

C3

Appendix C3: Priority Multi-use Recreational Trails Network Development



City of Vaughan

Pedestrian and Cycling Strategy

Report – Trail Network Development

June 2018

B000773



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1.0 Multi-use Recreational Trail Network Development

1.1 Benefits of Trails and Active Transportation

Active transportation has many physical benefits for healthy communities. It can improve public health by reducing rates of chronic disease such as heart disease and cancer, while also reducing greenhouse gas emissions and easing traffic congestion. Levels of walking and cycling in most communities are low compared to automobile use, but there is considerable room for growth and even some positive trends.

Across Canada, there is growing momentum among governments and non-governmental organizations as they develop policies and programs to support active transportation and healthy built environments. While community planning, design and implementation are largely the responsibility of municipal and regional governments, provincial and territorial governments can also lead valuable initiatives.

1.2 Introduction to Existing Pedestrian and Cycling Network

The City of Vaughan is centered on Highway 400 immediately north of Toronto, and occupies the southwestern portion of York Region. Its four main communities include Kleinburg, Maple, Woodbridge and Thornhill. Smaller districts include Nashville, Carrville, Purpleville, Vellore, Concord and Teston. The existing cycling network in Vaughan connects with the York Region Cycling and Pedestrian network and functions as both a regional and local system. Much of the existing network is comprised of multi-use recreational trails in the creek valley system of the Humber River East branch and the West Don River which has been the focus of network development.

The City of Vaughan includes four main communities, which results in limited access within and around the City of Vaughan by bicycle, and there is a growing demand for more infrastructure to connect residents to key destinations within these communities such as to residential, employment, cultural, natural and transit etc.

In recent years, the City has expanded the cycling network by constructing cycling routes to improve and enhance the multi-modal transportation and recreational system to accommodate growing demand from local cyclists, to achieve mode split targets outlined in the City of Vaughan's 2012 Pedestrian and Bicycle Master Plan Study, and reflect current best practices.

The existing multi-use recreational trail network is comprised of local fragments except for the following two key trail segments:

- *The Barley Smith Greenway* - A 15 km trail following the course of the West Don River through Maple and Concord.
- *The William Granger Greenway* - This 6 km trail follows the course of the East Humber River and is part of the historic Carrying Place Trail used by the Aboriginal people. The trail runs uninterrupted from Kleinburg to the Boyd Conservation Area.

Using existing GIS information, a map of current cycling conditions was created, and information was updated based on input from staff and field reviews. The map below illustrates the existing multi-use recreational trail network in Vaughan at the time the plan was developed.

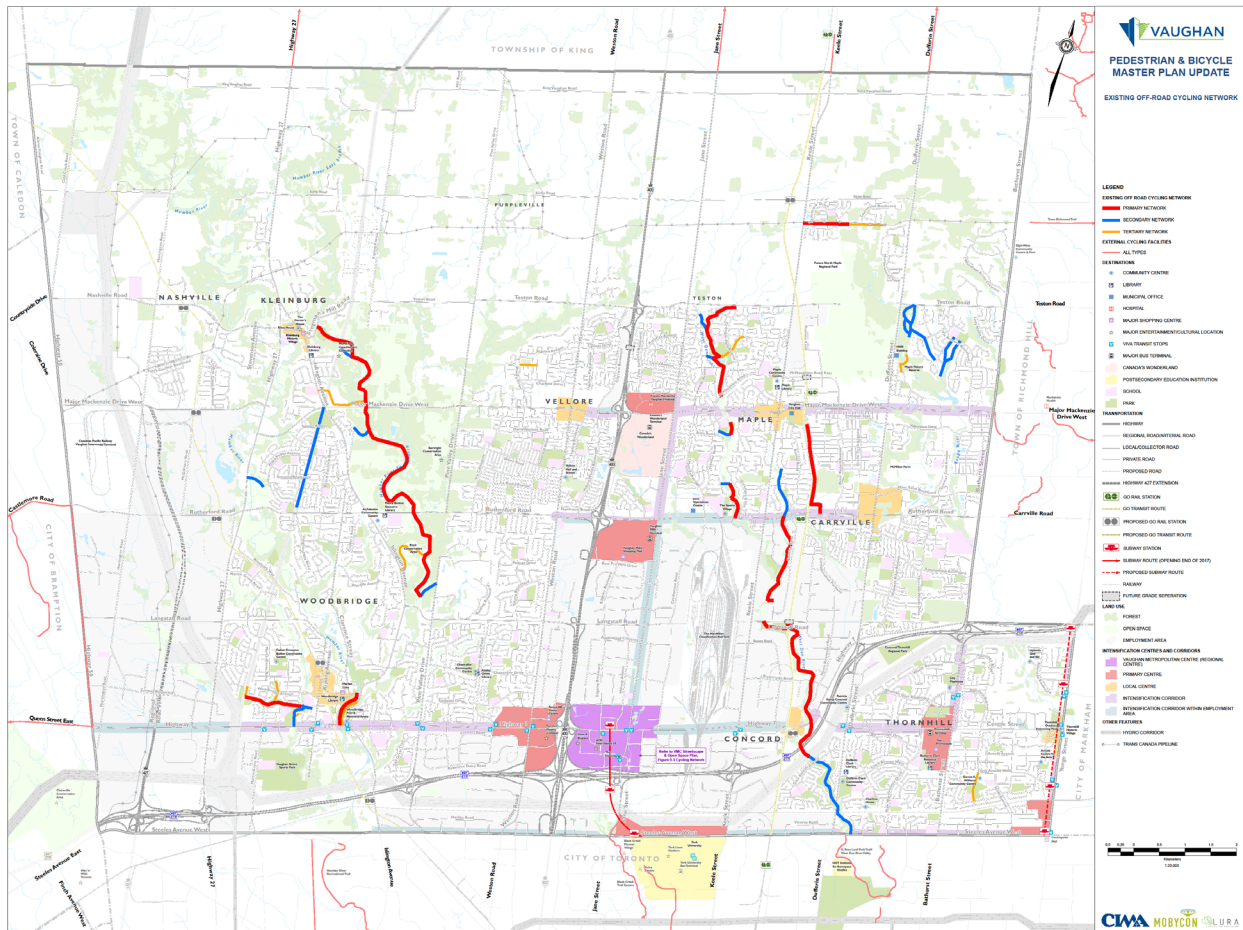


Figure 1.0 Existing Multiuse Recreational Trails Map (2018)

Existing multi-use trail systems outside of City of Vaughan Boundary - (refer to Figure 1.0 above)

There are several well connected trail systems at the City border such as:

- City of Toronto - Humber River Recreational Trail
- City of Toronto - Black Creek Trail System
- City of Toronto - G. Ross Lord Park Trail/West Don River Valley Trail System
- City of Richmond Hill - Trans Richmond Trail

The Vaughan Super Trail concept was shared with the Cycling and Pedestrian Advisory Task Force in December of 2016 through a “Connecting the Dots – The Vaughan Super Trail Concept” presentation. On April 3, 2017 through a presentation to Finance, Administration and Audit Committee, the concept was presented as part of final report by the task force. The concept was endorsed by Council on April 19, 2017. This plan was designed to connect local trails within a larger City-wide system with an aspiration to be 100 km long. The current study has used the Vaughan Super Trail as the basis for going forward and developing a complimentary Secondary Network. The Vaughan Super Trail will function as the Primary Spine, supported by a series of Secondary Network connections including shorter local secondary loops for access from neighbourhoods. These routes will also be interconnected with the cycling facility and multi-use recreational trail networks of adjacent municipalities.

1.3 User Profiles and Activity Types

Active Transportation describes all human powered forms of travel, such as walking, cycling, in-line skating, skate boarding, cross country skiing, scooters etc. Modes of travel are becoming more diverse where walking and cycling are still most popular, however designing multi-use recreational trails should accommodate different users. The intent is to develop a multi-use recreational trail network to be used for all purposes, and not only focused on recreational and commuter purposes.

Providing a high level of accessibility is important for the success of Vaughan's multi-use recreational trails. Compliance with legislated requirements and best practices for accessibility are critical for determining trail designs.

The majority of the multi-use trails must accommodate emergency vehicles, maintenance vehicles and/or waste removal trucks wherever possible. This will influence minimum trail widths and trail construction requirements, and have impact on loading requirements for trail structures, and the cover required over culverts and drains.

It is not always possible to make accurate calculations of user volumes for planned trails. However a generalized comparison with other, similar trails in the Greater Toronto Area is possible. Some factors to consider are ratio between size of catchment area and length of trail, population density of catchment area, number of entry points, and availability of alternative trail options within a given area or the cycling network.

1.4 Network Development Approach

The development of the planned trail network had broad input from the public during the development of the network plan. Residents acknowledged their enjoyment of the current trail system and encouraged the City to provide a more extensive and connected network. The key guiding principles for the multi-use recreational trail network are as follows;

- Promote the Vaughan Super Trail as a signature project;
- Expand the existing multi-use recreational trail network and support the proposed cycling network;
- Provide connections to well established trail networks in surrounding Municipalities;
- Maximize continuous cycling routes in Primary and Secondary loops; and
- Provide safe cycling routes and crossing locations.

1.5 The Vaughan Super Trail

The idea of The Vaughan Super Trail was endorsed through the Cycling and Pedestrian Advisory Task Force recommendations in early 2017. The Task Force recommendations included several goals and objectives, which have been further developed through this study:

- Identified by the City as a key component of the future multi-use recreational trail network
- Strong Marketing Tool to promote Active Transportation within the City of Vaughan
- Branded as the "Vaughan Super Trail" and becomes a Regional attraction itself
- Provides a platform for City-wide initiatives & programs such as charity bike rides & marathons

- Increase connectivity options within the Vaughan boundary by adding connections within the Vaughan Super Trail
- Provide alternative route options for both commuters & recreational trail users
- Potential to increase Municipal connections & Regional systems such as the Pan Am Path and the Lake to Lake Trail

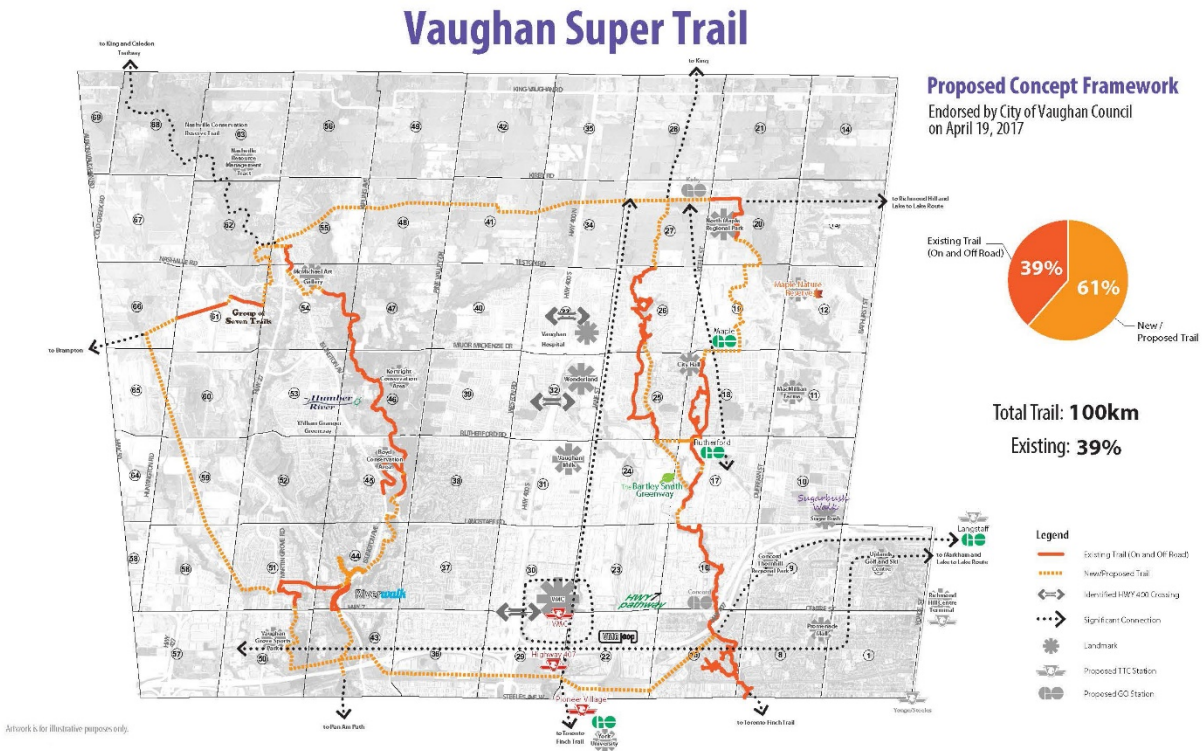


Figure 1.1 – Proposed Vaughan Super Trail Concept Framework

The Vaughan Super Trail (Primary Network) was modified slightly in the course of this study to better fit the needs of the community and also the connectivity with all parts of the trail system and cycling network. The revised network connects key destinations and areas within the City with continuous connected loops. The Vaughan Super Trail will be integrated with existing land use patterns optimizing the use of utility & transportation corridors, existing trail facilities, and the cycling network. Proposed additions to the trail network will connect the missing links in order to achieve a continuous network.

During the community outreach programme, strong support for the ‘Vaughan Super Trail’ concept as a multi-use recreational trail network and recreational opportunity/destination was noted as being valuable.

1.6 Secondary Network

The Secondary Network was developed building upon the existing trail facilities, the primary trail network (the Vaughan Super Trail), and proposed additions, to create a cohesive and continuous system of on and off-road cycling facilities throughout the City.

A series of Secondary Network connections supports shorter local secondary loops for access from neighbourhoods. These routes will also be interconnected with the cycling network and multi-use trail networks of adjacent municipalities. The proposed network does not preclude possible opportunities to connect across the City of Vaughan limits to adjacent cities and towns at other locations.

Secondary Network trails connect destinations within a small geographic area, and provide feeder links between neighbourhoods and the primary trail. The Secondary Network will be made up of existing neighbourhood trail facilities and proposed additions that will connect to the Super Trail network.

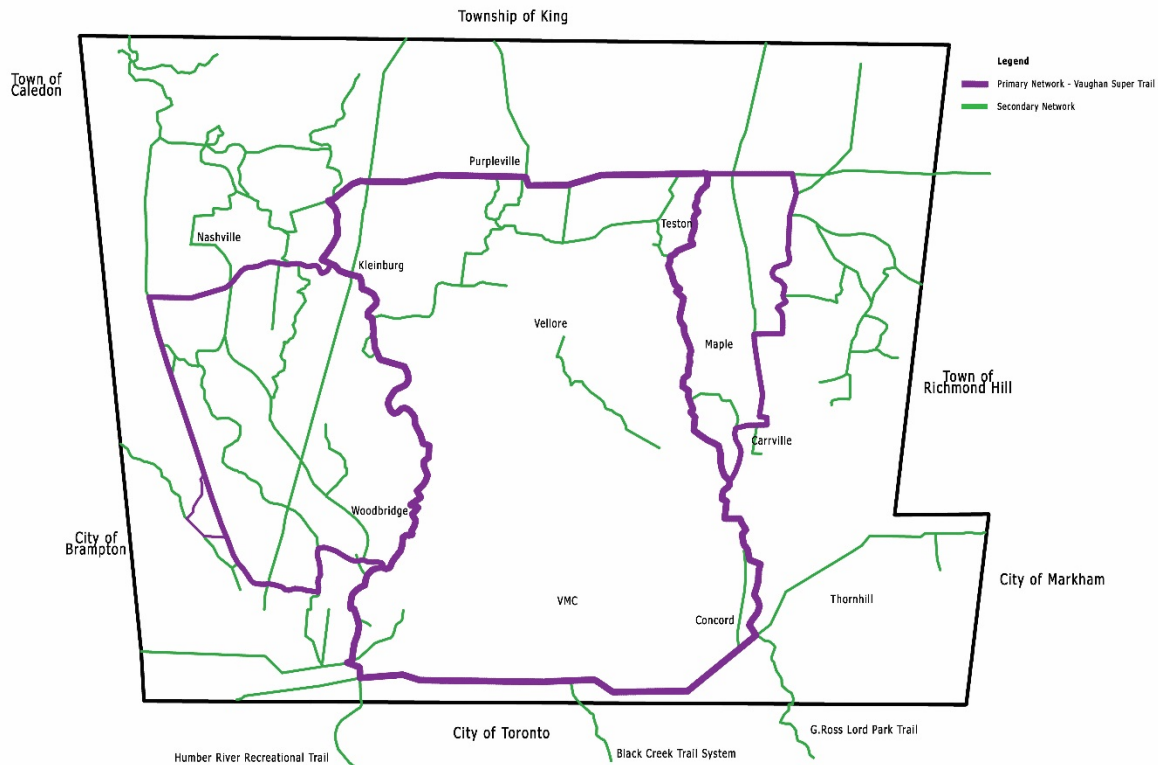


Figure 1.2 – Multi-use Recreational Trail Network Concept (Primary - Vaughan Super Trail, and Secondary)

2.0 Trail Network Implementation

The Vaughan Super Trail and Secondary Network plans provide a framework for making walking and cycling safe, convenient, and comfortable. Supporting policies developed through this study, together with education and outreach initiatives, will ensure that active transportation is considered in the implementation of the overall multi-use recreational trail network.

Recognizing that the long-term vision will require significant investment, an implementation phasing plan is required to prioritize and identify short-term, medium-term, and long-term improvements.

This section presents an implementation and phasing strategy, identifying priority actions over the short-term (up to 5 years), medium term (5 to 10 years), and long-term (10 to 20 years), which includes how the routes were determined through an evaluation process, existing network, input received from the public and stakeholders, cost estimates, priorities, best practices and a phasing approach.

2.1 Route Determination

The preferred multi-use recreational trail routes were ultimately selected based on input provided from residents and stakeholders through the public information process, stakeholder meetings and the information collected through field and desktop investigations.

Route determination for the multi-use recreational trail network is further guided by user experience, guided by the following principles:

- Inspiring and creating awareness: A User Experience that is inspiring and memorable
- Maximize connectivity for continuous multi-use recreational trails and commuter benefit;
- Integrate trail connections and crossings with cycling routes;
- Provide alternatives to cycling routes;
- Maintainable and sustainable infrastructure
- Maximize use of City-owned lands and integrate natural and parkland corridors, and available spaces in utility and transportation corridors;
- Meet Accessibility for Ontarians with Disabilities Act (AODA) requirements;
- Enhance access and use of parks and open spaces in an environmentally sensitive manner;
- Provide key amenities along the network (seating, parking, washrooms, bicycle parking etc.); and
- Ensure route aesthetics in order to heighten user experience and encourage new users by being diverse and multi-seasonal.

2.2 Evaluation Criteria to Establish Priority for Implementation of Trail Segments

In developing the network, the City considered cyclist preferences in route selection and ease and cost of implementation. To assess priority for implementation of trail segments, an Evaluation Criteria and Route Priority Ranking Matrix was developed to assist in establishing a phasing strategy for trail construction.

To assess alternative routes, an evaluation criteria matrix was developed using the following factors:

- Network Connectivity;
- External Trail Facility;
- Access to Transit;
- Density;
- Community Facilities and Services;
- Entertainment/Cultural Destinations; and
- Land Ownership.

The scoring system for each of the evaluation factors are discussed below:

2.2.1 Network Connectivity

New trail connection

- Vaughan Super Trail = 3 points
- Secondary Network Loop = 2 points
- Other; such as external connection or neighbourhood connection = 1 point

2.2.2 External Trail Facility Connection

External trail facility connections beyond the Vaughan City limits provide an expanded reach of the network to existing facilities that are already in place with established users.

New trail connection to an active transportation facility beyond the City of Vaughan limit = 1 point

2.2.3 Access to Transit

Major trip generators such as higher order transit stations should be accessible by active transportation so that residents have options when accessing essential transit services.

New trail connection to higher order transit station

- VIVA Transit stop = 1 point
- Major Bus Terminal = 1 point
- GO Rail station & TTC Subway station = 1 point

2.2.4 Density

Population and employment density can support additional active transportation trips. Areas of higher population and employment density often have built form and land use patterns that support active transportation. In other cases, they may represent strategic locations for investment in multi-modal connections due to their trip generation potential i.e. major employment areas.

Trail segment connecting to an Intensification Area (Urban Growth Areas, Primary Centres Regional Intensification Corridors, and Local Centres)

- Trail connection to an intensification area = 1 point
- Where proposed trail connects several intensification Areas, an additional point is given

2.2.5 Community Facilities and Services

New trail connection to Community Facilities and Services

- Postsecondary Education Institution or School = 1 point
- Community Centre, Library, Municipal Office or Hospital = 1 point
- Public Park = 1 point

2.2.6 Entertainment / Cultural Destinations

New trail connection to Entertainment or Cultural Destination

- Major Entertainment or Commercial Destination = 1 point
- Major Cultural or Natural Heritage Destination or Point of Interest = 1 point

2.2.7 Network Gap

Gaps in the existing multi-use recreational trail network

- Critical gaps in the trail network = 2 points
- Minor critical gaps in the trail network = 1 point

2.2.8 Land Ownership and Linear Infrastructure Easements

- Trail identified within publicly held lands = 2 points
- Trail identified as partially within publicly held lands = 1 point

It is recommended that as the multi-use recreational trail network is being implemented, the evaluation criteria for determining priority of implementation be reviewed and updated at least every 5 years, to ensure that priorities are still current.

2.3 Evaluation Criteria and Route Priority Ranking Matrix

The trail options #01A through to #29 were evaluated as summarized below.

Implementation	Route Number	Network Connectivity (0 to 3)	External Trail Facility Connection (0 to 1)	Access to Transit (0 to 3)	Density (0 to 3)	Community Facilities & Services (0 to 1)	Entertainment / Cultural Destinations (0 to 2)	Network Gap (0 to 2)	Land Ownership (0 to 2)	Total Score
	Maximum Score	3	1	3	3	3	2	2	2	19
Short-term 0-5 yrs.	01A	3	1	3	2	3	2	2	2	18
	01C	3	1	2	2	3	2	2	1	16
Medium-Term 5-10 yrs.	01B	3	1	3	3	2	2		2	16
	23	3	1	3	3	2	1	1	2	16
	03	3		3	2	3	1	2	1	15
	04	2	1	3	2	3	2		2	15
	11	2		2	3	2	2		2	13
	02	3			2	3	1	2	1	12
	18	2	1		2	3	1	1	1	11
Long-Term 10-20 yrs.	05	2		3	2	2			2	11
	26	1			1	3	2	1	2	10
	01D	3	1	2		1			2	9
	08	2		3	1	1	1		1	9
	22	1	1	1		1	1	2	2	9
	21	2		1	1	2	1		1	8
	12	2				3			2	7
	24			3	1	2			1	7
	25	2				2		1	1	6
	17	2			1	2			1	6
	10	2			1	1		1	1	6
	06	1	1			2			1	5
	20	1				2			2	5
	13	2				1	1		1	5
	29		1			1			2	4
	09	2				2				4
	07	1				1	1		1	4
	14	2				1			1	4
	15	2				1			1	4
	19	1	1			1			1	4
28	1				1			2	4	
27		1	2			1			4	
16	1				1			1	3	

Figure 1.3 – Evaluation Criteria and Route Priority Ranking Matrix

3.0 Typical Design Characteristics

To accommodate cyclists as well as other users, a trail will typically be designed to a width of minimum 3.0 meters and 4.0 meters as optimum with a surface material of asphalt. The design of a multi-use recreational trail facility will typically require additional considerations to address design and context including crossings, structures, and signage, all of which will be impacted by regulatory design requirements as outlined in the Accessibility for Ontarians with Disabilities Act (AODA).

This section provides guidance on the geometric design of multi-use recreational trails. Design should strive to comply with the design guidelines, knowing that every trail is unique and may require alterations. It is recommended that the City pursue the development of Detailed Design Guidelines for Multi-use Recreational Trails.

The Primary Network – The Vaughan Super Trail

Characteristic: Primary Multi-use Recreational Trail, service/access and emergency road

Capacity: higher use expected than on the secondary network

Type of Use/Accessibility: walking, jogging, cycling, rollerblading, stroller, wheelchair, maintenance access

Design Guidelines:

- Width: Minimum 3.0 meters- 4.0 meters as optimum, where level of use causes conflict between users or in areas where there is significant use consider widening
- Trail Surfacing: Asphalt; potentially concrete at major trail heads
- Slope: preferred maximum 5%, maximum 8%, 10% for short distances, cross-slope 2%
- Horizontal clearance: 1.0 meters minimum and 1.5 meters as optimum mowed from edge of path
- Vertical clearance: 3.0 meters in general, and minimum of 2.5 meters where constrained
- Landscape treatment: The type of treatment shall match surrounding conditions, preferably with plant material that is native or combination of native and ornamental and non-invasive
- Trailhead: Trail entry points shall be well marked with connections to public sidewalks and signage. See Major or Minor Trailhead for guidelines
- Universal Access: install signage at trail entry noting trail to be wheelchair/scooter friendly where applicable
- Privacy to residential homes: Where new trail sections are proposed for construction adjacent to existing residential homes and where there is no existing privacy delineation in place on private property, the City will follow applicable CPTED principles and recommendations
- Drainage: varies to respond to site situation: shallow swale on uphill side, culvert at low points, sheet flow, French drain or center crown. Geotextile fabric is required on wet and unstable subgrade
- Signage: use of trail markings and signage where applicable to direct and separate the direction of flow of pedestrians and wheeled users on shared multi-use trails. Trail identification or name signage to identify natural trail entry points combined with specific trail information identifying information including experience, length, slope, difficulty, warnings, permitted/suggested uses etc. for users to better make informed decisions and prepare expectations.

The Secondary Network

A minimum surface width of 3.0 metres apply for the secondary trail network unless the trail location and site conditions dictates that a more narrow width should be considered. Other distinguishing features will include branding, wayfinding signage, pavement markings, etc.

4.0 Multi-use Recreational Trail Network - Overall Map

The overall recommended multi-use recreational trail network is shown below in Figure 1.4. Figure 1.5 provides information on trail lengths based on a conceptual existing and planned trail alignment. Detailed mapping based on ground truthed information will likely capture additional trail segments adding to the total existing and planned system.

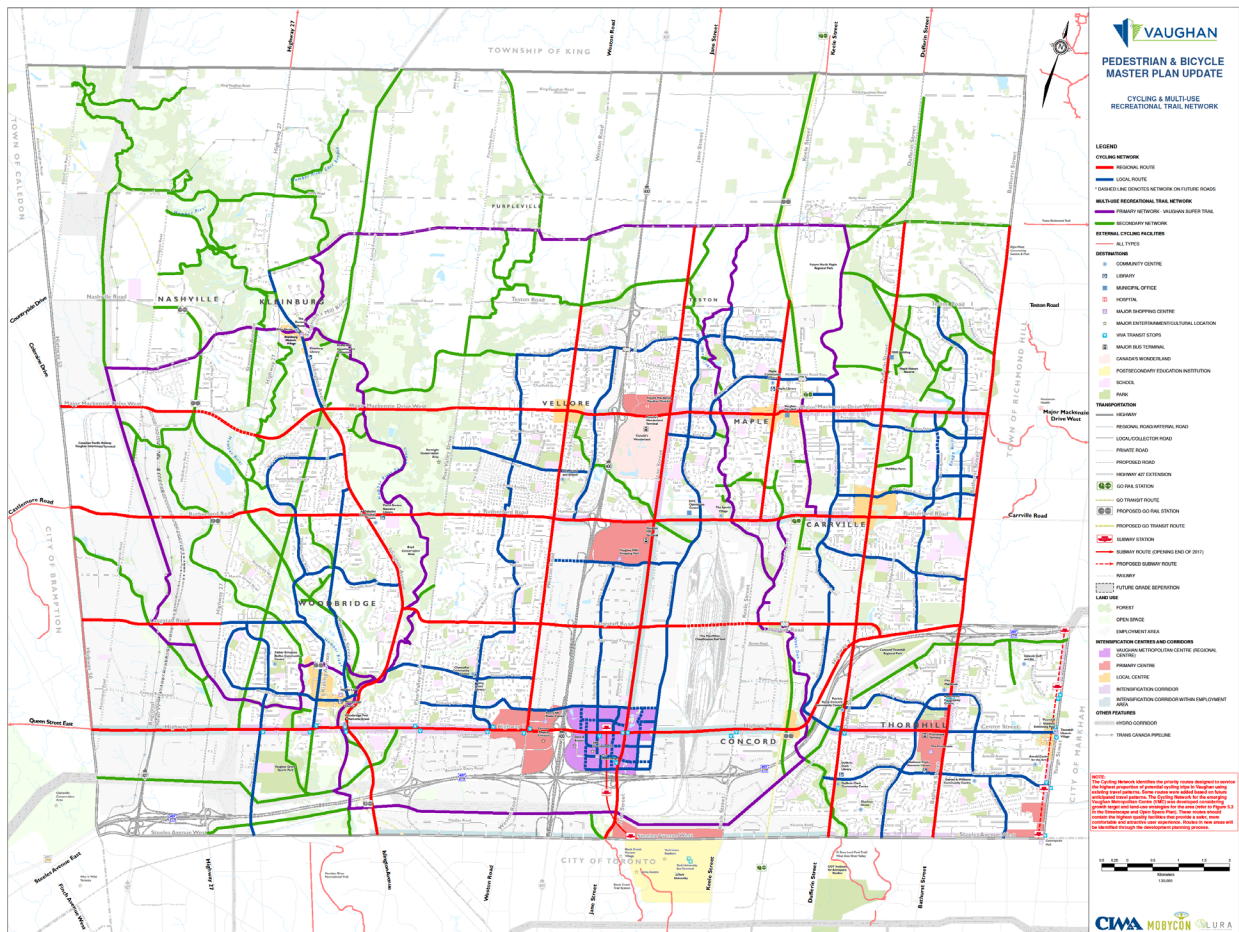


Figure 1.4 – Multi-Use Recreational Trail Network

* The map does not show all local and tertiary local connections and therefore does not preclude developing tertiary and local connections where warranted through future development.

**The map does not show all potential barrier crossings at local, arterial and highway points, railways, and other infrastructure. Additional crossings will be determined through feasibility and detailed studies of particular trail segments through implementation.

Multi-use Recreational Trail Facility Type	Existing (km)	Completed within 5 years (km)	Proposed Full Network 5 yr. +	Total (km)
Primary Network (The Vaughan Super Trail)	21.6	24.8	28.06	74.46
Secondary Network	10.5	18	130.2	158.7
Total	32.1	42.8	158.26	233.16

Figure 1.5 – Overview of Existing & Proposed Multi-use Recreational Trail Facility Type (based on conceptual alignment)

4.1 Relationship of Multi-use Recreational Trails to the Cycling Network Routes

Where a continuous trail system is not possible without a cycling network connection, (on-road) segments should be designed to match the trail facility as much as possible through features such as width, material and markings. TAC Guidelines and Book 18 are to be followed for sight distances, horizontal curves, illumination, road crossings, bicycle parking, signs, and pavement markings on curves and at bollards.

In cases where trail serve a dual purpose of both recreational and commuter in nature, the aim should be to develop a seamless and integrated system.

4.2 Network Barriers

The existing road and rail network serving Vaughan is comprised of provincial 400-series highways; such as Highway 400 separating Vaughan East and West, Highway 407 separating Vaughan and the City of Toronto to the south, a section of Highway 427 and its current extension to the southwestern border towards Brampton, the Mactier Subdivision rail line, the GO Train Line to Barrie and existing rail line connecting the Town of Caledon (future GO Train Line), Canadian Pacific Railway Vaughan Intermodal Terminal, the MacMillian classification rail yard, and Canadian National (CN) line running parallel south of Highway 407. These physical barriers result in very limited safe crossings for active transportation users within the pedestrian and bicycle network and restrict access to and from Vaughan. Especially Highway 400 creates an east to west connection challenge.

4.3 Regional Stakeholders

Regional stakeholders such as the Ministry of Transportation, the Toronto Regional Conservation Authority (TRCA), Ontario by Bike, Trans Canada Trail Association and Share the Road Cycling Coalition should be engaged as the plan is implemented. Opportunities to partner with these organizations exist to promote, encourage and support recreational and commuter cycling and active and healthy lifestyles, help municipalities advance safe cycling networks, enhance infrastructure to make Ontario’s roads safer for all road users and to build on cycling tourism.

Potential connections can be made into local conservation areas and opportunities to highlight local natural areas. The Conservation Authority also has other activities that they are required to undertake based on the Conservation Authorities Act Regulation (Section 28).

4.4 Cost

A detailed unit cost for trail implementation including the anticipated cost associated with barriers that each trail segment crosses has been established. Five types of trail were identified to suit the different trail corridor types, based on ownership and/or location within the City. Approximate cost per linear metre was developed for each land use type based on the expected design characteristics for each area.

Trail Type	Premium - Design Characteristics	Unit Price (\$/linear m)
Type 1 - Utility Corridor	3.0m wide asphalt path	\$ 550.58
	Minimal established vegetation	
	Minimum 0.6m horizontal clear zone on both sides of trail	
	Minimal grading modifications	
	Wide corridor (potential for trail meander)	
	Coordination Required with Utility Owner (Gas or Hydro)	
	Subject to specific technical requirements	
Type 2 - Rail Corridor	3.0m wide asphalt path	\$ 708.45
	Minimal to minor established vegetation	
	Minimum 0.6m horizontal clear zone on both sides of trail	
	Minimal grading modifications	
	Narrow corridor likely (straight trail alignment)	
	Coordination Required with Rail Owner (CP or CN Rail)	
	Subject to specific technical requirements	
	Safety Fencing to separate trail users from railway	
Type 3 - Road Right Of Way	3.0m wide asphalt path	\$ 812.02
	Potential established street trees	
	Minimum 0.6m horizontal clear zone on both sides of trail	
	Minimal grading modifications	
	Narrow corridor likely (straight trail alignment)	
	Trail located in boulevard (cost not included in on-road)	
Type 4 - Open Space	3.0m wide asphalt path	\$ 866.88
	Moderate established vegetation	
	Minimum 0.6m horizontal clear zone on both sides of trail	
	Potential for moderate modifications to existing grade	
	Variation in corridor width and potential for meander	
	Complement and highlight natural features	
	Potential to implement special features	
Type 5 - Creek Valley	3.0m wide asphalt path	\$ 1,096.75
	Well established vegetation	
	Minimum 0.6m horizontal clear zone on both sides of trail	
	Potential significant grading modifications	
	Variation in corridor width and potential for meander	
	Complement and highlight natural features	
	Potential to implement special features	

Figure 1.6 – Multi-use Recreational Trail Type Cost Chart

A Cost Breakdown for multi-use recreational trail estimate detailing the Unit Price per linear meter is included in **Appendix A** together with a total cost to implement the full trail network **Appendix B**. This Cost Breakdown for Trails includes the potential design and construction costs for each trail type, including Studies, Permits and Agreement that may be necessary.

4.5 Operating Costs

Based on best practices and examples from other municipalities, the expected operating cost for trails is approximately \$2,000 per km per year. It is recommended that when establishing capital budgets for trail design and construction, this figure be considered to guide budget requirements for operation costs. This operating cost generally includes maintenance for non-winter seasons.

The existing primary and secondary multi-use recreational trail network within the City of Vaughan is 32 km, with an additional 43km proposed over the next 5 years.

The total short-term network of 75km * \$2,000 per year = \$150,000 per year for maintenance costs.

Example from the City of London, Ontario

Annual Maintenance Costs for Existing and proposed Multi-use trails during Non-winter Seasons (pavement marking renewals, sweeping etc.). Excludes surface repairs, crack sealing, pothole repairs and catch basin repairs. **\$1,685 - \$2,310 per km cost (per year)**. Based on existing 166 km trails and proposed 78.7 km).

5.0 Trail Implementation Plan Map

The following map illustrates the short, medium, and long-term multi-use recreational trail implementation plan established through the rating of trail segments.

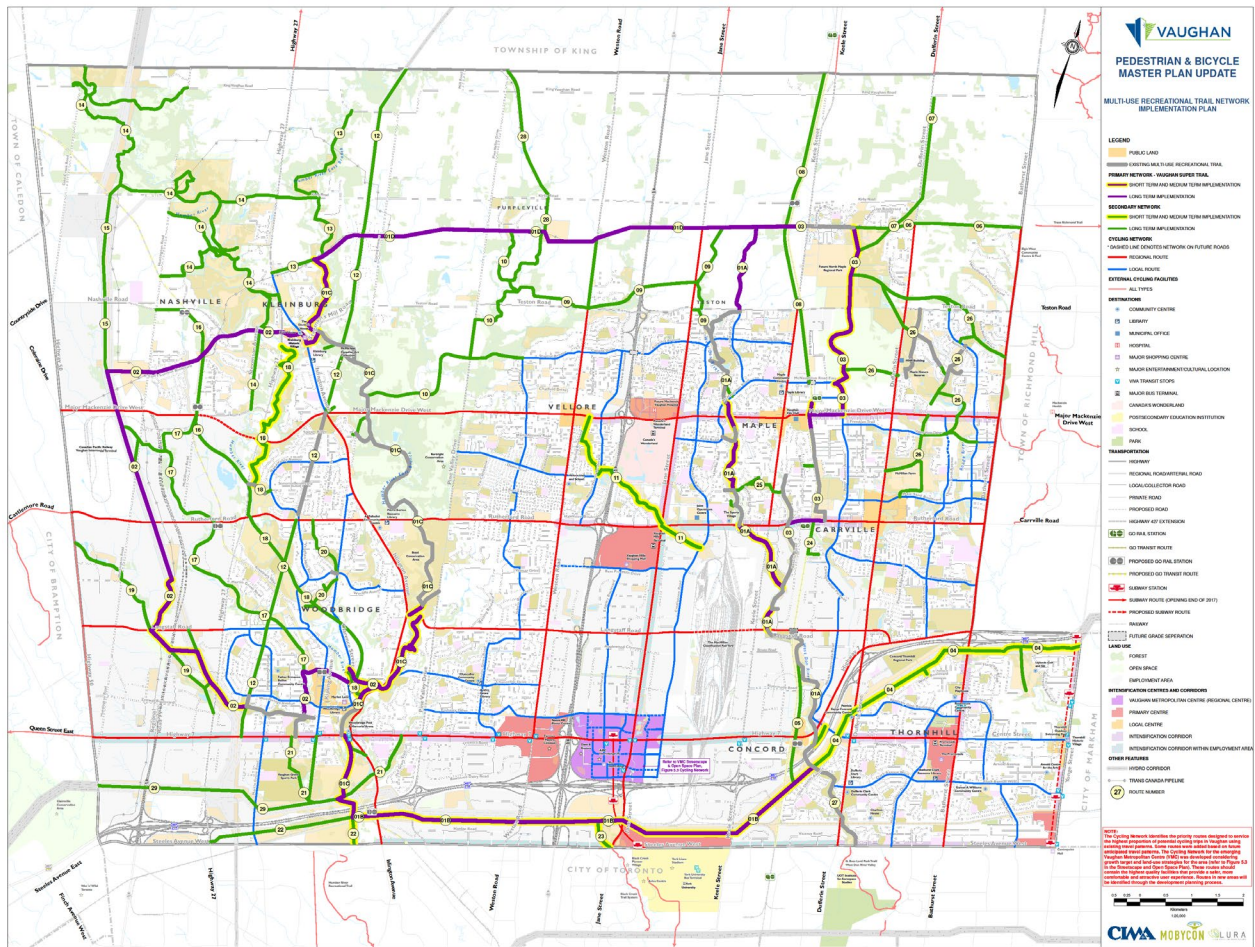


Figure 1.7 – Multi-use Recreational Trail Prioritization Plan

Immediate implementation should be focused on expanding trail segment 01A and segment 01C.

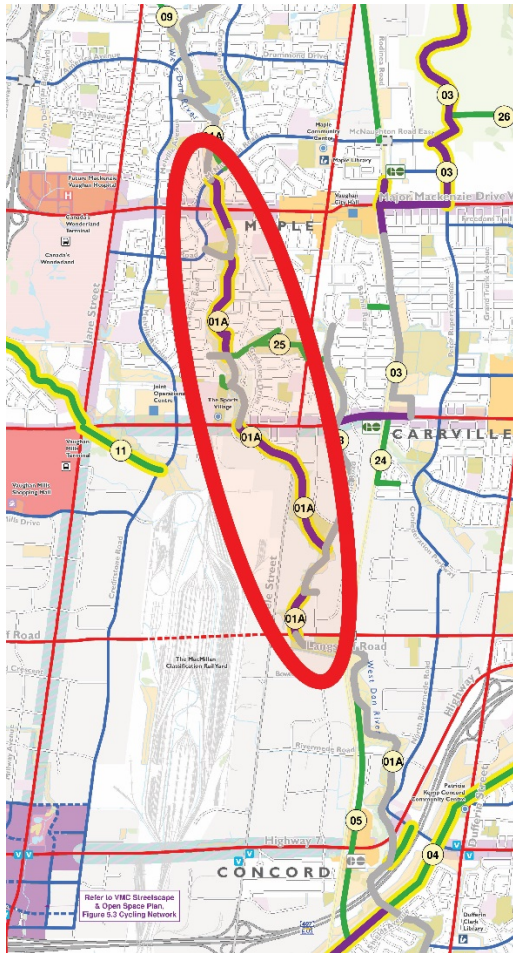


Figure 1.7: Short term implementation of trail segment 01A

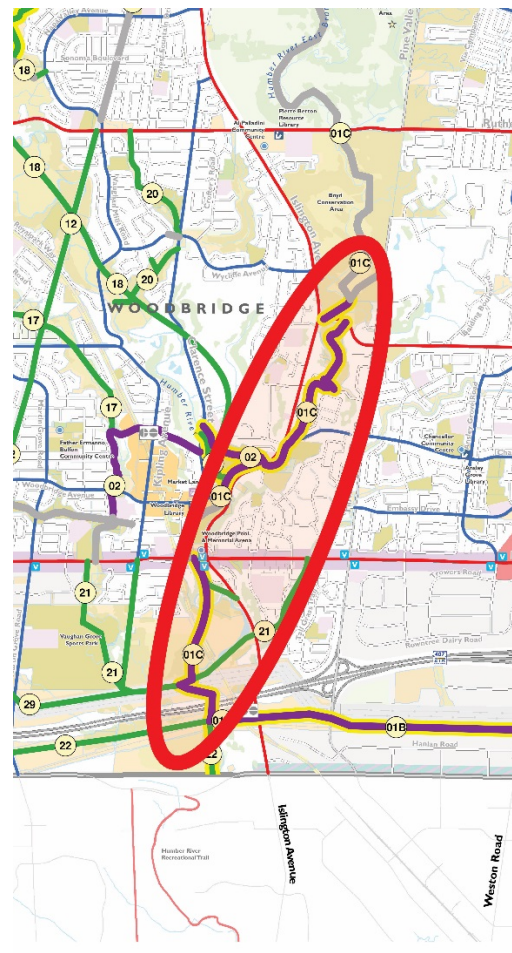


Figure 1.8: Short term implementation of trail segment 01C

- The cost estimate for design and construction of the portion of trail segment 01A identified for short term implementation is \$17M.
- The cost estimate for design and construction of the portion of trail segment 01C identified for short term implementation is \$10M.

The expansion of these two identified priority trail segments will add to the existing trail network and improve overall connectivity as well creating opportunities to implement supporting secondary links.

5.1 Additional Implementation Considerations

The following factors need to be considered by City of Vaughan staff in order to optimize the implementation of the overall trail network. These situations may influence the priority of implementation of trail segments, and also the route alignment.

- **Infrastructure Capital Works** – Trail development would be prioritized in areas identified for infrastructure capital works and associated EAs to benefit from implementation and cost synergies and limit future disturbances.

- **Environmental Sensitivities and Restrictions** – The approval process related to environmental concerns can influence the schedule of design, construction and route alignment.
- **Land Development** – Where trails are identified within lands with development applications in progress, the trail construction schedule can be accelerated and shall be implemented as a requirement of development when trail connections are deemed local in nature, or essential for access to amenities and facilities within biking or walking distances.
- **Linear Infrastructure Easements (e.g. Pipeline, Hydro, Rail corridor)** – Available unobstructed land in these areas can be simplify implementation of trail design, approval, and construction.
- **Timing of Trail Construction** – When trail construction is associated with subdivision development, trails should be built prior to, or at occupancy of residential units. Constructing trails after occupancy should be discouraged.
- **Trails may be delivered through several means and processes** - Private development and subdivisions, capital projects, infrastructure works, partnerships, etc.

Priorities identified may change due to capital projects and development priorities, and there may be opportunities for implementing some multi-use recreational trails through development or other infrastructure initiatives.

5.2 Initial Studies and Tasks to Facilitate Implementation

Initial feasibility studies may be required to confirm the exact trail location prior to proceeding with Detailed Design. Estimated cost for the following potential studies have been included in the per-metre Trail Type Cost Chart:

- Topographic Survey
- Geotechnical Investigation
- Natural Heritage
- Hydrological and Fluvial
- Flora and Fauna
- Archeological
- Geomorphic studies
- Tree Inventory and Assessment

Costs for these studies are identified in the Cost Breakdown for Off-Road Trails (Appendix A)

6.0 Design Considerations for Multi-Use Recreational Trails

Until the City of Vaughan develops Detailed Design Guidelines for Multi-use Recreational Trails, other Ontario guidelines should be followed in the interim, such as the Accessibility Design Guidelines for York Regional Forest Trails, TRCA Trail Planning and Design Guidelines, and the Toronto Multi-use Trail Design Guidelines.

6.1 Multi-Use Trail Surfacing Options

The following section provides a summary of the various alternative pavement surfaces to asphalt for multi-use trails. The selection of suitable materials for consideration was established based on past experience, review of current literature, input from the City of Vaughan and public feedback received through the public process.

Asphalt – Asphalt is readily available and widely used as a surface for multi-use trails throughout the GTA. Asphalt is a flexible material that is able to withstand cold and warm weather extremes, and is suitable for use on steep grades. Asphalt surfacing would not be recommended in wet areas that are prone to flooding. Asphalt meets AODA compliance with a firm and stable surface.

Maintenance required for asphalt multi-use trails includes sweeping or blowing at regular intervals, repairing cracks when required, and minor resurfacing approximately every 10 years.

Concrete – Concrete is widely used as a surface material for sidewalks and pathways. It is readily available and can be installed by most contractors. Concrete pathways last a very long time. However, they can be visually intrusive when newly constructed, especially in natural areas. Concrete is impermeable and subject to root heaving, and can be difficult to repair. Concrete is desired at road interface and trail heads since concrete has the unique ability to be imprinted with just about any pattern and colour, including wayfinding or to promote branding. Areas prone to flooding are suitable for concrete, since washout will be minimal. Concrete meets AODA compliance with a firm and stable surface.

Annual maintenance required for concrete surfaces is minimal, and far less than asphalt or crushed aggregate surfacing. It includes sweeping or blowing at regular intervals. A properly installed concrete multi-use trail can last significantly longer than asphalt. Root heaving from nearby trees can be problematic and when repairs are required, they are typically more expensive than for other surfaces.

Crushed aggregate – Crushed aggregate is commonly used as a surface for more rural trails, and is not used on multi-use trails because it restricts wheeled uses such as skateboards and rollerblades. However, a well compacted aggregate path can be compliant with AODA. Aggregate is readily available and can be installed by most contractors. Crushed aggregate may be suitable for tertiary trails to provide local connections to main trails within small neighbourhoods.

Maintenance required for crushed aggregate surfaces includes blowing off debris at regular intervals, weed control, repairing damaged spots approximately once per year, and resurfacing.

6.2 Lighting

Lighting trails can significantly increase the utility of a trail by extending the hours where trail users will be comfortable on a trail. However, due to the cost of trail illumination and considering that it is not essential, the focus should be on developing a larger and more integrated trail network. The question of whether lighting is required can be addressed in the future if a need for it is established. For example, lighting may be warranted where trails provide a commuter role. Every proposed new or upgraded trail should be considered independently and in consultation with stakeholders, before a decision is made to provide illumination.

In certain locations, lighting could impact sensitive wildlife activities and habitat. Where trail lighting is considered, it should be continuous between access points to ensure that trail users feel secure. If lighting of entire trail segments is not feasible, an alternative would be to consider lighting access points, tunnels, underpasses and intersections.

6.3 Trailheads

Trailheads can be developed as resting or viewing areas, with access points typically located at roads, or near parking lots within parks. Trailheads often support existing public areas, as they additionally function as landmarks and gateway areas. Consistency in the design of trailheads can help to establish an identity for the City's Multi-use Recreational Trail system and help in wayfinding. This is also promoted as a CPTED principle where trail entries should typically be well defined and pedestrian friendly with direct connection to the public sidewalk.

There are two general categories of trailheads which are typically implemented depending on the level of services required. The specific trailhead designs should also respond to site specific requirements to guide the ultimate layout and practical requirements. Some conditions to consider include soils, slopes, views, vegetation, interpretive opportunities, adjacent land uses and features. Trailheads in forested areas, near riparian corridors and other areas may require additional fencing, signage and educational information.

Major Trailheads – Locate major trailheads at strategic points where parking can be provided and there is a high demand for trail use. Major trailheads may coincide with community or citywide parks or school/park sites, as parking is often available at these sites. Amenities such as benches, trail maps, drinking fountain, waste receptacles, and washrooms should be considered.

A few additional guidelines apply for major trailheads:

- Additional space should be provided for meeting areas.
- Fencing or other barriers should be considered as elements to help guide trail users to the trail entrance and reduce short-cutting through natural areas.
- Wayfinding signage should be located near trail access points.
- Additional urban design improvements, such as gateways or public art features may be appropriate.
- Support facilities such as vehicle parking areas, transit stops, and bicycle repair stations may be considered.
- Clear sight lines must be maintained. Low planting is appropriate adjacent to parking stalls.
- Trailheads provide a good opportunity to establish the identity of a trail, which can support sponsorship of trail segments to increase funding resources.

Minor Trailheads – Minor trailheads typically do not include dedicated parking lots but may include street parking. These trailheads are smaller in scale and typically include fewer facilities such as railing and bollards/barriers required to control unauthorized vehicular access, trail identifier/trail map sign(s) and waste receptacles.

It is recommended that the City pursue the development of Detailed Design Guidelines for Multi-use Recreational Trails, and that design standards for trailheads should be further defined in that document.

6.4 Crossing Type

Crossing roads, railways and water courses presents a challenge to implementing trail networks but is an important aspect of the network. Crossing roads can be very dangerous for trail users, and hazards vary between crossing types and locations.

It is recommended that the City pursue the development of Detailed Design Guidelines for Multi-use Recreational Trails, and that the document include further detail regarding standards for vehicular, rail, and riparian trail crossings.

Specific crossing requirements must be defined through feasibility studies and detailed design. In some cases, detailed analysis will be required to assess traffic conditions, road alignment, distance to the nearest intersection, sight lines and trail user volume, in order to allow the crossing to be addressed in the safest possible manner.

The following information includes a high level classification of facility type referring to new Provincial and Regional policies, guidelines and terminology (OTM Book 18: Cycling Facilities 2013, Highway Traffic Act (HTA), MTO Bikeway Design Manual 2014, York Region Pedestrian and Cycling Planning and Design Guidelines 2016, etc.)

Road Crossing

It is essential that where trails cross roads, road operations must continue to function as planned and in accordance with the Highway Traffic Act (HTA). Preferably, crossings should be directed towards existing intersections where the crossing can be integrated into the existing operations. The volume and speed of the roadway and the user volume of the trail may also influence the choice of configuration. Crossside is the term used for the markings that direct trail or cycling facilities across roadways and through intersections.

Arterial Road At-grade Crossing: When a mid-block crossing is necessary, the at-grade crossing should include pavement markings in roadway crossings primarily to direct trail users, and to enhance visibility for motorists. Other elements to consider related to the crossing are crosssides, painted lines and symbols, warning and wayfinding signage, bicycle and pedestrian signals, tactile walking surface indicators and other existing elements. Traffic studies are to be considered in order to establish the appropriate design solution(s) needed based on traffic volumes and road speed for the location being considered.

Arterial Road Separated Crossing

Grade separated crossings should be a minimum of 4 meters wide, this will allow for adequate side clearance for the railings. They should be designed to support access for maintenance or emergency vehicles where required. To ensure access for all trail users a maximum 8% ramp grade should be followed. The bridge travel surface should be a non-slip material.

Highway Crossing

The number of highway crossings should be minimized, due to the complexity of the approval process and the extreme cost and thus should be strategically located. A highway crossing also presents an opportunity for a Signature Bridge Design providing an opportunity to provide a gateway architectural feature for the City.

Rail Crossings

The City of Vaughan has several active rail yards and corridors throughout the City. These include the GO Train Line to Barrie and existing rail line connecting the Town of Caledon (future GO Train Line), the Mactier Subdivision rail line, Canadian Pacific Railway Vaughan Intermodal Terminal, the MacMillian classification rail yard, and Canadian National (CN) line running parallel south of Highway 407. These rail corridors potentially present an opportunity for developing trails due to the relatively flat grades, and available land.

In general, any trail near an active railway will typically be separated physically with a noise attenuation wall or chain-link fencing with landscaping. Where feasible, providing a grade separated crossing, either overhead bridge or an underpass tunnel is preferred to any at-grade solution.

Rail crossing at grade will typically include PXO with pedestrian maze, warning lights and detectable warning strip and signage. Crossing configurations at rail lines should always be designed at or as close as possible to 90-degrees.

For any trail design adjacent to an active or inactive railway, the following documents and resources should be consulted: Canadian Railway-Roadway Grade-Crossings Standards (<https://www.tc.gc.ca/eng/railsafety/grade-crossings-standards.htm>) & the Rails to Trails Conservancy organization.

Riparian Crossings

Bridges and boardwalks are an important feature on trails. In addition to providing access, bridges and boardwalks can function as landmarks and viewing platforms. These structures provide opportunities to create interesting and unique destination features by using a combination of interesting decking, railing and bracing patterns. All major bridge and boardwalk structure designs and supporting components will require certification whether the structure is prefabricated or design/build. The type of crossing will depend on the trail width and construction access, and the width of the stream and riparian gully (high watermark or top of bank). Typically pre-fabricated bridges are recommended as a cost-effective solution, except when crossing very wide spans.

Major Crossings: A major crossing includes the need for a bridge to be located at significant creeks. The bridge will be up to 4 meters wide with a railing on both sides. The typical bridge deck will be wood with expanded metal lath in the centre to provide an adequate tread in wet weather. Major bridge crossing designs and support components require certification by a registered structural engineer.

Minor Crossings: A minor crossing allows for a simple bridge deck with minimal span. The flat deck will typically be 4 meters wide with a curbed edge. The deck will be precast concrete or wood with expanded metal lath in the centre.

Culvert Crossing

In some areas, trails could be routed under existing bridges or as a pedestrian crossing adjacent to a watercourse culvert. These areas must be studied in more detail to determine safety implications and requirements of the Conservation Authority and the agency with jurisdiction over the road, to determine whether a trail connection is feasible.

Boardwalks: Are typically located in very specialized areas where nature viewing and interpretative opportunities can be provided with minimal impact and damage to the existing environmental resources, such as disturbance to tree roots or other vegetation in sensitive areas. Boardwalks provide significant opportunities for nature appreciation.

6.5 Wayfinding & Signage Strategy

To ensure successful integration of multi-use recreational trails with cycling facilities, supportive amenities such as wayfinding signage should be strategically implemented. It is recommended that the City pursue the development of Detailed Design Guidelines for Multi-use Recreational Trails, and that the guidelines include a Branding, Wayfinding and Signage Strategy that includes integration of trails with cycling facilities. Creating a cohesive and continuous system of cycling and multi-use recreational trail facilities can be reinforced by implementing a consistent visual identity in the form of a City-wide wayfinding and signage strategy, which can further enhance the ability for pedestrians and cyclists to identify facilities and destinations City-wide. This can include information kiosks identifying key information such as transit, community facilities and businesses, and nearby destinations. This would need to be implemented consistently, particularly in areas where increased trail use is anticipated.

The wayfinding strategy will help increase awareness and provide trail users with information that will assist them in navigating through the trail system, and connect residents to local neighborhood multi-use recreational trails and green spaces. Wayfinding signage is also an important amenity for trail users and can potentially improve the function or operation of a trail, such as providing landmarks for wayfinding or demarcation of sensitive environments. These elements also help to create an identity for each trail and to designate trails as public spaces in the City. The need to implement a wayfinding and signage strategy was also clearly emphasized throughout much of the public input and feedback received throughout public consultation.



From Bikeway, City of Adelaide, Australia – Sample of Wayfinding Signage

Considerations to be included in a Wayfinding Signage Strategy;

- Develop a coordinated on-road / off-road cycling signage concept
- Develop a comprehensive wayfinding signage program along key cycling routes as they are implemented
- Ensure clear warning and wayfinding signage for trail crossings at intersections with other trails and roadways
- Sign panels and posts should be placed in highly visible locations that provide adequate clearance for trail users and minimize the risk of vandalism or theft
- Sign placement should include the top and bottom of all significant grade changes and structures, providing accessibility and alternative route information
- Wayfinding signage should be located near the entrances to trail access points (trailheads)

In addition to the City-wide wayfinding information, the City of Vaughan should consider working with partner agencies and organizations to develop neighbourhood-based maps showing walking and cycling routes within their community at a local scale. This can provide people with detailed information on where to travel within their own neighborhood to access local destinations, and can complement the City-wide information.

6.5.1 Warning Signage

Warning signage should be considered mandatory for all sections of a multi-use trail that do not meet guidelines, and should specify the conditions that will be encountered. Warning signs should be located in advance of the area requiring warning, and should conform to standard requirements for warning signs described in the Ontario Traffic Manual.

6.6 Bicycle Route Branding

A wayfinding strategy should be developed to ensure a common and consistent City-wide wayfinding system for both pedestrians and cyclists. This can also include protocols for route naming and identification of destinations, as well as the consistent design and application of route markings and cycling signage. Best practices from other cities indicate that providing guidelines on signage with directions, destinations, distances, and travel times to key destinations are important.

Other North American cities including Vancouver, Chicago, and Portland have ‘branded’ their bicycle routes with route names or logos to create a recognizable identity for their bicycle routes. Wayfinding signs help users find the best bicycle route to their destinations, while passively marketing the network throughout the region. Bicycle wayfinding signs also visually cue motorists that they are driving along a bicycle route and should use caution.



Lakewood Gulch, Denver, Colorado - Sample of Directional Signage

The use of pictograms in the directional signage example shows how simple images and colours can be used to convey information and provide direction.

It is recommended that the City of Vaughan pursue the development of Detailed Design Guidelines for Multi-use Recreational Trails, and that the guidelines include branding, raising awareness and wayfinding.

The Detailed Design Guidelines for Multi-use Recreational Trails should include branding/signage standards for the following:

- special branding and signage to promote and identify the Vaughan Super Trail.

- branding and distinct visual treatment of the Vaughan Super Trail to elevate its recognition and promotion within various communities and to visitors.
- complementing major trails with relevant educational and art installations
- Citywide wayfinding strategy for trail and cycling infrastructure.

6.7 Raising Awareness

Developing a strong branding strategy to promote the Vaughan Super Trail and Secondary Network will support wayfinding signage of trails and bicycle routes throughout the City. Efforts should be made to complete the strategy and design guidelines and begin implementing the recommendations as trails are constructed.

7.0 Partnership and funding Plan

Through short term planning, the City should consider pursuing available internal and external strategic partnerships to leverage funding for pedestrian and cycling facilities and programs. As funding opportunities change regularly, the information in this section is subject to change. The City should regularly check with all levels of government to keep up to date on current funding opportunities.

7.1 #CycleON Ontario's Cycling Strategy

Ontario is improving cycling across the province by launching a number of new initiatives to encourage people to get around by bike, improve safety and provide more travel options.

This includes actions that help design healthy, active, and prosperous communities, improve cycling infrastructure, make highways and streets safer, promote cycling awareness and behavioural shifts, and increase cycling tourism opportunities. The plan also includes developing a comprehensive cycling education framework that provides standards for curriculum, supports the development and certification of instructors, and delivers cycling education courses across the province.

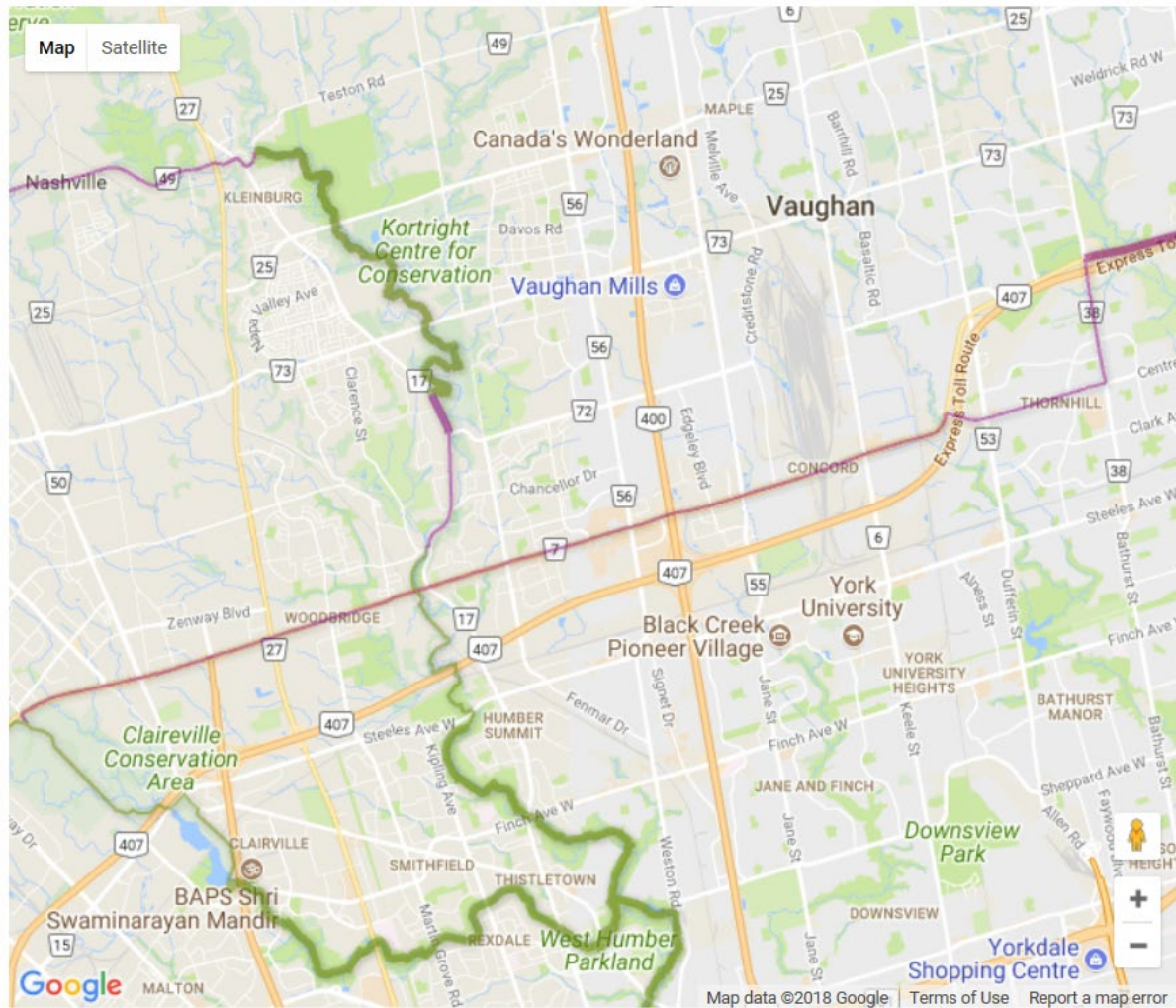
Ontario is taking action to implement [#CycleON Ontario's Cycling Strategy](#), to help keep Ontario cyclists safe and encourage more people to ride a bike. As part of #CycleON Action Plan 1.0, the province has identified a long-term aspirational network of cycling routes across Ontario including the following bicycle links that run through the City of Vaughan:

- Extending the Humber River Trail from Steeles Avenue West going north to the existing on-road cycling route on Islington Avenue, and north of the Langstaff Road intersection.
- Extending the off-road trail segment at Stegman's Mill Road west along Nashville Road toward the western City limit.

Given the Provincial interest, there may be cost sharing opportunities that will benefit both the Province of Ontario and the City of Vaughan. The proposed Province-wide Cycling Network reinforcing the current network and proposed improvements for Vaughan can potentially make short term priorities for Vaughan more affordable (see diagram below).

Province-wide Cycling Network

This map is for discussion only – It is not intended for navigation.



- Existing on road routes*
- Proposed on road routes*
- Existing off road routes◇
- Proposed off road routes◇

<http://www.mto.gov.on.ca/english/safety/province-wide-cycling-network.shtml>