Active Transportation Assessment of the Connection between Mayfield West and Valleywood Subdivision

Spine Road from Collector Road 'F' to Snelcrest Drive / Royal Valley Drive
Town of Caledon
Project #: TPB166090; Client Name: Town of Caledon

Prepared for:

Town of Caledon
6311 Old Church Road, Caledon, ON L7C 1J6

11/19/2018

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Prepared by:

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1.0 Introduction and Background

1.1 Introduction

The Town of Caledon (Town) has initiated a Municipal Class Environmental Assessment (Class EA) for the widening of McLaughlin Road and construction of the new East-West Spine Road (Mayfield West Phase 2). The improvements are required to meet the Town's development needs considering satisfactory level of service and safe driving conditions within the study area. Wood Environment and Infrastructure Solutions, was retained by the Town to complete the Study.

The study will consider alternatives that could practicably be implemented to satisfy the need for pedestrian and cycling facilities along the Spine Road (east of Collector Road "F") and Valleywood Boulevard corridor as it crosses over Highway 410/10.

Pedestrian and cycling infrastructure alternatives have been selected based on design guidelines for pedestrian and cycling facilities presented in *the "Ontario Traffic Manual (OTM) Book 15 – Pedestrian Crossing Treatments, June 2016" and "Ontario Traffic Manual (OTM) Book 18 – Cycling Facilities, December 2013"* by the Ministry of Transportation. In selecting an appropriate design, various factors have been considered including operating speed, traffic volumes, roadway type, and available space (right-of-way). Creating a safe, consistent, and efficient network for bicycle users is paramount, as they are exposed to collision risk and consequently a higher potential for serious injury or death.

1.2 Literature Review

A literature review of relevant planning documents was completed as part of this assessment and included the following documents:

- Region of Peel's Active Transportation Plan (2011)
- Town of Caledon's Transportation Master Plan (November 2017)
- City of Brampton's Technical Report #5 – Active Transportation (August 2015)

None of the documents above identified plans for improving or adding Active Transportation infrastructure within the Valleywood community or the Highway 410 / Valleywood Boulevard interchange.

Also completed was a review of the Mayfield West Phase 2 Transportation Master Plan (MW2 TMP). The MW2 TMP has recommended the following for the new subdivision west of Highway 410/10:

- 2.0m bike lanes for arterial roadways located within high intensification areas;
- Collector roads to accommodate cycling facilities will have 1.5m bike lanes;
- On-road bike lanes not recommended for Spine Road east of Collector Road F due to high volume of traffic to/from the interchange with Highway 410, and
- Provision for a dedicated bicycle / pedestrian crossing of Highway 10, connecting to the Valleywood Community in the vicinity of Snelcrest Drive.

1.3 Study Area

The study area for this assessment covers the area from the existing intersection at Valleywood Boulevard and Snelcrest Drive / Royal Valley Drive to future Collector Road 'F' west of Hurontario Street. **Figure 1.1.** shows the existing roadway network with the proposed future roadway network for the MW2 development area.

The new proposed future design of the connection of Valleywood Boulevard and the new east west Spine Road is show in **Figure 1.1.** The new design replaces the existing turning movements with a new signalized intersection (Hurontario Street / Highway 410 northbound on ramp and Spine Road / Valleywood Blvd).

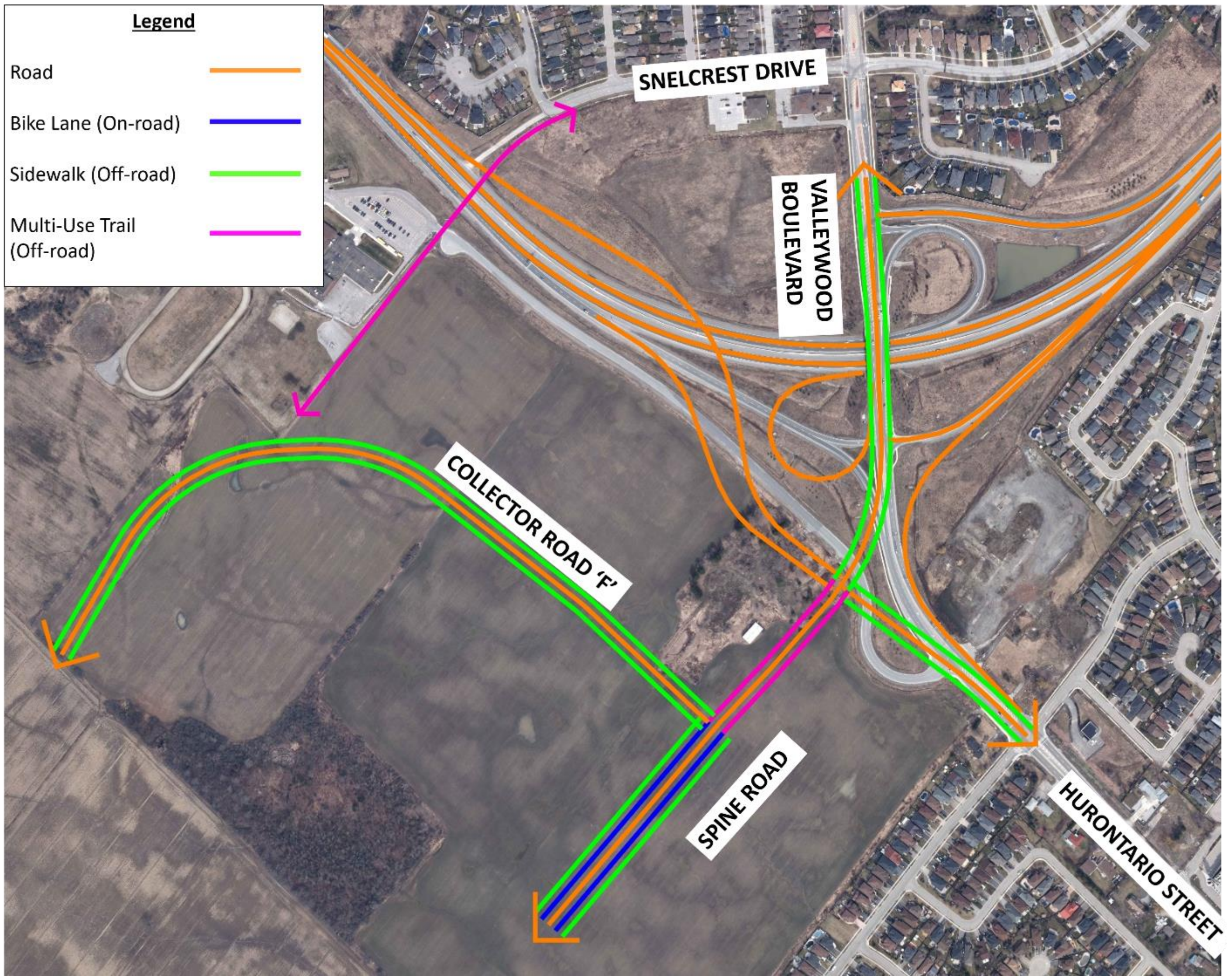


Figure 1.1. Existing and Proposed Roadway Network

The existing cross-section (looking west, east of the Highway 410 overpass) of Valleywood Blvd. consists of one lane in each direction with a westbound left turn to northbound Highway 410 and the Highway 410 northbound off ramp. Active transportation facility consists of a 1.5m sidewalks on both sides as shown in **Figure 1.2**.

Figure 1.2. Existing Typical Cross-Section, Valleywood Blvd. west of Highway 410 Overpass

Figure 1.3. Proposed Design, Spine Road / Valleywood Blvd. Connection

The existing cross-section (looking west on the west side of the Highway 410 overpass) of Valleywood Blvd. consists of one lane in each direction with a westbound left turn to southbound Highway 410 and the southbound Highway 410 off ramp with 2 connections with Valleywood Boulevard. Active transportation facility consists of a 1.5m sidewalks on both sides as shown in **Figure 1.3.**

Additionally, there is an existing trail along Etobicoke Creek which connects the Valleywood community (at Cliffview Court) to Mayfield Road, crossing under Highway 410. This trail allows for a continuous path from the City of Brampton to the Town of Caledon, and is suitable for walking, jogging, and cycling.

2.0 Design Considerations and Alternatives

2.1 Design Guidelines

Design guidelines for pedestrian and cycling facilities are presented in the *“Ontario Traffic Manual (OTM) Book 15 – Pedestrian Crossing Treatments, June 2016” and “Ontario Traffic Manual (OTM) Book 18 – Cycling Facilities, December 2013”*, Ministry of Transportation Ontario and “Bikeways Design Manual,” March 2014, Ministry of Transportation Ontario. These manuals were used in determining the design parameters for each alternative considered in this assessment.

2.2 Relevant Data

To complete the facility selection process, the following relevant data is required:

Critical Horizon Year: The critical year for this assessment is year 2031 which was identified by the Town of Caledon.

Mayfield West Phase 2 Transportation Master Plan: On Road bike lanes are not proposed along Spine Road east of Collector Road “F” due to the high number of turning movements.

Posted Speed: The posted speed on Spine Road / Valleywood Boulevard within the study limits is 50km/h.

85th Percentile Speed: Speed data was unavailable for the Spine Road as the road does not currently exist. For the purpose of this study it will be assumed the 85th percentile speed will be 10km over the planned posted speed 60km/h.

Traffic Volumes: Year 2031 projected ADT numbers were derived from peak hour projections for 2031. In cases were actual ADT counts are unavailable, peak hour volumes are multiply by 10 to get an estimated ADT volume.

Modal Split: The Town of Caledon does not have specific modal share targets for active transportation, though it does hope to achieve a modal split of 6% during the peak periods.

Cyclist / Pedestrian Volumes: As this is a new development tying in to an existing road network, no cyclist or pedestrian volumes were available. Estimated pedestrian and cyclist volumes were generated based on similar urban areas.

Roadway Classification: Spine Road and Hurontario Street are both classified as Arterial Roads, with an urban cross-section. Valleywood Boulevard is classified as a Collector Road.

Table 2.1 displays a summary of the data used for this assessment.

Table 2.1. ASSESSMENT DATA

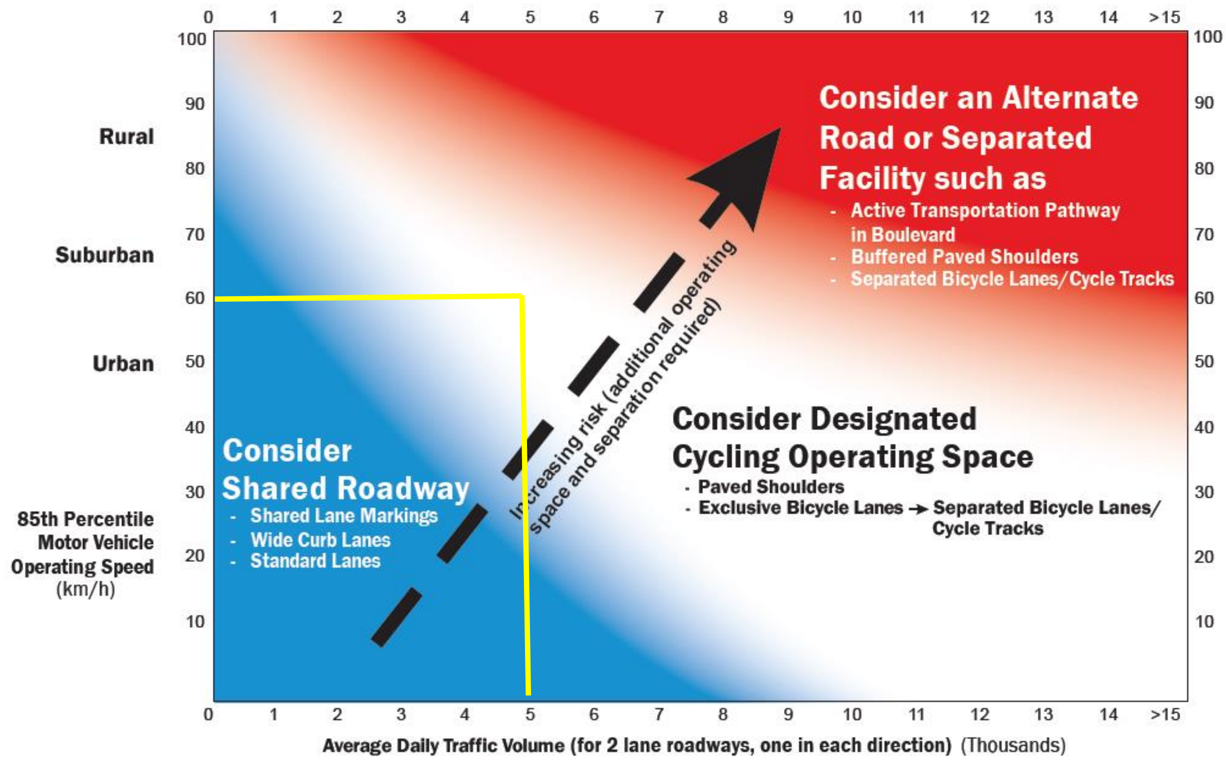
Roadway Classification	85th Percentile Speed (range)	Estimated Average Daily Traffic Volume	Average Estimated Pedestrian Volumes per/hour (peak hour)	Average Estimated Cyclist Volumes per/hour (peak hour)
Urban	55-60 km/h	5000	15	5

2.3 OTM Book 18 Bicycle Facility Selection Guideline

Section 3 of OTM Book 18 provides a three-step process for the selection of bicycle facilities:

Step 1 – Facility Pre-selection
Step 2a – Inventory Site-Specific Conditions
Step 2b – Review Key Design Considerations and Application Heuristics
Step 2c – Select Appropriate and Feasible Bicycle Facility Type
Step 3 – Justify Decision and Identify Design Enhancements

Step 1: Facility Pre-Selection



Based on operating 85th percentile speed and ADT volumes, the lines on the nomogram (shown in yellow) fall within the *Consider Designed Cycling Operating Space* zone which recommends paved shoulder, exclusive Bicycle Lane – Separated Bicycle Lanes/Cycle Tracks.

Step 2: A More Detailed Look

In this section of the guidelines, determining criteria (primary and secondary) are considered including:

Primary	Secondary
• 85th percent operating speeds • Motor vehicle volumes • Roadway function • Vehicle mix • Collision history • Space available	• Costs • Cyclist riders and skill level • Cyclist volumes • Route function, cycling facility network • Type of roadway improvement • On-street parking • Frequency of accesses

Tables 3.1 to 3.13, from OTM Book 18, present the appropriate factors for the Spine Road study area.

Table 3.1 – 85th Percentile Motor Vehicle Operating Speeds

As the speed differential between motorists and cyclists increases, so does the collision risk for cyclists using that roadway. Therefore, when selecting a bicycle facility type, the 85th percentile operating speed should be considered. Higher motor vehicle speeds may negatively influence a cyclist's ability to control their bicycle.

Site Characteristics	Design Considerations and Application Heuristics
Low (30 to 49 km/h)	Speed differential between bicycles and motor vehicles is within 30 km/h, suggesting integration of the two modes as mixed traffic, in standard or wide curb lanes, may be appropriate.
Moderate (50 to 69 km/h)	Exclusive operating space for both bicycles and motor vehicles, in the form of paved shoulders, bicycle lanes or separated facilities is recommended.
High (70 to 89 km/h)	Speed differential between bicycles and motor vehicles exceeds 40 km/h, suggesting physical separation of the two modes is most appropriate such as buffered paved shoulders.
Very high (90 km/h and greater)	Physical separation is preferable, particularly in an urban environment. In rural areas of the province, it may not be practical to provide physically separated facilities on very high speed roadways where bicycles are currently allowed. A painted buffer between the roadway and the paved shoulder is an alternative treatment for such cases. If this is not feasible, provision of a parallel bicycle route should be explored.

Table 3.2 – Motor Vehicle Volumes

As motor vehicle volume increases, so does the collision risk for cyclists using that roadway. For planning purposes, the future year traffic volumes should be used when selecting an appropriate bicycle facility type for a given roadway section. Where AADT volumes are unavailable, rush hour volumes may be used. Some municipalities suggest that as a rule of thumb, rush hour volumes typically represent 10% of the daily volume.

Site Characteristics	Design Considerations and Application Heuristics
Very Low Volume: where two-way daily average volume is less than 500 vpd on a two-lane road	No facility type is typically required.
Low Volume: where two-way daily average volume is 500 to 2,000 vpd on a two-lane road	Mixed traffic may be appropriate if vehicle speeds are low. Lanes should be wide enough to comfortably accommodate shared use by cyclists and motorists. If speeds are moderate, paved shoulders or bicycle lanes should be considered.
Moderate Volume: where two-way daily average volume is 2,000 to 10,000 vpd on a two-lane road	Some level of formal bicycle facility such as a conventional bicycle lane is recommended. If this is not feasible, a signed bicycle route with a paved shoulder may be considered.
High Volume: where two-way daily average volume is greater than 10,000 vpd on a two-lane road	Physical separation of motor vehicle and bicycle traffic may be most appropriate.
Hourly one-way volume in the curb lane exceeds 250 vph	Some level of formal bicycle facility such as a 'signed only' bike route with a paved shoulder or bicycle lanes are recommended.

Table 3.3 – Function of Street or Road or Highway

While generally reflected in motor vehicle volumes, the function of a roadway should also be considered in bicycle facility decisions. The significance of this factor will be higher in cases where volume or speed data are unavailable.

Site Characteristics	Design Considerations and Application Heuristics
Access roads such as local roads and residential streets	Mixed traffic may be appropriate if speeds and volumes are low. Where feasible, design features associated with Bicycle Priority Streets should be applied, as described in **section 5.1.** Otherwise, curb lanes should be wide enough to comfortably accommodate shared use by cyclists and motorists, with dimensions as indicated in **Table 4.1** for a Wide Signed Bicycle Route.
Both mobility and access roads such as minor collectors plus similar roads and streets	Some level of formal bicycle facility such as a signed bike route with paved shoulder or bicycle lane is appropriate. A Narrow Signed Bicycle Route may be implemented, with dimensions as indicated in **Table 4.1**.
Mobility roads such as arterials and major collectors	Some level of formal bicycle facility such as a bicycle lane or separated facility is appropriate.
Motor vehicle commuter route	Separated bicycle facilities should be considered to minimize conflicts with aggressive drivers on the roadway.

Table 3.4 – Vehicle Mix

Heavy vehicles, such as transport trucks and buses have a greater influence on cyclists than passenger vehicles. This is partly due to the larger difference in mass between cyclists and heavy commercial vehicles, and the increased severity of any resulting collision. Air turbulence generated by these high-sided vehicles also has a more significant impact on the difficulty of controlling a bicycle, which requires both greater skill and more caution on the part of the cyclist than in the presence of passenger vehicles. As the volume of heavy vehicles increases, so too does the desirability of providing buffers or physical separation of cyclists from motorized traffic. Stationary trucks and buses may also interfere with cyclist movements, creating a need for lane changes on the part of cyclists. This increases the interaction with vehicular traffic, and at times may obstruct other drivers' view of the cyclist on the road at inopportune moments.

Site Characteristics	Design Considerations and Application Heuristics
More than 30 trucks or buses per hour are present in a single curb lane	Separated bicycle facilities may be preferred by many cyclists. If paved shoulders, wide curb lanes or bicycle lanes are considered, additional width should be provided as a buffer.
Bus stops are located along the route	Facilities should be designed to minimize and clearly mark cyclist conflict areas with buses or pedestrians at stop locations. See **Section 5.4.2** for more details.

Table 3.5 – Collision History

Where there is evidence of the involvement of cyclists in collisions, historical patterns can sometimes provide valuable indicators of the factors that are present and pose particular challenges for the accommodation of cycling facilities, as well as the mitigating measures that can help resolve them.

Site Characteristics	Design Considerations and Application Heuristics
Bicycle collisions are relatively frequent along the route	A detailed safety study is recommended. Alternate routes should be considered. Separated facilities may be appropriate to address midblock conflicts. If on-road facilities are considered, the operating and buffer space provided to cyclists should be considered.
Bicycle collisions are relatively frequent at specific locations	Localized design improvements should be considered to address contributing factors at high-collision locations, often near intersection and driveway locations.
Noticeable trends emerge from bicycle collisions	The proposed facility and its design should attempt to address noticeable collision trends. For each facility type, safety countermeasures* can be developed. These can be based on road user behaviour and manoeuvres that resulted in the collision, or specific design and policy objectives.
Conflict areas exist between cyclists and motor vehicles or pedestrians	Facilities and crossings should be designed to minimize conflict between different types of users and the conflict area should be clearly marked.

*For detailed scenario-based information, refer to the Bicycle Countermeasure Selection System in the FHWA's BikeSafe guide.

Table 3.6 – Available Space

The space available to serve all functions and users of a roadway is finite. Consequently, practitioners should consider the constraints imposed by curbs, pinch points and physical barriers when choosing the most appropriate facility for a particular section of roadway. Once the facility type has been selected, the adequacy of sightlines, both at intersections and continuously along a roadway should be considered. Please refer to **Section 5.4** for more details.

Site Characteristics	Design Considerations and Application Heuristics
Sufficient curb-to-curb width exists to adequately accommodate motorists and cyclists.	Redistribute roadway space to accommodate bicycle lanes by narrowing or eliminating parking lanes, narrowing travel lanes, or eliminating unnecessary travel or turn lanes. Where bicycle lanes are not feasible, wide curb lanes may be provided. Please refer to **Section 5.2** for guidance on integrating bicycle facilities through road retrofits.
Sufficient curb-to-curb width exists, but pinch points are created where turn lanes are developed at intersections.	There is a higher risk of collisions at intersection compared to other sections of road and less confident cyclists may be deterred by a lack of designated bicycle facilities on the immediate approach to an intersection. Where feasible, localized widening should be undertaken to provide continuous bicycle facilities of constant width entering, through and exiting the intersection. Where this is not possible, bike lanes may be discontinued with appropriate positive guidance or warning measures upstream of the merge point or intersection. Practitioners should carefully and practically consider the way in which cyclists and general traffic will merge. Pavement markings and signage should encourage cooperative merging of cyclists and motorists into a single traffic lane. Sharrow markings can be used to denote a desirable cyclist path, particularly through narrow or atypical intersections. Refer to **Section 4.2.1.4** for design recommendations.
Physical barriers include those created by steep grades, rivers, freeways, railways, narrow bridges.	Separated facilities should be considered to bypass or overcome barriers.
Curb-to-curb width is not adequate to provide sufficient operating space for both motorists and cyclists.	Provide separated facilities adjacent to the roadway or within an independent right-of-way, provide paved shoulders, widen roadway platform to accommodate bicycle lanes. Where this is not feasible, wide curb lanes may be considered or alternate routes may be investigated. If on-street parking is present, explore opportunities for it to be eliminated or reduced.
Adequate sightlines for road users including both motorists and cyclists on rural roads given design and operating speeds.	Horizontal and vertical curves along the roadway as well as roadway width should be considered when providing adequate sightlines for road users. Regular maintenance of vegetation is also important in preserving sightlines throughout the year.
Sight distance is limited at intersections, crossing locations or where cyclists and motor vehicles share limited road space.	Improve sightlines by improving roadway geometry, removing or relocating roadside furniture and vegetation; provide adequate space for cyclists either on or off the roadway. Design intersection crossings to minimize and clearly mark conflicts, and restrict parking in close proximity to intersections.

Table 3.7 – Costs

In reality, provisions for cyclists on roadway projects will be affected by the availability of funding. Designers should seek to ensure that their solutions are cost-effective, meet project objectives and are appropriate for the intended users given the characteristics of the site. However, cost should not eliminate the need for due diligence in providing safe and effective cycling facilities that encourage use.	
Site Characteristics	**Design Considerations and Application Heuristics**
More than one type of bicycle facility appears appropriate	Benefit/cost analysis of alternatives should be conducted.*
Funding levels are not available to provide preferred type of facility	Consider alternate routes or focus on cost-effective improvements to existing facilities such as improved maintenance, pavement and drainage rehabilitation as well as removal of barriers. Poorly designed or constructed facilities may result in increased safety risks for cyclists, and are unlikely to encourage additional use.

*Refer to NCHRP Report 552 - Guidelines for Analysis of Investments in Bicycle Facilities.

Table 3.8 – Anticipated Users in Terms of Skill and Trip Purpose

It is important to consider different user skill levels and trip purposes in the design of bicycle facilities. Therefore, providing a variety of facility types, whose distinguishing feature is the presence of different degrees of separation between motorists and cyclists, helps encourage new or less experienced cyclists. This in turn improves overall cyclist safety within a road network. Research shows that one of the most effective measures for doing this is increasing the number of cyclists using the system. The appropriateness of the existing provision on a particular link can be assessed by undertaking cyclist counts. In addition to recording the number of cyclists, the hourly and daily profile will give an indication as to trip purpose; for example, peaks in use during weekday periods demonstrate commuter demand whereas high volumes on the weekend suggests recreational use.	
Site Characteristics	**Design Considerations and Application Heuristics**
Experienced cyclists (commuter or other utilitarian)	This group generally prefers direct, continuous facilities with minimal delay as is generally provided by the arterial road network. Experienced cyclists may be comfortable on shared use roadways with low motor vehicle volumes and speeds. However, users in this group typically prefer on-street bike lanes or separated facilities where the context warrants it.
Novice cyclists (recreational / beginner utilitarian)	This group generally prefers routes on residential streets with light traffic and low speeds. Bicycle lanes, paved shoulders (with or without buffers) and separated facilities should be considered.
Child cyclists	This group generally requires separated facilities free of conflicts with motor vehicle traffic. Separated facilities should be considered near schools, parks and neighbourhoods. Children under the age of 11 should be permitted to cycle on sidewalks since they may not have the cognitive ability or experience to ride on roads with motor vehicles by themselves.

Table 3.9 – Level of Bicycle Use

As cyclist volumes increase, so does the risk of interactions with motor vehicles. Therefore, as cyclist volume increases, practitioners should consider increased separation between motorists and cyclists.	
Site Characteristics	**Design Considerations and Application Heuristics**
Low bicycle volumes (< 10 cyclists per hour)	Wide curb lanes may be adequate in some cases. However, practitioners should carefully consider whether the low bicycle volumes represent a lack of cyclist demand or inadequate existing facilities. As improvements are made to cycling infrastructure, bicycle volumes tend to increase.
High bicycle volumes (> 50 cyclists per hour)	Paved shoulders, bicycle lanes or separated facilities may be appropriate. The width provided for urban bicycle facilities should accommodate bicycle volumes during peak periods both midblock and at intersections.
Significant bicycle traffic generators are nearby	Latent bicycle demand may exist if there are employment centres, neighbourhoods, schools, parks, recreational or shopping facilities along the route. Transit nodes also provide the opportunity for multi-modal travel, with bicycle trips to and from the node where appropriate end-of-trip facilities are provided (see **Section 7**). Bicycle lanes and separated facilities should be considered to accommodate the anticipated volume of cyclists.

Table 3.10 – Function of Route within the Bicycle Facility Network

The function of the route within the bicycle facility network is very important. Bicycle facilities depend on accessibility and connections between routes, major destinations, residential areas and recreational services. Route segments should be identified as primary or secondary routes, and ease of access to and from such facilities should be a major planning and design consideration.	
Site Characteristics	**Design Considerations and Application Heuristics**
Parallel bicycle routes already exist with bicycle facilities present	Redundancy of bicycle routes may provide an opportunity to provide different types of bicycle facilities within the same travel corridor. This would give cyclists with different skill levels and trip purposes the opportunity to choose the facility most appropriate to their needs.
New route provides a connection between adjacent existing facilities	Facility selection should provide continuity with adjacent bicycle facilities to the extent possible.
New route provides access to a neighbourhood, suburb or other locality.	Bicycle lanes and separated facilities should be considered to encourage cycling for all users.

Table 3.11 – Type of Roadway Improvement Project

The type of roadway improvement project can and most often does affect the type of bicycle facility that is appropriate for a given context. For example, retrofitting existing roads and intersections, platform width and other existing constraints will play a role in selecting the appropriate bicycle facility type. Therefore, consideration must be given to the type of roadway improvement project whether it is new construction, reconstruction or a retrofit. Combining works in this way allows bike facilities to be installed while achieving cost efficiencies. However, practitioners should consider the completeness of the resulting bikeway network. The implementation of small sections of disconnected bicycle facilities is unlikely to provide meaningful connections for cyclists since those facilities may suffer from low cycling volumes. Practitioners should consider using some the resources saved through the aforementioned synergies to provide additional links which will properly integrate the new facilities into the network.	
Site Characteristics	**Design Considerations and Application Heuristics**
New construction	Appropriate bicycle facilities should be planned and integrated with the design and construction of new roads and communities.
Reconstruction	Major roadway reconstruction provides an opportunity to improve provisions for cyclists through the redistribution of existing road space (if reconstruction only involves work between the curbs) or increased roadway width or off-road space. Efficiencies where the two projects overlap will reduce the cost of providing context-appropriate bike facilities.
Resurfacing	Affordable solutions may be limited to redistributing existing road space. Fully paved shoulders may be considered along rural arterials or collectors used by cyclists.

Table 3.12 – On-Street Parking (for urban situations)

The presence of on-street parking has a considerable influence on both the safety and comfort of a cyclist using a bicycle facility. In particular, the configuration of on-street parking, its degree of utilization and its separation from the bicycle facility are of concern selecting a bicycle facility type. Sound engineering judgement must be applied in the design of these facilities. The designer must assess the potential for conflict between cyclists and motor vehicles as a result of vehicles entering or leaving parking spaces. The potential severity and number of conflicts will vary based on the volume of cyclists as well as the parking demand and turnover. In each case, the objective should be to avoid or mitigate conflicts to the extent possible, while recognizing parking needs and alternatives.

Site Characteristics	Design Considerations and Application Heuristics
Parallel on-street parking is not permitted	Opportunities to provide bicycle lanes or, if not feasible, wide curb lanes should be explored and their appropriateness should be evaluated.
Parallel on-street parking is permitted in localized areas along the route	Consistent bicycle lanes may prove difficult to provide since available roadway width is likely to change where parking is provided. Wide curb lanes may be a compromise solution.
Parallel on-street parking is permitted but demand is low	Opportunities to remove, restrict or relocate parking in favour of providing bicycle lanes should be considered.
Parallel on-street parking is permitted but turnover is low	Bicycle lanes may be appropriate. Additional buffer space between bicycle and parking lanes should be provided.
Parallel on-street parking is permitted; turnover and demand is high	Separated bicycle facilities between on-street parking and the edge of the roadway may be most appropriate. Bicycle lanes between vehicle travel lanes and on-street parking are not desirable in this situation. This is due to the frequent occurrence of conflicts between cyclists and vehicles manoeuvring in and out of the parking area. Where separated facilities cannot be accommodated, potential provision for cyclists on alternate routes should be investigated.
Perpendicular or diagonal parking is permitted	On-road facilities are not appropriate unless parking is reconfigured or removed. Alternate routes or opportunities to provide a separated facility should be explored.

Table 3.13 – Frequency of Intersections (for urban situations)

The more intersections and access points along a bicycle route, the more conflict points that are present. Therefore, locations with increased intersection and access density require careful consideration when selecting a bicycle facility type for the area. Sound engineering judgement must be applied to determine the characteristics of a particular site and a corresponding facility design. The designer must assess the potential for conflict between cyclists and motor vehicles as a result of vehicles entering and exiting the road. The potential severity and number of conflicts will vary based on cyclist and vehicle turning movement volumes. In each case, the objective should be to avoid or mitigate conflicts to the extent possible. This may involve the application of conflict pavement markings, as described in **Section 4.2.1.4** and **4.2.2.4.**	
Site Characteristics	**Design Considerations and Application Heuristics**
Limited intersection and driveway crossings are present along the route	Separated facilities or bicycle lanes are well suited to routes with few driveways and intersections.
Numerous low volume driveways or unsignalized intersections are encountered	Bicycle lanes may be more appropriate than separated facilities since motorists are more likely to be aware of cyclists on the roadway rather than adjacent to the road. If bicycle lanes are not feasible, wide curb lanes may be provided.
Numerous high volume driveways or unsignalized intersections are present along the route	Separated facilities are generally not preferred in this situation; bicycle lanes may be more appropriate. Crossings should be designed to minimize conflicts; additional positive guidance should be considered to warn cyclists and motorists of conflicts. If bicycle lanes are not feasible, wide curb lanes may be provided.
Major intersections with high speed and traffic volumes are encountered	Consider provision of bicycle lanes, bike boxes, intersection and conflict zone markings as well as special bicycle signal phases at major intersections. Consider indirect left-turn treatments if there is significant bicycle left turn demand conflicting with through motor vehicle traffic. If a separated facility is being considered, crossings should have bicycle traffic signals with exclusive phases, and conflicts should be clearly marked.

2.4 NACTO High Comfort Bicycle Facilities

In December 2017, the National Association of City Transportation Officials released the "Designing for All Ages and Abilities – Contextual Guidance for High-Comfort Bicycle Facilities" which provides guidance on choosing an "All Ages & Abilities Bicycle Facility" based on vehicle speed and volume, number of vehicle lanes and operational considerations.

The guidelines suggest that protected bicycle lanes (or separated bike lanes / cycle tracks) are most appropriate for multi-lane roadways with speeds greater than 40 km/h and an ADT greater than 6,000 vehicles. It further notes that most people are uncomfortable riding a bicycle immediately next to vehicles travelling at 40 km/h or greater and that conventional bike lanes are usually inadequate to provide an All Ages & Abilities facility.

Professional Judgement

As shown in the above guidelines, various facility types may be suitable for Spine Road / Valleywood Boulevard and the other roadways within the study area. An assessment of the study area, future conditions, proposed geometrics, constraints and the overall corridor evaluation was completed along with consultation with the Town of Caledon and a review of relevant policy documents related to cycling in the study area was undertaken to determine the preferred alternatives suitable for study area.

OTM Book 18 provides a guideline on the preliminary selection of the facilities. However, as noted in the manual, the final decision on the preferred bicycle facility requires professional judgement:

"The experience and judgement of a qualified engineering designer or practitioner should ultimately influence the bicycle facility type, plus the added design features or enhancements that are selected."

As a result, a more detailed assessment was undertaken to identify the preferred cycling facility type and location.

The preferred pedestrian facility type will be chosen in line with the chosen cycling facility or facilities.

2.5 Cycling Facility Alternatives

Based on the assessment considered above, several alternatives were carried forward for further consideration and evaluation. Due to the variety of roadway sections, needed crossing over Highway 410 and the identified constraints, a variety of cycling facilities within the study area are appropriate. Four (4) alternatives were selected for further evaluation, as follows:

- Alternative 1: Do Nothing - Share Road (existing condition)
- Alternative 2: Multi-use Trail
- Alternative 3: On Road Bike Lanes
- Alternative 4: Pedestrian/Cyclist bridge over Highway 410 (only relates to Section 3).

Alternative 1: Do Nothing - Share Road (existing condition)

- Existing right-of-way can not support widening
- Existing bridge over Highway 410 (Valleywood Boulevard) has insufficient space for cycling infrastructure
- Cyclist will have to ride on the road "Share Road" condition

Figure 2.1. Share the Road

Alternative 2: Multi-Use Trial

- Off road (within boulevard), hard surfaced trail
- Intended for shared use by pedestrians, cyclists, inline skaters, etc.
- Accessible for all including people using wheelchairs, scooters, walkers
- Existing maintenance strip could be maintained

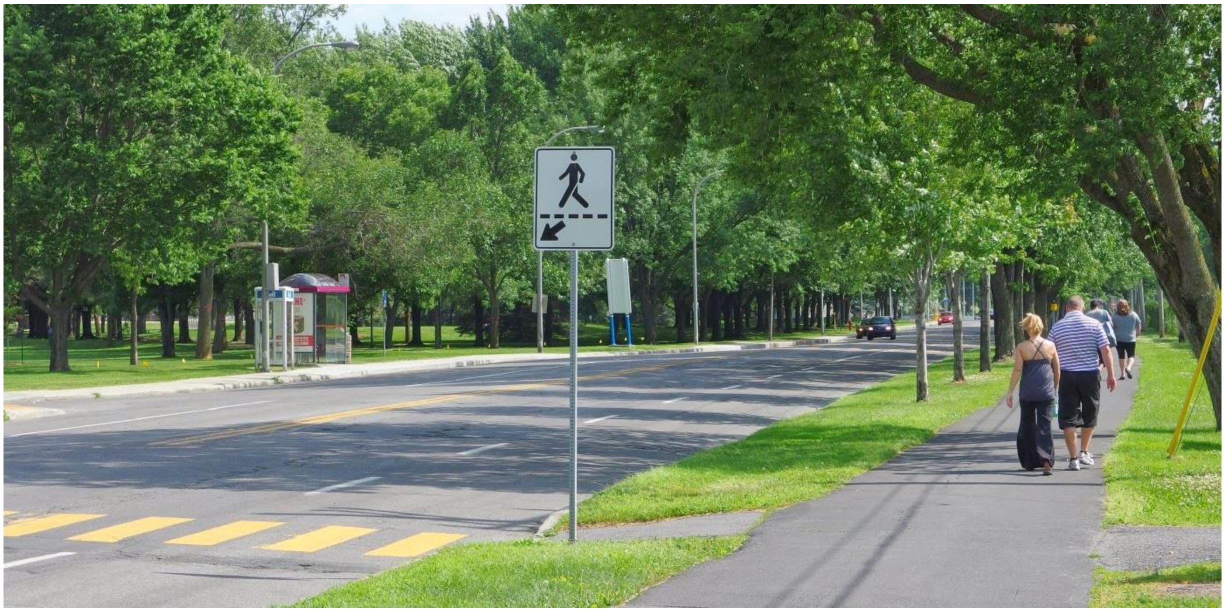


Figure 2.2. Multi-use Trail

Alternative 3: On-Road Bike Lanes

- On road adjacent to vehicular traffic lanes
- Delineated with pavement markings and regulatory signage
- Intended to provide dedicated space, exclusive to cyclists

Figure: 2.3. On-Road Bike Lanes

Alternative 4: Pedestrian / Cyclist Bridge

- Intended for shared use by pedestrians, cyclists, inline skaters, etc.
- Provides access to the Valleywood Community and the new Mayfield West Development
- Provides a safer alternative than crossing Highway 410 at the interchange

Figure: 2.4. Pedestrian / Cyclist Bridge

2.6 Facility Widths and Space Requirements

Table 3.14 to **Table 3.16** below are excerpted from OTM Book 18 and present the desired and suggested minimum widths for shared roadway, multi-use trial and on-road bike lanes. It is recommended that the desired widths be used in the design. However, for context-specific situations on segments or corridors with constrained right-of-way width, a reduction in width to a value greater than or equal to the suggested minimum may be considered.

Table 3.14. SHARED ROADWAY WIDTH

Facility	Desired Width	Suggested Minimum Width
Wide Shared Roadway / Signed Bicycle Route[a]	4.5 m[b]	4.0 m[c]
Narrow Shared Roadway / Signed Bicycle Route[a]	4.0 m	3.0 m[de]

[a]Applies to curbside lane. Widths for the shared travel lane should be considered from the face of the curb (for urban cross-sections without on-street parking), or the edge of the parking lane (for roads with on-street parking).
[b]Due to local variations in width, this may be up to 5.0m in places. However, the lane width should not consistently exceed 4.5m or motorists may attempt to overtake other motorists, causing a safety risk for cyclists. In these cases, provision of a designated bike lane should be considered.
[c]Only suitable for lanes without sharrows or where the designer considers traffic volumes to be low and the speed differential between motor vehicles and bicycles to be minimal. Otherwise, a minimum lane width of 4.3m is suggested.
[d]Applied for low volume and low speed conditions; cyclists may take the lane.
[e]It is recognized that travel lane widths may be less than 3.0m – cyclists are still permitted as a vehicle under the HTA to use these roads.

Table 3.15. MULTI-USE TRIAL WIDTHS

Facility	Desired Width	Suggested Minimum
One-Way In-Boulevard Bicycle Facility	2.0 m	1.8 m
Two-Way In-Boulevard Bicycle Facility	4.0 m	3.0 m[b]
Two-Way In-Boulevard Shared Facility	4.0 m	3.0 m[b]

[a]Excludes splash strip (typical width 1.0 metre) where the in-boulevard facility abuts the curb.

[b]This may be reduced to 2.4 metres over very short distances in order to avoid utility poles or other infrastructure that may be costly to relocate.

Source: Based on AASHTO Guide for Planning, Design and Operation of Bicycle Facilities, 2012; NACTO Urban Bikeway Design Guide, 2011

Table 3.16. ON-ROAD BIKE LANE WIDTHS

Facility	Desired Width	Suggested Minimum
Conventional Bicycle Lane[e]	1.8 m[a]	1.5 m[b]
Conventional Bicycle Lane splitting two travel lanes[c]	2.0 m	1.8 m
Conventional Bicycle Lane adjacent to on-street parking	1.5 m lane + 1.0 m buffer	1.5 m lane + 0.5 m[d] buffer

[a]Up to 2.0 metres where high volumes of cyclists are anticipated, to facilitate overtaking within the bike lane.

[b]In a low volume, low speed constrained corridor with no gutter, this may be reduced to 1.2 metres. Cyclists may have to cross into the adjacent travel lane with little warning to avoid any debris or pavement defects.

[c]Includes bike lanes between through lanes and turn lanes on the approach to an intersection. Also applies to bike lanes between through lanes and merge lanes downstream of an intersection.

[d]Assumes a parking lane width of 2.5 metres, although where possible the buffer width should be increased by reallocating road space from the parking lane. This is to encourage motorists to park closer to the curb, thus reducing the conflict zone between cyclists and car doors that may open without warning. In a low volume, low speed constrained corridor, a minimum 1.8-metre wide bicycle lane may be provided without a buffer. However, the practitioner should consider the increased risk of collisions between cyclists and opening car doors or alighting passengers.

[e]Includes bicycle lanes alongside continuous barriers such as guiderails and underpass walls. Where intermittent obstructions (for example, sign posts) are present alongside the bicycle lane, a width of 1.8 – 2.0 metres is recommended.

Source: Based on the AASHTO Guide for the Planning, Design and Operation of Bicycle Facilities, 2012

2.7 Typical Cross-Sections

To evaluate the space requirements and appropriateness of the facility relative to the proposed conditions for each alternative carried forward, typical cross-sections were created, and presented below. Cross-section elements may vary, therefore a range of widths is provided in **Table 3.17**

Table 3.17. CROSS-SECTION ELEMENTS

Cross-section Elements (ranges)	
Through Lanes	3.0m - 3.7m
Sidewalk	1.5m - 2.0m
Multi-Use Trial	2.4m to 6.0m
Maintenance Strip	0.0m to 1.0m

The study area has been divided into 2 sections:

Section 1 – Valleywood Boulevard from Snelcrest Drive to Hurontario Street/Spine Road (Approx. 600m)

The section of Valleywood Boulevard from Snelcrest Drive to Hurontario Street has a variety of cross-sections, including one lane each direction with left and right turn lanes at the Highway 410 on and off ramps. The existing condition supports sidewalks on both sides with on road cycling (Share Roadway). For Section 1, the following alternatives were considered.

Alternative 1: Do Nothing
The "Do Nothing" alternative would maintain the existing cross-section and cycling would continue to use the roadway as a shared roadway and pedestrians would continue to use the 1.5m wide sidewalk.

Alternative 2: Multi-use Trial
The multi-use trail alternative would require additional space on the bridge over Highway 410 which is not available. To accommodate a multi-use trial the structure would have to be widened or the construction of a separate structure would be required. This section of roadway also has on and off ramps to Highway 410 which are high traffic locations and are not generally preferred.

Alternative 3: On-Road Bike Lanes
The On-Road Bike Lanes alternative would require additional space on the bridge over Highway 410 which is not available. To accommodate On-Road Bike Lanes, the structure would have to be widened or the construction of a separate structure would be required. This section of roadway also has on and off ramps to Highway 410 which are high traffic locations and would conflict with on-road bike lanes.

Section 2 – Hurontario Street from Collingwood Avenue / Highwood Road to Valleywood Boulevard / Spine Road (Approx. 250m)

The section Hurontario Street from Collingwood Avenue / Highwood Road to Valleywood Boulevard / Spine Road has a proposed cross-section of 2 lanes in each direction, with turn lanes at the intersection. The existing condition supports sidewalks on both sides with on road cycling (Share Roadway).

Alternative 1: Do Nothing
The "Do Nothing" alternative would maintain the existing cross-section and cycling would continue to use the roadway as a shared roadway and pedestrians would continue to use the 1.5m wide sidewalk.

Alternative 2: Multi-use Trial
The multi-use trail alternative, though it could be accommodated for this section, this section is very short (approx.250m) and does not tie into an existing multi-use trail at either end of this section and therefore this option is not preferred. The current cycling infrastructure on Hurontario Street is shared roadway.

Alternative 3: On-Road Bike Lanes
The On-Road Bike Lanes alternative though it could be accommodated for this section, this section is very short (approx.250m) and does not tie into existing On-Road Bike Lanes at either end of this section and therefore this option is not preferred. The current cycling infrastructure on Hurontario Street is shared roadway.

3.0 Alternatives Assessment and Preferred Design

3.1 Alternatives Assessment

The alternatives for each section were evaluated using the following criteria:

- roadway constraints and constructability
- property impacts
- utility impacts

- safety and operations
- capital and maintenance costs

4.0 Conclusions and Recommendations

This report summarized the process taken to select the preferred cycling and pedestian facilities for Valleywood Boulevard between Snelcrest Drive and new proposed intersection at Hurontario Street / On/Off ramps to Highway 410 and Hurontario Street between Collingwood Avenue / Highwood Road and new proposed intersection at Hurontario Street / On/Off ramps to Highway 410. The preferred alternative was generated based on various factors, relevant policies, guidelines from OTM Book 15 and 18, input from the Town of Caledon and sound engineering judgement.

The recommended alternative for sections 1 and 2 is Alternative **1: Do Nothing -** maintain the existing conditions. Cycling volumes in the study area is very low, with an alternate route available for pedestrian / cyclists along the Etobicoke Creek Trail. Sidewalks in the study area will need to be extended to the new proposed intersection at Collector Road "F" and tying into the existing sidewalk at Collingwood Avenue / Highwood Boulevard. Additionally, the dedicated bicycle / pedestrian crossing of Highway 10 recommended by the MW2 TMP, when implemented, will further reduce the need for Active Transportation users to cross Highway 410 via the Valleywood Boulevard overpass.