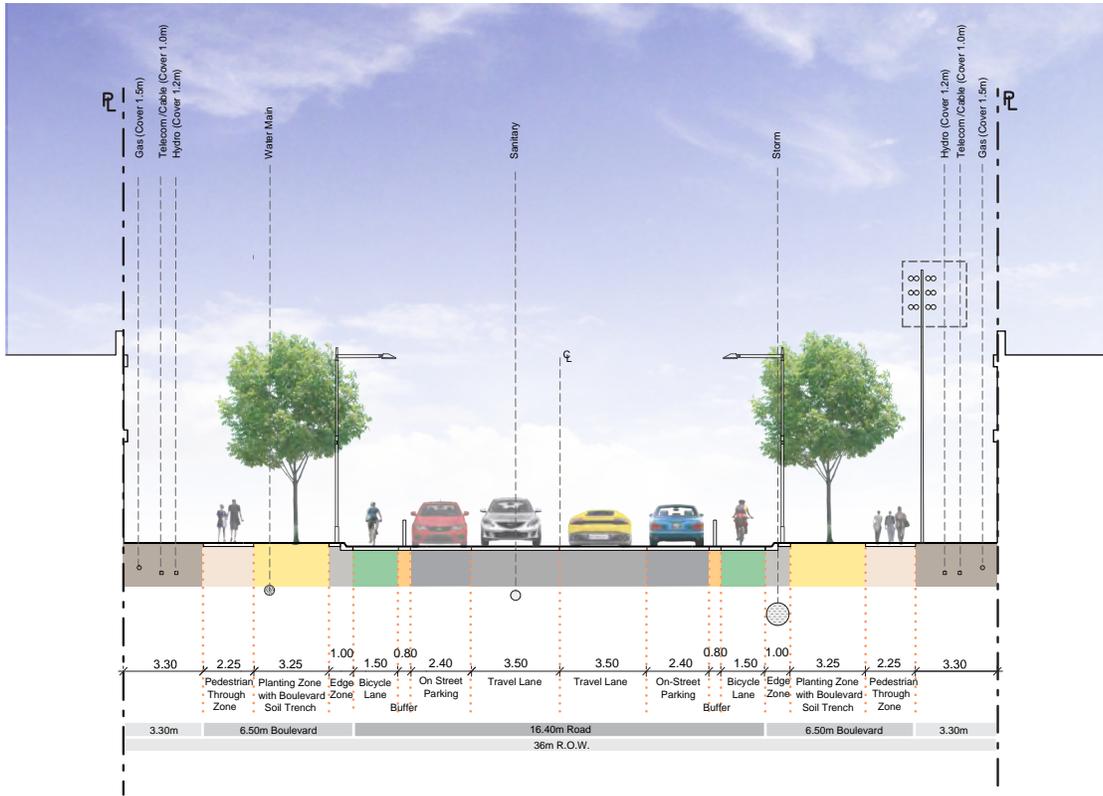
# HAMLET (20m R.O.W.)



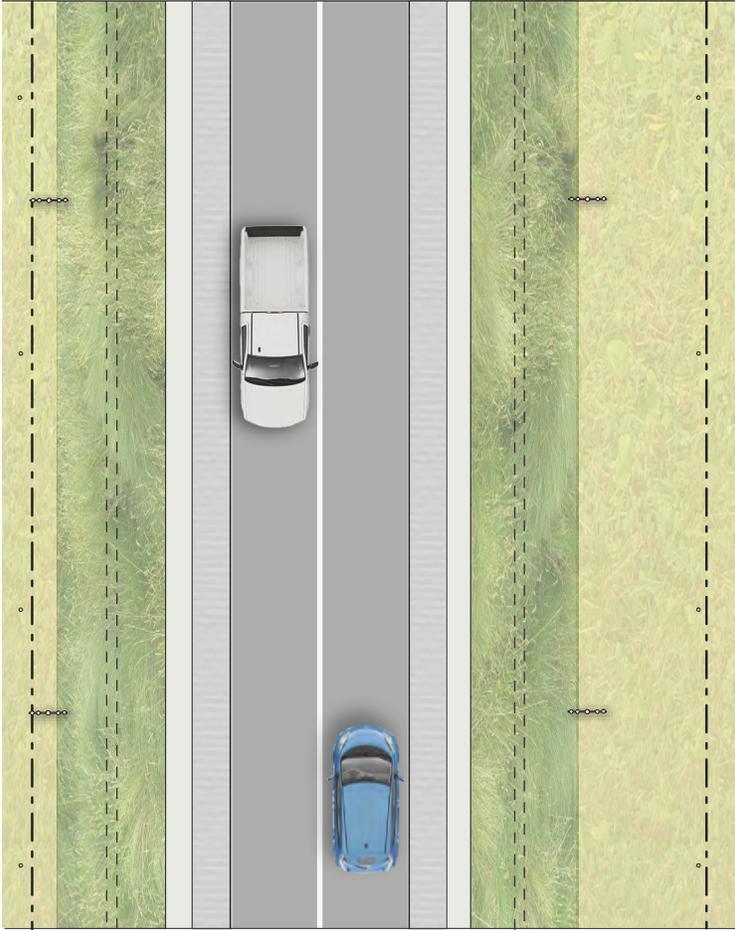
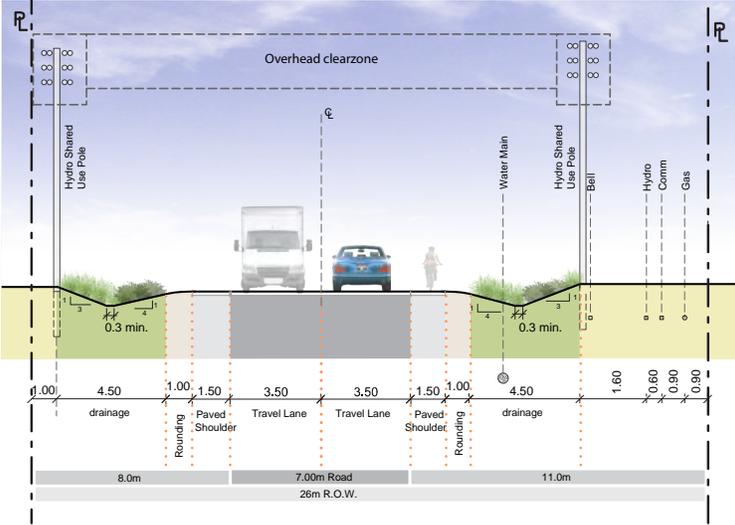
# HAMLET (30m R.O.W.)



# HAMLET (36m R.O.W.)

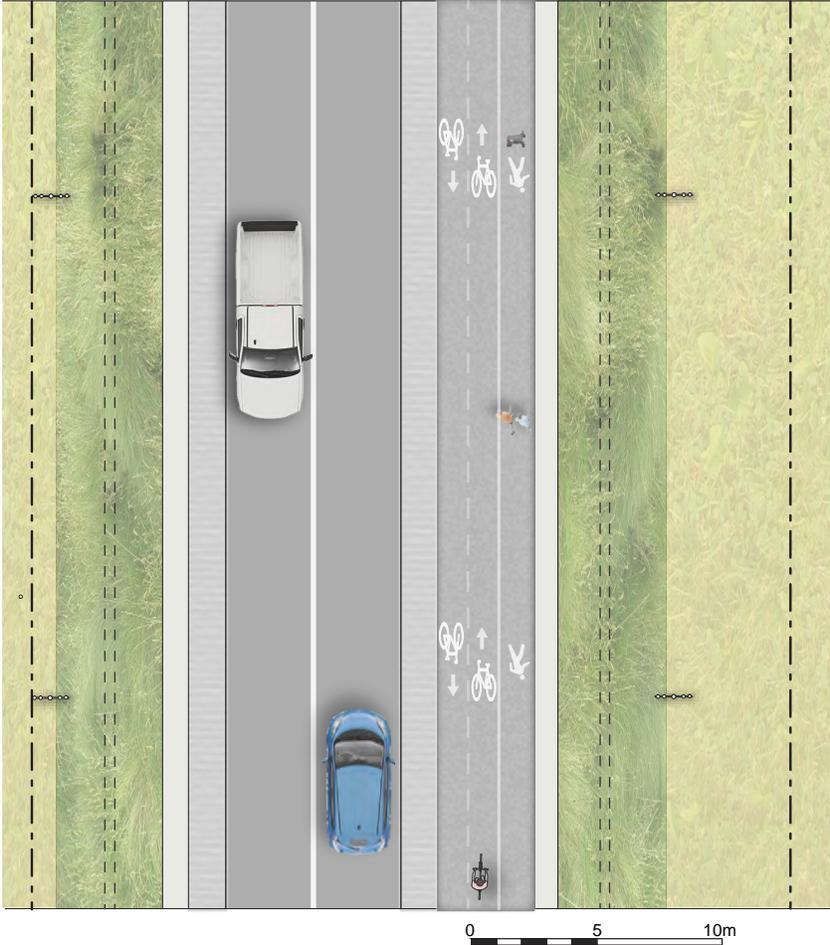
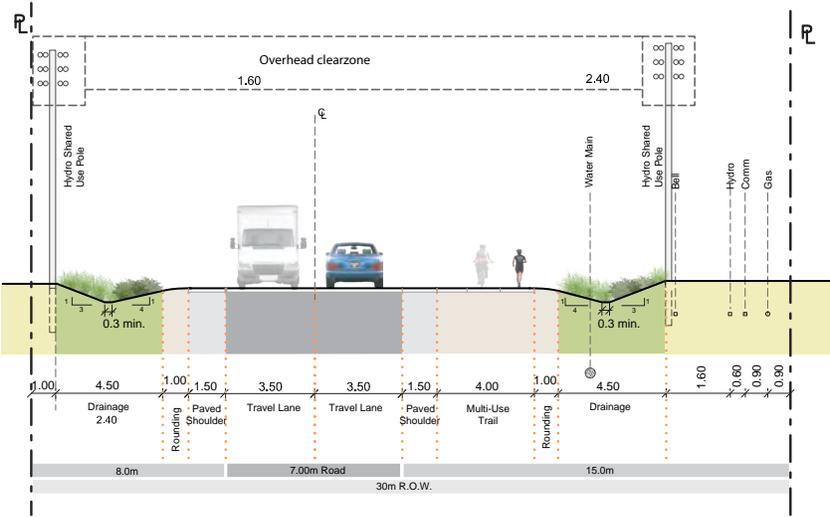


# RURAL (26m R.O.W.)

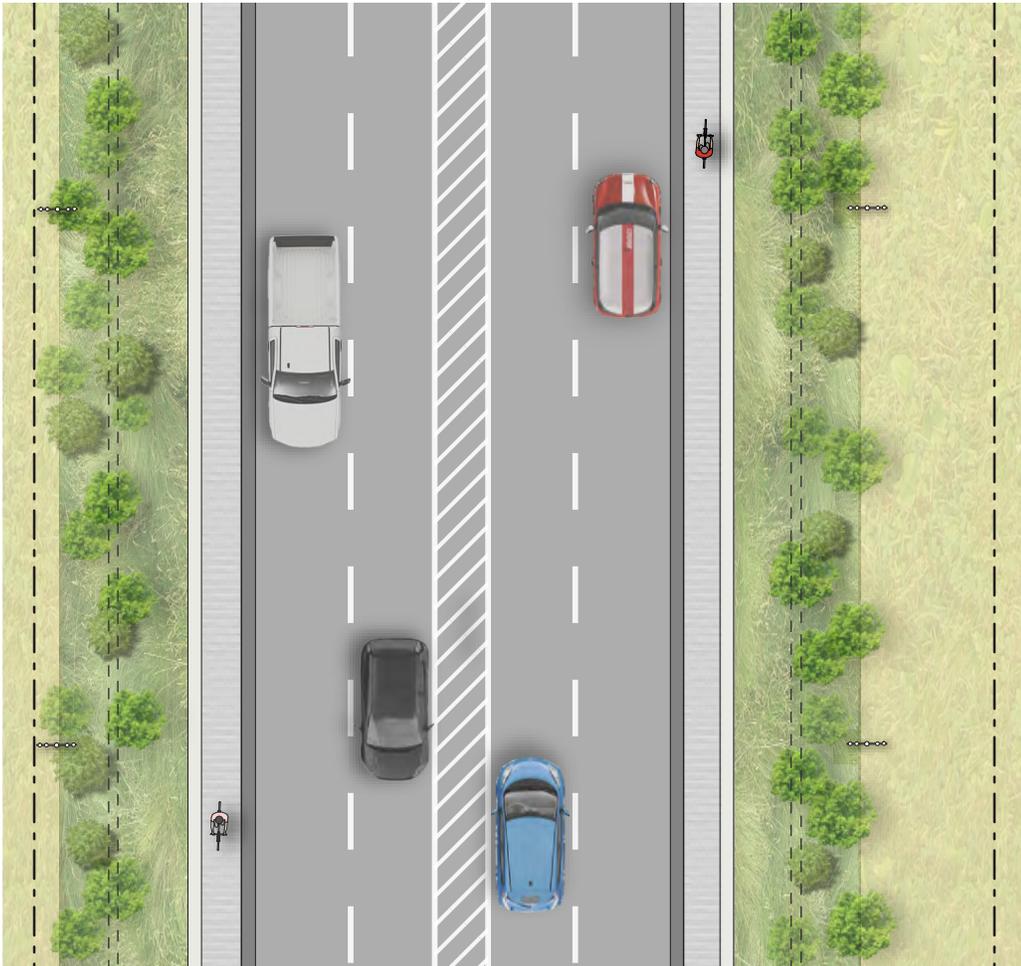
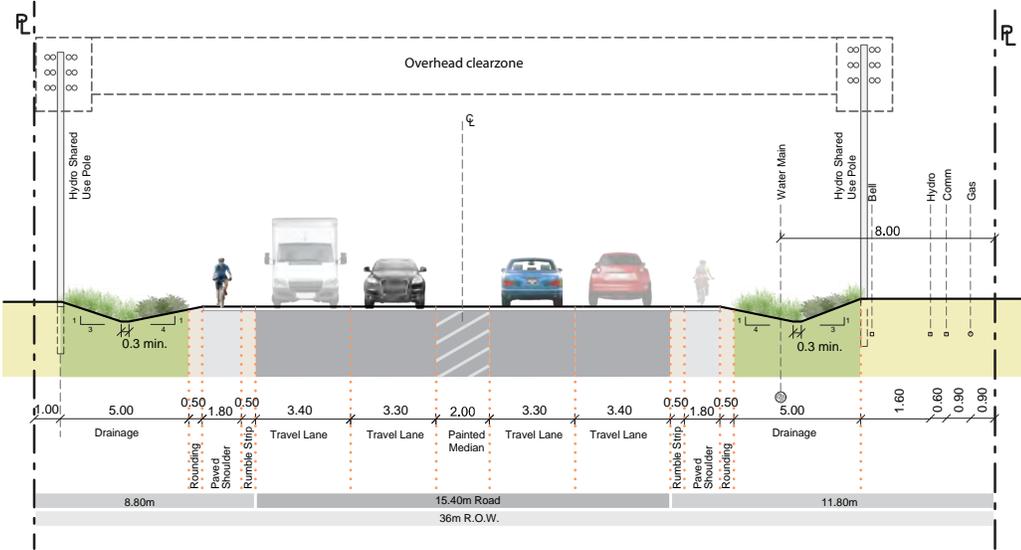


0 5 10m

# RURAL (30m R.O.W.)



# RURAL (36m R.O.W.)



0 5 10m

## **Appendix D- Multi-Modal Level of Service Guidelines**

# Multi-Modal Level of Service

## Niagara Region Complete Street Guidelines

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January 2017

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# Multi-Modal Level of Service Guidelines

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## INTRODUCTION

Multi-Modal Level of Service (MMLoS) has been identified as a new approach to be considered by the Niagara Region in determining transportation levels of service along Regional road corridors. In the past, municipalities have focused on the performance of vehicular traffic. By looking at level of service (LoS) performance measures for other modes of travel, the Region will be better able to view a street in the context of being complete and consider the trade-offs between cycling, walking, transit and vehicular modes.

A typical Traffic Impact Assessment Tool considers intersection capacity for a motor vehicle before and after a site is developed or a road is redesigned. A volume to capacity (v/c) ratio for a signalized intersection is related to a LoS rating. In the context of a site development application, mitigation measures in the form of additional lane capacity and/or signal timing/phasing adjustments are required where v/c ratios for signalized intersections exceed 0.90 (except in the urban core). For road rehabilitation projects, this concept of v/c is used as part of the analysis to determine if the geometry of the roadway and intersection should be changed.

For the Niagara Region, the MMLoS will be used as a qualitative tool to inform the decision-making framework for Complete Street projects. The tool will be used to assess road designs and allocate right-of-way based on the needs and trade-offs of road users. The MMLoS tool will focus on urban roadways, but will also have applicability to special routes, such as the Wine Route, and school zones in rural areas/hamlets.

## MULTI-MODAL LEVEL OF SERVICE TOOL

The MMLoS information provided herein is intended as a starting point for the Niagara Region to develop a suitable process for evaluating all modes of travel. Given the wide variety of roadway projects, right-of-way widths, regional needs etc., some roadway projects will not require an evaluation of every mode. The specific criteria relevant to the Niagara Region and the applicability of applying an MMLoS tool to a particular roadway design project will have to be determined once that roadway corridor has been given Complete Street status.

An MMLoS tool that captures the Niagara Region's multi-modal goals on designated roadways can be developed using the ideas and methods included herein. The application and development of an MMLoS tool should be tested and further developed based on the results of different 'test' projects<sup>1</sup> before implementing this tool for every roadway project. Once the tool is developed, it should be accompanied by a document clearly outlining the methodology for the user to apply the tool to the roadway in question.

## GOALS OF THE MMLoS TOOL

The goals of the MMLoS tool for the Niagara Region are as follows:

- Provide additional considerations to LoS analysis centered around motor vehicle delay;
- Assist discussions for rights-of-way and multi-modal trade-offs;
- To ultimately be applied to roadway segments and signalized intersections; and,
- Provide a starting point for developing an MMLoS evaluation process for relevant types of roadway studies.

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<sup>1</sup> The Niagara Region should select specific projects that will benefit from MMLoS analysis and start to develop an analysis technic suitable to the Niagara Region. Reviewers and analysts should work together to develop a useful assessment tool.

## APPLICATION OF MMLoS TOOL

Once an MMLoS evaluation process is further developed, the intention would be to use the MMLoS tool for the following types of analysis:

- The tool can be used at the commencement of new construction, reconstruction, and/or rehabilitation projects. Types of projects that would initiate the need for an MMLoS analysis include, but are not limited to:
  - Transportation environmental assessments;
  - Corridor studies; and
  - Transportation Impact Assessments (TIAs) for development projects;
- The MMLoS tool can be integrated with Transportation Impact Assessments (TIAs), such as those initiated for development projects; and
- Specific mode LoS will be assessed where applicable. For example, rural roadways will typically not require the use of the MMLoS tool, except in special areas as outlined below. The following table outlines the applicability of MMLoS analysis for each mode.

Table 1: Level of Service Mode Analysis Applicability

Mode	LoS Applicability (Urban Plan Designation & Other Significant Areas)				
	Urban, Suburban areas, including Greenfield areas	Downtown St. Catharines Urban Growth Centre; Local municipally designated Intensification Areas, Niagara Economic Gateway Zone	Rural Roads/Hamlets (Not including Special Rural/Hamlet Areas)	Special Rural/Hamlet areas: Main Streets, Schools, other Institutional Areas and others	Regionally significant cycling routes, including roadways identified in Bikeway Master Plan and the Wine Route
Pedestrian	✓	✓		✓	
Bicycle	✓	✓		✓	✓
Transit	✓	✓	✓	✓	✓
Truck & Vehicle	✓	✓	✓	✓	✓

## NIAGARA REGION MMLoS ANALYSIS PROCESS

Typical steps for an MMLoS analysis are as follows:

- (1) Identify candidate road segments and intersections for analysis;
- (2) Assess LoS (Pedestrian, Bicycle, Transit); and
- (3) Compare different MMLoS indicators and evaluate trade-offs, implications.\*

\*As noted, the end result is not a single MMLoS representing all modes but a tool for enabling trade-offs between different elements (i.e., space allocation within the right-of-way and/or time allocation within a traffic signal timing cycle).

Given the wide variety of factors affecting all modes along a roadway cross-section or intersection, there are many ways to evaluate MMLoS. This document provides tables that outline the features along a roadway cross section that may impact a particular mode and aims to rank each feature in importance relative to the specific mode (i.e. wider sidewalks achieves higher LoS for pedestrians). Similarly, the facilities provided at a particular intersection are evaluated on how they affect each mode. These tables are meant to provide a general understanding of the types of roadway features that impact each

individual mode. From these tables, the process of evaluating MMLoS may be developed to suit the requirements of roadways and intersections within the Niagara Region.

Table 2 shows an example of the qualitative Niagara Region LoS Tool. Detailed tables are included at the end of this guideline.

Table 2: Level of Service Ranges by Mode

Mode	Element	Level of Service (A to F)
Pedestrian (PLoS)	Segment	High level of comfort  Low level of comfort
	Intersection	Short delay, high level of comfort, low risk  Long delay, low level of comfort, high risk
Bicyclist (BLoS)	Segment	High level of comfort  Low level of comfort
	Intersection	Low level of risk/stress  High level of risk/stress
Transit (TLoS)	Segment	High level of reliability  Low level of reliability
	Intersection	Short delay  Long delay
Vehicle (LoS)	Intersection	Low lane utilization  High lane utilization

## MINIMUM DESIRABLE MMLoS TARGETS

Table 3 illustrates the desirable MMLoS targets for various designations for the Niagara Region. The table was designed to address the common question – *what should the target be?* The target is context sensitive. For example, areas designated for intensification, transit-oriented development, and/or traditional mainstreets would have the highest LoS for active modes.

Table 3: Minimum Desirable MMLoS targets for the Region

Official Plan Designation		Pedestrian LoS (PLOS)	Bicycle LoS (BLoS)		Transit LoS (TLoS)		Motor Vehicle LoS
			Bikeway Master Plan Designation	No Bikeway Master Plan Designation	Public Transit Route	No Public Transit Route	
Urban Area	• Built Up Area	A	B	C	B	C	E
	• Designated Greenfield Area	A	B	C	B	C	E
<ul style="list-style-type: none"> <li>• Downtown St. Catharines Urban Growth Centre;</li> <li>• Local municipally designated Intensification Areas;</li> <li>• Niagara Economic Gateway Zone</li> </ul>		A	B	C	B	C	E
• Rural Roads/ Hamlets (Not incl. Special Rural/ Hamlet Areas)		-	-	-	B	-	E
• Special Rural/Hamlet areas: Main Streets, Schools, other Institutional Areas and others		A	B	C	B	C	E
• Regionally significant cycling routes, including roadways identified in Bikeway Master Plan and the Wine Route		-	B	C	-	-	E

## METHODOLOGIES AND DATA REQUIREMENTS

### PEDESTRIAN LEVEL OF SERVICE (PLOS)

Pedestrian Level of Service (PLOS) is designed to help evaluate the level of comfort experienced by a pedestrian within a corridor or at a signalized intersection. To evaluate PLoS along a roadway segment, a look-up table is used to assess the pedestrian conditions. Key factors include: sidewalk width, boulevard width, motor vehicle volumes, heavy vehicle volumes, on-street parking and operating speed. A PLoS is in turn identified for the worst-case.

At signalized intersections, the comfort and safety of the pedestrian at the intersection is assessed. Each intersection approach is to be evaluated and the worst case identified. The PLoS tool will mainly be used to assess urban, suburban and greenfield areas, as well as special regionally or municipally designated areas. The tool for PLoS can be applied to rural areas/hamlets in certain circumstances, such as those outlined in the Mode Analysis Applicability Table (Table 1). These include schools, mainstreets, and other areas.

PLoS involves the evaluation of each segment and signalized intersection within the study area.

*Segment-Level:* Evaluating PLoS for segments involves a look-up table approach. Consideration is required for selecting the appropriate section of a corridor for evaluation that will be representative of the entire corridor. Within a segment, facilities are evaluated on both sides of the roadway unless a particular area does not require facilities on both sides. The overall score for a segment will be based on the lowest quality facility.

*Intersection-Level:* Evaluating PLoS for intersections involves measuring elements of pedestrian exposure to traffic (PETS) and average pedestrian delay crossing the street, using the Highway Capacity Manual (HCM) method. The longest delay on each approach will govern the PLoS score.

Table 4: Road Segment Pedestrian LoS

High (LoS A - B)	Medium (LoS C - D)	Low (LoS E - F)
<input type="checkbox"/> Low vehicular operating speed ( $\leq 50$ km/h) <input type="checkbox"/> Wide sidewalk width ( $\geq 2.0$ m) <input type="checkbox"/> Presence of boulevard <input type="checkbox"/> Low motor vehicle volume (AADT < 5,000 veh) <input type="checkbox"/> Presence of on-street parking <input type="checkbox"/> Presence of streetscaping	<input type="checkbox"/> Vehicular operating speed (50 km/h to 80 km/h) <input type="checkbox"/> Wide sidewalk width (1.8 - 2.0 m) <input type="checkbox"/> Possible presence of boulevard <input type="checkbox"/> Motor vehicle volume (AADT 5,000 veh - 20,000 veh) <input type="checkbox"/> Possible presence of on-street parking <input type="checkbox"/> Possible streetscaping	<input type="checkbox"/> High vehicular operating speed ( $> 80$ km/h) <input type="checkbox"/> No or narrow sidewalk width ( $< 1.8$ m) <input type="checkbox"/> No boulevard <input type="checkbox"/> High motor vehicle volume (AADT $> 20,000$ veh) <input type="checkbox"/> No on-street parking <input type="checkbox"/> No streetscaping
Select the Level of Service which most applies to the Road Segment. If the majority of the conditions are met within the High/Medium/Low box, select the higher of the two LoS grades (i.e. 4 out of 6 boxes checked in the 'High' criteria receives an LoS 'A'. 3 out of 6, receives an LoS 'B').		

Table 5: Pedestrian Exposure to Traffic at Signalized Intersections

Crossing Distance	
Total vehicle lanes crossed*	LoS
2	A
3	A
4	B
5	C
6	D
7	E
8-10	F

\*Total vehicle lanes crossed assumes no median. Where a median of more than 2.4 m is provided, the LoS may increase by up to one level.

Negating Factors		Supporting Factors	
<b>Corner Radius</b>			
Corner Radius >15 m	Significant	No Right Turn	Minimal
Corner Radius 5 – 15 m	Moderate	Right turn “smart channel”	Minimal
Corner Radius Less than or equal to 5 m	Minimal		
Right turn channel with receiving lane	Minimal		
<b>Crosswalk Treatment</b>			
Standard transverse crosswalk markings	Moderate	Raised Crosswalk	Moderate
		Textured/Coloured/Zebra stripe markings	Minimal
<b>Signal Phasing and Timing</b>			
Permissive left and right turn phases	Significant	Fully protected left turns/no left-turns	Moderate
Right-turn-on-red allowed	Minimal	Fully protected right turns/no right-turn	Moderate
		Right-turn-on-red prohibited	Moderate
		Leading pedestrian phase	Significant
<p><i>Negating and Supporting Factors reduce or increase (respectively) LoS by various degrees.</i></p> <p><b>Significant</b> – Entire level (increase or decrease one letter grade i.e. A to B, or B to A)</p> <p><b>Moderate</b> – Half level (two moderate factors will lead to LoS reduction or increase of one letter grade)</p> <p><b>Minimal</b> – Partial level (3 minimal factors will lead to LoS level reduction or increase of one letter grade)</p>			

## BICYCLE LEVEL OF SERVICE (BLOS)

In terms of the individual analysis tool, a common approach for Bicycle Level of Service (BLoS) is the application of Cycling Level of Traffic Stress (LTS). For road segments, data requirements include facility widths and vehicular operating speed. Cycling facilities that are physically separated from motor vehicle traffic have the lowest level of traffic stress (i.e., LTS 1). A painted bike lane corresponds with a LTS 3 and mixed traffic a LTS 4. The LTS approach is then converted to a letter grade for BLoS.

At signalized intersections, the BLoS is based on an analysis of turning movement conflicts for pocket bike lanes or mixed traffic situations. (i.e., a LTS 4 corresponds with the shifting of a painted bike lane to the left to accommodate dual right-turn lanes for motor vehicles).

### BLOS METHODOLOGY

Evaluating BLoS involves an evaluation of each segment and intersection approach within the study area, and ultimately the identification of the worst corridor and/or intersection condition. The score of the worst corridor and/or intersection condition will make up the overall BLoS score. Each approach direction requires separate evaluation. Tables 6 and 7 outline the BLoS scoring tables for road segments and intersections.

Table 6: Road Segment Bicycle Level of Service

LTS	DESCRIPTION	Niagara Region BLoS
LTS 1	<ul style="list-style-type: none"> <li><input type="checkbox"/> Low traffic stress.</li> <li><input type="checkbox"/> Recreational opportunity.</li> <li><input type="checkbox"/> Suitable for all ages and skills levels.</li> <li><input type="checkbox"/> Along links, cyclists are either:                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Physically separated from traffic.</li> <li><input type="checkbox"/> Provided with an exclusive bicycling zone next to a slow traffic stream with no more than one lane per direction.</li> <li><input type="checkbox"/> On a shared road where they interact with occasional motor vehicles (as opposed to a stream of traffic) with a low speed differential.</li> </ul> </li> <li><input type="checkbox"/> Ample operating space provided between cyclist and on-street parking.</li> <li><input type="checkbox"/> Low stress intersection approaches and crossings.</li> </ul>	A
LTS 2	<ul style="list-style-type: none"> <li><input type="checkbox"/> Suitable for most cyclists.</li> <li><input type="checkbox"/> Along links, cyclists are either:                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Physically separated from traffic.</li> <li><input type="checkbox"/> Provided with an exclusive bicycling zone next to a slow traffic stream with no more than one lane per direction.</li> <li><input type="checkbox"/> On a shared road where they interact with occasional motor vehicles (as opposed to a stream of traffic) with a low speed differential.</li> </ul> </li> <li><input type="checkbox"/> Adequate clearance between cyclist and on-street parking.</li> <li><input type="checkbox"/> Where a bike lane lies between a through lane and a right turn lane, it is configured to give cyclists unambiguous priority where cars cross the bike lane and to keep car speed in the right-turn lane comparable to bicycling speeds.</li> <li><input type="checkbox"/> Crossings are not difficult for most adults.</li> </ul>	B

<b>LTS 3</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> More traffic stress than LTS 2, yet markedly less than the stress of integrating with multilane traffic.</li> <li><input type="checkbox"/> Suitable for most experienced adult cyclists.</li> <li><input type="checkbox"/> Along links, cyclists have:             <ul style="list-style-type: none"> <li><input type="checkbox"/> Exclusive riding zone (lane) next to moderate-speed traffic or shared lanes on streets that are not multilane and have moderately low speed.</li> </ul> </li> <li><input type="checkbox"/> Crossings may be longer or across higher-speed roads than allowed by LTS 2, but are still considered acceptably safe to most adult cyclists.</li> </ul>	C - D
<b>LTS 4</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> High level of stress.</li> <li><input type="checkbox"/> Suitable only for very confident cyclists.</li> </ul>	E - F

Table 7: Intersection Bicycle Level of Service

High (A - B)	Medium (C - D)	Low (E - F)
<ul style="list-style-type: none"> <li><input type="checkbox"/> Fully protected intersection</li> <li><input type="checkbox"/> Two-stage left-turn bike boxes</li> <li><input type="checkbox"/> Presence of cross-ride</li> <li><input type="checkbox"/> Low motor vehicle volume (AADT &lt; 5,000 veh)</li> <li><input type="checkbox"/> Low vehicle operating speed (<math>\geq 50</math> km/h)</li> <li><input type="checkbox"/> 2 lane cross-section of roadway (plus auxiliary turn lanes)</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Presence of cycling lanes/sharrows</li> <li><input type="checkbox"/> Possible presence of left-turn bike box</li> <li><input type="checkbox"/> Vehicular operating speed (50 km/h to 80 km/h)</li> <li><input type="checkbox"/> Motor vehicle volume (AADT 5,000 veh – 20,000 veh)</li> <li><input type="checkbox"/> 3 to 4 lane cross-section of roadway (plus auxiliary turn lanes)</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Mixed traffic/no cycling facilities</li> <li><input type="checkbox"/> High vehicular operating speed (<math>&gt; 80</math> km/h)</li> <li><input type="checkbox"/> High motor vehicle volume (AADT <math>&gt; 20,000</math> veh)</li> <li><input type="checkbox"/> 5 or more lane cross-section</li> </ul>
<p>Select the Level of Service which most applies to the intersection. If the majority of the conditions are met within the High/Medium/Low criteria, select the higher of the two LoS grades (i.e. 4 out of 6 boxes checked in the 'High' criteria receives an LoS 'A'. 3 out of 6, receives an LoS 'B').</p>		

## TRANSIT LEVEL OF SERVICE (TLOS)

Where MMLoS criteria is applied in other municipalities, the primary objective for Transit Level of Service (TLoS) is transit travel time and transit priority. It is described as the relative attractiveness of transit in support of the City's aim to ultimately increase transit modal share. The data requirements for road segments are typically average transit travel speed, posted speed limit and the number of driveways along a corridor. For signalized intersections, the focus is on average signal delay.

### TLOS METHODOLOGY

Evaluating TLoS is intended to be used where transit service exists or is being planned. Typically, TLoS evaluations involve rapid transit service, though non-rapid transit service may also be evaluated using this method.

Table 8: TLoS Road Segment Evaluation Table

High (A - B)	Medium (C - D)	Low (E - F)
<ul style="list-style-type: none"> <li><input type="checkbox"/> Transit lanes</li> <li><input type="checkbox"/> No on-street parking</li> <li><input type="checkbox"/> Minimal driveway friction</li> <li><input type="checkbox"/> High frequency of bus trips</li> <li><input type="checkbox"/> Short dwelling time</li> <li><input type="checkbox"/> Convenient and close bus stops</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Mixed traffic with or without bus-bays</li> <li><input type="checkbox"/> Minimal on-street parking</li> <li><input type="checkbox"/> Minimal driveway friction</li> <li><input type="checkbox"/> Medium frequency of bus trips</li> <li><input type="checkbox"/> Short dwelling time</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Mixed traffic</li> <li><input type="checkbox"/> Frequent on-street parking</li> <li><input type="checkbox"/> Medium to high driveway friction</li> <li><input type="checkbox"/> Low frequency of bus trips</li> <li><input type="checkbox"/> Low dwelling time</li> <li><input type="checkbox"/> Bus stops located far from high density areas</li> </ul>

Table 9: TLOS Signalized Intersection Evaluation Table

High (A - B)	Medium (C - D)	Low (E - F)
<input type="checkbox"/> Grade separation or <input type="checkbox"/> Advanced bus phase/queue jump <input type="checkbox"/> Low transit delay (0 – 10 secs)	<input type="checkbox"/> Minimal/No transit signal priority <input type="checkbox"/> Low-medium transit delay ( $10 \geq 30$ secs)	<input type="checkbox"/> No transit signal priority <input type="checkbox"/> High delay ( $30 \geq 50$ secs)

**VEHICLE LEVEL OF SERVICE (LOS)**

Vehicle level of service is evaluated using traffic intersection analysis software such as SYNCHRO or equivalent. The level of service is based on the delay or the volume to capacity ratio (v/c) for the critical movement and is ranked as follows:

Control Delay Per Vehicle (s)	Level of Service by Volume to Capacity Ratio (v/c)	
	≤1	>1
≤10	A	F
>10 and ≤20	B	F
>20 and ≤35	C	F
>35 and ≤55	D	F
>55 and ≤80	E	F
>80	F	F

**TRADE-OFF DISCUSSION**

A common example used to illustrate the value of MMLoS and the discussion of trade-offs is as follows: if an intersection requires a right turn lane to achieve an auto LoS of C for cars, but this comes at the expense of a wider boulevard to achieve a pedestrian LOS better than E, a decision on whether the right turn lane is needed would occur. In this regard, the scores are used to facilitate a conversation about design alternatives. The challenge is not simply making streets wider based on MMLoS indicators. Table 10 presents an example of how trade-offs can be considered. In this example, a solution involving the implementation of traffic-calming measures would meet the targeted MMLoS criteria. Where targets cannot be achieved, it is recommended that a rationale be documented and mitigation measures applied where appropriate.

Table 10: Sample Presentation of Trade-off Discussion (Hypothetical Scenario)

Scenario	Pedestrian LoS	Bicycle LoS	Transit LoS	Motor Vehicle LoS
Existing	C	E	D	C
Targeted LOS	B	C	D	D
Concept: Traffic Calming	B	C	D	D
Concept: Road Diet	B	B	E	E
Concept: Signal Modifications	B	D	D	D