CYCLING MASTER PLAN




Final Report

JULY 2009

IBI GROUP

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EXECUTIVE SUMMARY

Introduction

The Burlington Cycling Master Plan is intended to guide the City in creating a network of on-road bikeways and multi-use pathways throughout Burlington, along with supportive policies, practices and programs to encourage more people to cycle. It is an update to the City's Multi-use Pathways and Bikeways Plan adopted by Council on October 6, 1997.

The benefits of cycling are significant to individuals, our community and the environment. Cycling is enjoyable, efficient, affordable, healthy, sociable, quiet, and a non-polluting form of transportation.

The Burlington Cycling Master Plan is a result of an initiative identified in the City's Strategic Plan: *Future Focus VII:*

- **Goal:** Provide an effective transportation network that moves people and goods efficiently within the City and neighbouring areas.
- **Strategic Action:** Build infrastructure to support the City's transportation demands, optimizing traffic flow and encourage alternative modes of transportation.
- **Initiative:** In partnership with the Burlington Cycling Committee, update the 10-year Bikeway Master Plan, including strategies and recommendations related to financial and other resources required to ensure safe, reliable and fully integrated infrastructure for cycling.

It also fits with Provincial initiatives including the Ministry of Health Promotion's *Ontario's Action Plan for Healthy Eating and Active Living* (June 2006), and Metrolinx's Regional Transportation Plan, *The Big Move: Transforming Transportation in the Greater Toronto and Hamilton Area* (November 2008).

Consultation

Consultation events conducted during the study included three public Open Houses, meetings and a workshop with the Burlington Cycling Committee, and collaboration with a delegation from Burlington's Twin City Apeldoorn, the Netherlands. More than 100 people were engaged in reviewing and providing input to the Cycling Master Plan.

During the week of October 13, 2008, Wim Mulder, a transportation engineer from the City of Apeldoorn, the Netherlands, visited Burlington as part of a Twin City delegation. Based on his experience in Burlington, Mr. Mulder concluded that there is a large potential for cycling in Burlington: distances are reasonable for trips by bicycle, the network provides a lot of possibilities for attractive cycle routes and the City is flat. The main concern why people do not cycle has primarily to do with road safety.

Bikeway Designs

There are many cities in modern, industrialized nations around the world with high bicycle mode share. They have achieved these high levels of bicycle use through adherence to various cycling-promoting policies and practices. One characteristic they share in common is they have all substantially removed the element of fear associated with bicycling in an urban environment. They have created transportation systems in which bicycling is often the most logical, enjoyable, and attainable choice for trips of a certain length for a wide swath—if not the majority—of their populace. For residents of these cities, concern about personal safety associated with bicycling is rarely a consideration, and certainly not to the levels experienced in North America.

Improvements to the transportation network to better accommodate cyclists are not only beneficial to cyclists but also to other network users. For example, restriping roadways from four travel lanes to two with a centre two-way, left-turn lane and bike lanes (a “road diet”) will improve the safety of motorists, better accommodate left-turning traffic, and assist pedestrians in crossing the roadway particularly if median refuges can be provided at key crossing locations. Motorists and pedestrians, like cyclists, can benefit from traffic calming. Therefore, creating good designs for cyclists will improve the transportation network for everyone.

Existing cycling facilities in Burlington that will continue to be implemented as part of the recommended bikeway and multi-use trail network include:

- Signed routes.
- Bike lanes.
- Paved shoulders.
- Multi-use pathways in parks, utility corridors and open space.

- Multi-us pathways in roadway corridors.
- Bike racks on buses extend the cycling network and provide an alternative in poor weather.

Improvements to existing bikeways and multi-use pathways, and the implementation of new, high quality facilities are recommended to include features to **improve the overall access to local streets and pathways**, such as

- Median refuges to cross busy streets.
- Traffic signals to cross busy streets.
- Raised crossings to give the multi-use pathway priority at local street crossings.
- Bicycle detection or cyclist pushbuttons to activate traffic signals.
- "Bike box" pavement marking in advance of the motorist's stop bar where cyclists wait during the red signal and then proceed first when the signal turns green.
- Bicycle traffic signals.
- "Crossbike" cyclist crossing pavement marking adjacent the pedestrian crosswalk.
- Neighbourhood traffic circles to replace stop signs.

A new bikeway design recommended to be implemented in Burlington as part of the Cycling Master Plan is the **bicycle priority street,** or "bicycle boulevard" as it is known in western US. It is a traffic-calmed, local street that has been optimized for through bicycle traffic, but discourages other non-local traffic. Traffic controls (signals, stop signs and yield signs) are placed to control conflicts with motorists and give priority to cyclists. Traffic control or features are provided so cyclists can cross major streets. These types of streets enhance neighbourhood liveability and traffic safety. Most people know how to get around their own neighbourhood so signed bicycle routes are not really needed. For cyclists who do not want to cycle on busy roads, signed bicycle priority streets on local streets can route them through neighbourhoods to their destinations. Cities with a network of bicycle priority streets include Berkeley, Portland and Eugene CA, Albuquerque NM and Vancouver.

A feasibility study is recommended to develop **European cycle tracks** on Dundas Street as part of the Rapid Transit Corridor project. This fits with Metrolinx's support for active

transportation access to transit. European cycle tracks are bike lanes separated from travel lanes, parking lanes and sidewalks by pavement markings, pavement colouring, bollards, curbs, raised medians, or a combination of these elements. They are used by cyclists only. Cycle tracks **differ from the boulevard pathways** built along arterial roadways in the follow ways:

- Design quality—Typically they operate one-way with traffic. The surface, width, drainage, traffic control, signage and overall layout are well thought-out. Main intersections often include traffic signals for cyclists, bike boxes, or other features to protect cyclists from motorists turning across their path.

- Maintenance quality—Cycle tracks along busy routes are afforded the level of summer and winter maintenance that permit them to be used 24 hours a day, 7 days a week, 365 days a year. They must be designed to accommodate City maintenance equipment.

- Legislative environment—Cycle tracks in the Netherlands are defined as part of the main roadway and cyclists using the cycle tracks are provided with the same rights-of-way as motorists on the main roadway. Thus side street and driveway traffic must yield to cyclists. Cyclists that ride on sidewalks or boulevard pathways in Burlington are expected to behave like pedestrians at side street crossings, dismounting to use crosswalks as per Ontario's Highway Traffic Act.

Recommended Bikeway and Multi-use Pathway Network

NETWORK GUIDING PRINCIPLES

A good cycling network should encourage people to use the bicycle more often. In the Netherlands, this is achieved by understanding the needs or so-called requirements of the cyclist, as follows:

- **Coherence**: The network consists of cycle routes. It is important that these routes are well connected with each other and with the main destinations.

- **Safety**: This is the starting point for planning and design. Road situations must always be safe. The safety applies also to situations in parks where public safety can be an issue.
- **Directness**: Cyclists want to move on. Stopping is costing them energy and results in delays. There are many situations where cyclists take a high risk on road safety in order to save travel time.
- **Comfort**: The road surface must be smooth and comfortable.
- **Attractiveness**: An attractive surrounding is desired along the route.

QUALITY FRAMEWORK FOR A CYCLING NETWORK

As a priority, **a framework of high quality cycling routes**, as illustrated on Map 2, is recommended consisting of:

- Proposed cycle tracks on Dundas Street traversing the northern urban area.
- Upgrades to the Hydro Corridor Trail from Dundas Street to the QEW.
- A new grade-separated pedestrian / cycling crossing of the QEW in the hydro corridor east of Brant Street.
- Upgrades to the Centennial Trail from the City's eastern boundary to the Downtown.
- Existing and proposed bike lanes on Brant Street, Maple Avenue, Fairview Street and Guelph Line connecting in and around the Downtown.

It is important to increase the **cycling quality** of these routes through upgrading, improved designs and maintenance. Measures to improve the cycling quality of these routes to meet the requirements of cyclists (i.e., coherent, safe, direct, comfortable, and attractive) consist of:

- Ensure the trail surface is smooth and wide enough for many types of users.
- Implement safe and convenient crossing facilities where the Hydro Corridor Trail and Centennial Trail cross roads.

- Provide well-designed and highly functional segregated cycle tracks on Dundas Street in conjunction with this corridor being developed for rapid transit.

- Create a new crossing of the QEW freeway to join the Hydro Corridor Trail to the bike lanes on Brant Street.

- Extend Centennial Trail through the parking lots in the downtown with pavement markings giving it a clear destination in the downtown.

- Implement signage on Centennial Trail and the Hydro Corridor Trail so that it is clear where they are going, the destinations that they connect and the distances to those destinations.

DOWNTOWN AND THE WATERFRONT CONNECTIONS

The top five priorities for improving the Downtown and the Waterfront for cyclists include the following:

- Add bike lanes on Lakeshore Road west of the Downtown through a “road diet” and improve the intersection of Lakeshore Road at North Shore Boulevard.

- Upgrade signing and pavement markings on the multi-use pathway through Spencer Smith Park to reduce conflicts between cyclists and pedestrians, and provide bicycle parking at the entrances.

- Provide long-term bicycle parking in existing parking garages for employees in the Downtown.

- Upgrade the Lake Ontario Waterfront Trail to 6 m wide between the Downtown and Hamilton, including a separate pedestrian / cyclist bridge cantilevered on the east side of the existing Burlington Canal lift bridge.

- Implement a pilot project on Lakeshore Road east of the Downtown, removing the existing centre two-way, left-turn lane and installing bicycle lanes; requires minor widening to retain left-turn lanes at signalized intersections; reduce the speed limit to 50 km/h; and time the implementation with the provision of HOV lanes on the QEW.

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Map 2: Proposed Quality Framework for the Cycling Master Plan

- City Hall
- Hospital
- Attractions
- Community Centre and Library
- Sports and Recreation
- Transit / GO Station
- Schools

Bikeway Type

- Existing Bike Lane
- Existing Signed Route
- Existing Multi-Use Path
- Proposed Bike Lane
- Proposed Cycle Track
- Proposed Bicycle Priority Street
- Proposed Paved Shoulder
- Proposed Multi-Use Path

- Regional Cycling Network
- Quality Framework for Burlington
- Metrolinx Rapid Transit Corridor

Proposed Barrier Crossings

- Highway Interchange Crossing
- Grade-Separated Crossing
- Intersection Improvement

Notes:
1. "Regional Cycling Network" based on Cycling and Pedestrian Infrastructure Plan, Figure 1: Conceptual Regional Cycling and Pathways Network (Dec 2003)
2. "Proposed" includes routes already approved by City for construction and routes considered as additions to the network in this study.

Note: Improved access from cycling network to GO Stations will be examined in detail in future studies.

Note: Proposed pedestrian/cycling bridge cantilevered off east side of Burlington Canal Lift Bridge.

N

0 0.5 1 2 Kilometers

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QEW CROSSINGS

Grade-separated crossings of the QEW for pedestrians and cyclists are recommended in three locations to provide essential network continuity across this major freeway barrier that traverses the City. Three potential locations have been identified:

- Maple Park to Greenwood Place, between Fairview Street and North Shore Boulevard.
- Hydro corridor, between Brant Street and Guelph Line.
- Near Sutton and Century Drives, between Appleby Line and Burloak Drive.

RECOMMENDED NETWORK

The recommended bikeway and multi-use pathway network is illustrated on Map 3 and consists of 373 km of existing and proposed facilities. The length of the existing and recommended network by facility type is summarized in Exhibit A for roads under the jurisdiction of the City of Burlington and those of Halton Region.

Exhibit A: Recommended Bikeway and Multi-use Pathway Network by Length, Facility Type and Roadway Jurisdiction

Facility Type	Jurisdiction/Right-of-way Ownership		Total Length
	City of Burlington	Halton Region	
EXISTING*			
Bike Lane	36 km	6 km	42 km
Signed Route	3 km		3 km
Pathway**	42 km		42 km
Subtotal Existing	81 km	6 km	87 km
PROPOSED			
Bike Lane	78 km	13 km	91 km
Cycle Track		10 km	10 km
Bicycle Priority Street	50 km		50 km
Paved Shoulder	63 km	11 km	74 km
Pathway**	61 km		61 km
Subtotal Proposed	252 km	34 km	286 km
Total Recommended Bikeway and Multi-use Pathway Network	**333 km**	**40 km**	**373 km**

Notes:
* Built facilities as of May 2009
** Includes multi-use pathways considered as critical links in the cycling network

Signage is a key component of the cycling network. Cyclists need way-finding signage for:

- Route confirmation along the route
- At route intersections
- For changes in route direction
- In advance of routes to help find them
- For directions and distance to destinations
- To find cycling amenities such as parking

It is recommended that the City of Burlington develop **a way-finding signage strategy** in partnership with the Region of Halton and collaborate with the City of Hamilton and Town of Oakville to sign the cycling network so that it is more visible to cyclists and the traveling public, and the signs communicate the network's connectedness, destinations and distances.

PHASING OF IMPLEMENTATION

The network implementation plan consists of three phases: short-term (2009 to 2015); mid-term (2016 to 2020) and long-term (2021 and beyond). The phases are illustrated on Map 4. The following strategies were considered to establish priorities for the implementation of the various routes in the recommended network:

1. Take advantage of and work in tandem with planned City, Regional and Provincial road, trail and transit construction projects
2. Construct bikeways and pathways in new development areas as construction progresses
3. Consider the Burlington Cycling Committee, staff and public opinions regarding priorities
4. Close gaps in the existing network
5. Improve the quality of cycling by implementing the quality framework for a cycling network, including connections across the QEW, to Downtown Burlington and the Waterfront, and GO stations
6. Build cycling related infrastructure where cycling demand is anticipated and higher cyclist volumes are expected (includes key corridors and/or key destinations)

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Map 3: Proposed Burlington Cycling Network

- City Hall
- Hospital
- Attractions
- Community Centre and Library
- Sports and Recreation
- Transit / GO Station
- Schools

Bikeway Type

- Existing Bike Lane
- Existing Signed Route
- Existing Multi-Use Path
- Proposed Bike Lane
- Proposed Cycle Track
- Proposed Bicycle Priority Street
- Proposed Paved Shoulder
- Proposed Multi-Use Path

Proposed Barrier Crossings

- Highway Interchange Crossing
- Grade-Separated Crossing
- Intersection Improvement

Notes:
1. "Proposed" includes routes already approved by City for construction and routes considered as additions to the network in this study.

Note: Provide paved shoulders on rural City roadways north of Highway 5 / 407 if Average Annual Daily Traffic (AADT) exceeds 2,500 vehicles per day.

Note: Improved access from cycling network to GO Stations will be examined in detail in future studies.

Note: Proposed pedestrian/cycling bridge cantilevered off east side of Burlington Canal Lift Bridge.

N

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Map 4: Bikeway Network Implementation Schedule

- City Hall
- Hospital
- Attractions
- Community Centre and Library
- Sports and Recreation
- Transit / GO Station
- Schools

Bikeway Implementation Phases

- Existing
- Short Term (2009 - 2015)
- Medium Term (2016 - 2020)
- Long Term (2021 and beyond)
- Unspecified (Route on Regional Road)

Proposed Barrier Crossings

- Highway Interchange Crossing
- Grade-Separated Crossing
- Intersection Improvement

Note: Provide paved shoulders on rural City roadways north of Highway 5 / 407 if Average Annual Daily Traffic (AADT) exceeds 2,500 vehicles per day.

Note: Improved access from cycling network to GO Stations will be examined in detail in future studies.

Note: Proposed pedestrian/cycling bridge cantilevered off east side of Burlington Canal Lift Bridge.

N

0 0.45 0.9 1.8 Kilometers

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7. Provide connections to the main multi-use pathways, such as the Hydro corridor, Centennial Trail and Waterfront Trail, that also serve as high quality cycling routes

8. Provide an equitable distribution of routes north, south, east and west of the QEW and in the various neighbourhoods throughout the City

Strategy No. 1 is fundamental to the implementation strategy and is based on known and/or documented capital forecasts, which change from time to time and require annual Council approval. Therefore, it is important that those responsible for monitoring and scheduling the network implementation reconfirm capital forecasts at the City, Region and Province on a regular basis.

The on-road bikeways of the plan are expected to be funded through the capital works program, development charges, by the private sector in the construction of new developments, through rapid transit expansion programs, and other funds from Provincial and Federal programs and grants.

Bicycle-friendly Policies, Practices and Programs

Specific policies and practices recommended to support the vision for cycling in Burlington are summarized in Exhibit B. The recommendations have been developed to address four main action areas: bicycle-friendly community, bikeway network, cycling-related practices and cycling-supportive programs. They have also been further categorized by implementation time frames: on-going, immediate (within 1 year) and in 2 to 5 years. These initiatives combined with the development of the recommended cycling network will help the City meet their gaol of providing an effective transportation network, and making it more comfortable for more people to cycle in the City.

Exhibit B: Recommended Cycling Policies, Practices and Programs

Recommended Policy or Practice	Time Frame for Implementation
BICYCLE-FRIENDLY COMMUNITY	
Continue to support a Burlington Cycling Committee of Council	On-going
Support the City's land-use policy and regulations to require developers and owners to provide bicycle end-of-trip facilities, and create sites that are bicycle-friendly	On-going
Provide end-of-trip facilities at all City-owned buildings	On-going
Co-ordinate the integration of cycling with Burlington Transit, including continuing to support bicycles on transit vehicles, bicycle parking and bicycle route access to key stops	Immediate
Collaborate with Metrolinx on the integration of cycling with regional transit, including bicycles on transit vehicles, improved access and parking at GO Stations, and bicycle route access to and along corridors, in particular the Dundas West Rapid Transit Corridor	Immediate
Through the secondary planning or draft plan of subdivision process, consider the bikeway network and integrate bicycle facilities to create new communities and neighbourhoods that are bicycle-friendly	Immediate
Collaborate with the Region of Halton on implementing their Cycling Master Plan	Immediate
Create a program that will make it easier for property owners to address the lack of bicycle parking at existing developments	2 to 5 years
Create and provide design guidelines on bicycle end-of-trip facilities	2 to 5 years
BIKEWAY NETWORK	
Continue to work with the Province to create safe space for cyclists and pedestrians to cross freeway interchanges within the City	On-going
Commit to the implementation of the recommended cycling and multi-use pathway network	Immediate
Routinely consider the needs of cyclists in transportation projects, such as: • Design of new collector and arterial roadways, and bridge construction projects to include bike lanes and/or paved shoulders • Reconstruction and resurfacing of collector and arterial roadways to include bike lanes and/or paved shoulders, and providing paved shoulders on rural roadways that carry more than 2,500 vehicles a day • Projects for the Downtown and Waterfront • Crossings of existing and future barriers, including waterways, railways, freeways and interchanges, and rapid transit corridors • Traffic calming projects	Immediate
Develop a bicycle lane by-law that allows the City to regulate and enforce traffic use of the bicycle lanes subject to the *Highway Traffic Act*	Immediate

Recommended Policy or Practice	Time Frame for Implementation
Collaborate with adjacent municipalities create continuous cycling routes and links between communities	Immediate
Collaborate with the Region of Halton and adjacent municipalities on developing and implementing a signage strategy for the bikeways	Immediate
Develop a policy to define electric bicycles and their use on City bikeways and multi-use trails	2 to 5 years
Review the sidewalk riding by-law in the context of pedestrian needs, cyclists' safety and the adequate provision of comfortable, on-road bikeways	2 to 5 years
CYCLING-SUPPORTIVE PRACTICES	
Continue to update and circulate the Cycling and Multi-use Pathway Guide as needed	On-going
Consider the need for a City cycling co-ordinator to oversee the implementation of the plan and co-ordinate responsibilities among City departments	Immediate
Collaborate with Halton Region and the Safe Routes to School programs	Immediate
Encourage the Ministry of Transportation of Ontario to establish an expert review process to recommend changes to the Provincial Highway Traffic Act and Municipal By-Laws as they affect cyclists, including legislation or regulations that would support the implementation of cycle tracks	Immediate
Routinely consider the needs of cyclists in transportation services and practices such as: • Strategies to maintain bikeway and multi-use pathway infrastructure physical condition, surface condition, and signs and pavement markings • Traffic data collection programs including traffic counts and collision records • Construction zones and traffic management plans for public rights-of-way	2 to 5 years
Develop a cycling-specific road or multi-use pathway hazard reporting strategy for cyclists	2 to 5 years
CYCLING-SUPPORTIVE PROGRAMS	
Continue to collaborate with the Region of Halton, Metrolinx and Smart Commute Halton on travel demand management programs (Bike to Work Day, Clean Air Commute, etc.) to shift transportation behaviours of City staff and other large employers in the City	On-going
Support community events and activities that encourage more cycling, including co-operatively planning traffic control during events, and requiring the provision of bicycle parking or bicycle parking valet services at events	Immediate
Collaborate on safety, education and enforcement campaigns and programs that focus on skills training and collision prevention	Immediate
Work with Burlington Tourism to promote cycling and bicycle tourism in the City and consider hosting competitive cycling events	Immediate
Develop a one portal information link on the City's web site for information about cycling in Burlington	2 to 5 years

Recommended Policy or Practice	Time Frame for Implementation
Consider partnering with community stakeholders to deliver Kids CAN-BIKE Camps as part of the summer camps and programs offered through the City's Parks and Recreation Department	2 to 5 years
Collaborate with the Halton Police to support neighbourhood policing using bicycle patrols	2 to 5 years
Develop a bicycle-friendly designation for destinations program and a bicycle-friendly business awards program to recognize the efforts of private organizations in supporting cycling in the City	2 to 5 years

1. INTRODUCTION

The Burlington Cycling Master Plan study was undertaken to update the 1997 *Pathways and Bikeway Plan*. The master plan will guide the City in creating a network of on-road bikeways and multi-use pathways throughout Burlington, along with supportive policies, practices and programs to encourage more people to cycle.

1.1 Cycling Master Plan Goals

The goals of the Cycling Master Plan are to:

- Develop a network of bikeways to be implemented over time.
- Address specific areas of concern in the City that are barriers to cycling or uncomfortable for cyclists.
- Develop policies and other initiatives to create a bicycle-friendly Burlington.

1.2 Study Process

The Cycling Master Plan study was divided into three main phases and several tasks:

Phase 1: Project Foundation

- Gather background data—mapping, traffic data, existing policies and programs, issues, etc.
- Benchmark Burlington to five other municipalities: Cambridge, Kingston, London, Markham and Windsor.

Phase 2: Network Development

- Develop a long-term cycling network including recommendations on:
    - The downtown and waterfront
    - Improvements to the QEW and Highway 403 interchanges
    - Options for a pedestrian/cyclist bridge over the QEW and Highway 403
    - Feasibility of bike lanes on Lakeshore Road
    - Pavement markings and signage

- Develop an implementation strategy for the cycling network

Phase 3: Implementation

- Develop cycling policies and supportive initiatives
- Document the study
- Present the study recommendations to Council for endorsement

Numerous public consultation events and meetings with the Burlington Cycling Committee were held throughout the study to gather their input, and are documented in Section 3—Consultation.

1.2.1 Acknowledgements

The Cycling Master Plan study was guided by a Technical Review Committee that included City staff from the Engineering, Transit and Traffic, Parks and Recreation Departments and members of the Burlington Cycling Committee. Specifically, the following individuals are acknowledged for their contributions, collaboration and guidance throughout the study:

- Study Technical Review Committee:

  City of Burlington:
  - Paul Allen
  - Leah Bisutti
  - Kerry Davren
  - Leo DeLoyde
  - Evelyn Eichenbaum
  - Tom Eichenbaum
  - Charlotte O'Hara-Griffin
  - Marion Rabeau
  - Lynn Robichaud
  - Vito Tolone
  - Robin VandeLande

  Burlington Cycling Committee:
  - Eleanor McMahon
  - Gary Murphy
  - Gene Wasik

- Burlington Cycling Committee.
- Mayor Fred DeGraaf, Apeldoorn NL and Mayor Cam Jackson, Burlington ON for supporting the exchange of knowledge on cycling planning and design between the two cities.
- Burlington – Apeldoorn October 2008 Delegation Co-ordinator, Evelyn Eichenbaum and Kim Phillips, City Clerk, City of Burlington.

- Wim Mulder, Traffic Engineer, Apeldoorn NL, for sharing his expertise and collaborating on the “quality framework” for a cycling network in Burlington, and design concepts.

2. BACKGROUND

2.1 The 1997 Bikeway Plan

The City of Burlington adopted the Multi-use Pathways and Bikeways Plan on October 6, 1997. It was prepared by the Multi-use Pathway Committee, Burlington Bikeway Committee with consultation with the public through two Open Houses. The plan consisted of implementing 82 km of pathways and bike lanes at a capital cost of $3 M to be implemented over 20 years. The recommended network consisted of a series of priorities:

- Priority 1 (26 km): Brant Street from Leighland to Caroline and Upper Middle to Hwy. 5; Lakeshore from QEW to Smith; Richmond, Hager and Ghent; New Street from the Downtown to Burloak; Drury Lane from Centennial Path to Fairview; Walkers Line from the hydro ROW to Lakeshore; Appleby Line from Fairview to Lakeshore; Burloak from new to Lakeshore; Harvester form Guelph Line to Walkers Line; Cumberland from New to Fairview; Prospect from Guelph Line to Brant; Waterdown from North Serve to Plains; Guelph Line from Lakeshore to Harvester.

- Priority 2 (20 km): North Service from east of Brant to the hydro ROW; Fairview from Guelph Line to Appleby Line; Ghent, George and Hillfair; Mountainside from east of the hydro ROW toe Mainway west of Walkers Line; Northshore from Gorton to Plains, Plains from York to Brant; Appleby Line from Mainway to QEW.

- Priority 3 (17 km): Hydro corridor from Upper Middle to Mainway; Harvester from Walkers Line to Burloak; Spring Garden; Townsend from LaSalle to King; Guelph Line from Harvester to Hwy. 5; Prospect form Guelph Line to Cumberland; Burloak from North Service to QEW.

- Priority 4 (3 km): Shoreacres from New to the Waterfront; TransCanada pipeline from Kerns to King; Upper Middle from Orchard to Burloak.

- Priority 5 (16 km): Hidden Valley from Flatt to Waterdown; York from Snake to Old York; Hillsdale, Snake, Main and Mountain Brow.

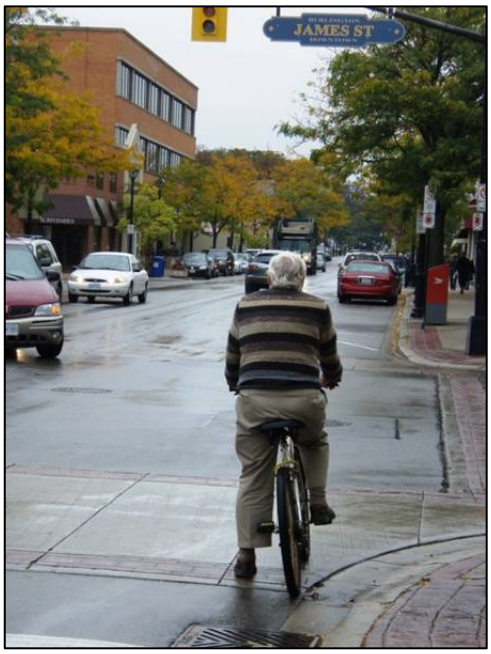
The plan also established guidelines for the design of pathways and bikeways, including:

- Off-road, multi-use pathway: 3.0 m wide asphalt surface.

- Bike lane retrofit to an existing roadway width: 1.0 m wide bike lane plus 0.3 m wide gutter adjacent 3.0 m wide travel lane, on both sides of the roadway.

- Bike lane in new construction or roadway widening reconstruction: 1.2 m wide bike lane plus 0.4 m wide gutter adjacent 3.3 m wide travel lane, on both sides of the roadway.

2.2 Objectives of the Cycling Master Plan

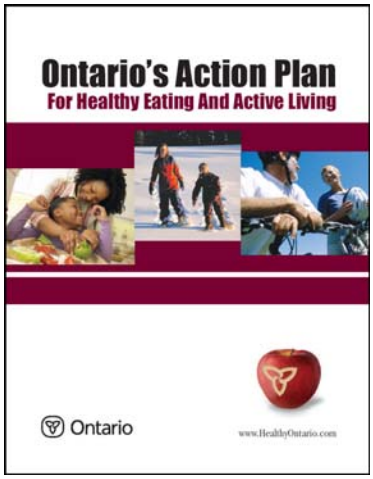


The Burlington Cycling Master Plan is a result of an initiative identified in the City's Strategic Plan: *Future Focus VII:*

- **Goal:** Provide an effective transportation network that moves people and goods efficiently within the City and neighbouring areas.
- **Strategic Action:** Build infrastructure to support the City's transportation demands, optimizing traffic flow and encourage alternative modes of transportation.
- **Initiative:** In partnership with the Burlington Cycling Committee, update the 10-year Bikeway Master Plan, including strategies and recommendations related to financial and other resources required to ensure safe, reliable and fully integrated infrastructure for cycling.

2.2.1 PROVINCIAL INITIATIVES

Transportation and land use plans at all levels of government recognize the need for an increased focus on active transportation modes (pedestrians, bicycles and other human powered transportation). The reasons for this are numerous including reduced greenhouse gas emissions, reduced congestion, reduced transportation user costs and improved health for those that participate in active transportation. Noteworthy is the Province of Ontario's recently announced targets for greenhouse gas emissions reductions—80% below 1990 levels by 2050—which implies a significant shift towards non-motorized transportation.



In 2004, Ontario's Chief Medical Officer of Health, Dr. Sheela Basrur, sounded the alarm in their report *Healthy Weights, Healthy Lives*, highlighting barriers that make it difficult for Ontarians to achieve and maintain optimal health through nutritious eating and appropriate physical activity. The Ministry of Health Promotion released *Ontario's Action Plan for Healthy Eating and Active Living* in June 2006.

MHP's mandate includes raising awareness of how urban design and the built environment affect health. MHP will work with partners responsible for municipal design and growth planning, including the Ministries of Public Infrastructure Renewal and Municipal Affairs and Housing, to support the implementation of initiatives such as the Growth Plan and the Greenbelt Plan. MHP will also hold a series of Active Transportation and

Urban Design Forums for community planners, engineers, designers and other professionals where participants will share best practices on how to implement healthy urban design and build communities that enable Ontarians to live healthy, active lives. *ACTIVE2010: Ontario's Sport and Physical Activity Strategy* includes a number of key components, including the Ontario Trails Strategy, which supports convenient, affordable and health-enhancing physical activity on Ontario's province-wide network of trails and bikeways, such as walking, hiking, jogging, rollerblading, cross-country skiing, cycling and other activities.

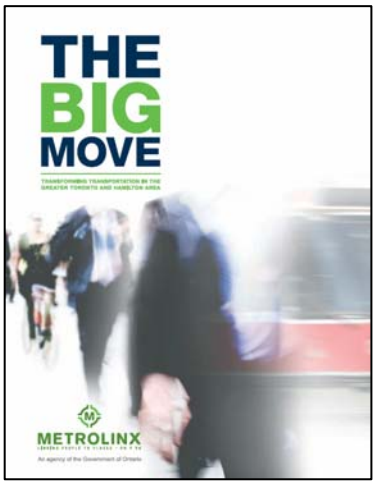
From: Ontario's Action Plan on Healthy Eating and Active Living:

The Compelling Facts

- In 2004, almost 60% of adults in Ontario were overweight or obese[20].
- In a 2001 report, 28% of Ontarians reported that the lack of pleasant places to walk or bicycle was a barrier to them being more active[21].
- Our communities are designed in ways to make it easier to drive than to walk, and that is a threat to our health: each hour per day spent in a car increases the likelihood of being obese by 6%[22].
- The health status of Aboriginal peoples is worse than that of other Canadians on all measures, including life expectancy, infant mortality, smoking, obesity and suicide[23].

The Ministry of Public Infrastructure Renewal's *Growth Plan for the Greater Golden Horseshoe* provides a clear and coherent plan to support the creation of complete and livable communities where people are close to jobs, shops and parks. The Ministry of Municipal Affairs and Housing through reforms to Ontario's land-use planning system will also help create more pedestrian-friendly neighbourhoods.

Metrolinx, the Greater Toronto Transportation Authority, released the Regional Transportation Plan, *The Big Move: Transforming Transportation in the Greater Toronto and Hamilton Area* in November 2008. Four of the thirteen goals of the Regional Transportation Plan speak directly to active transportation:



- **GOAL C—Active and Healthy Lifestyles:** Walking and cycling will be attractive and realistic choices for all, including children and seniors.
  OBJECTIVE 8—Increased share of trips by walking and cycling.

- **GOAL D—Safe and Secure Mobility:** Getting around will be safer and more secure. Parents will feel comfortable allowing and encouraging their children to walk, cycle or take public transit to school.
  OBJECTIVE 11—Improved safety for cyclists and pedestrians.

- **GOAL G—Reduced Dependence on Non-Renewable Resources:** By reducing our dependence on non-renewable resources, the transportation system will be more resilient. We will be better able to withstand volatility in energy supply and prices, and have more flexibility to switch to new fuels and technologies.
  OBJECTIVE 16—Increased proportion of trips taken by transit, walking and cycling.

- **GOAL H—Foundation of an Attractive and Well-Planned Region:** The transportation system will be a cornerstone of city building, helping to create a region that is a destination of choice for new residents and businesses. The transportation system will help us create valuable, beautiful and attractive places. Roads, streets, transit lines and stations will be designed to benefit both travelers and local residents. The transportation system itself will use less space, and help curb sprawl by supporting more compact and efficient urban forms. Transportation services, particularly transit, will not lag behind population and employment growth.
  OBJECTIVE 21—More transit and pedestrian-friendly streetscapes, and improved walking and cycling amenities.

The RTP contains ten strategies that are needed to achieve the vision, goals and objectives of the RTP, of which two are related directly to cycling:

- Strategy #2—Enhance and Expand Active Transportation.
- Strategy #7—Build Communities that are Pedestrian, Cycling and Transit-Supportive.

> OUR VISION IN NUMBERS—25 YEARS FROM NOW…
> The distance that people drive every day will drop by ONE-THIRD compared to today. We will accommodate 50% MORE PEOPLE in the region with LESS CONGESTION than we have today. On average, ONE-THIRD of trips to work will be taken by transit and ONE in FIVE will be taken by walking or cycling. 60% of children will walk or cycle to school. There will be SIX times more bike lanes and trails than today. ALL transit vehicles will be accessible. Customer satisfaction with the transportation system will exceed 90%. A single fare card will be used for ALL transit trips throughout the GTHA, and ALL fares will be integrated. By transforming the GTHA's transportation system, we will help meet the province's Go Green Action Plan for Climate Change. Per person, our emissions from passenger transportation will be HALF what they are today.
>
> From: *The Big Move* (November 2008)

The Nine Big Moves are the Priority Actions that will have the largest and most transformational impact on the GTHA's transportation system. Big Move #4 is to complete walking and cycling networks with bike-sharing programs. The Priority Actions related to cycling are outlined below.

BIG MOVE #4

Complete walking and cycling networks with bike-sharing programs.

2.1 Plan and implement complete, integrated walking and cycling networks for the GTHA, including Toronto's PATH system, that address key barriers such as bridges over 400-series highways, rail corridors and major rivers, and missing sidewalks on major roads. The cycling networks will bring every GTHA urban resident to within a maximum of one kilometre of a dedicated bicycling facility. This will be supported by a provincial funding commitment increased over time to at least $20 million per year for municipalities to complete the walking and cycling networks.

2.2 Create pilot bike-sharing programs in major urban centres.

Additional actions and policies that support the Strategy #2 include:

2.3 Research, standardize and promote best practices to integrate walking and cycling in road design, such as scramble intersections, bike boxes, and signal prioritization.

2.4 Install bike racks on all buses and Light Rail Transit (LRT) vehicles and amend both the Highway Traffic Act (Section 109) and the Public Vehicles Act (Sections 23 and 24) so that transit vehicles with bike racks do not require special permits.

2.5 Establish a coordinated, region-wide bicycle registry with the ability to report and search for stolen bikes.

2.6 Consider changes to the Highway Traffic Act that implement the 1998 recommendations of the Regional Coroner for Toronto to provide greater clarity with respect to the relationship between motorists and cyclists in areas such as safety equipment, lane positioning and passing procedures.

2.7 Implement or expand safe cycling training programs, similar to the Commuter Cycling Skills Course offered in the Vancouver area, or the CAN-BIKE courses offered by municipalities across Canada.

2.8 Undertake Active Transportation Master Plans and incorporate them into municipal Transportation Master Plans.

2.9 Opportunities for promoting active transportation and connecting key destinations, including mobility hubs and major transit station areas, shall be identified and implemented when designing greenways strategies and park systems.

2.10 Enabling Official Plan policies to support active transportation shall be adopted. Where appropriate, the bonusing provisions under the Planning Act should be used to require that any application for major commercial, employment or multiple residential development, particularly in a mobility hub, provides appropriate facilities for cyclists and pedestrians such as secure bike storage, showers and change rooms.

2.11 School catchment areas shall be defined, and school campuses shall be designed, to maximize walking and cycling as the primary means of school travel.

2.12 Sidewalks should be required on all new regional and new local roads inside settlement areas.

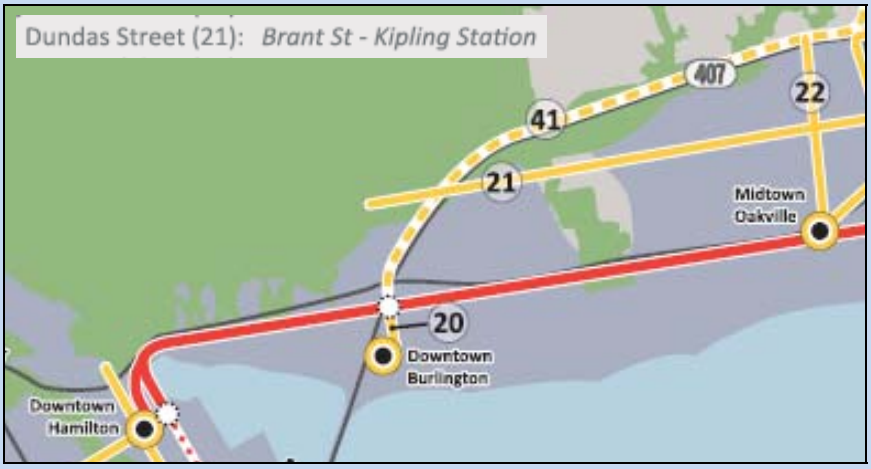
By the 15-year mark of the RTP, as much as $300 million will have been invested in new walking and cycling infrastructure across the region, creating up to 4,500 kilometres of new, dedicated, on- and off-road facilities, including new facilities to overcome barriers such as the 400-series highways, rail corridors and major rivers, and missing sidewalks on major roads. New policies and programs will have created environments that encourage walking and cycling throughout the GTHA. In years 16 to 25 of the RTP, a further $200

million will be invested in walking and cycling infrastructure for an additional 3,000 kilometres of new facilities.

The top transit priorities in the first 15 years include rapid transit on Dundas Street in Halton and Peel regions, providing a direct linkage to the subway system at Kipling Station. To demonstrate early action on transit improvements, Metrolinx recommended to the province a package of "Quick Win" transit investments across the GTHA with a total budget approval of $750 million in the 2008 Provincial Budget. The Quick Wins will be in service within five years or less, including the early phases of the Dundas Street Rapid Transit spine. This would be an appropriate location to improve cycling route connections to and along the corridor.

The 15-year plan, 25-year plan, Quick Wins and areas of focus for active transportation as they pertain to Burlington are illustrated in Exhibit 1.

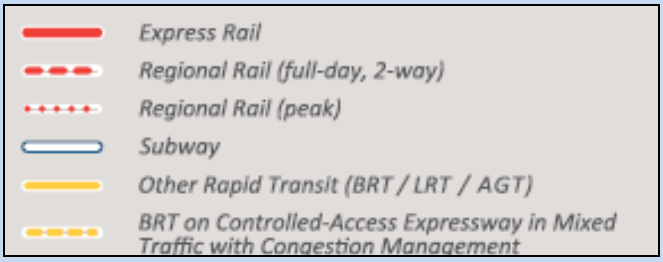
Exhibit 1: Excerpts from Metrolinx's *The Big Move Regional Transportation Plan* (November 2008)

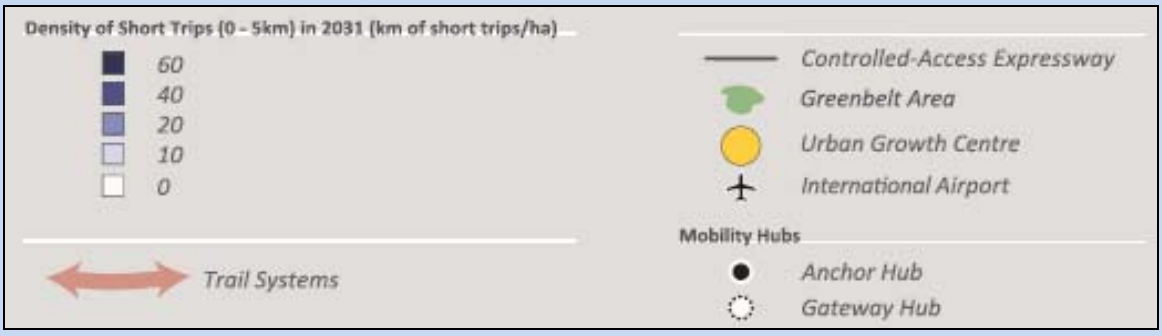
	**15-year Plan for the Regional Rapid Transit and Highway Network**
	**25-year Plan for the Regional Rapid Transit and Highway Network**

Metrolinx Quick Wins

Areas of Focus for Active Transportation

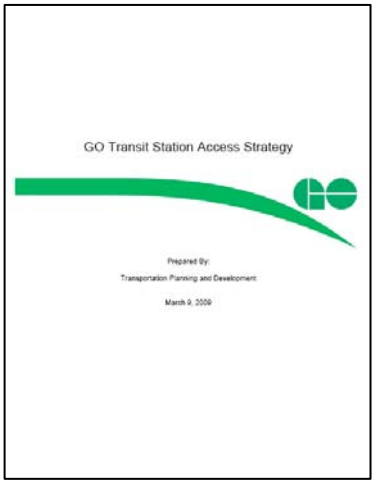
LEGEND:





GO Transit's *Station Access Strategy* (March 2009) provides a framework to achieve the goals in their *2020 Strategic Plan:* by 2020, the proportion of GO passengers accessing GO rail stations (other than Union) by walking, cycling, or transferring to and from other local services will double to exceed 35%.

The strategy outlines four broad themes to achieve the goals:



- Lead with GO stations, prioritize access by pedestrians, cyclists and local transit users at all GO stations.
- Integrate with communities, including joint investment to create walking and cycling routes and transit priority measures where they would benefit travelers to GO stations.
- Communicate and promote access options, improvements and develop initiatives to encourage customers to choose alternative modes to access the stations.
- Collaborate with key stakeholders including local and regional municipalities, transit provides, provincial government agencies, developers, and local businesses to station access goals.

Station access by cycling will be improved through integrating convenient and continuous cycling routes on the station sites and in the areas surrounding the stations. Highly secure bicycle parking (lockers, cages and stations), and sheltered bicycle racks will be provided at stations, terminals and park & rides. Bike racks will be available on all GO buses in 2009, and bicycles will continue to be permitted on off-peak trains with future on-train bicycle racks.

A public workshop was held on October 18, 2008 hosted by Walk & Bike for Life to improve the safety, walkability, bikability, and overall accessibility in and around the Appleby GO Station. GO Transit is working on station and surrounding site improvements in partnership with the City of Burlington.

2.2.2 BURLINGTON'S OFFICIAL PLAN

At the municipal level, supporting transportation and recreational cycling fits the mission of the City's *Official Plan*:

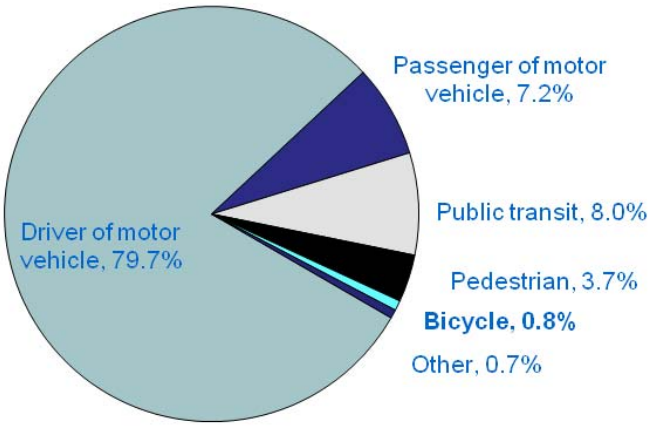
- To maintain and enhance the City's physical, natural and cultural features and to manage growth and development in a manner that enhances the quality of life in Burlington and reflects an awareness of the environment, ensuring that

ecological and environmental considerations will be incorporated into the planning process.

2.3 Current Travel Characteristics in Burlington

Canada's 2006 Census includes information on travel behaviour for home to work trips. Based on the data for the Hamilton Census Metropolitan Area (CMA) that includes Hamilton, Burlington and Grimsby, 0.8% of the trips from home to work are currently made by bicycle, as illustrated in Exhibit 2.

Exhibit 2: How People Commute to Work Today in Hamilton / Burlington / Grimsby

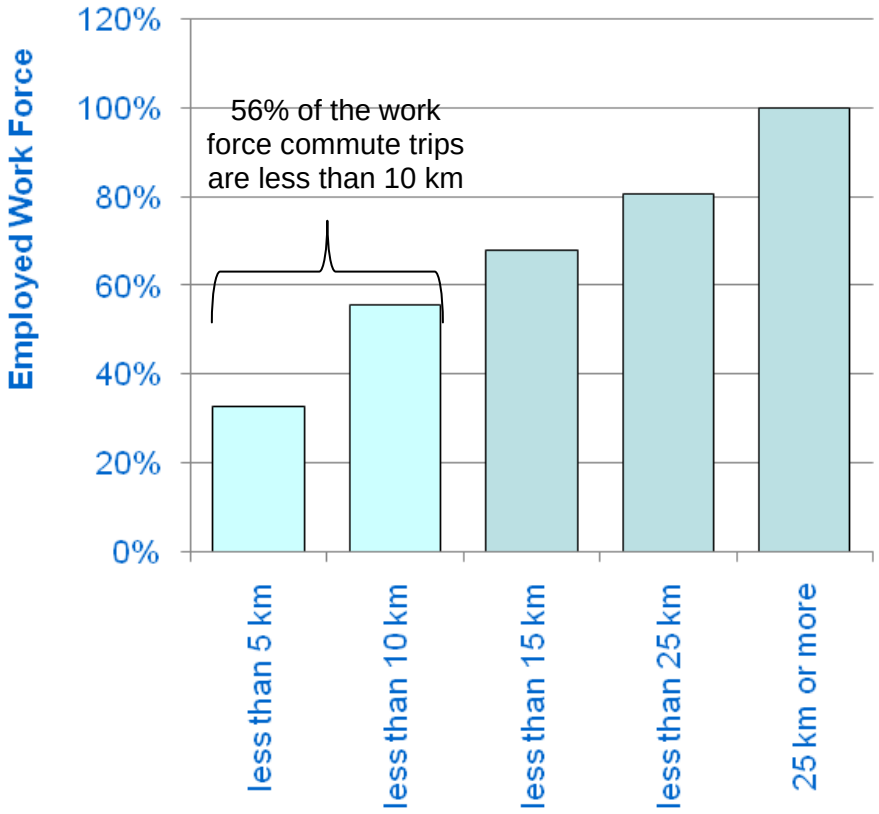


In addition, the home to work trip of almost 60% of the employed workforce in the Hamilton CMA is less than 10 km in length, as illustrated in Exhibit 3. This distance is considered easily travelled by bicycle. In Apeldoorn, the Netherlands, Burlington's Twin City, 50% of all trips less than 8 km in length are made by bicycle.

There are other trips besides the work trip that can be made by bicycle In North America. Generally:

- 10% of cycling trips are commuting to work
- 20% are for personal, family business or shopping
- 55% are social or recreational trips
- 15% are to school, church or other civic places
- 5% other

Exhibit 3: Commuting Distance from Home to Work



2.4 Benchmarking Burlington to Other Ontario Municipalities

A benchmarking exercise was undertaken to compare municipal cycling practice among the Ontario cities of Cambridge, Kingston, London, Markham and Windsor. These municipalities were selected because they are comparable in size to Burlington (mid-size cities with populations between 100,000 and 500,000 people), have varying levels of success in developing and promoting cycling based on documented cycling plans, and agreed to participate in the questionnaire to municipal staff. Information collected was related to cycling master planning, supportive municipal policies, implementation and funding programs, challenges and opportunities, and lessons learned.

According to Statistics Canada based on the transportation to work information from the 2006 Census, the walking / cycling mode share for the City of Burlington was 4.5%, which is comparable to Cambridge at 4.3%. Although the City of Kingston had the highest walking / cycling mode share at 14.5% , it has university/college student populations that tend to rely on walking, cycling and public transit as their primary modes of transportation, along with London at 8.2% and Windsor at 7.1%. Markham's walking / cycling mode share was the lowest of the six cities at 2.3%.

All five of the comparison municipalities have established cycling plans that are less than 10 years old, with the oldest being 7 years. Most have supportive policies in their Official Plans or other policy documents.

The key findings from the municipal questionnaire based on the responses received form the five comparison municipalities included:

- Municipalities face a variety of challenges and constraints, ranging from design issues (e.g. bike lanes versus wide shared lanes), to funding, to internal coordination.
- Lessons learned include the importance of "demonstrating successes", working with partners and advisors, and educating the public about cycling.
- Cycling infrastructure and promotion ranged in priority between very high and low.
- Priorities for improving cycling tended to focus on network implementation and education.
- Most of the municipalities have policies or programs aimed at improving the integration of cycling with public transit.
- The factors identified the most that would help accelerate and support implementation were funding and staff resources / coordination.
- Funding for pedestrian and cycling infrastructure and program initiatives varied. Relative to the estimated total costs shown in their municipal cycling plans, significant increases in funding will be required to deliver on the plan recommendations.
- Most municipalities responded that they have a staff person dedicated to transportation demand management, cycling or active transportation initiatives as part of their duties. Only two municipalities (London and Markham) have designated lead departments for cycling master planning and implementation.
- All of the municipalities reported that they provide winter maintenance for some or most of their on-street bike lanes.

2.5 Benefits of Cycling

The benefits of cycling are significant to individuals, our community and the environment. Cycling is enjoyable, efficient, affordable, healthy, sociable, quiet, and a non-polluting form of transportation. The benefits include:

Helping People and Communities:

- Improved health and well-being
- Improved quality of life
- Increased accessibility
- Promotion of secure and liveable communities
- Reduced travel costs

Helping to Improve our Environment:

- Reduced air pollution
- Reduced greenhouse gas emissions
- Reduced surface area dedicated to roads and parking

Helping the Economy:

- Happier, healthier people are more productive at work and school
- Increased land values
- More efficient use of existing infrastructure
- Increased tourism potential
- Revitalized urban centres

And cycling is fun creating a sense of *joie de vivre*!

The Canadian Fitness and Lifestyle Research Institute reports that less than half of Ontarians are physically active on a regular basis, costing Ontario's health care system an estimated $1.8 billion a year. Health Canada recommends that cycling 30 minutes a day can result in significant health benefits.

Statistics Canada reported that the average annual expenditure per household on transportation is about $7,800, second only to what is consumed by shelter at about $10,900.

Pollution Probe reported in 2002 that on a national basis, motor vehicles emit 70% of carbon monoxide, 50% of nitrogen oxide, 30% of volatile organic compounds, 25% of carbon dioxide and 65% of benzene pollution in the atmosphere. Cars and trucks burn millions of barrels of oil, a non-renewable energy source, every day. Although individual cars are much cleaner today than they were in earlier years, if total traffic continues to grow, overall air quality will continue to deteriorate.

2.6 Types of Cyclists

Numerous surveys have found that the number one reason people do not cycle as a mode of transportation is because of their fear of sharing the roadway with automobiles. This has been documented and reported in transportation literature across Canada, the United States, and Europe. Addressing concerns about personal safety and comfort is the key to creating a city where cycling is recognized as both a mode of transportation and a recreational activity.

Generally, cyclists can be divided into four categories based on their comfort level while riding on a roadway with traffic as outlined below and illustrated in Exhibit 4. Some communities are using these cyclist types to describe the potential for people to choose cycling as a mode of transportation or recreational activity.

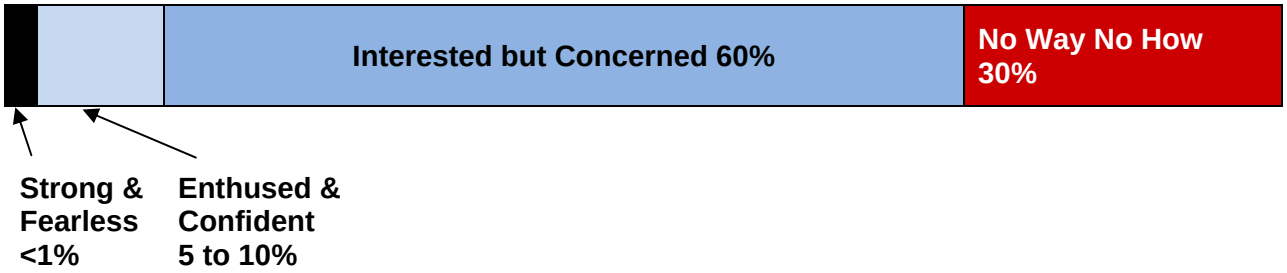
- **The Strong and the Fearless**—perhaps 1% of the population, who are comfortable riding with traffic and will ride regardless of the condition of roadways.

- **The Enthused and the Confident**—5 to 10% of the population who are attracted to cycling as a result of improvements made to bikeway networks in their communities. They may be comfortable sharing the road with motorists, but appreciate bike lanes and other facilities designed specifically for them. They may choose to cycle more often as further improvements are made.

- **The Interested but Concerned**— perhaps 60% of the population. They may like riding a bicycle, but are afraid to ride with traffic. Few ride a bicycle regularly but would ride if they felt the roadways were safer and traffic travelled slower.

- **No Way No How**—Some one-third of the population is not interested in or capable of cycling at all.

Exhibit 4: Four Types of Cyclists



This categorization illustrates that there is great potential to change the behaviour of a large proportion of the population, if changes to transportation infrastructure are made to address the perception of cycling safety and comfort. The cycling master plan must also create a more bicycle-friendly environment for experienced and confident cyclists.

There are many cities in modern, industrialized nations around the world with high bicycle mode share. They have achieved these high levels of bicycle use through adherence to various cycling-promoting policies and practices. One characteristic they share in common is they have all substantially removed the element of fear associated with bicycling in an urban environment. They have created transportation systems in which bicycling is often the most logical, enjoyable, and attainable choice for trips of a certain length for a wide swath—if not the majority—of their populace. For residents of these cities, concern about personal safety associated with bicycling is rarely a consideration, and certainly not to the levels experienced in North America.

3. CONSULTATION

Consultation events conducted during the study included public Open Houses, meetings with the Burlington Cycling Committee, and collaboration with a delegation from Burlington's Twin City Apeldoorn, the Netherlands.

> "The inclusion of cycling tracks along Dundas is a great addition to the network. Dundas is a very busy roadway with high speeds. Including separated bicycle lanes that are part of the road network and not part of the sidewalk infrastructure has the potential to increase the number of people who will feel comfortable cycling on Dundas while ensuring that it is a practical bicycle commuting road."
> Halton Region Health Department
> June 2009

3.1 Burlington Cycling Committee

The Burlington Cycling Committee (BCC) was established on February 12, 1990 and is a volunteer Citizens Advisory Committee, reporting to City Council through the Community and Corporate Services Committee. The goal of the BCC is to assist, advise, recommend, and support Council in matters pertaining to cycling in the City of Burlington, including:

- Promote safe cycling as an alternative means of transportation and recreation in the City of Burlington.
- Respond to requests for advice from Council and City staff on matters pertaining to the cycling system and cycling in Burlington.
- Provide representation and liaison where and when appropriate with existing cycling groups in the Province of Ontario.
- Provide Council and City staff with a list of capital construction priorities for the cycling system prior to budget deliberations.
- Assist in monitoring the condition of the existing cycling network in the City of Burlington, also to recommend maintenance of same when required.
- Prepare and submit an Annual Report to Council on the committee's activities to date and work plan for the upcoming year.

The BCC is comprised of 11 members, including: 1 Council liaison (non-voting), 10 representatives from the community at large (voting members), and staff liaisons (non-voting).

As part of the Cycling Master Plan study, two meetings and a workshop were held with the Burlington Cycling Committee.

3.1.1 BCC MEETING NO. 1

A meeting was held with the BCC on May 14, 2008 to gain their insight on issues to be addressed in the study. The discussion centred on the following issues:

- A connected network of bikeway Infrastructure is the foundation for increasing cycling. Create connectivity in the bike lane network so that there is no need for “bike lane ends” signs.
- Create signage so that one does not need to know anything about the City to find a bike path, stay on it and enjoy it.
- Need safe bicycle parking at more destinations throughout the City.
- Design multi-use trails wide enough to accommodate more users.
- Consider trail opportunities and policies to accommodate trails in Hydro, GO Transit and other utility corridors.
- Hire a full-time cycling co-ordinator until cyclists are routinely accommodated in City services and functions
- Bring Halton Region and City staff together to focus on continuity of design and policies.
- Regular maintenance of the bikeways and pathways is needed in the spring / summer / fall and winter to the same level of service as roadways.
- Safety at interchanges is key.
- Need a change in attitude and culture—use education to reduce the irritation between drivers and cyclists, and create.

3.1.2 BCC WORKSHOP / CYCLING TOUR

A workshop was held on June 14, 2008 with the BCC to review and discuss bikeway designs that could work in Burlington. The workshop included a cycling tour to experience firsthand some of the opportunities and challenges in the City.

The participants discussed issues and opportunities during a debriefing session following the cycling tour. Their ideas were categorized and then attendees were asked to select which issues or topics they felt were their top priorities by placing three sticker dots next to the topics of their choice. The results are summarized in Exhibit 5.

Exhibit 5: Summary of Top Issues from the BCC Workshop

Key Issues/Topics defined during BCC Workshop	Priority based on no. of "dots" given to each topic by attendees
Introduce new tools in bikeway design such as "sharrows" (bicycle symbol with double chevron for shared-used lanes), blue bike lanes and bike boxes	6
Improve the Burlington Canal lift bridge to better accommodate cyclists	5
Create more bike lanes, i.e. Prospect Street	5
Work with MTO on "lines and signs" improvements for the QEW/403 interchanges	4
Focus on safety and education	3
Provide bicycle parking	2
Partner with businesses, i.e. MEC	2
Find a crossing of the QEW and rail lines	2
Create a "small fixes" program	2
Redesign the QEW/403 interchanges	2
Support providing bike lanes on Regional roads	2
Focus on Transportation Demand Management (TDM) and encouragement	1

3.1.1 BCC MEETING NO. 2

The draft recommendations of the Cycling Master Plan were presented to the BCC and generally accepted at their meeting on Tuesday, April 22, 2009.

3.2 Twin City Apeldoorn, NL

During the week of October 13, 2008, Wim Mulder, a transportation engineer from the City of Apeldoorn, the Netherlands, visited Burlington as part of a Twin City delegation. The week included events to focus on Burlington's Cycling Master Plan including informal tours of the City; meetings with City and Regional staff; a cycling tour with staff, consultants and Burlington Cycling Committee members to discuss issues in the field; and a public Open House to present the differences and similarities of the two cities.

Based on his experience in Burlington, Mr. Mulder concluded that there is a large potential for cycling in Burlington: distances are reasonable for trips by bicycle, the network provides a lot of possibilities for attractive cycle routes and the City is flat. The main concern why people do not cycle has primarily to do with road safety. Recommendations regarding a cycling network for Burlington based on his experience are presented in Section 5—The Cycling Network.

Dutch cycling expert rolls into Burlington

1

October 16, 2008

ROB FAULKNER
THE HAMILTON SPECTATOR
BURLINGTON (Oct 16, 2008)

In the shadow of Burlington City Hall, the tall, lanky Dutchman Wim Mulder looks down at the bike helmet as if he doesn't often wear one or hasn't even seen one before.

Yet, the traffic engineer visiting from Apeldoorn, the Netherlands, is here to help Burlington build its cycling infrastructure. He rides. In fact, his job is all about growing his hometown's cycling network.

3.3 Public Open Houses

3.3.1 OPEN HOUSE NO. 1

A public Open House was held on Tuesday, June 3, 2008 from 4:00 to 8:00 PM in the Atrium at City Hall. The purpose of the Open House was to introduce the study and obtain feedback on what needs to be improved to support more cycling in the City. Seventeen people signed the Open House register, but it was estimated that approximately 25 people viewed the displays.

Attendees could mark on a map of Burlington their ideas about potential barriers to cycling and candidate bikeway routes. A chart was provided that listed criteria used by the League of American Bicyclists in designating communities as bicycle friendly. Attendees were asked to select from the criteria what they thought the City could do better. The top criteria with the number of attendees who selected them in brackets are as follows:

- Make bridges accessible to cyclists (7)
- Routinely accommodate cycling in roadway planning, design, construction and maintenance (6)
- Provide bike lanes on major streets (6)
- Commit to implementing the cycling plan (6)
- Maintain bikeways and routes (5)
- Provide a point of contact for cyclists to submit ideas / concerns (5)
- Create a comprehensive cycling plan that is funded (5)
- Campaign for motorists to share the road (5)

> The recommendation has been made to encourage the Ministry of Transportation of Ontario to establish an expert review process to recommend changes to the Provincial Highway Traffic Act and Municipal By-Laws as they affect cyclists, including legislation or regulations that would support the implementation of cycle tracks. The Health Department strongly supports this recommendation and would be happy to work with the City to move this issue forward.
> Halton Region Health Department
> June 2009

3.3.2 OPEN HOUSE NO. 2

A public Open House was held on Wednesday, October 15, 2008, from 6:30 to 8:30 PM with a presentation at 7 PM in Tansley Woods Community Centre. The purpose of the Open House was to provide an opportunity for members of the public to meet Mr. Wim Mulder, a transportation engineer from Burlington's Twin City of Apeldoorn, the Netherlands, find out what makes Apeldoorn bicycle-friendly, and discuss how Burlington can become a bicycling city. Twenty-two people signed the Open House register.

One element that was discussed was the high level of government support to encourage and support cycling in Apeldoorn—cycling is not just a cultural preference among the Dutch but government policy:

- Design comfortable infrastructure and visible space for cyclists on roadways.
- Enact legislation that protects cyclists.
- Support cycling education for all school children.
- Host cycling events to promote the cycling culture.
- Encourage large employers to provide end-of-trip facilities for cyclists.
- Provide secure bicycle parking at destinations.

In Apeldoorn, most, if not all, drivers are cyclists so drivers are sensitive to cyclists' needs. More cyclists means more safety and more visibility of cycling.

3.3.3 OPEN HOUSE NO. 3

A public Open House was held on Thursday, April 23, 2009, from 6:00 to 8:30 PM with a presentation at 7 PM at the Burlington Senior's Centre. The purpose of the Open House was to provide an opportunity for members of the public to review the recommended cycling network, phasing and policy themes. Sixty-nine people signed the Open House register.

The main comments received at the April 23, 2009 Open House were:

- Introduce a bike lane by-law.
- Work with GO Transit to improve ability to ride trains with bikes.
- Improve year-round maintenance of cycling facilities.
- Improve signage and education of cycling in Burlington.

4. BIKEWAY DESIGN

Improvements to the transportation network to better accommodate cyclists are not only beneficial to cyclists but also to other network users. For example, restriping roadways from four travel lanes to two with a centre two-way, left-turn lane and bike lanes (a "road diet") will improve the safety of motorists, better accommodate left-turning traffic, and assist pedestrians in crossing the roadway if median refuges are provided at key crossing locations. Motorists and pedestrians, like cyclists, can benefit from traffic calming. Therefore, creating good designs for cyclists will improve the transportation network for everyone.

Bikeway design should be based on the application of current bikeway planning and design guidelines and engineering judgement regarding context. Context includes such elements as available right-of-way and pavement width, horizontal and vertical alignment (curves, grades, hills), sight lines, traffic volumes, truck volumes, transit provisions, traffic control, side street spacing, driveway types and spacing, etc. The following are recommended guidelines available in North America:

- Jolicoeur, Marc and Jean-François Pronovost ed., *Technical Handbook of Bikeway Design*, 2nd edition, Vélo Québec, Montreal, Québec, 2003, available from http://www.velo.qc.ca/english/bikewaysdesign.php (July 2009)

- AASHTO Task Force on Geometric Design, *Guide for the Development of Bicycle Facilities*, American Association of State Highway and Transportation Officials, Washington DC, 1999, available at http://safety.fhwa.dot.gov/ped_bike/docs/b_aashtobik.pdf (July 2009); 3rd edition expected in 2010

- *Bikeway Traffic Control Guidelines for Canada,* Transportation Association of Canada, Ottawa, Ontario, December 1998; available from https://vws3.primus.ca/dev.tac-atc.ca/english/bookstore/products.cfm?catid=12&subcatid=21&prodid=63 (July 2009); update anticipated in 2010 based on *Guidelines for the Design and Application of Bikeway Pavement Markings—Final Report* (August 2007); *Bicycle Signage Recognition Testing* (March 2008); and *Coloured Bicycle Lanes Simulator Testing* (March 2008)

- Alta Planning + Design, *Fundamentals of Bicycle Boulevard Planning and Design*, Initiative for Bicycle & Pedestrian Innovation, Portland State University, Portland, Oregon, July 2009, available at http://www.ibpi.usp.pdx.edu/guidebook.php (July 2009)

4.1 Existing Bikeways in Burlington

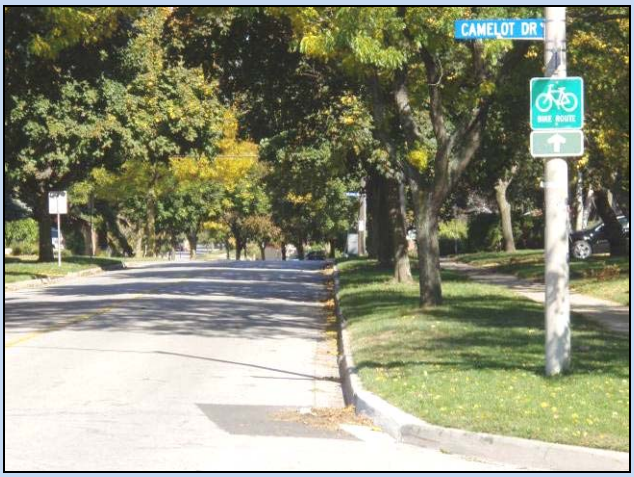
Existing bikeways designs that can be found in Burlington are illustrated in Exhibit 6. These include features or traffic controls that improve access to local streets and pathways.

Exhibit 6: Existing Types of Bikeways in Burlington

Shared Lanes

- Two-lane wide, lower speed and volume streets with bicycle route signs
- Help cyclists navigate through neighbourhoods or the City
- Signs can provide information about the route name / number, destinations, distances, etc.

Spruce Avenue Bike Route ➔



Bike Lanes

- On higher volume roadways; lane designated for cyclists use only

Burlington established the following design criteria:

- Bike lane retrofit to an existing roadway width: 1.0 m wide bike lane plus 0.3 m wide gutter adjacent 3.0 m wide travel lane, on both sides of the roadway
- Bike lane in new construction or roadway widening reconstruction: 1.2 m wide bike lane plus 0.4 m wide gutter adjacent 3.3 m wide travel lane, on both sides of the roadway

New Bike Lane on Brant Street ➚

Retrofit Bike Lane on Maple Avenue ➔

Road Diets

- Reallocating existing road space to make more room for bicycles, pedestrians, transit, etc.
- Can reduce crashes and speeds
- Guelph Line will be converted from four travel lanes to two travel lanes, a centre two-way left-turn lane and two bike lanes in 2009
- Road diets can be beneficial to other road users

Before Road Diet ↗

After Road Diet ➔

Paved Shoulders

- On rural road with high traffic volumes or large vehicles
- Reduce run-off-the-road motor vehicle crashes, reduce erosion, and extend pavement life; typically benefits for all road users are realized for traffic volumes above 2,500 vpd
- In Burlington, some paved shoulders are shared with pedestrians

Paved Shoulder on King Road adjacent Pedestrian Path ➔

Multi-use Pathways

- Typically at least 3.0 m wide
- Used for either transportation or recreational cycling
- Pedestrians can either share space or have a separate path
- Connecting destinations and other routes is very important; otherwise the multi-use trail will be underutilized and will create a gap in the overall network. Thus, access points to destinations must be designed so that they are easy to find, safe and bicycle-friendly

Lake Ontario Waterfront Trail ↗

Centennial Trail ➔

Hydro Corridor Trail ➔

Boulevard Bikeways or Pathways

- Bike paths within the boulevard area adjacent the roadway, sometime adjacent sidewalk; Burlington by-law permits cyclists to ride on sidewalks except on Brant Street in the Downtown
- In Ontario, cyclists on boulevard bikeways or sidewalks must behave like pedestrians at street crossings / crosswalks
- Risks include conflicts with turning motorists who do not look for cyclists in the boulevard or on the sidewalk, particularly those that are riding against the direction of traffic on the adjacent roadway

Boulevard Bikeway on Walkers Line ➚

Pathway on Appleby Line ➔

Pathway on Lakeshore Road ➔

Boulevard Bikeways or Pathways (continued)

Sidewalk riding on Brant Street north of the Downtown ➔

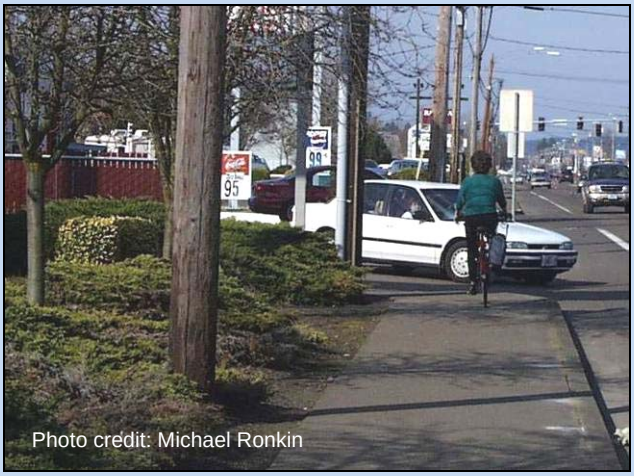


Photo credit: Michael Ronkin

"Wrong-way" Sidewalk riding is risky ➔

Measures that Improve Access to Local Streets and Pathways

Median Refuge Islands

- Centre islands located on roadways to allow trail users to cross traffic one direction at a time
- Centre island should be wide enough to accommodate a bicycle with trailer (minimum of 3.0 m)

Median Refuge Island on New Street ➔

Pedestrian Half Signals

- Pedestrian-activated traffic control signals located mid-block or at intersections that stop traffic on the main street to allow trail users to cross the road
- May or may not have a median refuge island

Pedestrian Half Signal and Median Refuge Island on the Centennial Trail at Walkers Line ➔

Burlington Transit provides bike racks on buses. These racks are mounted on the front of buses and can carry two bicycles. Use is on a first come, first served basis and there is no extra charge for bicycles. The racks are easy and quick to use and are an important aspect of the bikeway network. They can support cycling in poor weather, extend the length of trips that would otherwise be too far by bicycle. Bicycles also support transit trips with cycling extending the service door-to-door at a faster pace than walking and without requiring car parking at the transit stop / station.

4.2 New Tools for Bikeways in North America

Other types of bikeways and new tools that are being implemented in North America, but are not currently present in Burlington are illustrated in Exhibit 7. These include measures that improve access to local streets and pathways.

Exhibit 7: Other Types of Bikeways and New Tools used in North America

Shared-use Lane Markings ("Sharrow")

- Symbols placed on the road in the area where cyclists are intended to travel; raises awareness to both cyclists and motorists of the correct position for cycling in the lane
- Typically used in wide curb lanes (placed 1.0 m from the curb) in lanes not quite wide enough to stripe a bike lane; adjacent on-street parking to guide cyclists away from the car's open door zone (placed 3.4 m form the curb); or in the middle of lanes (less than 4.0 m wide) that are too narrow for cyclists and motorists to share side-by-side

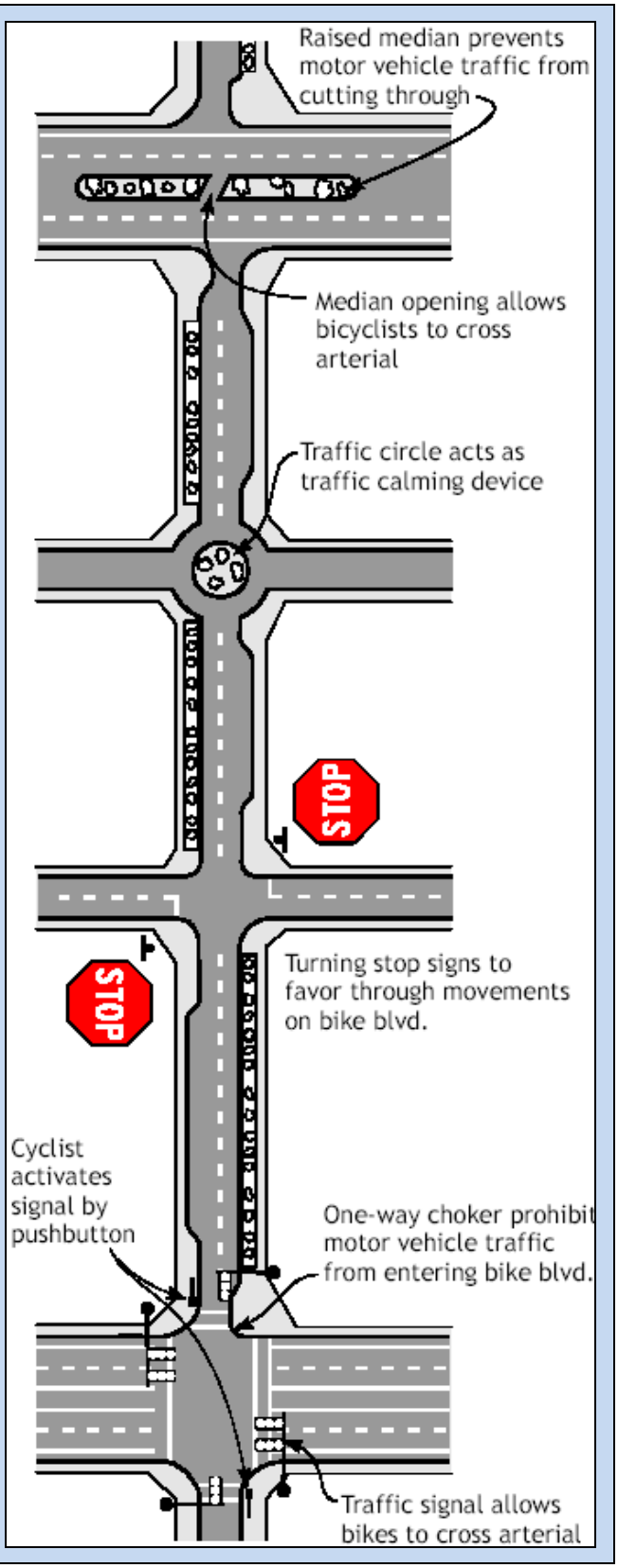
Share-use Lane on York Boulevard, Hamilton ↗

Downhill Share-use Lane adjacent Parking and Uphill Bike Lane, Seattle, WA ➔

Bicycle Priority Streets

- Also called **"Bicycle Boulevards"**
- Traffic-calmed, local streets that are enhanced for the safety and convenience of cyclists, but discourage other non-local traffic
- Traffic calming features are used to slow motorists; traffic controls (signals, stop signs and yield signs) are placed to give priority to cyclists
- Facilities (median refuge islands, traffic signals, bike boxes, etc.) are provided to assist cyclists in crossing major streets
- Attract new or inexperienced cyclists who do not feel comfortable riding on busy, higher speed roads

Most people know how to get around their own neighbourhood so signed bicycle routes are not really needed. For cyclists who do not want to cycle on busy roads, signed bicycle priority streets on local streets can route them through neighbourhoods to their destinations. Cities with a network of bicycle priority streets include Berkeley, Portland and Eugene CA, Albuquerque NM and Vancouver.



Bicycle Priority Streets (continued)

Photo credit: City of Berkeley

Bicycle Boulevard Street Sign, Berkeley, CA ➔


Photo credit: John Luton

Traffic Circle on Bicycle Priority Street, Vancouver ➔

Bicycle Priority Streets (continued)

Photo credit: John Luton

Bicycle Priority Street Crossing of Major Arterial Roadway, Vancouver ➔

Measures that Improve Access to Local Streets and Pathways

Bicycle Detection at Traffic Signals

- Pavement markings—A symbol is put on the pavement to identify the most sensitive area of a detection loop where a bicycle will activate the traffic control signal
- Push Button—A push button that activates the traffic control signal is mounted where is accessible to cyclists riding on the road


Photo credit: Richard Drdul

Bicycle Detection Pavement Marking, Vancouver ➔


Photo credit: Richard Drdul

Traffic Control Signal Push Button for Cyclists, Vancouver ➔

Bike Box

- An area just in front of the stop bar for motorists at a traffic signal for cyclists to wait in and, when the signal turns green, proceed ahead of motorists; when the traffic signal is green, cyclists proceed through the intersection conventionally without using the bike box
- Reduces conflicts with right-turning motorists; accommodates high left-turning cyclist volumes

Bike Box, Victoria ➔

Bicycle Only Traffic Signals

- Traffic control signals that allow cyclists to proceed through an intersection while motorists are stopped by a conventional red light on a separate traffic signal head

Bicycle Traffic Control Signals, Montreal ➔

Raised Trail Priority Crossings

- Where a trail crosses a roadway, a speed hump is installed to slow traffic and increase visibility of the crossing
- Traffic control can be installed to give priority to the trail traffic over the street traffic

Galloping Goose Trail Raised Priority Crossing, Saanich ➔

Cyclists Left-turn Lane

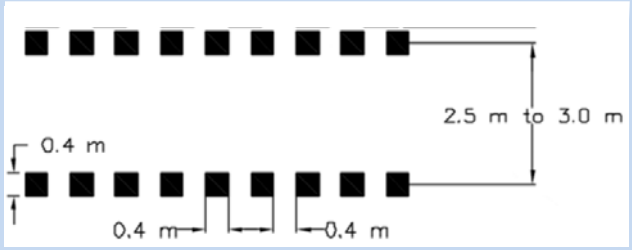
- Left-turn pocket provided in median on major roadway so cyclists can access side street or trail

Cyclist Left-turn Lane access for Galloping Goose Trail, Saanich ➔

"Crossbike"

- Crossing area for cyclists adjacent a crosswalk. The Ontario Highway Traffic Act requires cyclists to dismount in pedestrian crosswalks; the "crossbike" provides an defined crossing area but without the requirement to dismount

Eglinton Avenue Bike Path "Crossbike" adjacent Crosswalk at Signalized Intersection, Toronto ➔



"Elephant's feet" pavement marking proposed by the Transportation Association of Canada for marking the cyclists' crossings area for off-road bike paths ➔

Other Innovative Treatments

Bike Lane Treatment across Narrow Bridge, London ON ➔

4.3 European Cycle Tracks

Cycle tracks or segregated cycle paths are bikeways that have the following characteristics:

- The space is intended to be used, generally, by cyclists only.
- The space is separated from motor vehicle lanes, parking lanes and sidewalks by pavement markings, pavement colouring, bollards, curbs, raised medians, or a combination of these elements.
- They generally operate in one direction and are provided on both sides of the street, but can also operate two-way or contra-flow on just one side of the street.

Design guidelines from various Northern European countries recommend segregated cycle tracks when motor vehicle traffic volumes and speeds are higher, as illustrated in the Danish example shown in Exhibit 8 and the London UK example in Exhibit 9. The London guidelines indicate that the two main options are either better mixed cycling conditions (on calmed roads with limited space and with low/slow flows) or better segregation (on highly trafficked/higher speed roads). These examples suggest that cycle tracks would be appropriate as traffic volumes rise above 10,000 vpd with speeds of 30 km/h, and above 5,000 vpd when speeds are at 55 km/h.

Exhibit 8: Danish Bikeway Type Selection Criteria from *Collection of Cycle Concepts* (2000)

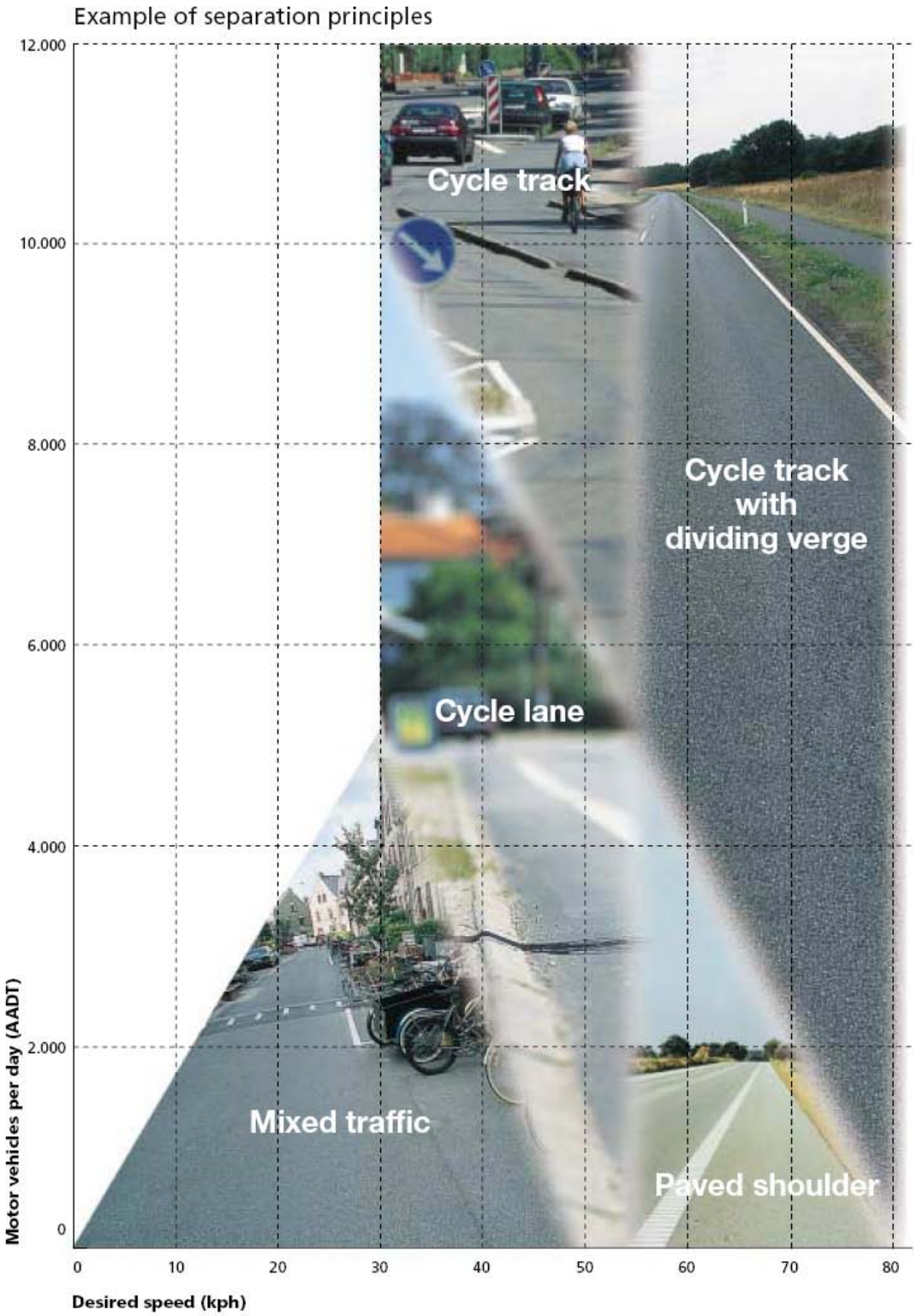
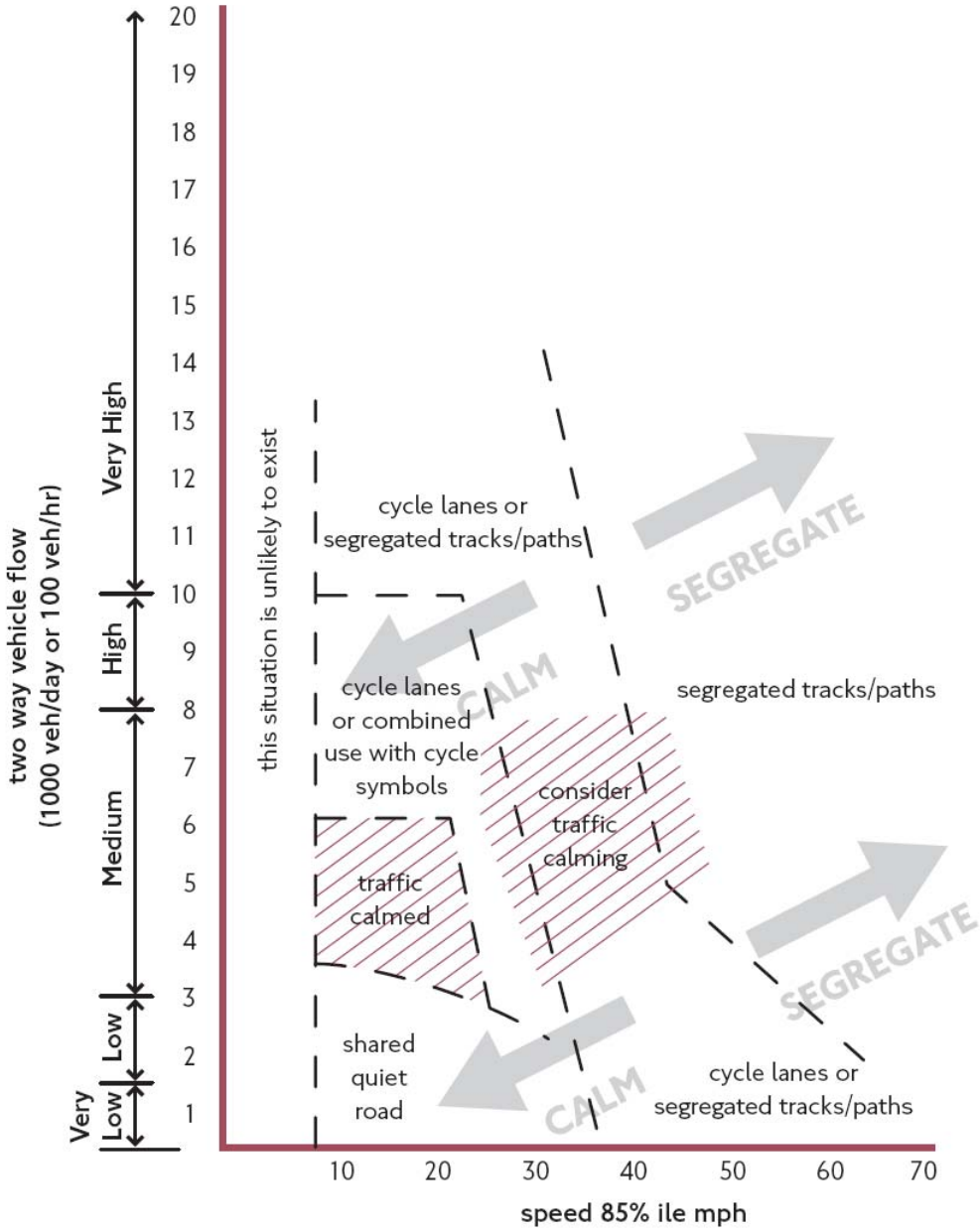


Exhibit 9: Transport for London Diagram of Cycle Facility Solutions based on Motor Traffic Volume and Speed from *London Cycling Design Standards*



Notes:

1. Each route will need to be judged in the light of its specific situation
2. Cycle lanes or tracks will not normally be required in traffic calmed areas
3. Congested traffic conditions may benefit from cycle lanes or tracks
4. Designs should tend to either calm traffic or segregate cyclists

There are differences between the Northern European cycle tracks and the boulevard bikeways or boulevard pathways that have been built in Burlington such as along Upper Middle Road, Walker's Line, Appleby Line, and Maple Avenue. The design, maintenance and legislative environments differ:

- **Design quality**—Cycle tracks are often built on both sides of the roadways and operate one-way with traffic. This avoids the "wrong-way" cyclist risk of not being expected by or visible to motorists. In addition, the quality of the surface, width, drainage, traffic control, signage and overall layout are well thought-out, not just an asphalt strip paved in the boulevard. For example, the cycle track can be offset 5 m from the main roadway at side street intersections allowing a motorist to queue between the cycle track and the main roadway without blocking the path of the cyclist. In Burlington, the boulevard bikeways or pathways are typically located such that side street motorists block the cyclist's path while waiting to turn onto or cross the main roadway.

  Attention to design is of particular importance at main intersections. Design elements may include separate traffic control signals for cyclists, fully-protected left-turns only, setback stop bars, bike boxes, prohibition of right turns on red, "jug-handle" left turn designs for cyclists, etc. Interaction with transit also requires design considerations, particularly where passengers are boarding and alighting.

- **Maintenance quality**—Cycle tracks along busy routes are afforded the level of summer and winter maintenance that permit them to be used 24 hours a day, 7 days a week, 365 days a year. The Danish *Collection of Cycle Concepts* specifies three levels of winter maintenance: category "A" tracks must be kept clear of snow 24 hours a day, category "B" tracks are swept or cleared daily, and category "C" receives less regular winter maintenance. Specialized equipment may be required to fit the width and surface material of the cycle track.

- **Legislative environment**—Some Northern European countries, including Germany, France, Denmark, Belgium and the Netherlands have defined liability legislation regarding vulnerable road users, i.e., cyclists and pedestrians. Motorists are automatically considered liable in law for any injuries that occur if they collide with a cyclist or pedestrian, unless the motorist can prove that the vulnerable road user behaved recklessly. The law recognizes that vulnerable road users are far more likely to be injured or killed if hit by a motor vehicle, thus motorists have a greater duty of care for their safety. This may significantly affect the behaviour of motorists when they encounter cyclists, particularly in higher risk locations such as intersections.

  In the Netherlands, the cycle track is defined as part of the main roadway and cyclists using the cycle track are provided with the same rights-of-way as motorists on the main roadway. Thus side street and driveway traffic must yield to cyclists in the cycle track. Cyclists that ride on sidewalks or boulevard bikeways / pathways in Burlington are expected to behave like pedestrians at side street crossings, dismounting to use crosswalks as per Ontario's *Highway Traffic Act.* In addition, motorists commonly do not yield the right-of-way to

users on the sidewalk, and typically block their path when yielding to traffic on the main roadway.

Examples of cycle tracks in Burlington's twin city Apeldoorn NL are provided in Exhibit 10.

Exhibit 10: Cycle Tracks in Apeldoorn NL

Various types of cycle tracks—One-way operation on both sides of the street, two-way operation on one side of the street, between parking and sidewalk, various separators / buffers ↓

Winter Maintenance of Cycle Tracks—And bicycle traffic control signals at an intersection with push button activation ↓

Mid-block Crossings with Median Refuge ↓

Cycle Track Crossings of Side Streets and Driveways—Motorists on the side streets yield to cyclists on the cycle track ↓

Cycle Tracks and Signalized Intersections—Separate bicycle traffic control signals ↓

Bike Box and Bicycle Traffic Signal—Cyclists receive green signal in advance of motorists ⬇

Cycle Track at Roundabout—Motorists yield to cyclists crossing the approaches ⬇

Cycle Track at Transit Stop ⬇

The increased comfort on a busy road that cyclists expect with a cycle track makes them a desirable type of bikeway in North America. Some cities are implementing this type of bikeway, and a few with such great care and attention to detail that the results are considered successful for cyclists, pedestrians, transit and motorists. A North American case study, 9th Avenue in New York City, is presented in Exhibit 11. Cycle tracks are currently being implemented in BC in Richmond (Road 3) and Vancouver (Carrall Street). Cambridge MA has cycle tracks near the MIT campus on Vasser Street. Montreal has installed separated, bi-directional bike lanes throughout the City for a couple of decades. However, the bi-directional operation on one side of the street complicates the design, requiring additional traffic signals, signage and pavement markings to address conflicts between cyclists riding against traffic in the adjacent lane, particularly at intersections. These are illustrated in Exhibit 12.

Exhibit 11: North American Cycle Track Case Study—9th Avenue Cycle Track in New York City

9th Avenue, New York

- A one-way "buffered bike lane" on the left side of a one-way street; cyclists are not exposed to the motorist right-turn "hook" of cut-off conflict
- Bicycle traffic control signals stop cyclists during the protected motor vehicle left-turn only green signal, so that conflicts with left-turning traffic are separated in time; motor vehicle left-turns are from a protected bay
- Mid-block, on-street parking is between the cycle track and the motor vehicle lanes, with an additional painted buffer and bollards; prevents double parking in bike lane; car doors open into the buffer not the bike lane
- There are generally no driveways
- Islands between the cycle track and the travel lanes at intersections provide a refuge for pedestrians crossing the street
- Heavy by-law enforcement initially required to deter delivery vehicles from using the cycle track
- Conventional street maintenance vehicles are accommodated; snow is cleared from the cycle track in winter
- Cyclist volumes increased by 40% in 9 months

Photo credits: NYC DOT

Exhibit 12: Cycle Tracks in North American

Road 3 under the Canada Line Elevated Rapid Transit, Richmond BC ↓

Carrall Street, Vancouver BC ↓

Vasser Street, Cambridge MA ↓

Boulevard de Maisonneuve, Montréal PQ ↓

4.4 Design Lessons from Apeldoorn NL

4.4.1 WHERE ARE BIKE LANES AND CYCLE TRACKS NEEDED IN BURLINGTON?

The following are general guidelines for selecting various types of bikeways assuming traffic volume and speed are the key elements:

- Roadways with speeds up to 50 km/h and up to 5,000 vehicles/day do not necessarily need any special bikeway. However, depending on other context such as the role of that route in the overall cycling network, adjacent land-use, importance of nearby destinations, etc., cyclists and other roadway users may benefit from creating a bicycle priority street or adding bike lanes.

- Bike lanes are needed when the speed of motorists is 50 or 60 km/h and traffic volumes are over 5,000 vehicles/day. They are also applicable to city centres and larger destinations areas that may have operating speeds below 50 km/h but higher traffic volumes, say above 7,000 vpd.

- Segregated cycle tracks are recommended when motorists are operating at 70 km/h or higher, and traffic volumes are more than 12,000 to 15,000 vpd.

4.4.2 THE CASE FOR CYCLE TRACKS IN BURLINGTON

The rationale for introducing cycle tracks in Burlington includes:

- These bikeways provide cyclists with the best physical protection in traffic. This protection is needed most when volumes and speeds of motorists is high. For example, a motorist driving 80 km/h is covering 22 metres in one second. This is provides very little time or space to react to a vulnerable road user should there be conflicts.

- The higher speed and size of a vehicle in a collision results in serious injuries or death. The probability of a vulnerable road user, a pedestrian or a cyclist, surviving a crash with a motor vehicle travelling at 70 km/h is very low. The segregated cycle track can assist in preventing some collisions, particularly between intersections.

- Large vehicles create wind drag behind the vehicle particularly at higher speeds. This can put cyclists out of balance, therefore more distance between the cyclist and truck traffic is needed.

- When the volumes are high and the speed increases, the driving task becomes more complex. Removing cyclists from the motorists travel lane reduces the stress and makes the task of driving more comfortable for them.

- Cycling is much more comfortable for cyclists. This is very important. Instead of trying to survive heavy and speeding traffic, they will start to enjoy cycling. When people do not feel safe they will not cycle. The moment they feel safe they will try cycling. And when they notice that the routes are direct and fast they will cycle even more.

The reasons for segregated cycle tracks in Burlington are clear: they are needed because the most direct routes for cyclists are along the higher speed, arterial roads, in particular those north of Fairview Street that cross the QEW—Brant Street, Guelph Line, Walker's Line, and Appleby Line. There are no alternatives for crossing the QEW other than using these routes. Dundas Street is a candidate for cycle tracks that would be compatible with the development of this corridor for rapid transit.

4.4.3 BIKEWAY DESIGN ISSUES

Based on the experience of Mr. Wim Mulder, an effective and safe cycling network in Burlington will depend on how well the busy roads, intersections and crossings are designed.

4.4.3.1 Cycle Tracks and Intersections

In order for segregated cycle tracks to be an effective part of the cycling network, they must be considered still part of the main road. That is, cyclists traveling along the cycle track must be given the same right of way as the main traffic, and not be stopped or slowed at every driveway and intersection. This involves good design, changes to traffic laws, and communication campaigns to change the behaviour of motorists at these intersections.

At minor side roads, traffic signals are generally not needed. Cyclists on a cycle track right beside the main road should have the right of way over traffic traveling from and to the side road, just as the motorists have on the main road. If cyclists do not have this right of way, they are constantly delayed and will prefer the main road because it will be more direct for them. A good design is needed to indicate to motorists that cyclists on the cycle track have the right of way over side street traffic, such as clear pavement markings, signage or measures such as a raised crossing. Traffic laws must also make it possible for cyclists to have right of way on the cycle track.

At busy intersections there are usually traffic signals. There are design options that can greatly improve the safety of cyclists at these intersections such as bicycle traffic control signals, bike boxes, etc.

4.4.3.2 Stop Signs on Residential Streets

At intersections on residential streets where all directions must stop, cyclists also have to stop. For cyclists, it can become very tiring, using up their energy to stop and start up again. This also leads to cyclists disregarding stop signs. For cycle routes through

residential areas, stop signs are a significant disadvantage. Alternatives to stop signs on cycle routes through residential areas need to be considered.

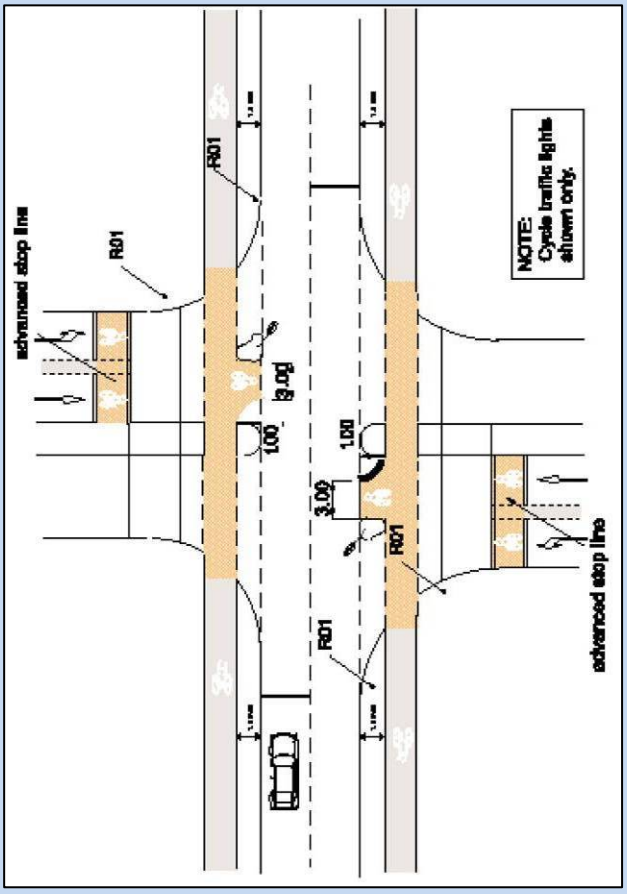
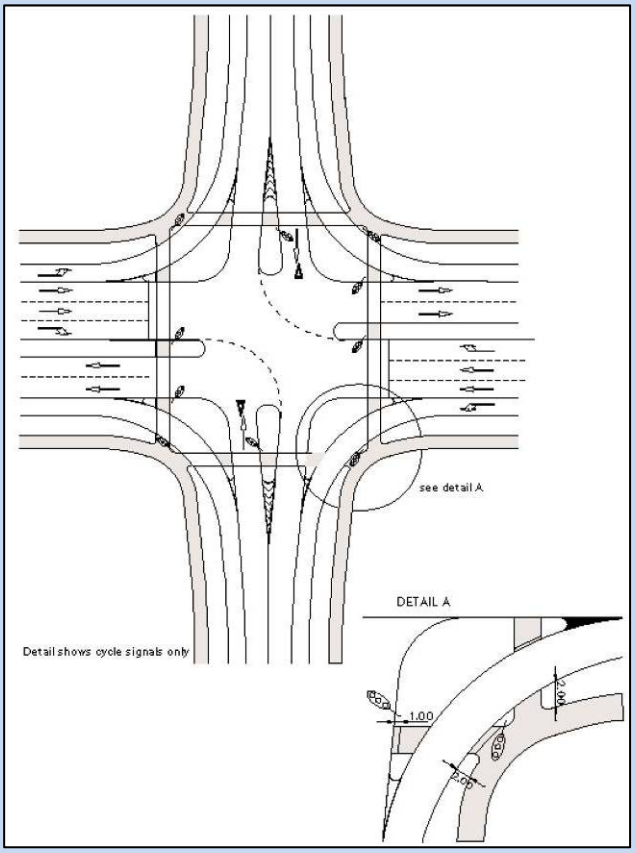
4.4.3.3 Roadway Crossings

Safe crossings for cyclists of busy roads are needed. A detour for cyclists to traffic signals is not an option. In many situations, a centre median can make the crossing of four-lane roadways manageable, allowing cyclists to cross one direction of traffic at a time when there is a gap in traffic. An advantage of medians is that traffic signals are generally not needed and unnecessary delays for motorists and cyclists are avoided.

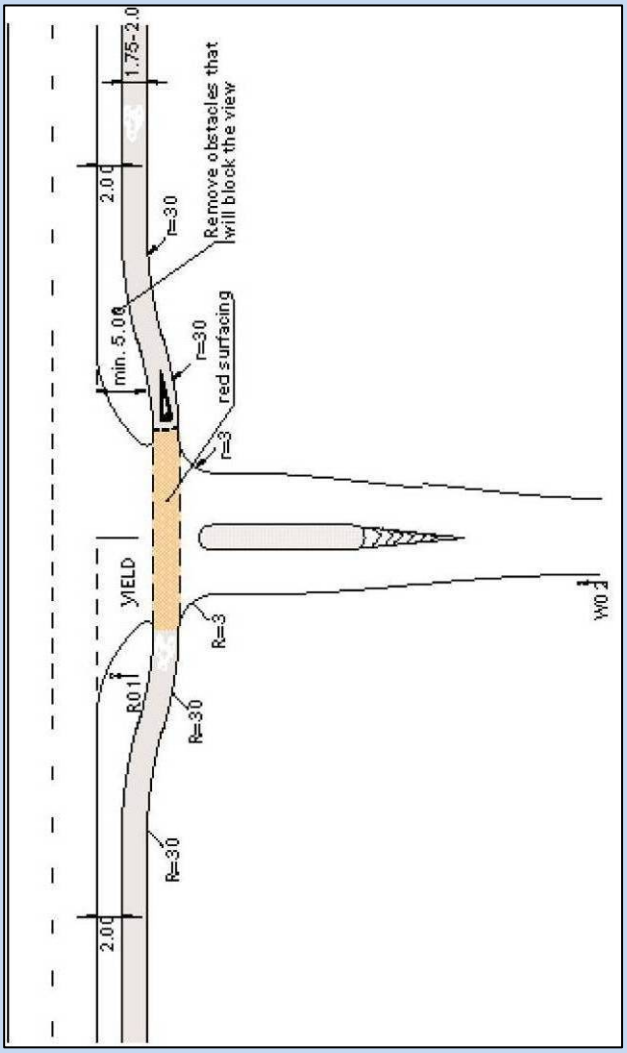
Examples of cycle track design concepts from the Dublin Transportation Office *Provision of Cycling Facilities | National Manual for Urban Areas* are shown in Exhibit 13.

Exhibit 13: Examples of Cycle Track Design Concepts from Dublin Transportation Office *Provision of Cycling Facilities | National Manual for Urban Areas*

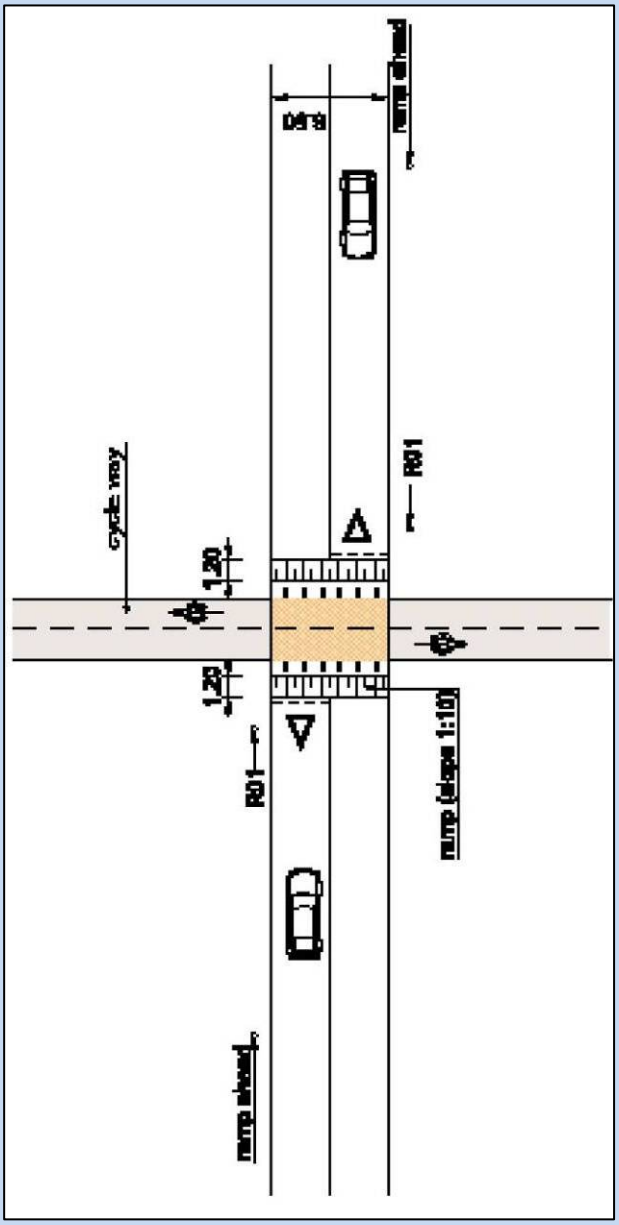
Note: Illustrations are for driving on the left

Facility for Cyclists to Turn Left from Cycle Track at Major Intersection (only extra signal facilities for cyclists are shown, not the complete traffic signal layout for the intersection) ⬇	**Traffic Signals for Cyclists at Major Intersections** (only extra signal facilities for cyclists are shown, not the complete traffic signal layout for the intersection) ⬇
	

Bending Out of Cycle Track at a minor street or driveway ⬇



Multi-use Trail Raised Crossing of Roadway ⬇



4.5 Bike Lane Signage and Pavement Markings

The pavement markings and signage associated with existing bike lanes on King Road, Maple Avenue and Brant Street were reviewed. Each of these facilities was installed during different time frames based on the design guidelines available at the time. The review was intended to determine the need for upgrades based on current design guidelines. Photographs of the typical pavement markings and signs on each roadway are provided in Exhibit 14.

Exhibit 14: Existing Bike Lane Signage and Pavement Markings in Burlington

King Road	
	
Bicycle lane symbol (diamond and bike) ↑	Bicycle lane pavement markings and Reserved Bike Lane LEFT / Pedestrian Path RIGHT sign ↑
Brant Street	
	
Bicycle lane symbol (bike but no diamond) ↑	Reserved Bicycle Lane Rb-84A sign ↑

Maple Avenue	
	
Bicycle lane symbol (diamond and bike) ↑	Non-standard Reserved Bike Lane ↑

4.5.1 TRAFFIC CONTROL GUIDELINES FOR BIKEWAYS

The pavement markings and signage identified in the field and on aerial mapping were compared to the following guidelines where appropriate:

- Transportation Association of Canada (TAC), *Bikeway Traffic Control Guidelines for Canada* (December 1998)—For bike lanes, apply the pavement marking symbols and typical applications (layouts) from this publication.

- TAC, *Guidelines for the Design and Application of Bikeway Pavement Markings—Final Report* (August 2007) and *Bicycle Signage Recognition Testing* (March 2008)—These reports will be used by TAC to update the above guideline. For shared-use lanes where bike lanes may terminate near an intersection or through a narrow section of roadway, apply the shared-use pavement marking symbol ("sharrow") and typical applications from this publication.

- Ministry of Transportation, Ontario (MTO), *Ontario Traffic Manual, Book 5—Regulatory Signs* (March 2000)—For bike lanes, apply the bike lane reserve lane regulatory sign from this publication.

Ontario Traffic Manual, Book 11—Pavement, Hazard and Delineation Markings (March 2000) includes reserved facility markings for bicycles. However, it does not include the use of the OTM diamond symbol for reserve lanes or provide example applications. The TAC manuals listed above are recommended for bikeway pavement markings until such time that the OTM is updated.

The O*ntario Traffic Manual, Book 5—Regulatory Signs* specifies that a Reserved Lane sign is used to designate specific lanes on the road exclusively for high occupancy and

special use traffic. The legal status of the sign is covered by the *Highway Traffic Act* Section 154. (1):

> Where a highway has been divided into clearly marked lanes for traffic, (c) any lane may be designated for slowly moving traffic, traffic moving in a particular direction or classes or types of vehicles and, despite section 141, where a lane is so designated and official signs indicating the designation are erected, every driver shall obey the instructions on the official signs.

Signs must be supported by municipal by-law to be enforceable in municipalities. Reserve Lane signs are not yet included in HTA Regulation 615 (amendment: O. Reg. 261/08)

4.5.2 GENERAL RECOMMENDATIONS

The essential elements of bike lane pavement markings and signage include the bicycle symbol plus diamond marking located after every intersection and spaced less than 200 m, and the RESERVED BICYCLE LANE Rb-84A sign after every intersection and spaced less than 300 m. Below are the key, generalized recommendations for the existing bike lanes:

- Brant Street—Include the diamond symbol pavement marking immediately upstream of each bicycle symbol.
- King Road and Brant Street—Install RESERVED BICYCLE LANE Rb-84A signs after every intersection and spaced less than 300 m throughout.
- King Road—Place the diamond plus bicycle symbol pavement marking after every intersection and spaced less than 200 m throughout.
- King Road—Replace all non-standard RESERVED BICYCLE LANE LEFT signs with the RESERVED BICYCLE LANE Rb-84A sign when the Rb-84A sign is added to the HTA Regulation 615.
- King Road—Where the bike lane ends near the Plains Road intersection because of limited roadway width, continue the bikeway to the intersection using the shared-use lane pavement marking (bicycle symbol with two chevrons) and signage (Share the Road).
- Maple Avenue—Replace all non-standard RESERVED BICYCLE LANE, BIKE PATH BEGINS, and BIKE PATH ENDS signs with the RESERVED BICYCLE LANE Rb-84A sign with appropriate BEGINS and ENDS tabs either when signs are in poor condition or when the Rb-84A sign is added to the HTA Regulation 615.

- Maple Avenue—Install the bike lane pavement markings to the left of the right-turn lane at Lakeshore Road intersection.

4.5.3 BICYCLE LANE BY-LAW

It is recommended that the City of Burlington adopt a bicycle lane by-law that allows the City to regulate and enforce traffic use of the bicycle lanes subject to the *Highway Traffic Act*. Such a by-law would consider the following elements:

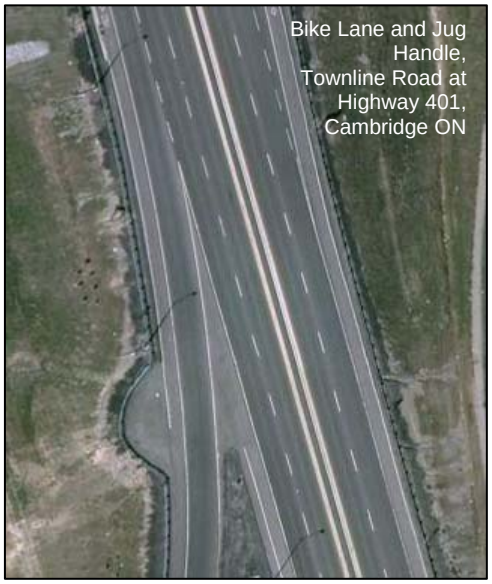
- A schedule of roadways that have bicycle lanes designated for use by cyclists only.
- Designating that the bicycle lane is in effect with the erection of authorized signage.
- Permit exceptions to operating a vehicle other than a bicycle in a bicycle lane for some distance (say 50 m) for the purpose of ingress / egress from private driveways, making a turn at a roadway intersecting a bicycle lane, entering or exiting a curb lane used for parking, loading or unloading a person with a mobility impairment, operating a school bus while actively engaging in loading and unloading passengers, etc.

- Vehicle exemptions to the by-law such as emergency services vehicles, City-operated transit or works vehicles, and public utility vehicles.
- Contraventions of the by-law liable to prosecution under the Provincial Offenses Act.

4.6 Design Tools for Interchanges

Arterial / freeway Interchanges in Burlington are significant barriers to creating a bicycle-friendly City. In particular, there are no roadway crossings of the QEW without interchanges, and there are no grade-separated pedestrian/cyclist only crossings either. This means that almost all residents of the City are faced with the challenge of crossing the freeway at high-volume and high-speed interchanges in order to access destinations and services north / south and east / west of the QEW. Some cyclists do travel through these interchanges. They face not only high volume, high-speed traffic, and a mix of cars and large trucks, but also geometry that does not provide a comfortable path or route for them to safely negotiate through the interchanges.

Just as one cannot "count the number of people swimming across a river to establish the need for a bridge", one cannot count the number of people cycling though these interchanges to establish the need for improved conditions. Key destinations include employment and retail areas along the QEW and the North and South Service Roads, and the Burlington and Appleby GO Transit Stations. Some 65,000 residents living north of the QEW are segregated by the freeway from the Burlington Downtown and Waterfront, and the Lake Ontario Waterfront Trail. The North and South Aldershot area, a population of about 15,000, is also segregated from the Burlington Downtown and Waterfront by the QEW.



Bike Lane and Jug Handle, Townline Road at Highway 401, Cambridge ON

4.6.1 DESIGN ISSUES

At a very basic level, pedestrians and cyclists approaching freeway interchanges typically are confronted with either free-flowing traffic to/from ramps, or stop controlled or signalized intersections, or a combination of these. Cyclist comfort is influenced by the speed of traffic, volume and mix of traffic. It may be moving at high speeds or lower speeds depending on the geometrics, adjacent land-use context and traffic operations. Traffic volumes may be lighter, moderate, heavy. Speed and volume may combine resulting in congestion during peak travel periods. And a mix of vehicle types including buses and heavy trucks may be passing cyclists.

The specific geometry through the interchange may include:

- **On ramps**: parallel lanes developed upstream or a travel lane transitioning to a right-turn lane, direct tapers, and direct spirals.
- **Off ramps**: parallel lanes including those that are dropped downstream or transition to an additional travel lane on the crossing roadway, direct tapers.
- **For both on and off ramps**: ramps that terminate on the crossing roadway at stop controlled or signalized intersections, and could include channelization.
- **Overpasses or underpasses of the freeway mainline**: with and without paved shoulders, without sidewalks, or with sidewalks on one or both sides.
- **Crossing roadways**: without sidewalks, or with sidewalks on one or both sides, and with or without bike lanes.

The relationship of one element to another, i.e., the order in which the various ramp terminal configurations and crossing road infrastructure are encountered by cyclists, along with the available width influences the route through the interchange and design improvements.

4.6.2 DESIGN TOOLS

Various design tools are noted in North American bikeway design guidelines and reports that could be applied to interchanges. Design, pavement marking and signage recommendations from various Transportation Association of Canada reports are illustrated in Exhibit 15. The references should be reviewed for further details on the devices (pavement markings and signs), design criteria, guidance and applications. The recommendations include:

- Jug-handles at merging and diverging ramps on roadways with speeds higher than 70 km/hr.
- Crossing area through the gore for cyclists at merging or diverging ramps with speeds higher than 70 km/h.
- Bike lane striped adjacent merging and diverging ramps with speeds of 70 km/h or less.
- Bike lane or shared-use lane marked adjacent auxiliary lanes at signalized intersections.
- Additional pavement marking of the conflict zone (weave, merge or diverge) in a bike lane.

A concept sketch for European cycle tracks through the interchange on Guelph Line at QEW created by Mr. Wim Mulder, traffic engineer, Apeldoorn NL is illustrated in Exhibit 16.

Exhibit 15: Design Tools for Application at Interchanges

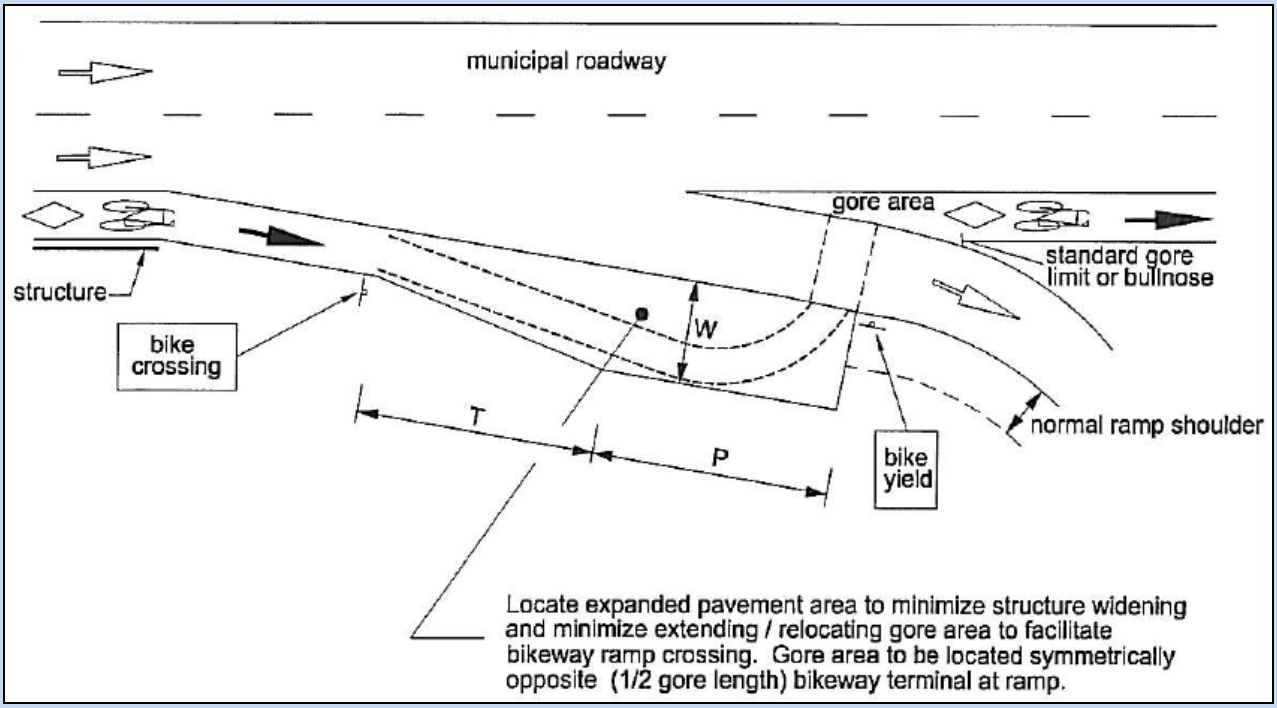
Jug Handle at Diverging Ramp (>70 km/h)

Transportation Association of Canada, Geometric Design Guide for Canadian Roads (1999): Bikeways Crossing Freeway Entrance Type Ramps ↓

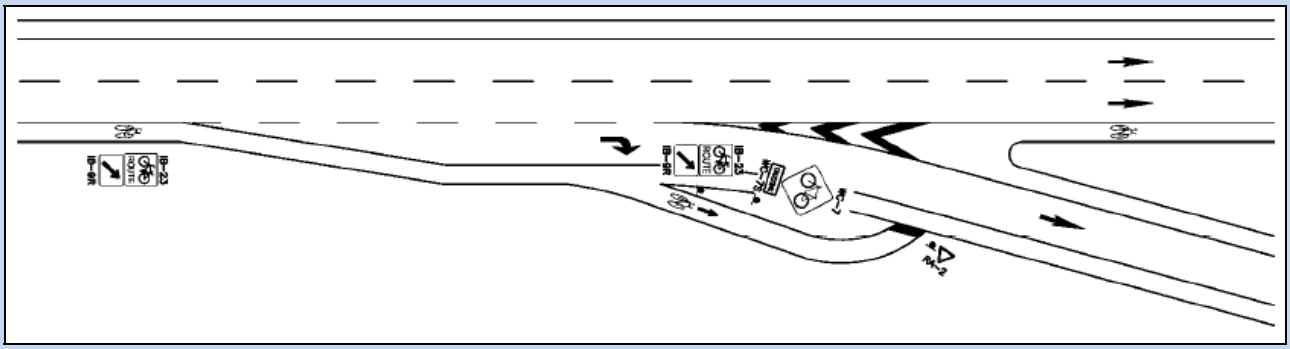
Table 3.4.7.2 Design Standards for Bikeways Crossing Freeway Entrance Ramps

Design Standard	Taper (T) Length (m)[a]	Parallel (P) Length (m)[a]	Width (W) Length (m)[b]	Bike Path Radius (m)	Path Inter. Angle (°)	Terminal Radius (m)
Minimum	11	11	4	20	65	6
Desirable	13	13	5	20	70	8
Preferred	14	14	6	20	75	10

Notes: a) Measured parallel to edge of ramp pavement.
b) Measured perpendicular to edge of ramp pavement.

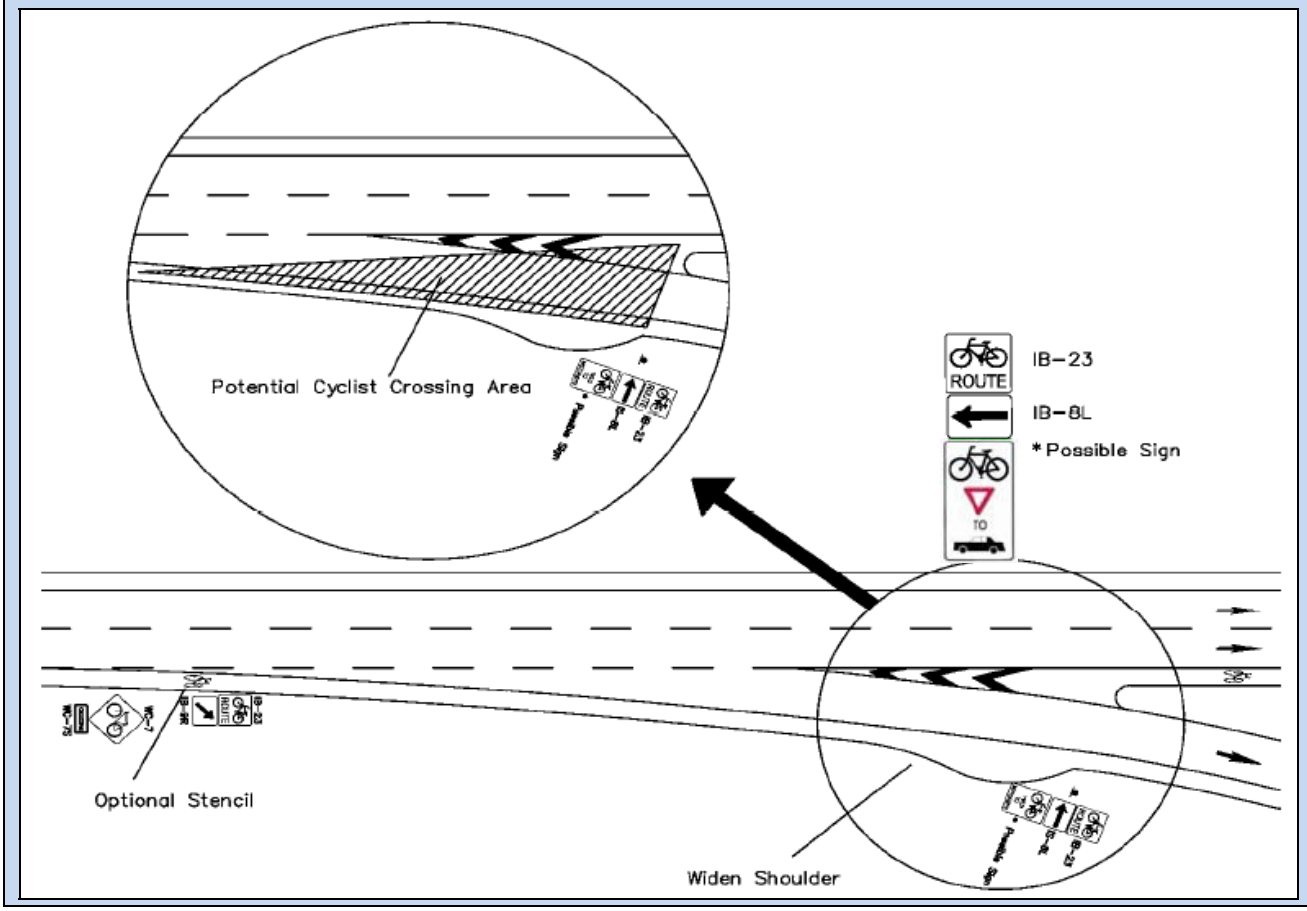


Transportation Association of Canada, Guidelines for the Design and Application of Bikeway Pavement Markings (December 2007): Cyclist Crossing (High Speed >70km/h) Off-ramp with Jug Handle (This application assumes the bike lane is on the freeway, but could be applied where ramps diverge from high-speed arterial roadways with bike lanes) ⬇



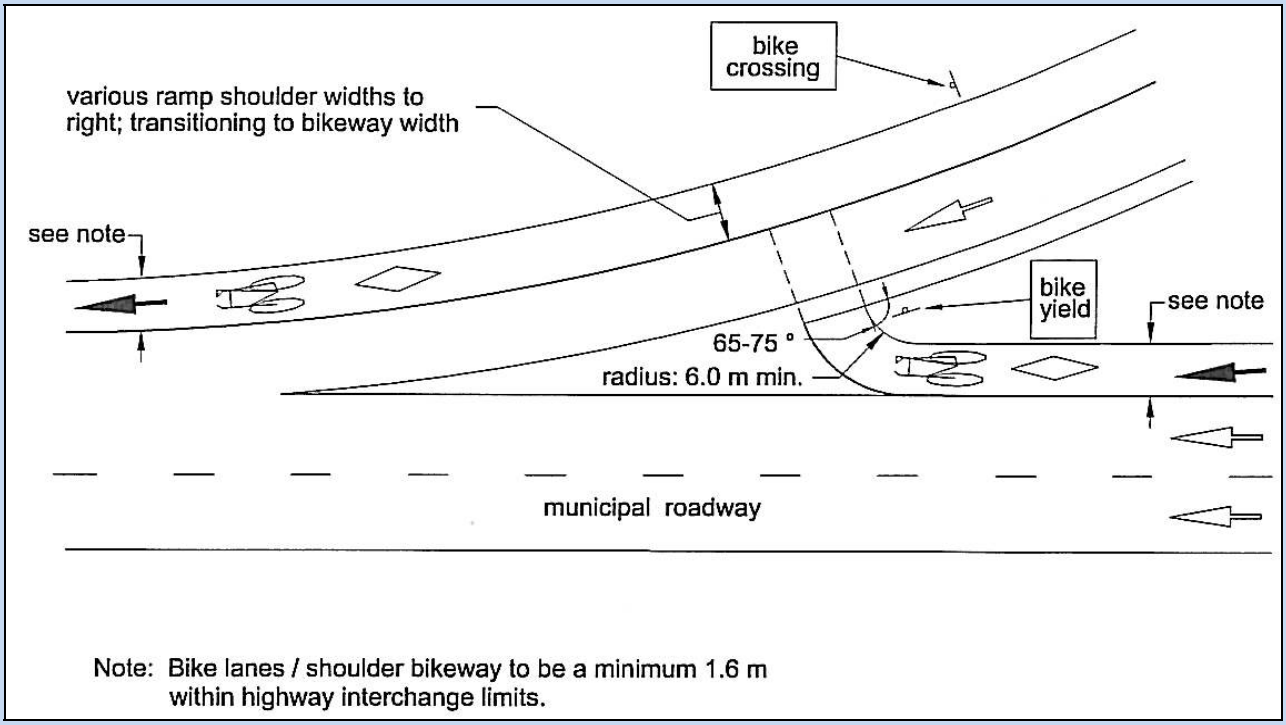
Crossing Area Unmarked at Diverging Ramp (>70 km/h)

Transportation Association of Canada, Guidelines for the Design and Application of Bikeway Pavement Markings (December 2007): Cyclist Crossing at High-Speed (>70 km/h) Interchange Off-Ramp Along the Ramp—No Crossing Area Cyclist Markings (This application assumes the bike lane is on the freeway, but could be applied where ramps diverge from high-speed arterial roadways with bike lanes) ⬇

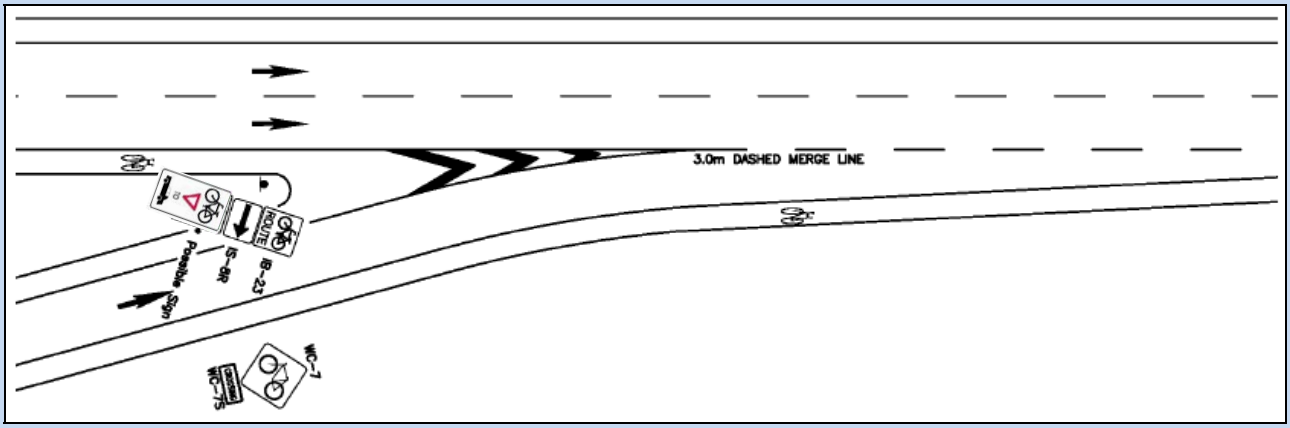


Jug Handle at Merging Ramp (>70 km/h)

Transportation Association of Canada, Geometric Design Guide for Canadian Roads (1999): Bikeways Crossing Freeway Exit Type Ramps ⬇

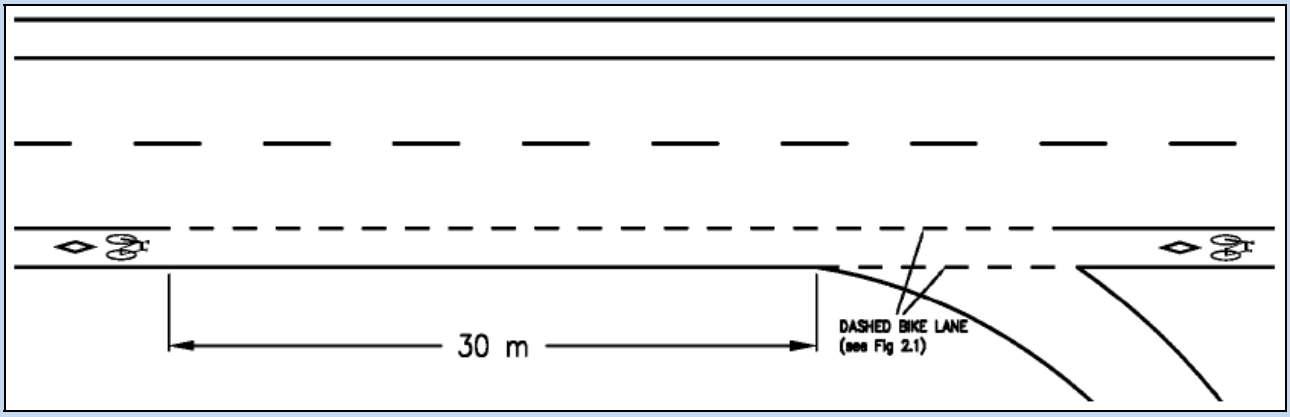


Transportation Association of Canada, Guidelines for the Design and Application of Bikeway Pavement Markings (December 2007): Cyclist Crossing at High-Speed (>70 km/h) Interchange On-Ramp (No crossing markings) ⬇

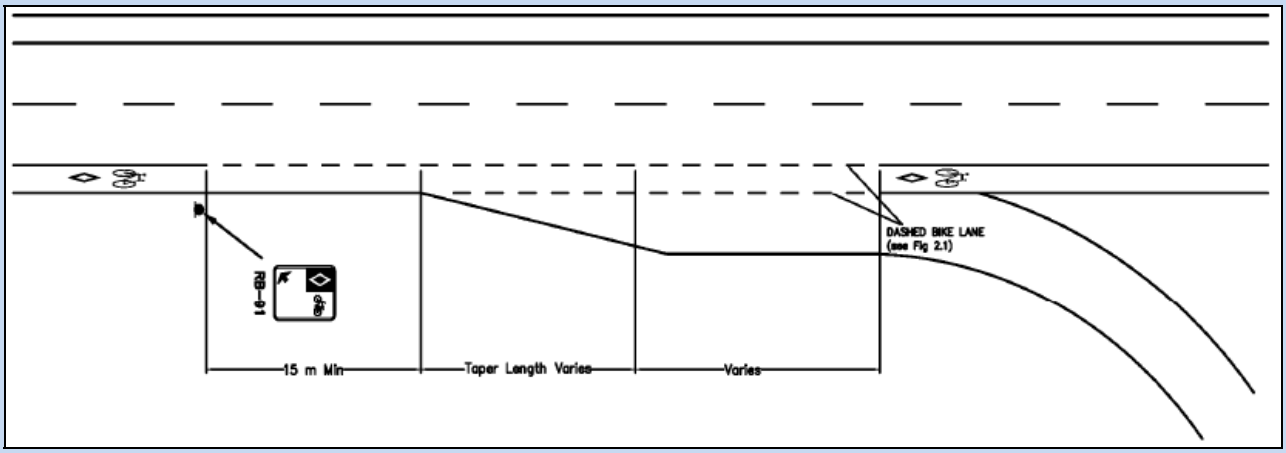


Bike Lane adjacent Diverging ramp (≤ 70 km/h)

Transportation Association of Canada, Guidelines for the Design and Application of Bikeway Pavement Markings (December 2007): Bicycle Lane Across Lower-Speed (≤70 km/h) Roadway Off-Ramp ↓

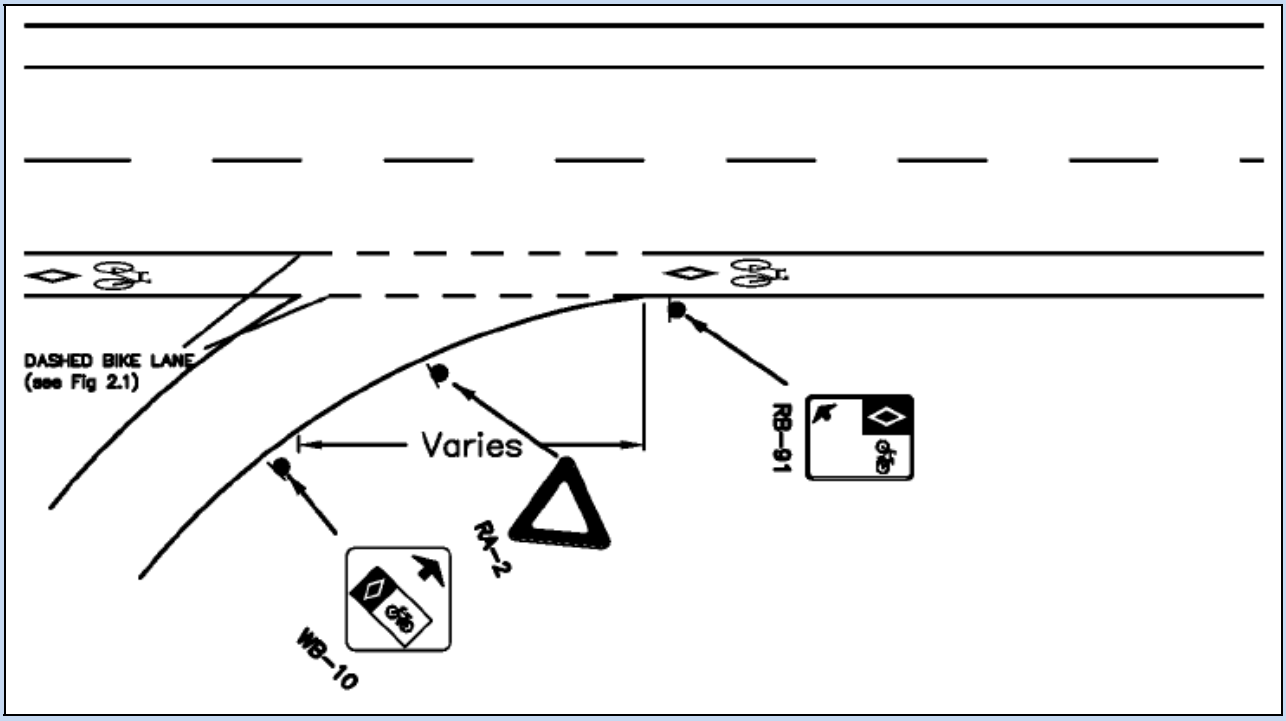


Transportation Association of Canada, Guidelines for the Design and Application of Bikeway Pavement Markings (December 2007): Bicycle Lane Across Lower-Speed (≤70 km/h) Roadway Off-Ramp with Parallel Lane ↓

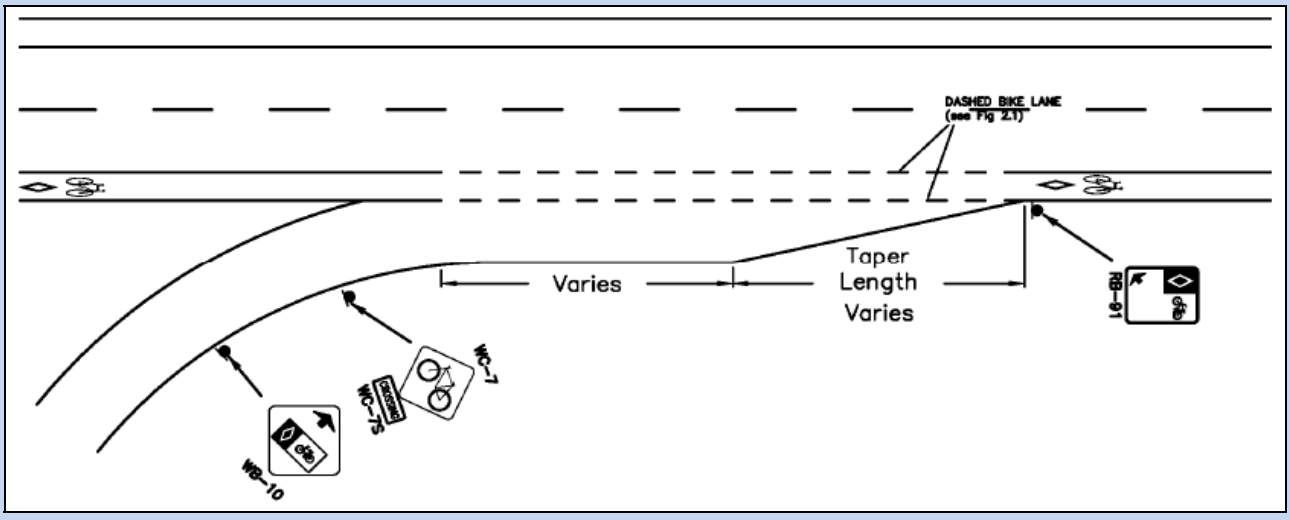


Bike Lane adjacent Merging Ramp (≤ 70 km/h)

Transportation Association of Canada, Guidelines for the Design and Application of Bikeway Pavement Markings (December 2007): Bicycle Lane Across Lower-Speed (≤70 km/h) Roadway On-Ramp With No Acceleration Lane ↓

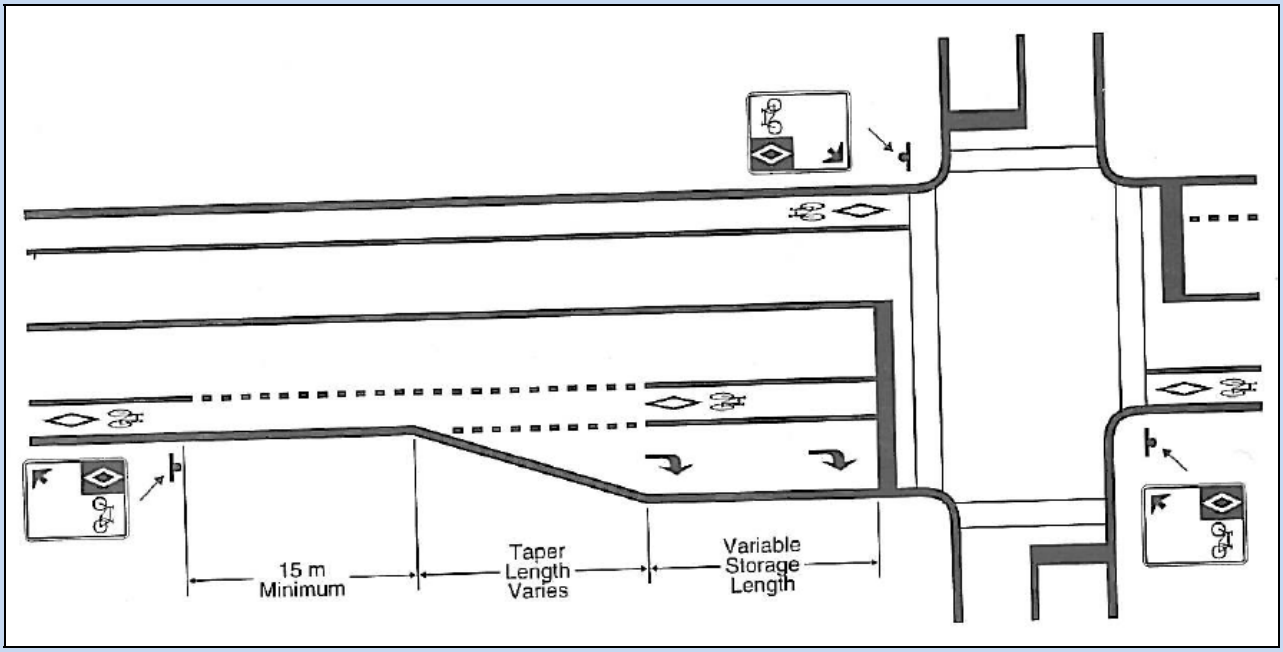


Transportation Association of Canada, Guidelines for the Design and Application of Bikeway Pavement Markings (December 2007): Bicycle Lane Across Lower-Speed (≤70 km/h) Roadway On-Ramp With Acceleration Lane ↓

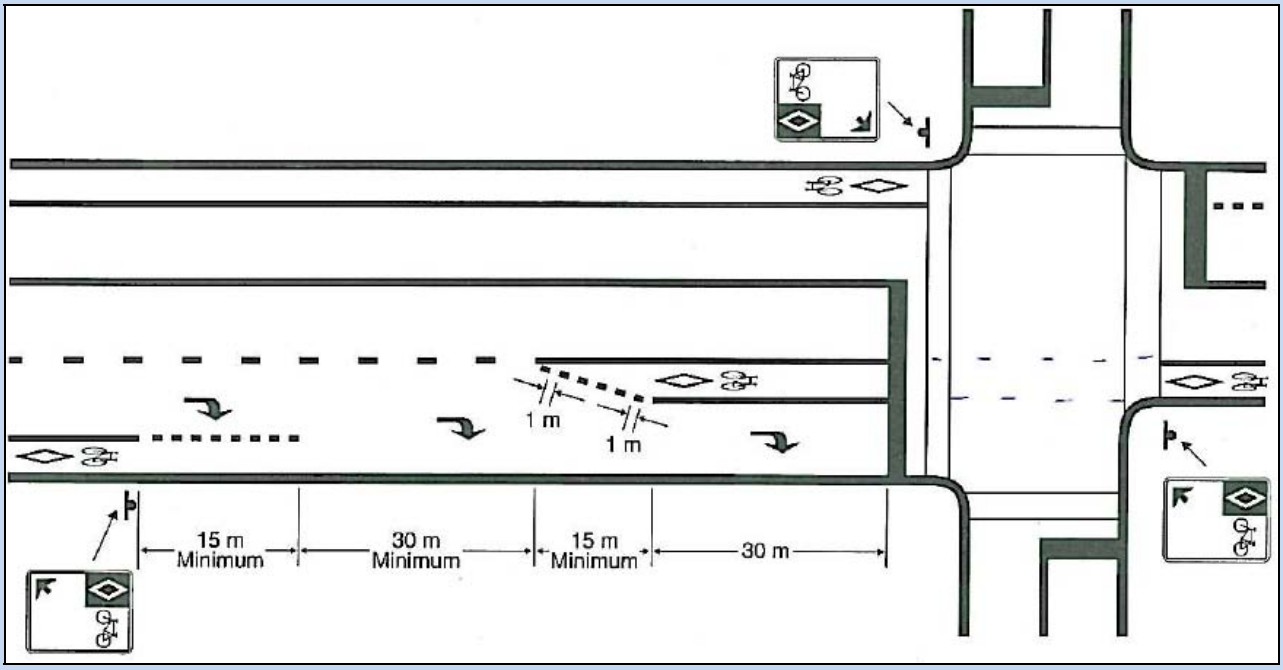


Bikeway adjacent Auxiliary Lanes at Signalized Intersections

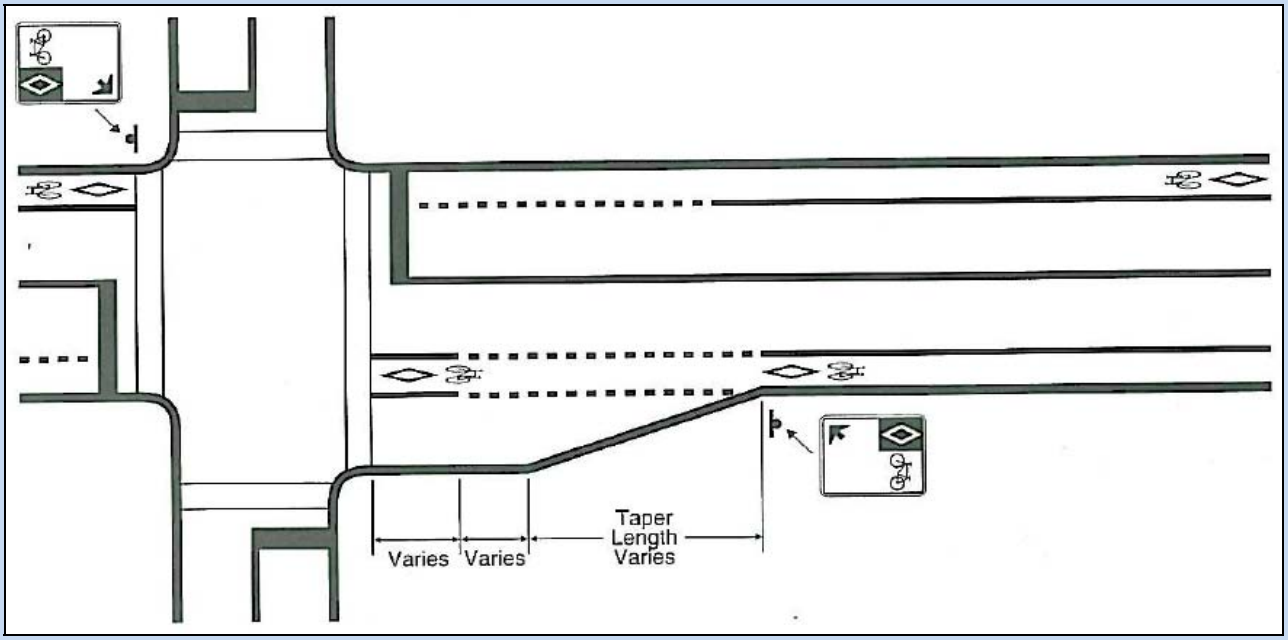
Transportation Association of Canada, Bikeway Traffic Control Guideline for Canada (December 1998): Bicycle lane adjacent introduced right-turn lane ↓



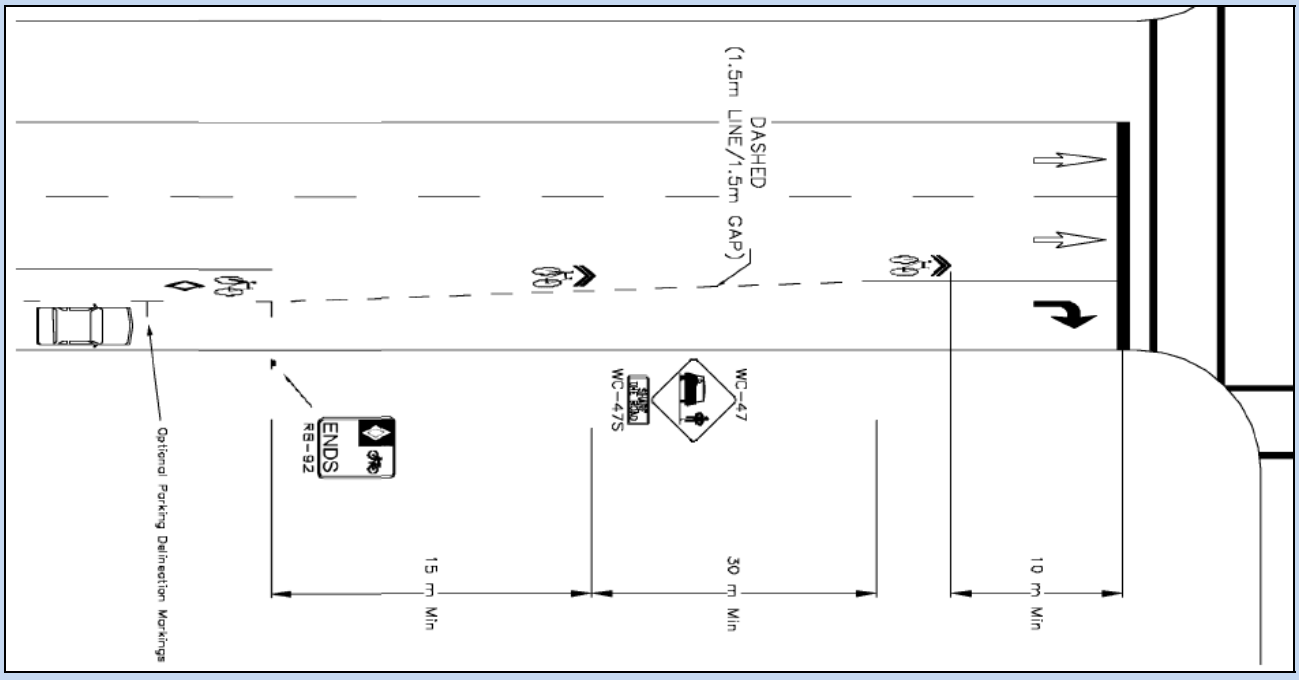
Transportation Association of Canada, Bikeway Traffic Control Guideline for Canada (December 1998): Bicycle lane adjacent curb lane transitioning to right-turn lane ↓



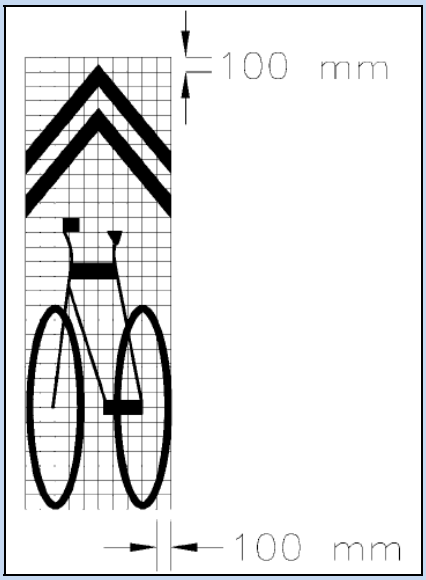
Transportation Association of Canada, Bikeway Traffic Control Guideline for Canada (December 1998): Bicycle lane adjacent merge lane ↓



Transportation Association of Canada, Guidelines for the Design and Application of Bikeway Pavement Markings (December 2007): Insufficient width for bike lane at intersection; shared use lane marking adjacent right-turn lane. The position of the marking within the lane at the intersection is dependent upon the width of the turning lane (if wide enough, place with side-by-side alignment, else place in centre of lane). ↓



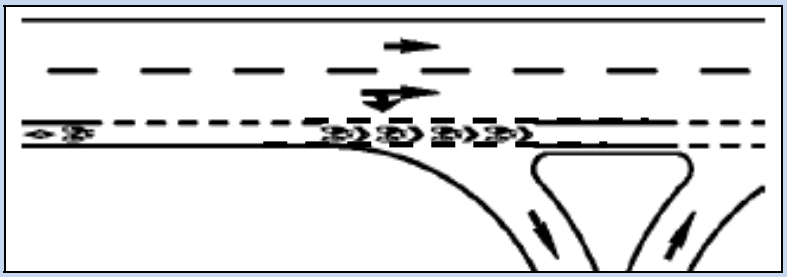
Bike Lane through Conflict Zones: Weave, Merge or Diverge Areas



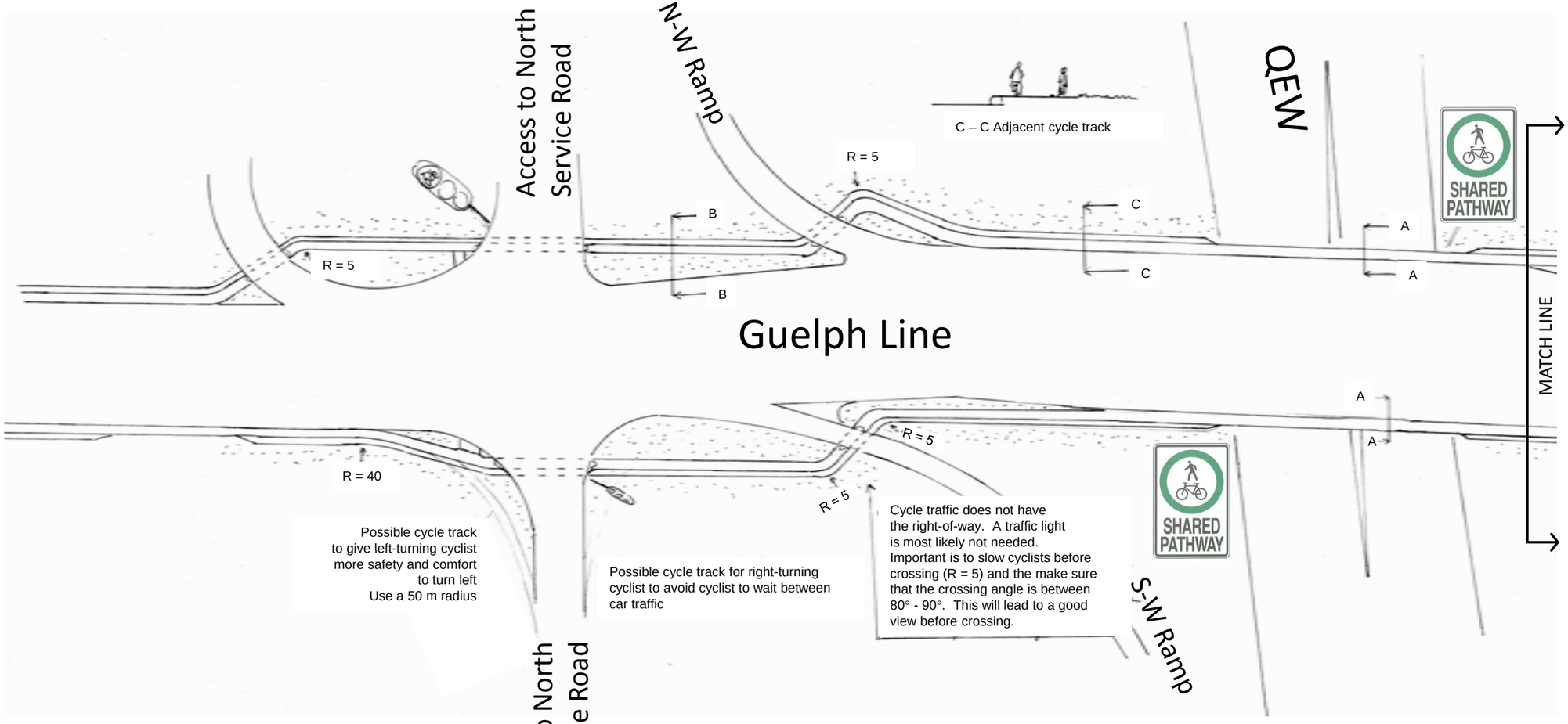
←↓ Transportation Association of Canada, Coloured Bicycle Lanes Simulator Testing (May 26, 2008): Conflict zones are defined as areas where cyclists have the right of way but where this may not be understood by motorists or even cyclists. For example, where a right-turn lane is added or a curb lane becomes a right-turn only lane and the bike lane is intended to carry straight through. Conflicts arise between cyclists and right-turning motorists in these cases since their paths cross. Another example is at merging and diverging ramps in interchanges.

These markings must not, however, be used to demarcate conflict zones across high-speed roadway ramps (roadways >70km/h), as the high speed differential between cyclists and motorists introduce a significant conflict potential and motorists do not typically expect to yield to cyclists in these locations.

In areas where conflict zones are of particular concern, the white "sharrow" marking (bicycle stencil with chevron arrows may be added as a potential optional treatment.

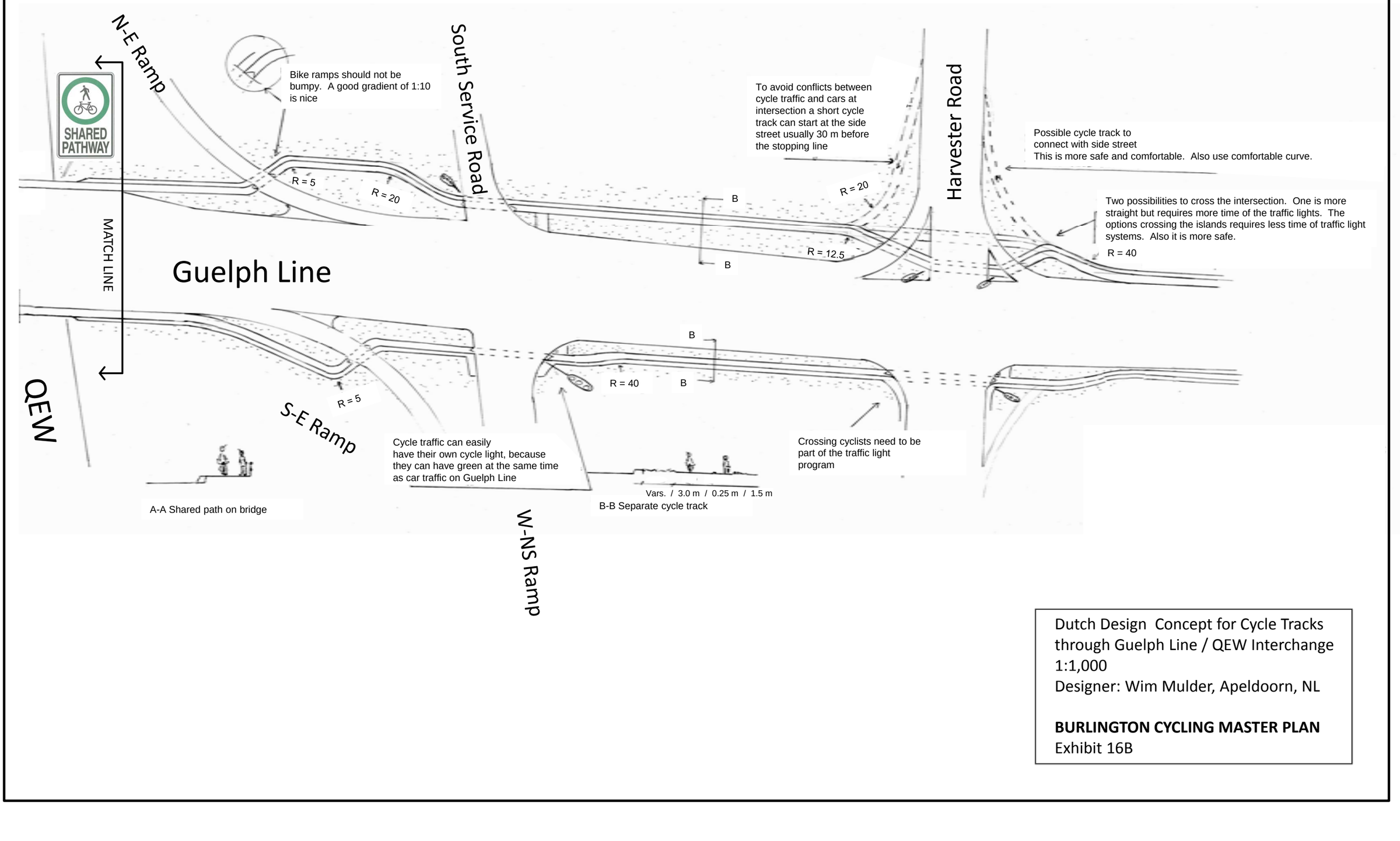


Note that the addition of the stencil does not replace any of the conventional bikeway marking requirements and may therefore require dashed guiding lines on either side. The "sharrow" marking should extend through the conflict zone whether at an intersection or elsewhere. Consideration of what would be a conflict zone should be done by a qualified professional using industry standard safety or conflict analysis techniques.



Dutch Design Concept for Cycle Tracks through Guelph Line / QEW Interchange
1:1,000
Designer: Wim Mulder, Apeldoorn, NL

BURLINGTON CYCLING MASTER PLAN
Exhibit 16A



Dutch Design Concept for Cycle Tracks through Guelph Line / QEW Interchange
1:1,000
Designer: Wim Mulder, Apeldoorn, NL

BURLINGTON CYCLING MASTER PLAN
Exhibit 16B

4.7 Cycling Network Signage Strategies

The Transportation Association of Canada's (TAC) *Bikeway Traffic Control Guidelines for Canada* (December 1998) indicates that bikeway guide and informational signs convey information to cyclists for route selection, for locating off-road facilities, or for identifying geographical features or points of interests. These *Guidelines* indicate that on shared rights-of-way, separate signing for cyclists is not necessary; however, guide and informational signs are intended to help cyclists find their way in unfamiliar areas and provide insight into the coherence of a network of bikeway routes.

4.7.1 CYCLISTS' NEEDS

Street name signposting, and guide and informational signs for motorized traffic are not ideal from the cyclist's viewpoint, in terms of positioning and information:

- Some bikeways are designed to take advantage of low traffic speeds or volumes, or scenic routes and as such may not remain on any given street. The bike route will take turns and short-cuts not intended for motorists but of great advantage to cyclists. Separate signing of these routes is required for way-finding.

- Cyclists generally travel shorter distances than motorists and are more concerned with direct connections to destinations within those smaller areas. They may require information on the exact route to the frontage of the property or building that is bicycle-accessible. For example, circulating by bike around a shopping or transit centre to find bike parking or bicycle lockers could be very frustrating.

- Time and distance along bike routes to destinations can indicate to the traveling public that the trip is quite manageable by bicycle.

- Advance signing for a cyclist on a roadway or trail approaching a roadway with a bike lane, wide lane, or other type of bikeway on it is needed. The cyclist will not be aware that the bikeway exists until they pass through the intersection or they may not detect the bikeway at all. If they do detect it at the intersection, they may not be in a position that allows them to turn directly onto the bikeway, and then will have to expend additional personal energy to go out of their way to turn around.

- A coherent and consistent system of way-finding signs for cyclists is lacking in Canada. Some of the shortcomings of bicycle route signage programs include:

- Signs are inconsistently implemented across a network such that some routes are well marked and others are not.

- Useful information from a cyclist's perspective, such as destinations, directions, distances, amenities, is lacking or inconsistent across a network.

- Signs are not maintained on an annual or as-needed basis with signs disappearing over time.

- Initial implementation of bicycle route network signage is not continued as the network expands over time such that older sections are signed and newer sections are not. The reverse can also happen if older signs are not maintained but newer signs are installed as the network expands.

- Sign placement is poor so that it is not easily visible to cyclists.

- Signage types are lacking, i.e., route confirmation signs at regular intervals, change in route direction signs, intersection signs of two or more bicycle routes, advance or access signs from major roadways or trails to bicycle routes.

4.7.2 SIGNAGE EXAMPLES

Examples of bicycle route signage from North America and Europe are provided in Exhibit 17. These illustrate the basic bike route guide signing to more complex signing that provides useful information on destinations, distances and amenities.

4.7.3 RECOMMENDATION

Bicycle route signage in Burlington will be important for integrating the on-road system with the multi-use pathway system, and the City bikeways with the Region of Halton's bikeways to form an overall co-ordinated network. The City will need to examine which signage strategy will work within the resources available to implement and maintain the signs. The signage should be easy to integrate into bicycle route maps, and address the features described above such as route confirmation, route intersections, advance route signing, destinations, directions, distances (or time), and amenities. Such a signage plan would go beyond the basic guide and information signs recommended by TAC. Consistency with Provincial sign design principles is also recommended.

Recognizing the different needs of cyclists for way-finding compared to motorists, it is recommended that the City of Burlington develop a strategy in partnership with the Region of Halton and co-ordinated with adjacent municipalities to sign the bikeways in such a way that the network is more visible to cyclists and the traveling public, and the signs communicate the network's connectedness, destinations and distances or travel time. It is recommended that a working group be set-up to develop the signage strategy that would consist of staff responsible for the on-road bikeway network, multi-use pathways, the waterfront and downtown, signage installation and maintenance, and tourism.

Exhibit 17: Examples of Cycling Network Signs

Transportation Association of Canada Bikeway Traffic Control Guidelines for Canada

Basic bike route guide sign ➔

Distance supplementary tab sign indicate the distance and direction to the bikeway (colour should match the signs that they supplement) ➔

Supplementary directional arrow, tab signs for change in the route direction, along with route “Ends”, “Begins”, “To” tabs (colour should match the signs that they supplement) ➔➔

Hamilton ON

Bicycle route marker sign with destinations and direction located at decision points in the bicycle route network ➔

Burlington ON

↑ Basic bicycle route sign

Street name blade at multi-use pathway / roadway intersections ↗

Burlington Waterfront Trail sign and map at trail intersection ➔

Burlington Waterfront Trail sign with destinations and distances ➔➔

Vancouver BC

↑ Street name blade with bicycle logo identifies a street as a bikeway to cyclists and motorists

Bicycle route marker sign with destinations, direction, distance and average time by bicycle at decision points in the bicycle route network ➔

Photos by Richard Drdul

Toronto ON

Signed route system for bicycle-friendly routes includes numbering of north-south (odd) and east-west (even) routes

↑ Confirmation signs with cardinal direction

Direction change signs with arrows ↑

Route options at intersection bicycle routes ➔

Photos from City of Toronto

Québec

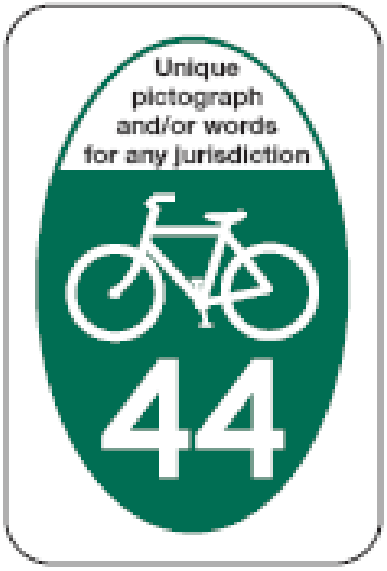
La Route verte cycle tourist route sign ➔

Photo from Vélo Québec

US Manual of Uniform Traffic Control Devices (DRAFT)

↑ Bike route guide signs and with destination alternatives. Auxiliary junction or cardinal direction plaques can be added to them

Alternative bike route guide signs can be customized ➔



Bicycle destinations signs with directions and distances ➔

Seattle WA

Bike route sign with names route and destination signs including direction and distance ➔

Berkley CA

↑ Bicycle boulevard signage identifies the street as a priority street for cyclists with a route name

Destinations signs include distances and directions ➔

Photo from City of Berkley, CA

Germany

Bicycle route signage includes region name, node number, destinations, directions, distances, amenities, and map ➔

Photo by John van der Mark

Switzerland Photos from SwitzerlandMobility Foundation

↑ SwitzerlandMobility national and regional cycling route signage

Destination distance and trip time signage ➔

The Netherlands

Dutch national and regional route signage—destination route signs are green, tourist route signs are red ↑

Photos from the Netherlands Fiets Platform

5. THE CYCLING NETWORK

A good cycling network should encourage people to use the bicycle more often. In the Netherlands, this is achieved by understanding the needs or so-called requirements of the cyclist, as follows:

- **Coherence**: The network consists of cycle routes. It is important that these routes are well connected with each other and with the main destinations.
- **Safety**: This is a starting point for planning and design of bikeways. Road situations must always be safe. The safety applies also to situations in parks where public safety can be an issue. All children in the Netherlands are taught cycling safety as part of the education curriculum.
- **Directness**: Cyclists want to move on. Stopping is costing them energy and results in delays. There are many situations where cyclists take a high risk in road safety in order to save travel time.
- **Comfort**: The road surface must be smooth and comfortable.
- **Attractiveness**: An attractive surrounding is desired along the route.

Most of all people cycle because they enjoy it, therefore, bikeways must not only meet their needs but make cycling fun.

The Bikeway and Multi-use Pathway Network recommended to be implemented over time consists of:

- A “quality framework” to improve the quality of cycling in Burlington based on ideas from Apeldoorn NL.
- Waterfront—Downtown connections.
- Pedestrian / cyclist only crossings of the QEW (bridges or tunnels).
- Short-term and longer-term bike lanes, bicycle priority streets, shared lanes and multi-use pathways.

5.1 Existing Network

The existing bikeway and multi-use pathway network is illustrated on Map 1. There are currently 42 km of bike lanes, 3 km of signed bike route, and 42 km of multi-use pathways in parks and corridors for a total of 167 km in the City of Burlington.

5.2 Waterfront—Downtown Connections

A workshop was held on December 18, 2008 with employees of the City of Burlington to review and discuss the existing and planned cycling facilities in the Downtown and Waterfront areas, as well as to make recommendations that would improve cyclists' safety, the cyclists' experience, and promote Downtown as a cycling destination. The top five priorities for improving the Downtown and the Waterfront for cyclists included the following:

- Add bike lanes on Lakeshore Road west of the Downtown through a "road diet" and improve the intersection of Lakeshore Road at North Shore Boulevard.

- Upgrade signing and pavement markings on the multi-use pathway through Spencer Smith Park to reduce conflicts between cyclists and pedestrians, and provide bicycle parking at the entrances to allow cyclists to lock their bicycle so they can transition to walking when the pathway is busy. These improvements can be implemented with other projects being considered to upgrade the park.

- Provide long-term bicycle parking in existing parking garages for employees in the Downtown.

- Upgrade the Lake Ontario Waterfront Trail to 6 m wide between the Downtown and Hamilton, including a separate pedestrian / cyclist bridge cantilevered on the east side of the existing Burlington Canal lift bridge. The Federal government announced in March 2009 that repairs and restoration of the bridge will occur over the next two years.

- Implement a pilot project on Lakeshore Road east of the Downtown, removing the existing centre two-way, left-turn lane and installing bicycle lanes (see below).

5.3 Lakeshore Road

Lakeshore Road from Martha Street in downtown Burlington, to Burloak Drive at the Burlington-Oakville boundary was reviewed to determine if it could be converted from three lanes (eastbound and westbound travel lanes and a centre two-way left turn lane) to two lanes (eastbound and westbound travel lanes) with on-road bicycle lanes. Such a conversion would provide bike lanes along the Lake Ontario Waterfront Trail as an alternative to the existing multi-use pathway parallel to the road, and connect Burlington's Downtown and Waterfront to easterly areas of the City and Oakville.

Currently this section of Lakeshore Road services a mix of local and commuter traffic. Both the delay and occurrences of rear end collisions at signalized intersections within the study are appear to be related to heavy east-west traffic volumes and queuing.

CITY OF BURLINGTON
CYCLING MASTER PLAN

Map 1: Existing Bikeways and Multi-Use Paths

- City Hall
- Hospital
- Attractions
- Community Centre and Library
- Sports and Recreation
- Transit / GO Station
- Schools
- Existing Bike Lane
- Existing Signed Route
- Existing Multi-Use Path

N

0 0.5 1 2 Kilometers

L:\jobs\20816\16-08046-001-TP1 Burlington Cycling Master Plan\GIS\Maps\April 2009\65000670_Map_1.mxd

Removing the centre left-turn lane from Lakeshore Road has the potential to significantly alter the traffic operations of the roadway. Presumably, the associated increase in peak period travel congestion (delay) would cause some, possibly a significant amount of the commuter traffic to seek alternate routes. The frequency of motor vehicle collisions/conflicts may also increase. However, adding bicycle lanes to Lakeshore Road has the potential to establish Burlington as a cycling destination, and it could result in economic, environmental, and safety benefits for the surrounding community.

Provided that the City of Burlington is prepared to accept the potential resistance to the increased vehicle delays on this popular commuter link, Lakeshore Road between Martha Street and Burloak Drive presents an opportunity to improve access to on-road bikeways within the City. The following recommendations should be considered if the City of Burlington elects to move forward with the conversion of Lakeshore Road from a three-lane cross-section to a two-lane cross-section with on-road bicycle lanes:

- A pilot section, for example, Martha Street to Guelph Line, could be selected for initial conversion and observation (i.e., before and after monitoring of delay, collisions/conflicts, and lane use). Once the success of the pilot project is demonstrated, conversion of Lakeshore then could be extended eastward to Burloak Park to line with the Town of Oakville's network.

- The auxiliary left-turn lanes at signalized intersections should be maintained through road widening, and the pedestrian signal timings and vehicle clearance intervals should be increased proportionally.

- The pedestrian refuge islands in the east end of the study area should be preserved through road widening.

- The 60 km/h speed limit east of Walker's Line should be reduced to 50 km/h to reflect the surrounding recreational and residential land uses, and to provide a safe environment for on-road cyclists.

- Enforcement should be increased to reduce the incidents of illegal stopping and parking on Lakeshore Road.

- The timing of any modifications to Lakeshore Road can be co-ordinated with MTO's proposed widening of the QEW so that commuters can respond to the increased capacity on the QEW corridor and the increase in delay on Lakeshore Road. This would support the City's intent of accommodating less "QEW through" traffic on City streets.

5.4 Freeway Grade-separated Crossings

The QEW and Highway 403 freeways in their current condition are barriers to cyclists and pedestrians in Burlington. The QEW east of Highway 403 segments the newer, more suburban planning districts of Tansley and Nelson with a population of about 60,000 from the City to the south, where many amenities are located such as the Downtown, Waterfront, Go Transit Stations, employment areas, shopping centres, etc. The planning districts south of the QEW, Wellington and Lakeshore, have a population of about 65,000 that are also segmented by the QEW from amenities to the north including employment, community centres, shopping, etc. The QEW south of Highway 403 segments the planning district of South Aldershot with a population of about 14,000 from the Downtown and amenities to the east. Highway 403 segments South Aldershot from North Aldershot with a population of about 1,200.

Crossings of the freeways accessible to cyclists do exist but they are along arterial roadways. These are Waterdown Road, King Road, Lakeshore Road, Fairview Street, Brant Street, Guelph Line, Walker's Line, Appleby Line and Burloak Drive with generally high traffic volumes, a mix of heavy trucks, high speeds, and, if interchanges are present, high speed freeway traffic merging and diverging at ramps. Addressing the safety and comfort of interchanges is discussed in Section 4.6. Two railway lines also traverse Burlington with crossings restricted to the arterial roadways.

To meet the needs of cyclists, that is, coherence, safety, directness, comfort and attractiveness, locations for pedestrian / cyclist only bridges or tunnels crossing the freeways were investigated. Field observations considered the initial feasibility of going over or under the freeway based on local grades along with property available at either end to provide access to the structure.

One of the initial sites observed was at Cumberland Avenue at the QEW. The City is planning to construct a tunnel for pedestrian and cyclist access under the railway located south of the QEW. Bike lanes exist on Cumberland Avenue between Prospect Street and New Street. It is also about halfway between Brant Street and Appleby Line. However, field observations indicated that there is very little vacant or public land for accommodating access to the structures over the QEW and over the railway to the north in this location.

Three potential sites for cycling/pedestrian crossings as illustrated in Exhibit 18 were identified and are recommended for structural feasibility studies:

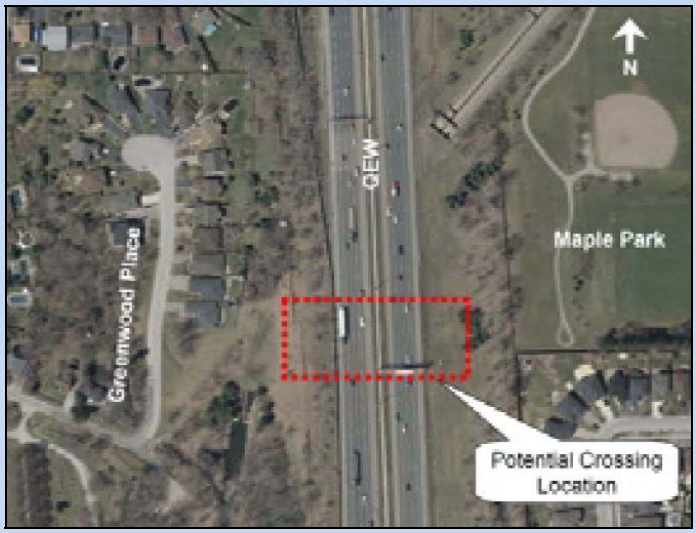
- Pedestrian / cyclist bridge over the QEW north of Lakeshore Road connecting Greenwood Place to Maple Park—this would provide access between the residential and commercial areas in South Aldershot, and the Downtown, Waterfront, and Burlington GO Station to the east, avoiding using Lakeshore Road interchange crossing of the QEW. A trail connection through Maple Park would connect to the existing bike lanes on Maple Avenue.

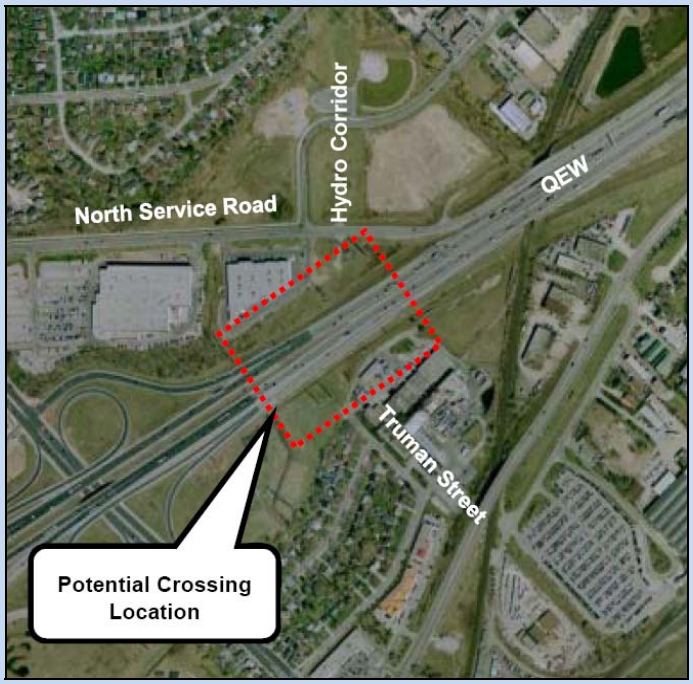
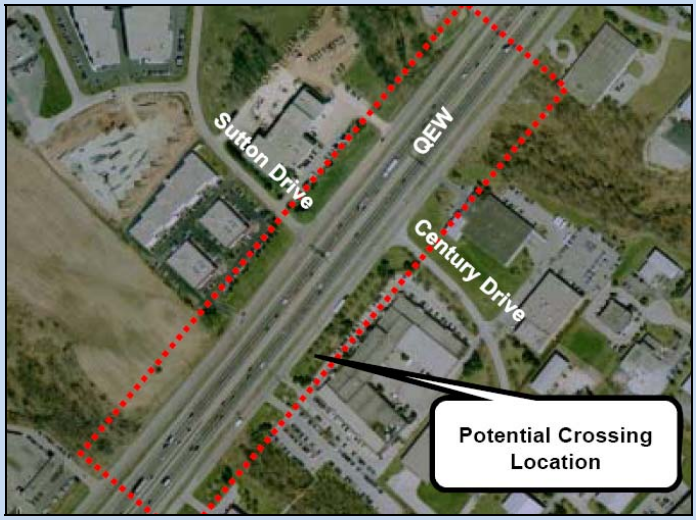
- Pedestrian / cyclist tunnel under or bridge over the QEW along the hydro corridor east of Brant Street. This location has the advantage of connecting the trail along the hydro corridor that traverses the City north of the QEW to the bike lanes on Brant Street south of the QEW. In addition, it could be connected to the Burlington GO Station.

- Pedestrian / cyclist bridge over the QEW near Sutton and Century Drives, between Appleby Line and Burloak Drive. The widening of the QEW to accommodate HOV lanes, and the presence of the North and South Service Roads constrain the provision of a structure over the QEW at this location. However, switch-backed ramps or a staircase with a bicycle-wheel gutter may be feasible.

It is recommended that any structures over or under the freeways are a minimum clear width of 4 m to accommodate the volume and mix of pedestrians and cyclists that such a grade-separated crossing would attract as an alternative to the busy arterial roadway crossings. The newly constructed tunnel for the Bruce Trail under Highway 6 between Highway 5 and Plains Road is only 3 m wide to accommodate hikers only. Tunnels should provide a clear height of 2.75 m to accommodate cyclists.

Exhibit 18: Recommended Locations for Pedestrian / Cyclists Grade-separated Crossings of the QEW

Maple Park to Greenwood Place, between Fairview Street and North Shore Boulevard ➔	

Hydro corridor, between Brant Street and Guelph Line ➔	
Near Sutton and Century Drives, between Appleby Line and Burloak Drive ➔	

5.5 The Quality Framework for the Cycling Network

As a priority, a framework of high quality cycling routes is recommended consisting of:

- Proposed cycle tracks on Dundas Street traversing the northern urban area.
- Upgrades to the Hydro Corridor Trail from Dundas Street to the QEW.
- A new grade-separated pedestrian / cycling crossing of the QEW in the hydro corridor east of Brant Street.

- Upgrades to the Centennial Trail from the City's eastern boundary to the Downtown.

- Existing and proposed bike lanes on Brant Street, Maple Avenue, Fairview Street and Guelph Line connecting in and around the Downtown.

It is important to increase the **cycling quality** on these routes through upgrading, improved designs and maintenance. The Quality Framework is illustrated on Map 2. Additional routes are recommended to complete the network over a period of time.

Measures to improve the cycling quality of these routes to meet the requirements of cyclists (i.e., coherent, safe, direct, comfortable, and attractive) consist of:

- Ensure the trail surface is smooth and wide enough for many types of users. A minimum width of four metres is recommended for multi-use pathways, with six metres being desirable for heavily used pathways.

- Implement safe and convenient crossing facilities where the Hydro Corridor Trail meets major roads such as Guelph Line and Walker's Line. A concept sketch for a median crossing created by Mr. Wim Mulder, traffic engineer, Apeldoorn NL is illustrated in Exhibit 19.

- Provide well-designed and highly functional segregated cycle tracks on Dundas Street in conjunction with this corridor being developed for rapid transit.

- Create a new crossing of the QEW freeway to join the Hydro Corridor Trail to the bike lanes on Brant Street (see Section 5.4).

- A nice crossing facility already exists for the Centennial Trail at Guelph Line; improve the other roadway crossings. Consider raised trail crossings of local streets with trails users having the right-of-way over side street traffic.

- Extend Centennial Trail through the parking lots in the downtown with pavement markings giving it a clear destination in the downtown.

- Implement signage on Centennial Trail and the Hydro Corridor Trail so that it is clear where they are going, the destinations that they connect and the distances to those destinations.

Exhibit 19: Concept Sketch for Median Crossing of Walker's Line at the Hydro Corridor Multi-use Pathway

Source: Mr. Wim Mulder, Traffic Engineer, Apeldoorn NL

5.6 The Recommended Bikeway and Multi-use Pathway Network

The long-term, recommended bikeway network consists of the following:

- Bike lanes on arterial and collector roadways.
- Bicycle priority streets through neighbourhoods.
- Paved shoulders on rural roads.
- Multi-use pathways through open space, parks and corridors.

The recommended bikeway and multi-use pathway network is illustrated on Map 3 and consists of 373 km of existing and proposed facilities. The length of the existing and recommended network by facility type for roads under the jurisdiction of the City of Burlington and those of Halton Region is summarized in Exhibit 20.

CITY OF BURLINGTON
CYCLING MASTER PLAN

IBI GROUP · Stantec · MMM GROUP

Map 2: Proposed Quality Framework for the Cycling Master Plan

- City Hall
- Hospital
- Attractions
- Community Centre and Library
- Sports and Recreation
- Transit / GO Station
- Schools

Bikeway Type

- Existing Bike Lane
- Existing Signed Route
- Existing Multi-Use Path
- Proposed Bike Lane
- Proposed Cycle Track
- Proposed Bicycle Priority Street
- Proposed Paved Shoulder
- Proposed Multi-Use Path

- Regional Cycling Network
- Quality Framework for Burlington
- Metrolinx Rapid Transit Corridor

Proposed Barrier Crossings

- Highway Interchange Crossing
- Grade-Separated Crossing
- Intersection Improvement

Notes:
1. "Regional Cycling Network" based on Cycling and Pedestrian Infrastructure Plan, Figure 1: Conceptual Regional Cycling and Pathways Network (Dec 2003)
2. "Proposed" includes routes already approved by City for construction and routes considered as additions to the network in this study.

Note: Improved access from cycling network to GO Stations will be examined in detail in future studies.

Note: Proposed pedestrian/cycling bridge cantilevered off east side of Burlington Canal Lift Bridge.

N

0 0.5 1 2 Kilometers

L:\jobs\2008\16-08046-001-TP1 Burlington Cycling Master Plan\GIS\Maps\April 2009\Open House Maps\65000670_Map_2.mxd

CITY OF BURLINGTON
CYCLING MASTER PLAN

IBI GROUP · Stantec · MMM GROUP

Map 3: Proposed Burlington Cycling Network

- City Hall
- Hospital
- Attractions
- Community Centre and Library
- Sports and Recreation
- Transit / GO Station
- Schools

Bikeway Type

- Existing Bike Lane
- Existing Signed Route
- Existing Multi-Use Path
- Proposed Bike Lane
- Proposed Cycle Track
- Proposed Bicycle Priority Street
- Proposed Paved Shoulder
- Proposed Multi-Use Path

Proposed Barrier Crossings

- Highway Interchange Crossing
- Grade-Separated Crossing
- Intersection Improvement

Notes:
1. "Proposed" includes routes already approved by City for construction and routes considered as additions to the network in this study.

Note: Provide paved shoulders on rural City roadways north of Highway 5 / 407 if Average Annual Daily Traffic (AADT) exceeds 2,500 vehicles per day.

Note: Improved access from cycling network to GO Stations will be examined in detail in future studies.

Note: Proposed pedestrian/cycling bridge cantilevered off east side of Burlington Canal Lift Bridge.

N

0 0.45 0.9 1.8 Kilometers

L:\jobs\2008\16-08046-001-TP1 Burlington Cycling Master Plan\GIS\Maps\April 2009\Open House Maps\650006?0_Map_3.mxd

Exhibit 20: Recommended Bikeway and Multi-use Pathway Network by Length, Facility Type and Roadway Jurisdiction

Facility Type	Jurisdiction/Right-of-way Ownership		
	City of Burlington	Halton Region	Total Length
EXISTING*			
Bike Lane	36 km	6 km	42 km
Signed Route	3 km		3 km
Multi-use Pathway**	42 km		42 km
Subtotal Existing	81 km	6 km	87 km
PROPOSED			
Bike Lane	78 km	13 km	91 km
Cycle Track		10 km	10 km
Bicycle Priority Street	50 km		50 km
Paved Shoulder	63 km	11 km	74 km
Multi-use Pathway**	61 km		61 km
Subtotal Proposed	252 km	34 km	286 km
Total Recommended Bikeway and Multi-use Pathway Network	**333 km**	**40 km**	**373 km**

Notes:
* Built facilities as of May 2009
** Includes multi-use pathways considered as critical links in the cycling network

6. CYCLE TOURISM

Supporting cycling can enhance several sectors of the economy:

- Create a healthier work force.
- Improve the quality of life leading to a vibrant community that attracts business.
- Support recreational activities of residents with the investment remaining local.
- Attract tourists to explore and enjoy a more vibrant community.
- Create an activity-based tourism sector.

6.1 Case Studies

6.1.1 LA ROUTE VERTE

Regional and even national cycle tourism networks elsewhere in Canada and the world have succeeded in attracting local and international tourists. Inspiring is *La Route verte* in the Province of Québec. It is a 4,000 km long network of bicycle routes that link 16 regions and more than 320 municipalities. It was officially inaugurated on August 10, 2007 with 86% of the network complete. Based on a concept developed by Vélo Québec, *La Route verte* has been under development since 1995, with the collaboration of Transport Québec as well as numerous regional partners. The network was expanded by:

- Using pubic rights-of-way such as abandoned rail corridors, tow paths and hydroelectric rights-of-way.
- Paving shoulders to make roads safer for cyclists.
- Identifying certain rural roads with little traffic as “designated cycling routes”.

Vélo Québec reported that between 1978 and 2005, the government of Québec invested over $104 million in the development if bikeways, including $60 million on *La Route verte*. Paved shoulders, non-existent in 1995, are now more than 1,400 km in length.

In 2000, *La Route verte* cyclists spent a total of $95.4 million. This corresponds to approximately 2,000 jobs (person years) and revenues of $15.1 million for the Government of Québec and $11.9 million for the Government of Canada. Québec cycling tourists spent a total of $54.6 million and people who live near *La Route verte* spent over $24.5 million.

Vélo Québec’s travel agency serves 6,000 cyclists a year with 2,000 of them enjoying Le Grand tour over seven days in Québec.

6.1.2 INTERNATIONAL CYCLE TOURISM

Extensive cycling routes are being implemented in other countries:

- The European cycle route network, Euro Velo, is comprised of 12 long-distance cycling routes crossing the continent of Europe for a total length of 65,000 km, of which 30,000 km is in place.
- The United Kingdom national cycling network consists of more than 16,000 km of cycling routes on multi-use trails, quiet roads and traffic-calmed roads with approximately 75% of the population of the UK living within 3 km of a national route.
- The German national cycling network is made up of 12 national routes with a length of 11,700 km, part of the country's national cycling plan to promote more cycling in Germany.

- SwitzerlandMobility is a national strategy to support a national human-powered network (cycling, mounting biking, in-line skating and canoeing). The network consists of 20,000 km of routes, 100,000 signposts accessible from 18,000 public transit stops. Planning and implementation of the 3,300 km of national cycling routes has cost approximately $4.6 M CAD over five years (much of the infrastructure was in place but needed minor upgrading and signing). Revenue from vacationing cycle tourists was reported at $75 M CAD per year and for cycling day trips at $55 M CAD a year. Marketing is integrated into Switzerland Tourism. SwitzerlandMobility continues to invest $2.2 M CAD per year to provide overall co-ordination and monitoring of the networks, develop partnerships, ensuring quality, updating, publishing and marketing the networks. Thirty-nine percent of this funding is from the federal government, 39% from the municipalities and 22% from private sources.
- The Dutch National Cycling Platform supports 4,500 km of national cycling routes plus thematic circle tours and regional routes for a total of 25,000 km of cycling routes. The essential elements of their strategy include working with a good landscape, infrastructure, product development, services and marketing for cycle tourism. At the Ontario Cycle Tourism Forum 2009, they reported that their investment in cycle tourism infrastructure is approximately $110 EUR/km/year ($175 CAD) with revenue from cycle tourism returning at a rate of $20,000 EUR/km/year ($32,000 CAD/km/year).

European trends indicate that cycle tourism could reach 5 to 10% of the total tourism market. In 1999 it was reported that three million people cycled In Switzerland. Some 350,000 stayed overnight spending on average C $120/day. Day-trippers spent on

average C $20/day. In 1999 in the UK, cycle tourists spent on average $200/person per holiday.


Photo credit: Waterfront Trust

Bicycle-friendly and walkable communities are good for business, revitalizing urban centres, creating business opportunities around urban and rural scenic routes, and creating active tourism-related businesses. The Consul General of the Kingdom of the Netherlands in Toronto, Mr. J. Kramer, at the Ontario Cycle Tourism Forum 2009 stated that there is a "strong relationship between the everyday cyclist and tourism cycling".

6.1.3 CYCLE TOURISM IN NORTH AMERICA


Photo credit: Victor Gedris

Closer to home, the Pennsylvania Tourism Office reported that the state has 2,100 km of rails-to-trails plus additional state parks and forest trails for a total of 8,000 km of paths. Their marketing campaign focuses on personal conversations, encouraging tourists to "share experiences, share enthusiasm and share secrets" through their tourism web site. Cycling is a part of the outdoor tourism segment. It is understood by everyone—everyone can image themselves doing it, thus it can stimulate traveling. It is also eco-friendly and psyche-friendly—few people fail at cycling.

The Government of Maine reported in 2001 that self-guided bicycle tourists spend $55/day, guided tourists spend $115/day, day trippers $25/day and local residents $4/day. Multiple-day bicycle tours constitute 2% of the total number of cyclists but 17% of the total expenditures.

A study of bicycle facilities in North Carolina reported in 2004 indicated that the Government had invested $6.7 million of public funds to construct off-road paths and add wide paved shoulders to roads in the Outer Banks region. Bicycling in the Outer Banks benefits the area annually at an estimated US $60 million and bicycle facilities are an important factor for many tourists in deciding to visit the area.

The Toronto-Niagara Bike Train Initiative was developed by Transportation Options, a non-profit organization dedicated to promoting sustainable transportation, in response to the growing tourism demand and economic opportunity for improved transportation access for cyclists between Toronto and the Niagara Region. Bike racks were introduced onboard select VIA Rail departures between Toronto and Niagara Falls in 2007. In 2008, over 1,000 bike trips were made by passengers using the Bike Train. Addition funding and partnerships will be expanding the service to Windsor, Kingston and North Bay.

The Waterfront Trust developed and ran their first cycling tour, The Great Waterfront Trail Adventure, in 2008 with 170 cyclists—54% had never been on a cycling tour before—cycling 730 km through 40 communities over 8 days. The key challenges were support in the local hotels and inter-modal transportation to the start or finish of the route. The

Waterfront Trust works to mobilize the local trail managers to “get ready for company”. The 2009 tour is expanded to 250 participants with a base price of $450 per individual.

In the Regional Niagara Bikeways Master Plan it was reported that:

- In 2005, cycling tourists represent 15.7% of all tourists in Niagara Region and is expected to grow to 18% by 2020.

- Direct expenditures from cycling tourists represent approximately $164 M in 2002, or 12% of the total tourism expenditures in the Region. This is projected to grow to $237 M over the next 20 years.

- The spin-off of the direct expenditures is 4,900 direct and indirect jobs in the Region in 2002, projected to increase to 7,000 over the next 20 years.

Regional Niagara has partnered with the Niagara Freewheelers Cycling Club to create the on-line Library of Scenic Bicycle Routes in Niagara with over 200 of their cycling route maps. In the first month, they received 1,300 visits to the web site.

6.1.4 CYCLING RACES

Based on a press release by the Canadian Sport Tourism Alliance, the 2003 Road World Cycling Championships held in Hamilton generated a total estimated economic activity of $48.3 M in the Province including $31.1 M in the Hamilton region and an additional $17.2 M for other regions in Ontario. In the City of Hamilton, wages totalled $9.4 M and nearly 410 jobs. $3.8 M in taxes was accrued to the federal government, $3.3 M to the Province of Ontario, and $1.4 M to municipal government, including $980,000 to the City of Hamilton. The Championships involved over 900 participants and an estimated 23,800 other visitors to the region.

Philip Pugliese, Bicycle Coordinator for Outdoor Chattanooga reported that the City has had an overall positive experience from their relationship with the Tour de Georgia professional stage race. The benefits include:

- Placing cycling in front of local and regional businesses as a driver of economic activity and creating sponsorship relationship for future cycling promotions and activities.

- Solidified their relationship with the Convention & Visitors Bureau for bicycle tourism activities.

- Created numerous press opportunities for cycling stories, both racing and general cycling for transportation and recreation. The local newspaper served as the local host sponsor and created a special Tour section for distribution.

The impacts noted were traffic closures that created some disturbance to local traffic and businesses.

Deb Ridgway, Bicycle & Pedestrian Coordinator, Kansas City, MO reported that a stage of the Tour of Missouri, CycloCross Nationals and annual regional races are held in Kansas City. The City has established good will and cooperation for the region with entities that may not have been as supportive of local cycling issues prior to such events. The City saw over $5 million in economic impact in the first year of the Tour of Missouri.

Each year the Sea Otter Classic, North America's largest cycling festival, brings Olympic, professional, and amateur athletes from over 30 countries to the Monterey Peninsula CA for four days of intense competition in front of audiences of nearly 50,000 cycling enthusiasts. According to an Economic Impact Report released in 2006, the 2005 Sea Otter Classic generated $28.6 million for local communities. The event is a major vehicle to promote tourism for the region.

6.2 Travel Activities and Motivation Survey—Cycling Trips

The *Travel Activates and Motivation Survey* (TAMS) examines the recreational activities and travel habits of Canadians and Americans for out-of-town, overnight travel for one or more nights over the two year period of 2004 and 2005. For cycling, the survey examines recreational someday excursions, mountain biking, and overnight cycle touring. Some of the results of the survey are summarized in Exhibit 21.

Exhibit 21: Characteristics of Canadian and American Pleasure Travels to Canada who Participated in Cycling While on an Out-of-town, Overnight Stay of One or More Nights (2004 and 2005)

Characteristics	Canadian Pleasure Travellers	American Pleasure Travellers
No. of adults who went cycling	10.1% (2.94 M)	4.9% (10.9 M)
Participated in— Recreational same-day cycling excursion: Mountain biking: Overnight cycle touring: All three cycling activities	 8.3% 3.0% 1.0% 0.3%	 3.8% 1.5% 0.4% 0.1%
Gender and Age	More likely male 25 to 54 years of age More likely to have children under 18 than non-cyclist pleasure travellers	
Average Age	40.6	41.8
Level of Education	Above average—38.9% with university degree	Above average—72.2% with university degree
Average Household Income	Above average—$78,800	Above average—$91,200
Travelling to Ontario	58.2% (1.71 M)	14.3% (1.56M)

Characteristics	Canadian Pleasure Travellers	American Pleasure Travellers
Culture and entertainment pursued while on trips	More than half pursue: Shopping and dining Historical sites, museums and art galleries Theme parks and exhibits Fairs and festivals Musical concerts, festivals and attractions	More than half pursue: Shopping and dining Historical sites, museums and art galleries Theme parks and exhibits Casino, theatre and comedy clubs Fine dining and spas
Use of internet to plan and book travel	Plan—75.3% Book travel—48.7%	Plan—84.9% Book travel—64.6%
Preferred accommodations	Public campgrounds, wilderness campsites and resorts	Public campgrounds and various types of resorts

6.3 City of Burlington Context

Implementation of Burlington Tourism Service Model (November, 2005, Cameron Hawkins & Associates Inc. et al) outlines the vision statement that guides the City's initiatives related to its tourism investments and roles:

> Burlington will provide a distinct tourism experience focused on the waterfront, downtown and natural features and attractions that will respect and enhance the quality of life of the community.

Cycle tourism fits with the five of the six key elements of the vision statement:

- Create quality tourism destinations that also enhance the high quality of life of Burlington residents.
- Continue developing the waterfront in a manner that will attract visitors and provide long term benefits to residents.
- Create a distinct and vibrant downtown experience for tourists.
- Develop outdoor and natural area tourism activities that profile Burlington's unique natural areas, features and attractions.
- Foster energy and excitement as the central elements of Burlington's attraction as a destination point and provide a memorable tourism experience for visitors who will want to come back again and again.

Photo credits: John J. Barnhardt

Some successes in the City include events organized for Bike Week (Lids for Kids, Bike to Work Day and Ride with the Ride with the Mayor and Community Barbecue), the bicycle valet parking that was offered for the first year at one of the Waterfront festivals, and the first annual Tour de Greenbelt. On the 2008 Tour de Greenbelt, over 1,200 riders enjoyed four separate rides, one being 65 km long from Burlington to St. Catharines marketed as the "Sea to Sky - Ride the Escarpment". The Waterfront Trail, Royal Botanical Gardens, Niagara Escarpment, parks and natural areas are promoted through Burlington Tourism, and are destinations appealing to cyclists. A number of cycling clubs from the area take training rides on the rural roads in Burlington and there are a number of mountain biking tails along the Niagara Escarpment.

Although photographs of cyclists can be found on the Burlington Tourism web site with information or links to the Waterfront Trail and natural areas, there is no explicit mention of cycling opportunities, not even a link to the *Burlington Cycling and Multi-use Pathway Guide*. Bicycle rentals are currently not available in Burlington. Burlington Transit integrates with cycling through their bicycle racks on buses service, but regional transportation carriers bringing visitors to the City from other areas are more restrictive. GO Transit will have bicycle racks affixed to all of their buses in the near future, and bicycles are permitted on GO trains but only during off-peak travel periods. VIA Rail offers transportation of bicycles on their regularly scheduled trains with baggage cars on the Windsor to Montreal corridor, but the Aldershot station in Burlington does not offer baggage handling services so bicycles cannot be loaded or unloaded at this station. An overall destination-oriented and/or scenic routes signage strategy for City cycling routes and trails is lacking.

Burlington could become a host for cycling races to support sport, cycling in general and tourism in the region given the mix of rural roads, urban centre for visitor support, and topography offered by the Niagara Escarpment,.

6.4 Bicycle Tourism Recommendations

The City of Burlington should work with Burlington Tourism to promote cycling and bicycle tourism in the City, and consider hosting competitive cycling events.

A cycle tourism marketing strategy in Burlington should generate interest in the varied cycling opportunities in the City, provide information about cycling resources to assist travelers in planning cycling vacations, direct cyclists to areas where road and traffic conditions, landscape and services create a positive cycling experience, and stimulate private sector investment in making Burlington a cycle tourism destination. Approaches could include:

- Leverage promotional activities for major events such as the festivals that occur at the Waterfront.

- Continue to co-ordinate promotion with the Waterfront Trust on the Lake Ontario Waterfront Trail, and the Friends of the Greenbelt Foundation on the Tour de Greenbelt.

- Build on the cycle tourism success of the Niagara Region, with Burlington as a starting or stopping-over point.

- Extend the Go by Bike program that markets GTA visitors to take their bicycle on the GO train on weekends and travel to a municipality to explore their bike routes and trails.

- Continue to host Ontario Cup Races, Provincial Championship Races and other competitive cycling events. Council approved submitting a bid to host the 2011/12 Canadian Cycling Championships.

Based on the successful structure of SwitzerlandMobility, tapping into the cycle tourism market requires investment in:

- The development and maintenance of cycling routes in the urban and rural areas of the City.

- Way-finding and destination signage and information along the route.

- Information such as guidebooks and maps (hard copy and/or electronic) about the routes, accommodation, services, events and public transportation transfer or access points.

- Publicity or marketing via various media and partners to guests.

- Finally, the guests returning investment to the region.

Funding for the creation of tourism experiences and innovative product development for emerging markets is available through the Ontario Ministry of Tourism's Tourism Development Fund (www.tourism.gov.on.ca/english/IDO/tdf.htm).

7. BICYCLE-FRIENDLY POLICIES, PRACTICES AND PROGRAMS

Specific policies and practices recommended to support the vision for cycling in Burlington are summarized in Exhibit 22. The recommendations have been developed to address four main action areas: bicycle-friendly community, bikeway network, cycling-related practices and cycling-supportive programs. They have also been further categorized by implementation time frames: on-going, immediate (within 1 year) and 2 to 5 years.

Exhibit 22: Recommended Cycling Supportive Policies

Recommended Policy or Practice	Time Frame for Implementation
BICYCLE-FRIENDLY COMMUNITY	
Continue to support a Burlington Cycling Committee of Council	On-going
Support the City's land-use policy and regulations to require developers and owners to provide bicycle end-of-trip facilities, and create sites that are bicycle-friendly	On-going
Provide end-of-trip facilities at all City-owned buildings	On-going
Co-ordinate the integration of cycling with Burlington Transit, including continuing to support bicycles on transit vehicles, bicycle parking and bicycle route access to key stops	Immediate
Collaborate with Metrolinx on the integration of cycling with regional transit, including bicycles on transit vehicles, improved access and parking at GO Stations, and bicycle route access to and along corridors, in particular the Dundas West Rapid Transit Corridor	Immediate
Through the secondary planning or draft plan of subdivision process, consider the bikeway network and integrate bicycle facilities to create new communities and neighbourhoods that are bicycle-friendly	Immediate
Collaborate with the Region of Halton on implementing their Cycling Master Plan	Immediate
Create a program that will make it easier for property owners to address the lack of bicycle parking at existing developments	2 to 5 years
Create and provide design guidelines on bicycle end-of-trip facilities	2 to 5 years
BIKEWAY NETWORK	
Continue to work with the Province to create safe space for cyclists and pedestrians to cross freeway interchanges within the City	On-going
Commit to the implementation of the recommended cycling and multi-use pathway network	Immediate

Recommended Policy or Practice	Time Frame for Implementation
Routinely consider the needs of cyclists in transportation projects, such as: • Design of new collector and arterial roadways, and bridge construction projects to include bike lanes and/or paved shoulders • Reconstruction and resurfacing of collector and arterial roadways to include bike lanes and/or paved shoulders, and providing paved shoulders on rural roadways that carry more than 2,500 vehicles a day • Projects for the Downtown and Waterfront • Crossings of existing and future barriers, including waterways, railways, freeways and interchanges, and rapid transit corridors • Traffic calming projects	Immediate
Develop a bicycle lane by-law that allows the City to regulate and enforce traffic use of the bicycle lanes subject to the *Highway Traffic Act*	Immediate
Collaborate with adjacent municipalities create continuous cycling routes and links between communities	Immediate
Collaborate with the Region of Halton and adjacent municipalities on developing and implementing a signage strategy for the bikeways	Immediate
Develop a policy to define electric bicycles and their use on City bikeways and multi-use trails	2 to 5 years
Review the sidewalk riding by-law in the context of pedestrian needs, cyclists' safety and the adequate provision of comfortable, on-road bikeways	2 to 5 years
CYCLING-SUPPORTIVE PRACTICES	
Continue to update and circulate the Cycling and Multi-use Pathway Guide as needed	On-going
Consider the need for a City cycling co-ordinator to oversee the implementation of the plan and co-ordinate responsibilities among City departments	Immediate
Collaborate with Halton Region and the Safe Routes to School programs	Immediate
Encourage the Ministry of Transportation of Ontario to establish an expert review process to recommend changes to the Provincial Highway Traffic Act and Municipal By-Laws as they affect cyclists, including legislation or regulations that would support the implementation of cycle tracks	Immediate
Routinely consider the needs of cyclists in transportation services and practices such as: • Strategies to maintain bikeway and multi-use pathway infrastructure physical condition, surface condition, and signs and pavement markings • Traffic data collection programs including traffic counts and collision records • Construction zones and traffic management plans for public rights-of-way	2 to 5 years
Develop a cycling-specific road or multi-use pathway hazard reporting strategy for cyclists	2 to 5 years

Recommended Policy or Practice	Time Frame for Implementation
CYCLING SUPPORTIVE PROGRAMS	
Continue to collaborate with the Region of Halton, Metrolinx and Smart Commute Halton on travel demand management programs (Bike to Work Day, Clean Air Commute, etc.) to shift transportation behaviours of City staff and other large employers in the City	On-going
Support community events and activities that encourage more cycling, including co-operatively planning traffic control during events, and requiring the provision of bicycle parking or bicycle parking valet services at events	Immediate
Collaborate on safety, education and enforcement campaigns and programs that focus on skills training and collision prevention	Immediate
Work with Burlington Tourism to promote cycling and bicycle tourism in the City and consider hosting competitive cycling events	Immediate
Develop a one portal information link on the City's web site for information about cycling in Burlington	2 to 5 years
Consider partnering with community stakeholders to deliver Kids CAN-BIKE Camps as part of the summer camps and programs offered through the City's Parks and Recreation Department	2 to 5 years
Collaborate with the Halton Police to support neighbourhood policing using bicycle patrols	2 to 5 years
Develop a bicycle-friendly designation for destinations program and a bicycle-friendly business awards program to recognize the efforts of private organizations in supporting cycling in the City	2 to 5 years

8. IMPLEMENTATION

The implementation of the recommended bikeway and multi-use pathway network is intended to guide decision-making over the next 10 years plus. It is based on the current knowledge of the City's capital works program, development phasing, and network priorities to improve the cycling quality and network continuity to key destinations. The implementation plan consists of three phases: short-term (2009 to 2015); mid-term (2016 to 2020) and long-term (2021 and beyond).

The following strategies for the implementation of the various routes in the recommended network were considered:

1. Where possible take advantage of and work in tandem with planned City, Regional and Provincial road, trail and transit construction projects.

2. Construct bikeways and pathways in new development areas as construction progresses.

3. Consider the Burlington Cycling Committee, staff and public opinions regarding priorities.

4. Close gaps in the existing network.

5. Improve the quality of cycling by implementation the quality framework for a cycling network, including connections across the QEW, to Downtown Burlington and the Waterfront, and GO stations.

6. Build where cycling demand is anticipated and higher cyclist volumes are expected (includes key corridors and/or key destinations).

7. Provide connections to the main multi-use pathways, such as the Hydro corridor, Centennial Trail and Waterfront Trail that also serve as high quality cycling routes.

8. Attempt to provide an equitable distribution of routes north, south, east and west of the QEW and in the various neighbourhoods throughout the City.

Strategy No. 1 is fundamental to the implementation strategy and is based on known and/or documented capital forecasts, which change from time to time and require annual Council approval. Therefore, it is important that those responsible for monitoring and scheduling the network implementation reconfirm capital forecasts at the City, Region and Province on a regular basis.

8.1 Unit Costs for Construction

A schedule of estimated unit costs used to estimate network implementation costs is provided in Exhibit 23. These are based on the following assumptions:

- Estimates do not include the cost of property acquisitions or utility relocations.
- Costs associated with major site-specific projects such as bridges, railway crossings, retaining walls and stairways are not included in the estimate.
- Typical environmental conditions and topography are assumed.
- All applicable taxes are additional.

Estimated unit costs for the construction of bikeways and multi-use pathways are based on averages obtained from recent construction projects in southern Ontario. They should be used as a guideline only for establishing the costs for implementing the network.

Exhibit 23: Estimated Unit Cost Schedule for Bikeways and Multi-use Pathways

	Item	Unit	2009 Dollars Unit Price	Comments / Assumptions
1. Bike Lanes				
1.1	Paint bike lanes on existing wide lanes / roadway or as part of road resurfacing project (line painting and signage)	per km	$10,000	Paint bike lane lines, bicycle symbol and diamond every 200 m, bike lane signage every 300 m
1.2	Retrofit bike lanes to existing roadway (line removal, painting and signage)	per km	$23,000	Remove existing lines (assume four-lane roadway), repaint lane lines including bike lane, bicycle symbol and diamond every 200 m, bike lane signage every 300 m
1.3	Add bike lanes as part of road new construction / reconstruction / widening project	per km	$116,000	Additional pavement (granular and asphalt), paint bike lane lines, bicycle symbol and diamond every 200 m, bike lane signage every 300 m; removals, curb & gutter, utility leads included in road portion of construction costs
1.4	Pave existing granular shoulders as part of road resurfacing / reconstruction project	per km	$76,000	Additional asphalt, paint bike lane lines, bicycle symbol and diamond every 200 m, bike lane signage every 300 m

Item		Unit	2009 Dollars Unit Price	Comments / Assumptions
1.5	Add paved shoulders as part of road new construction / reconstruction / widening project	per km	$130,000	Additional pavement (granular and asphalt), paint bike lane lines, bicycle symbol and diamond every 200 m, bike lane signage every 300 m; removals, grading, sub-drains included in road portion of construction costs
2. Shared Lanes				
2.1	Add bicycle route signage rural area	per km	$1,300	One bicycle route sign with appropriate tabs (directions, destinations, distances, etc.) every 1 km, plus two on side streets every 1 km, additional route map sign every 5 km
2.2	Add bicycle route signage urban area	per km	$2,800	One bicycle route sign with appropriate tabs (directions, destinations, distances, etc.) every 300 m, plus two on side streets every 500 m, additional route map sign every 5 km
2.3	Add shared lane markings to existing travel lanes	per km	$15,000	Bicycle symbol and double chevrons every 75 m both sides, share the road signage every 300 m both sides
2.4	Create bicycle priority street	per km	$76,000	Traffic calming, major roadway crossing (detection and bike box, median refuge, or signalization every 1.5 km), bicycle route sign with tabs (directions, destinations, distances, etc.) every 300 m
3. Cycle Tracks				
3.1	Construct cycle tracks adjacent existing roadway	per km	$470,000	2.0 m wide with boulevard side curb, travel lane delineation / curb, cycle track pavement, bicycle symbol and diamond every 200 m, bike lane signage every 300 m, major intersection bicycle signals every 600 m, minor side street / driveway modifications

Item		Unit	2009 Dollars Unit Price	Comments / Assumptions
3.2	Construct cycle tracks as part of road new construction / reconstruction / widening	per km	$320,000	2.0 m wide with travel lane delineation / curb, cycle track pavement, bicycle symbol and diamond every 200 m, bike lane signage every 300 m; removals, grading, boulevard side curb, additional bicycle traffic signal heads; signalization and side street / driveway modifications included in road portion of construction costs
4. Multi-use Pathways				
4.1	Pave existing granular pathway and add signage	per km	$45,000	3.0 m wide
4.2	Widen and resurface existing asphalt pathway and add signage	per km	$110,000	Widen from 3.0 m to 4.0 m
4.3	Construct new multi-use asphalt pathway with signage	per km	$200,000	4.0 m wide, normal site conditions
4.4	Construct new multi-use concrete pathway with signage	per km	$200,000	3.0 m wide, normal site conditions
4.5	Construct trail crossing of minor roadway (high visibility crosswalk)	each	$1,500	Inlaid durable ladder marking
4.6	Construct raised trail crossing of minor roadway	each	$8,500	Includes inlaid durable ladder marking
4.7	Construct median refuge trail crossing within existing roadway width	each	$10,000	
4.8	Construct median refuge trail crossing of major roadway, deflecting roadway alignment	each	$53,000	3.0 m wide x 30 m long refuge island with 60 m long roadway tapers (alignment deflection), 50 m of trail realignment; assume existing sidewalk remains
4.9	Construct signalized trail crossing of major roadway	each	$50,000	Construct signals with detection; no median refuge
4.10	Upgrade existing multi-use trail including crossings and signage	per km	$390,000	Widen from 3.0 to 4.0 m, and improve minor and major street crossings

Item		Unit	2009 Dollars Unit Price	Comments / Assumptions
5. Freeways				
5.1	Interchange retrofit with pavement markings and signage	each	$22,000	Assume interchange area is 800 m long, assume remove one set of existing lane lines both sides, repaint lane lines including shared lane marking every 75 m, warning signs
5.2	Interchange retrofit with jug-handle crossing of ramps	each	$42,000	Includes four jug handles per interchange, some restriping of lanes and addition of shared lane markings every 75 m leading up to jug-handle
5.3	Grade-separated structure over freeway	each	$2 to $8 M	Basic bridge with railing and chain-link enclosure

8.2 Network Phasing and Funding

A potential phasing plan of the recommended bikeway and multi-use pathway network is illustrated on Map 4. The probable cost to implement the various bikeway types is summarized in Exhibit 24. The potential sources of funding for the first two phases are also estimated.

Exhibit 24: Probable Cost and Potential Sources of Funding for each Phase of the Recommended Bikeway and Multi-use Pathway Network

Facility Type	Length	Probable Cost
PHASE 1 SHORT TERM (2009 – 2015)		
Bike Lane	40 km	$ 9,846,000
Cycle Track	10 km	$ 3,000,000
Bicycle Priority Street	15 km	$ 1,140,000
Paved Shoulder	9 km	$ 950,000
Multi-use Path[1]	44 km	$ 11,790,000
Subtotal Phase 1	118 km	$ 26,726,000
Phase 1 Funding Sources	Development Charges (DC)	$ 2,930,000
	Roadway Capital Works (CW)	$ 3,670,000
	Combination of DC and CW	$ 3,940,000
	Joint Federal and Provincial Infrastructure Program	$4,300,000
	Other funds	$ 1,980,000

Facility Type	Length	Probable Cost
PHASE 2 MEDIUM TERM (2016 – 2020)		
Bike Lane	8 km	$ 5,270,000
Bicycle Priority Street	17 km	$ 1,290,000
Paved Shoulder	3 km	$ 390,000
Multi-use Path[2]	4 km	$ 2,850,000
Subtotal Phase 2	32 km	$ 9,800,000
Phase 2 Funding Sources	Development Charges (DC)	$ 3,400,000
	Roadway Capital Works (CW)	$ 1,690,000
	Other funds	$ 1,200,000
PHASE 3 LONG TERM (2021 and beyond)		
Bike Lane	30 km	$ 2,320,000
Bicycle Priority Street	18 km	$ 1,350,000
Paved Shoulder[3]	51 km	$ 140,000
Multi-use Path	13 km	$800,000
Subtotal Phase 3	112 km	$ 4,610,000
Phase 3 Funding Sources	To be Determined	
GRAND TOTAL[4]	262 km	$ 42,140,000

Notes:
Includes cost to upgrade 42 km of existing multi-use pathways
Includes pedestrian/cyclist railway underpass at Cumberland Street
Costs for paving rural road shoulders north of the 407 are not included
Does not include Regional facilities, except Cycle Track proposed along Dundas Street

CITY OF BURLINGTON
CYCLING MASTER PLAN

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Map 4: Bikeway Network Implementation Schedule

- City Hall
- Hospital
- Attractions
- Community Centre and Library
- Sports and Recreation
- Transit / GO Station
- Schools

Bikeway Implementation Phases

- Existing
- Short Term (2009 - 2015)
- Medium Term (2016 - 2020)
- Long Term (2021 and beyond)
- Unspecified (Route on Regional Road)

Proposed Barrier Crossings

- Highway Interchange Crossing
- Grade-Separated Crossing
- Intersection Improvement

Note: Provide paved shoulders on rural City roadways north of Highway 5 / 407 if Average Annual Daily Traffic (AADT) exceeds 2,500 vehicles per day.

Note: Improved access from cycling network to GO Stations will be examined in detail in future studies.

Note: Proposed pedestrian/cycling bridge cantilevered off east side of Burlington Canal Lift Bridge.

N

0 0.45 0.9 1.8 Kilometers

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The on-road bikeway network component of the plan is expected to be funded as follows:

- Bikeways on new roads within new subdivisions should be built and funded by development, through subdivision agreements with the City.
- Bikeways on existing arterial and collector roads in growth areas that are to be widened to accommodate growth should be funded through development charges.
- Bikeways on existing roads in established areas of the City will be funded through the Capital Works program.
- Developers of new residential and commercial subdivisions should be encouraged through the planning process to construct new multi-use pathways and connections to the proposed network.
- Bikeways proposed in future rapid transit corridors should be funded by the transit program supported by the City, Region and Province.
- Other funds from Provincial and Federal programs and grants, such as the Gas Tax transfers, Metrolinx's "Quick Wins" funding and infrastructure renewal programs.

For Phases 1 and 2, $16.8 M of the network (56%) is already funded through the *2009-2018 Capital Budget and Forecasts* and the proposed *2009 Development Charges Background Study* and other special funding. Additional funding of $13.4 M over 12 years equivalent to $1.1 M per year would be required to fully implement the plan within that timeframe. This is equivalent to about $6.80 per capita per year. In contrast, the City of Toronto has approved a bike lane program for 2009 equivalent to $7/capita, and Apeldoorn NL spends $3.2 M annually on stand-alone bikeway projects (not including those projects included in road construction projects) plus an additional $100,000 on promotion a year equivalent to about $21/capita. City of Burlington staff will identify both capital and operating budget implications as cycling projects move forward to implementation.

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