Cape Breton Regional Municipality

GRAND LAKE ROAD MULTI-USE PATH, MAYFLOWER MALL TO RESERVE MINES



This study was made possible through the assistance of:

NOVA SCOTIA
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Canada

CAPE BRETON UNIVERSITY

Cape Breton Regional Municipality
Active TRANSPORTATION

FINAL DESIGN REPORT

MARCH 2012

IBI GROUP

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1. INTRODUCTION

Cape Breton Regional Municipality (CBRM) retained IBI Group in association with Exp. to undertake a design feasibility study for a multi-use path along Grand Lake Road from Mayflower Mall to Reserve Mines.

Grand Lake Road (Trunk 4) is the primary route between Sydney and Glace Bay under the jurisdiction of the Province of Nova Scotia. The section of interest is from Mayflower Mall near Highway 125, to Reserve Mines, approximately 10 km. Sections of concrete and asphalt sidewalks have been built over the years along the south side of the highway. CBRM is responsible for the installation and maintenance of the sidewalk.

CBRM considered the need to accommodate pedestrians travelling along this corridor, and connecting Sydney, Glace Bay and Cape Breton University (CBU), by rehabilitating and filling the gaps in the existing sidewalk. The idea that a higher-quality path is desired came to light through the CBRM Active Transportation Plan (August 2008). It could serve not only pedestrians but also cyclists and other non-motorized wheeled users. It became a "signature project" as shown in Exhibit 1, i.e. one with the potential for strong community backing. Identifying this project as a signature project would help to leverage funding from other levels of government, engage community interest, highlight and resolve design challenges, and provide visible actions.

1.1 Project Rationale

The Study Area and the populations that would be served by the proposed path along Grand Lake Road are illustrated in Exhibit 2. The rationale for constructing the path is based on a variety of benefits as presented below.

Supporting Efficient Transportation: a short trip by bicycle

The length of the proposed path is about 10 km, with CBU lying about 5 km from either end, from Sydney and from Reserve Mines. Creating a multi-use path would make this distance doable by bicycle within a reasonable amount of time, i.e. about 15 to 20 mins. to the ride to CBU from either end. Given the number of people who live in the communities at either end, the staff and student populations at CBU and NSCC Marconi Campus, and the residents living along Grand Lake Road, there is potential to significant increase the number of people walking and cycling along this corridor. As the longest asphalt path in Nova Scotia, it will also be a destination for recreational or fitness users that may drive to the corridor to use it.

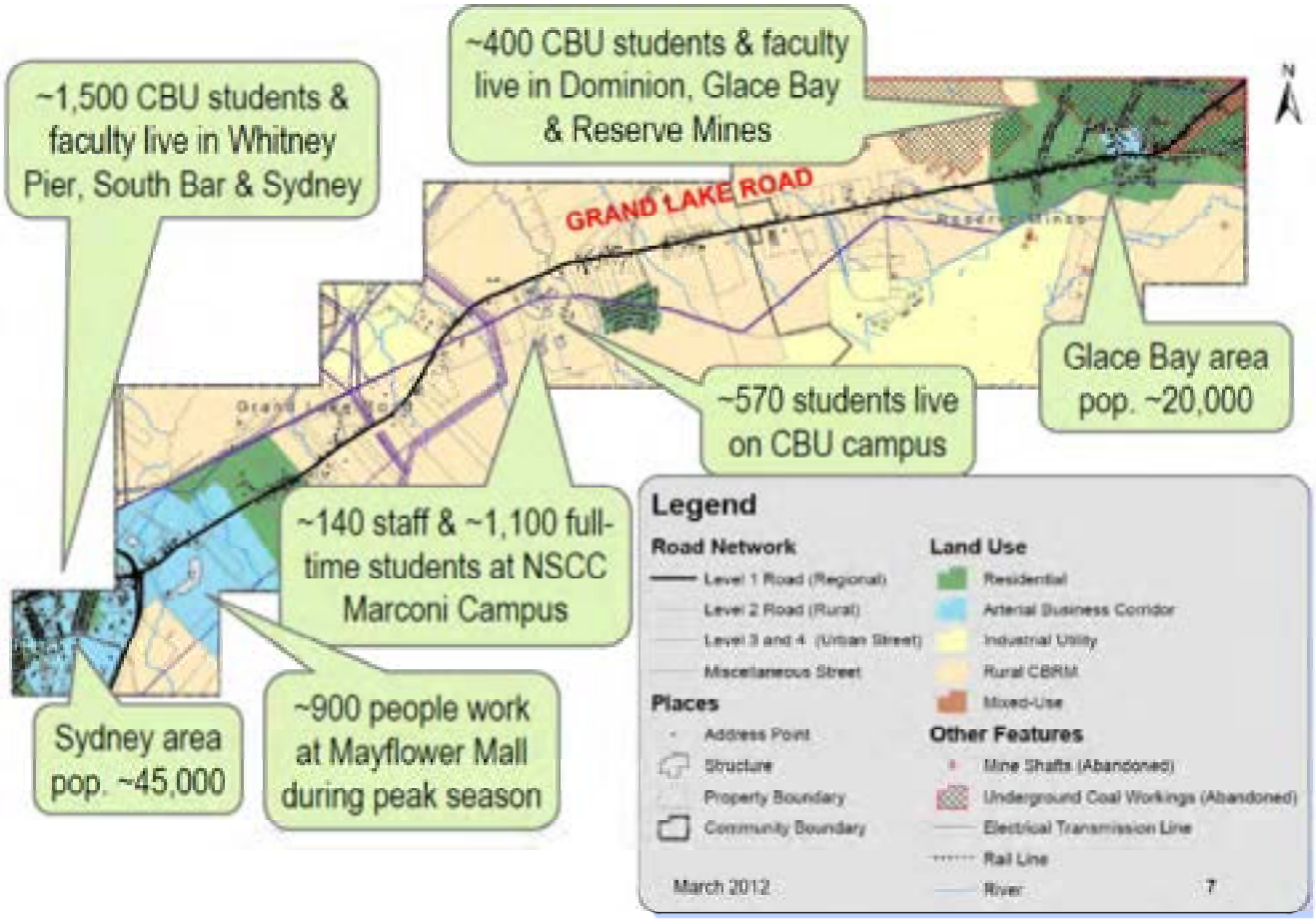
Improving Safety: an alternative to riding on Grand Lake Road

A path along Grand Lake Road would provide a pleasant and relaxing ride compared to cycling on Grand Lake Road in heavy traffic travelling at 80 km/h or more. Grand Lake Road is four lanes wide throughout the length of the project, narrowing to two lanes as it enters Reserve Mines where the path would connect with the existing sidewalk and paved shoulders. The *Trunk 4 Corridor Study*[1] indicates that it carries around 16,000 to 33,000 vehicles per day, and traffic is predicted to increase by 8% between 2004 and 2014, and another 8% to 2024. The posted speed is predominantly 80 km/h, although it drops to 60 km/h approaching Sydney and 50 km/h approaching Reserve Mines.

[1] CBCL Limited, *Trunk 4 Corridor Study: Volume 1 Technical Report*, Nova Scotia Transportation and Public Works, Cape Breton Regional Municipality, October 2004.

Exhibit 1: Signature Projects

Exhibit 2: Study Area



These traffic conditions are not conducive to motorists and cyclists sharing the travel lanes. The high speeds and volumes would make it very uncomfortable for experienced cyclists; inexperienced cyclists or those just considering riding a bicycle are highly unlikely to ride on Grand Lake Road.

Connecting Places: getting to important destinations

The path is an essential component of supporting active transportation between communities. Coupled with bikes on buses, the path can provide flexibility for a variety of travel modes. It will enhance the position of the CBU campus in that it will no longer be isolated and only accessible by motor vehicle. Other destinations it will serve include Mayflower Mall, Reserve Mines, Sydney Airport, Nova Scotia Community College Marconi Campus, and the Cape Breton Health Recreation Complex. Residents who live along Grand Lake Road and students who live on the CBU campus will also benefit from having access to transportation alternatives to get to the destinations along the corridor and beyond in Sydney and Glace Bay. The recently announced Cossitt Heights housing development is adjacent to the May Flower Mall. The Grand Lake Road Path will significantly enhance this development.

Boosting Economic Development: CBU and Sydney Airport as accessible centres of economic activity

Cape Breton University, Nova Scotia Community College Marconi Campus, and J.A. Douglas McCurdy Sydney Airport are economic drivers in the region's economy. CBU employs around 400 faculty and staff, and attracts over 3,400 full-time and part-time students from the region, Province, Canada and 40 other countries. Almost 1,900 of them live within 10 km of the campus plus 570 live on campus. CBU is interested in making the campus more walkable and bicycle-friendly with

improved walkways and bikeways, and bicycle parking. NSCC Marconi Campus employs about 140 people and there are 1,100 full-time students. Sydney Airport supports personal, vacation and business travel through three airlines and four charter businesses with almost 140,000 passengers per year. The path along Grand Lake Road will demonstrate that these economic drivers are connected to an active transportation network that supports healthy activity leading to a healthier work force and an improved quality of life.

Simplifying Eco-Tourism: Land at Sydney Airport and ride

Cape Breton and the Cabot Trail in particular are known internationally as destinations for cycling tourism. Cyclists are attracted to the challenge of the terrain, the beauty of the scenery and the vibrancy of the communities. The Grand Lake Road path will be the first experience for those arriving by air with their bicycles. They will no longer be faced with negotiating a four-lane, high speed, high traffic road to get started on their adventure or having to arrange transport for their gear to start their trip. Instead they will be able to seamlessly transition from arriving by air to starting their vacation by pedal. Cycle-tourism is expected to see substantial growth based on experience elsewhere in North America. Bicycle-friendly communities create business opportunities around urban and rural scenic routes.

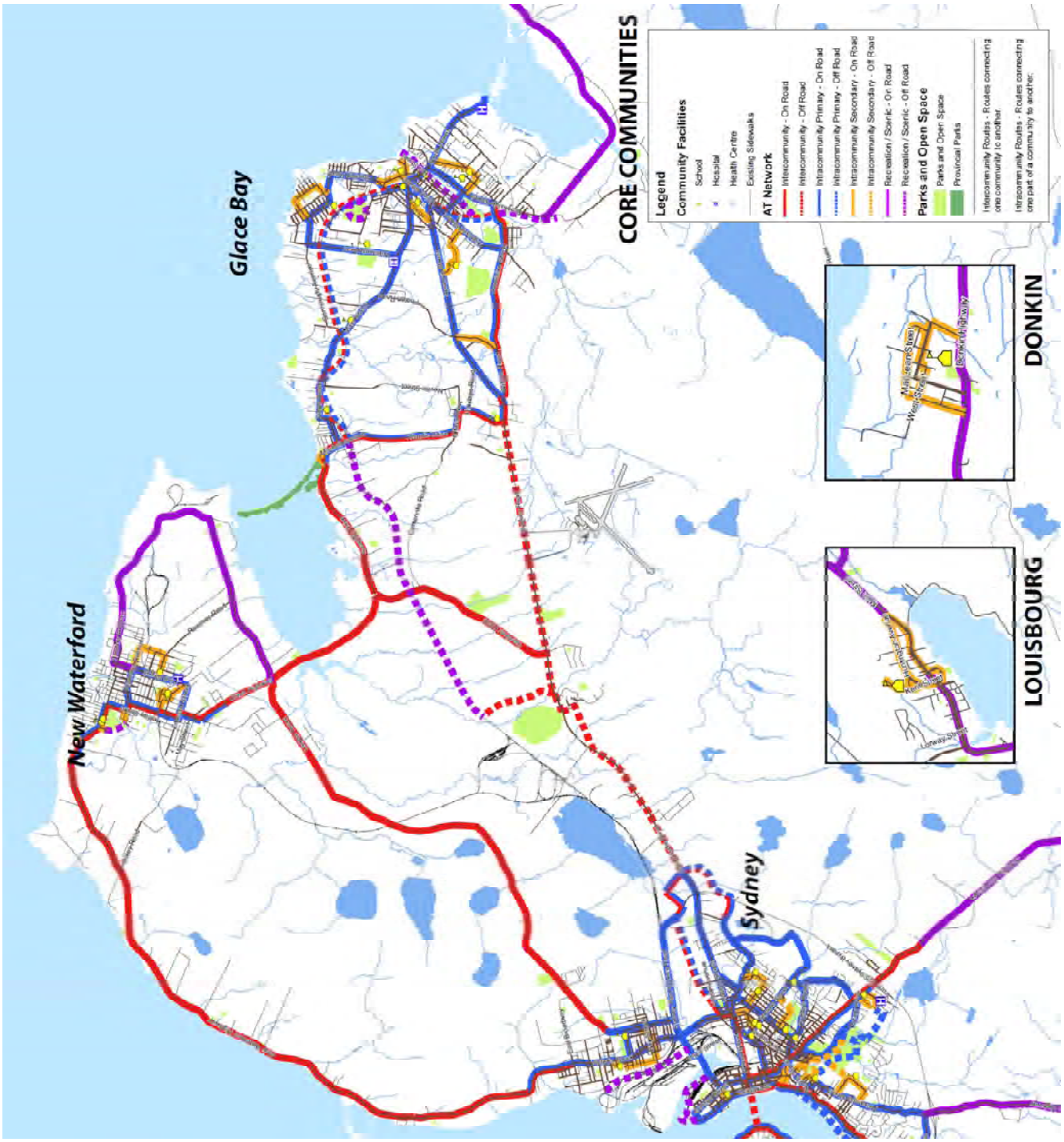
1.2 Active Transportation Connections

The CBRM Active Transportation Plan recommends walking and cycling routes in the four core communities of Glace Bay, New Waterford, North Sydney / Sydney Mines and Sydney, intercommunity routes between these communities, and a regional recreational network, as illustrated on Exhibit 3.

The proposed path along Grand Lake Road is an essential part of the intercommunity network connecting Sydney to Glace Bay. It connects to the following active transportation routes in the recommended region network:

- Existing paved shoulders and sidewalk on the north side of Grand Lake Road / Sydney Road in Reserve Mines
- Proposed on-road routes to Dominion and Glace Bay along Gardiner Road, Main Street, Reserve Street and Wilson Road
- Proposed path along the DEVCO rail line and the access road to the CBRM sewage lagoon near CBU to Dominion and Glace Bay
- Proposed pedestrian upgrades on Welton Street in Sydney
- Proposed on-road routes to Whitney Pier on Garth-Wilson Drive and Sydney Port Access Road
- Proposed off-road route along the tramline from Sydney Port Access Road to Victoria Road into Sydney
- Planned multi-use trail from the future Cow Bay Road overpass of Highway 125 to Mayflower Mall
- Proposed on-road routes from the future Cow Bay Road overpass of Highway 125 along Prince Street and Cossitt Heights Drive into Sydney

Exhibit 3: Excerpt from the CBRM Active Transportation Region Network



1.3 Consultation

1.3.1 STAKEHOLDERS

At key points in the study, members of the Steering Committee and consultant team met with stakeholders to review options and present the recommended design. The stakeholders and their general response to the project are as follows:

- **Cape Breton University**—CBU is very supportive of the proposed path. They see the path as a benefit to the students who live on campus and to faculty, staff and students who live nearby in Sydney and Glace Bay. It will contribute to the quality of life associated with campus in attracting future employees and students. They are considering other modifications on campus to make it more walkable and bicycle-friendly. An agreement between CBU and CBRM for constructing the path on their property and the rest area at South West Brook, along with maintenance and liability responsibilities of the two parties will be required.

- **CBU Student Union**—The students' interests in quality of life, fitness, environment and sustainability issues align with the development of the proposed path. The Student Union is interested in viable transportation options and see the path as providing alternatives for students who live on campus and in nearby Sydney and Glace Bay.

- **A. Douglas McCurdy Sydney Airport**—The Airport Authority is supportive of the path and the rest area that would be constructed on their property. They see both as enhancing their property, fitting with their overall desire to enhance customer and employee services, and benefitting residents nearby that often walk along Silver Dart Way for exercise. It will serve the cycling tourists who arrive at the airport well, and is a good fit with regional tourism strategies.

- **Mayflower Mall**—The owners / managers of Mayflower Mall view the path as an important link that will provide more flexibility to their customers and employees to access the Mall. They see a benefit to students that live on the CBU campus to be able to arrive at the Mall without having access to a car. An agreement between Mayflower Mall and CBRM would be required for liability and maintenance; CBRM's liability insurance would cover the use of the path.

- **Loblaws**—The path is proposed to traverse vacant lands owned by Loblaws on the east side of the Fire Hall and along the Grand Lake Road frontage. Loblaws would consider permitting the path to be constructed on their property subject to a review of the design plans. An agreement between Loblaws and CBRM would be required for liability and maintenance; CBRM's liability insurance would cover the use of the path.

- **Velo Cape Breton**—This organization is a non-profit, volunteer-run bicycling organization serving all of Cape Breton Island. They offer a wide variety of rides for people of all ages and abilities, including safe cycling instruction. Velo Cape Breton has been a long supporter of improved conditions for active transportation and is fully behind the development of the Grand Lake Road Multi-use Path.

1.3.2 PUBLIC

Two open houses were held during the study to obtain input and feedback from members of the public and property owners along Grand Lake Road. Over 150 people attended the open houses. Generally a few property owners are concerned over the potential impact to their property, such as landscaping, septic beds and water wells. Some residents living on Grand Lake Road noted the

traffic issues that they deal with on a daily basis, and some regard the path as enhancing their quality of life. A few people are concerned with the cost of the path.

Twenty-two comment forms were submitted. Of these, 17 were supportive of the pathway, one was supportive of the pathway but not along the highway, one was not supportive, and three did not indicate support or opposition to the project but expressed concerns about aspects of the project such as funding or property impacts. Comments submitted are summarized in Exhibit 4.

Exhibit 4: Comments Received from Members of the Public

First open Houses (January 2011)

Concerns about the multi-use path:

- Children will be too close to the highway
- Worried about the message sent to vehicle commuters about bike use on sidewalks. A wider sidewalk is still a sidewalk where cyclists are usually no permitted. Drivers may think all cyclists on all streets should use sidewalks.
- Just with regards to safety concerns in the area located around CBU itself; because of the high volume of traffic in this area. If it is possible to direct the property ownership and use the short tram section there, then it would be ideal in this location.
- It is too close to the highway. 18 wheelers are going too fast. The speed limit must be slower.

Supportive of CBRM pursuing construction of the path:

- I fully support the path to Reserve Mines from CBU. I've used those sorts of cyclist lanes in London and Toronto and find that what is key is that the beginning and end of the path are hazardous for users unless they are clearly marked for motorists. Lots of space for motorists and path users to merge into the same space is usually a good idea.
- I think it will be a great asset and will make life easier for a great number of people who either do not have a car, or want to be more active. Active transportation is the way to go.
- We need such things to open our area to the modern era found in larger communities
- Great to see in CBRM; long overdue
- Very supportive!
- This is a great beginning to improving AT in CBRM
- I am very supportive of the project. It would be a good start for citizens to get healthier and would be an asset for CBU students, staff and faculty. A lot of foreign students, use to cycling in their own countries, would certainly be attracted by such a commodity.
- I would love to see a multi-use path between CBU and the Mayflower Mall! Especially if there was a space for pedestrians to walk. I see lots of students walking back along the grass on the side of the highway; it would be good to have a separate lane there. I've used those sorts of lanes too, which are not on the road surface but adjacent to the road, where the sidewalk would be. Cyclists share with pedestrians, but there are two clear lanes marked. Everyone stays to their right for the direction they are heading, and cyclists must ring their bells in advance of passing pedestrians (and must wait for the other lane to be clear to pass). Now that sort of a path would be excellent to see all around Sydney, even in the downtown area (to Wentworth Park!).
- Anything that gets people outside and on to moving in some way, shape or form would be a good thing. Health issues, people of all ages—would be a plus for the area.
- I am in favour of the pathway, but must be behind the highway along the first power line

Not supportive of CBRM pursuing construction of the path:

- Definitely not supportive. We are $120,000,000 in debt now. Who is going to pay for this? We should be cutting costs and reducing salaries. The population and profit-making industries are too small for the project.

Suggestions for improving the design of the path:

- Try including engineering students in the design to involve fresh perspectives
- Would like to see linkage into New Waterford
- To create “buzz”, suggest closing down 2 of 4 lanes of the highway on Sunday mornings for cyclists / pedestrians
- Stick to the width of 3 m!
- Spend more to get path out of sight of vehicle commuters—put it behind street in wooded areas where possible
- What about connecting to buses—cyclists should be able to board buses and hang their bikes on the back of them anywhere along the road—that would enhance the trail offerings.
- I hope that an education plan for motorists is underway to accompany the path. I have found it dangerous to cycle on the roads around Sydney/Dominion because motorists either slow right down behind you, threatening to pass for a dangerously

First open Houses (January 2011)

long time, or else they come too close to you as they pass. Perhaps that problem is because there is very little room between the white line and the shoulder of the road to cycle.

- Interpretive panel/kiosk—it was mentioned about possibly a panel going on the trail about half-way through informing people of how long they have gone and how much further they have before the trail finishes. Take this one step further and possible locate a kiosk/interpretive panel at the beginning of the trail at the Mayflower Mall and another panel at the end of the trail at Reserve Mines. Each one of these interpretive panels could be sponsored by a local business(s) with their respected logos, but also could be culturally significant as well. Each panel could have some type of significant historical fact pertaining to its place in Cape Breton's history that formed an integral piece of hospitality that Cape Breton is so incredibly famous for. For example, the panel near the Mall could have something about how the Mall got its name (The Mayflower Ship from the early settler's). And a piece of information about Reserve Mines could talk about the thriving mining industry back at the turn of century that shaped the hard-working Cape Breton attitude. I noticed these same types of panels along the trails in Fredericton, NB, that garnered much attention from both local and tourists alike. Trail users might benefit from having these interactive panels pose as a resource tool as well to educate them on the trail guidelines as far as etiquette and for appropriate use by both walkers and bicyclists and to approach the trail with due diligence.
- Lingan Golf Course—the course is opposite to where the trail is projected but perhaps more of the courses resources could be used for the trail. The course spans out for many kilometres and it requires certain etiquette for its users. There are signs that have to be complied with and speed zones enforced, both in the Parking Lot and on the cart paths. The course might be a good partner to collaborate with in the coming months and years for support and possible suggestions.
- Name for the trail—to involve the community and empower them and make them feel like this is their trail, have a contest around the Cape Breton Municipality to see who or what organization can come up with the best name for the trail. This could be based on certain criteria that are articulated by an organizing committee or it could be a free-for-all. The local radio stations would have a field day when it came time to promoting this contest and Public Health has a great partnership with the local radio station and we have a great PR staff that are well versed in the Cape Breton Culture.
- As someone who has been involved in land survey work in the local area for some time, I think it has potential. If you could use the natural setting, i.e., parts of the old tram line in conjunction with the road reserve itself, then I think it would turn out to be a positive thing along the line!
- We do not need a path. All that is needed is a repaving of the existing sidewalk and a reduction in the maximum speed limit.
- To improve the walkway, it must be away from the highway. I have experienced the water off the road by the speed of the traffic

Second Open House (February 2012)

Supportive of CBRM pursuing construction of the path:

- Very interested in having a safe place to walk and bike by my house
- Great idea for Grand Lake. We need more stuff for us 'Laker's' and our kids
- I very much support this project!
- Wonderful idea. So great to connect communities.
- Excellent idea, and long overdue. Everyone I meet agrees and supports this idea as we are entering an era of energy conservation, fitness awareness, and wellness. This project suits visions for the future health of the community in multiple ways.
- Awesome idea – will improve the general level of fitness in our community.
- I am a CBU student in the MBA, Community Economic Development Program. This path is a great initiative to connect CBU students with downtown Sydney, especially students living in residence. I have been discussing the path with many classmates, most of whom have bikes. They are very keen to use the path. It would be a great addition to our beautiful city. Build it and they will come.
- On behalf of many cyclists, thank you for the multi-use path. So nice to see that Sydney will finally follow in the footsteps of global trends. It will be nice to cycle and feel safe. Thank you, thank you, thank you.

Concerns about the multi-use path:

- Who is going to pay for removal of poles? What about speed limit? Who wide will the base be? Will the tax payer be charged for this? My driveway will have to be raised.
- Will the rest area at CBU be wheelchair accessible?
- Please use native species of trees and shrubs, i.e. is a "bean tree" native? I encourage the incorporate of public transit, i.e. in the rest stops.
- Concern with how close this is to my septic disposal bed.

1.4 Acknowledgements

The Grand Lake Road Multi-use Path Design Feasibility Study was prepared under the direction of a Steering Committee. Their commitment to understanding the needs of path users and reviewing the design options and details has resulted in a high quality path design. Steering Committee members include:

Cape Breton Regional Municipality:

- Rick McCready, Planning, Project Manager
- Fred Brooks, Recreation
- Lorne Fraser, Public Works Operations (East Division)
- Malcolm Roach, Public Works Operations (East Division)
- Bill Wadden, Engineering Services

Nova Scotia Department of Transportation and Infrastructure Renewal:

- Roy MacDonald

Nova Scotia Public Health Services:

- Aron Ashton

ape Breton University:

- Yann Artur

Velo Cape Breton:

- Andree Crepeau
- Chris Milburn

This study was made possible through the assistance of:

- Nova Scotia Department of Health and Wellness
- Enterprise Cape Breton Corporation
- Cape Breton University
- CBRM Active Transportation

2. DESIGN CRITERIA

2.1 References

Design criteria for the design of the Grand Lake Road Multi-use Path are based on the following references:

- Jolicoeur, Marc, *Planning and Design for Pedestrians and Cyclists: A technical guide*, Vélo Québec Association, 2010.
- *Geometric Design of Guide for Canadian Roads: Chapter 3.4—Bikeways*, Transportation Association of Canada, Ottawa, 1999.
- *Toronto Multi-use Path Design Guidelines* (Draft), City of Toronto, March 2007.
- *Geometric Design of Guide for Canadian Roads: Roadside Safety*, Transportation Association of Canada, Ottawa, 1999.
- *Bikeway Traffic Control Guidelines for Canada* (2nd edition), Transportation Association of Canada, Ottawa, 2012.
- "Appendix "C"—Walking and Multi-use Trail Treatments", Nova Scotia Transportation and Infrastructure Renewal, August 2009.
- *Pedestrian Crossing Control Manual*, Transportation Association of Canada, Ottawa, March 1998.
- *Designing Sidewalks and Trails for Access: Best Practices Design Guide (Part 2),* US Department of Transportation, September 2001.
- *Design manual for bicycle traffic,* CROW, The Netherlands, June 2007.
- "An Informational Report on Pedestrian Countdown Signals (PCS)", Traffic Operation & Management Standing Committee, Pedestrian Countdown Signal Project Steering Committee, Transportation Association of Canada, February 2008.

Grand Lake Road Multi-use Path design criteria are based on designing for the following intended users: pedestrians, pedestrians with mobility or visual impairments, cyclists (children under adult supervision, youth, adults, tandems, recumbents, adult tricycles, electric bicycles operated below 30 km/h, etc.), skateboarders, kick-scooters, strollers, and occasional maintenance vehicles. In-line skaters require a path width of 4 m to accommodate the sweep in their stride; they will be able to use the path but may find it somewhat narrow in full stride.

The design speed is recommended to be 30 km/h, allowing for cyclists generally travelling 15 to 25 km/h. This is for design purposes; a posted speed is not recommended at this time.

The design criteria are presented as follows: horizontal alignment, vertical alignment, cross-section, crossings and intersections, signage and pavement markings.

2.2 Horizontal Alignment and Superelevation

In general, the horizontal alignment will follow that of Grand Lake Road. However, in some locations, the path may deviate from this alignment.

- Min. horizontal curve radii: 17 m (asphalt surface)
- Preferred superelevation: 2%
- Max. superelevation: 3%
- Min. length of tangent between reverse curves: 7.5 m for transition of superelevation

2.3 Vertical alignment

In general, the vertical alignment will follow that of Grand Lake Road. However, in some locations, the path may deviate from this alignment. Since the path will be replacing a sidewalk, the grades must be accessible to persons with mobility devices.

- Preferred max. grade: 5%
- Max. grade: 10%
- Where the grade exceeds 5%, provide a level rest area (1.5 long, max. slope 2%) every 100 m
- Min. length of vertical curves to maintain sight distance:

Algebraic Difference in Grade (%)	Minimum Length (m)
4	0
6	23
8	35
10	43
12	53
14	61
16	70

2.4 Cross-section

2.4.1 PATH WIDTH

- Absolute min. width: 2.5 m
- Min. width: 3.0 m
- Preferred width: 4.0 m (NSTIR design criteria)
- A rideable shoulder of graded / compact granular materials or grass: width: 0.6 m (see also Section 2.4.2: Horizontal Clearances)

2.4.2 HORIZONTAL CLEARANCES

- Barrier curb and gutter on Grand Lake Road:
  To back of barrier curb: 1.0 m
  (NSTIR requires 1.2 m to face of barrier curb; barrier curb width is 0.2 m)

- Unprotected embankments, 1 m or less in height, or flatter than 3:1:
  Min. clearance: 1.0 m
  Preferred clearance: 1.5 m
  Embankments higher than 1 m or steeper than 3:1 require protection (fence or railing)

- Fixed objects or lateral obstructions (utility poles, trees, fences, walls, furniture, bus shelters, etc.):
  Min. clearance: 0.6 m
  Preferred clearance: 1.0 m
  A min. clearance of 0.4 m may be tolerable to intermittent fixed objects such as utility poles if relocation of the pole is costly

2.4.3 CROSS SLOPES

- Path: max. 2%

- Shoulder: max. 6%
  (includes horizontal clearance between back of curb along Grand Lake Road and edge of path)

2.5 Materials

Pavement materials to be confirmed by geotechnical engineer.

- Granular base, path and shoulder: 100 mm Type 1 and 200 mm Types 2

- Asphalt path: 75 mm D-HF

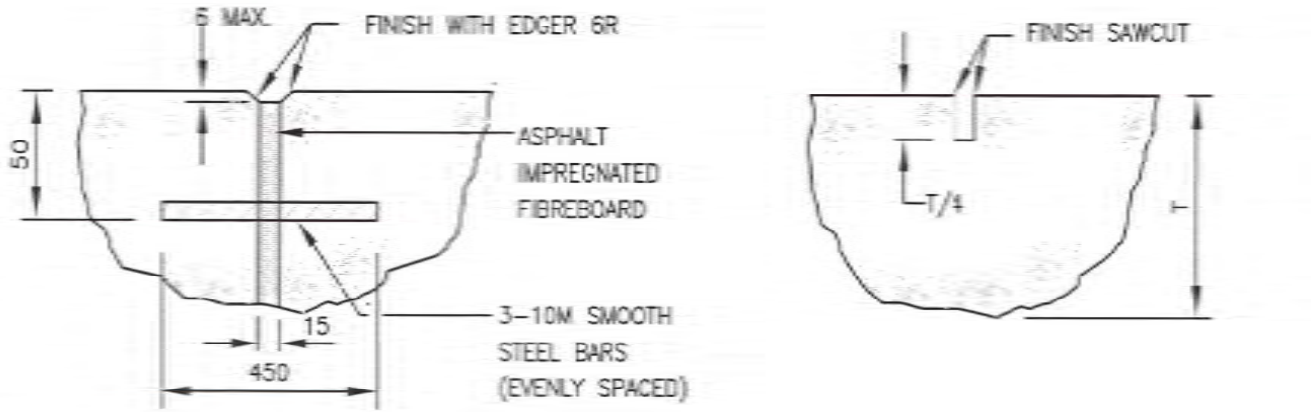
- Concrete path and ramp approaching intersections: 125 mm

- Concrete path through commercial driveways: 200 mm

- All concrete to be broom-finished with saw-cut contraction joints every 1.5 to 2.5 m, and asphalt impregnated fibreboard expansion joints with steel bars every 30 m; see Exhibit 5

- Buffer between back of curb on Grand Lake Road and path: native grasses or sod

Exhibit 5: Concrete Path Joint Details



Notes:
Bars are to be greased on one side of joint;
During consecutive pours, the end of each pour is to occur at an expansion joint where feasible. Where not feasible, an additioanl expansion joint is to be isntalled

2.6 Crossings and Intersections

2.6.1 PARALLEL CURB RAMPS

At all side street intersections (see Exhibit 6):

- Width should match that of multi-use trail (3.0 m)
- Max. grade: 8% (length of ramp based on achieving max. grade)
- Max. cross slope: 2%
- Level landing at top and bottom of ramp: width of path and 1.2 m long with max. grade of 2% and max. cross slope of 2%
- Detectable warnings: 600 mm wide for full width of curb cut at bottom of curb ramp; use local standard, or truncated domes (see Exhibit 7)

Exhibit 6: Concept for Concrete Curb Ramp at Side Street Intersections

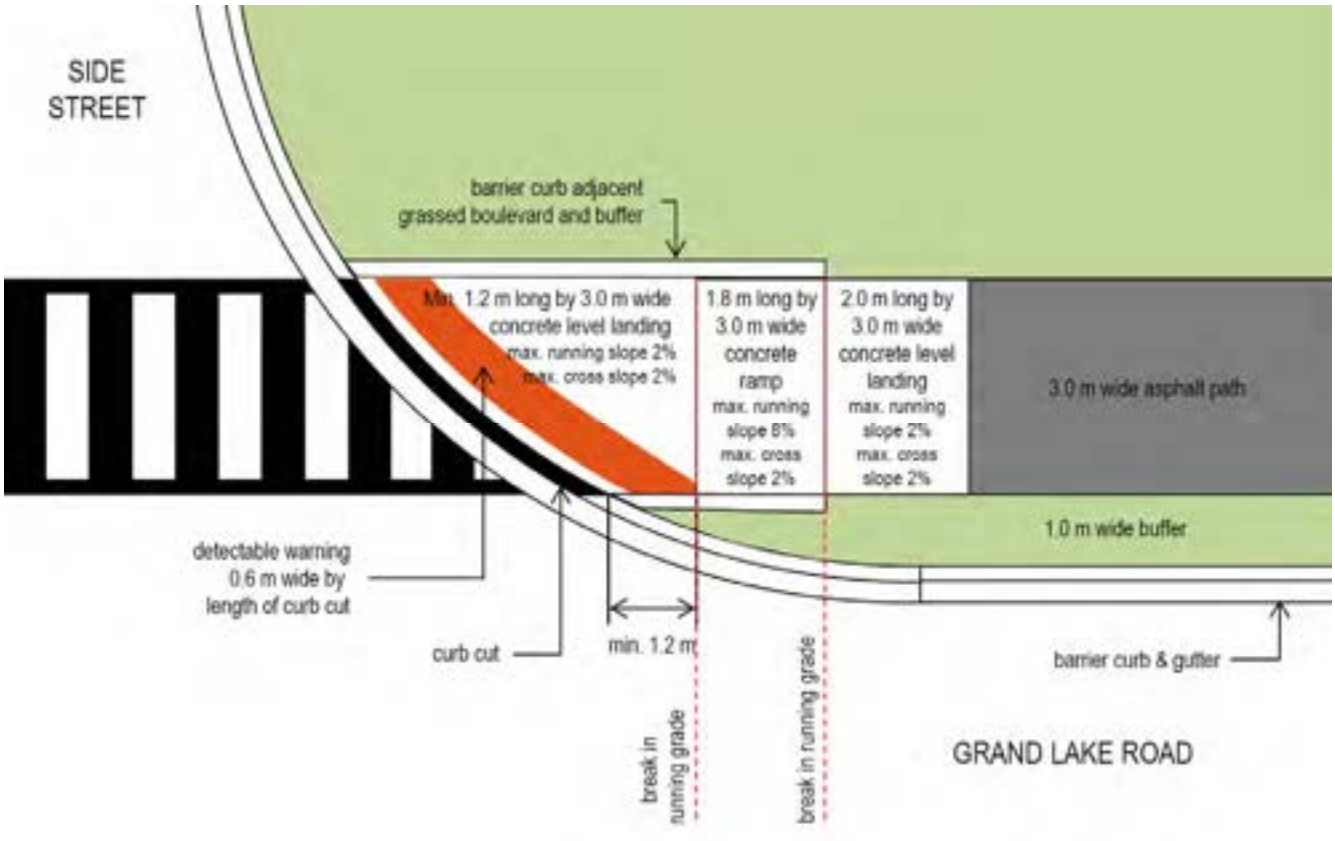
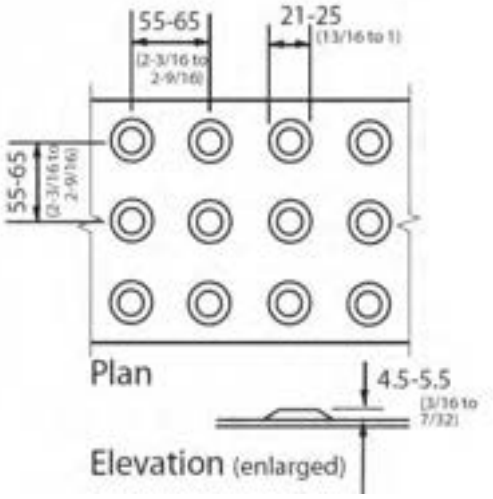


Exhibit 7: Truncated Dome Detectable Warning Surface

- Slip resistant
- Contrasts visually from adjacent surface
- Preferred material: cast iron; available in trapezoidal panels that can be placed on a curve



2.6.2 SPECIAL PEDESTRIAN CROSSWALK

See Section 2.7, page 18, Exhibit 13.

2.6.3 PEDESTRIAN COUNTDOWN SIGNALS

Initiated at the beginning of the flashing “DON’T WALK” interval, provide on all legs of intersections controlled by traffic control signals where the number of lanes crossed is greater than two. Refer to TAC’s “An Informational Report on Pedestrian Countdown Signals (PCS)”.

Provide at the following intersections on Grand Lake Road:

- Grand Lake Road and Highway 125 / Sydney Port Access Road—north, south, east and west legs
- Mayflower Mall westerly access—south leg
- Mayflower Mall easterly access / Garth Wilson Avenue—north, south, east and west legs
- University Boulevard—south leg
- Grand Lake Road at Evergreen Drive / Gardiner Road —east leg (to bus stop / proposed transit shelter)

2.6.4 DRIVEWAYS

Path to be continuous through residential and commercial driveways.

Path through driveways for the Ultramar gas station / Tim Horton’s to be 200 mm thick concrete to contrast with the adjacent asphalt. Install barrier curb and gutter to narrow the easterly entrance to 20 m wide and the westerly entrance to 25.0 m wide

Path cross slope not to exceed 2%; change in grade from Grand Lake Road to path along driveway to be taken up in the cross slope of the 1.0 m wide asphalt buffer between the path and cut curb & gutter.

2.6.5 MID-BLOCK CROSSINGS

Where the path alignment may deviate from Grand Lake Road and cross a side street mid-block, such as at the easterly access to Cape Breton University, consider the following design elements:

- Realign path approaching crossing to slow path users where feasible—min. 15 m radius curve followed by an 8 m radius curve and 5 m long tangent before the crossing; see Exhibit 8.
- Install raised path crossing (speed table) to limit motorists’ speeds to below 45 km/h; see Exhibit 9.

Exhibit 8: Reverse Curves Approaching Mid-block Path Crossing

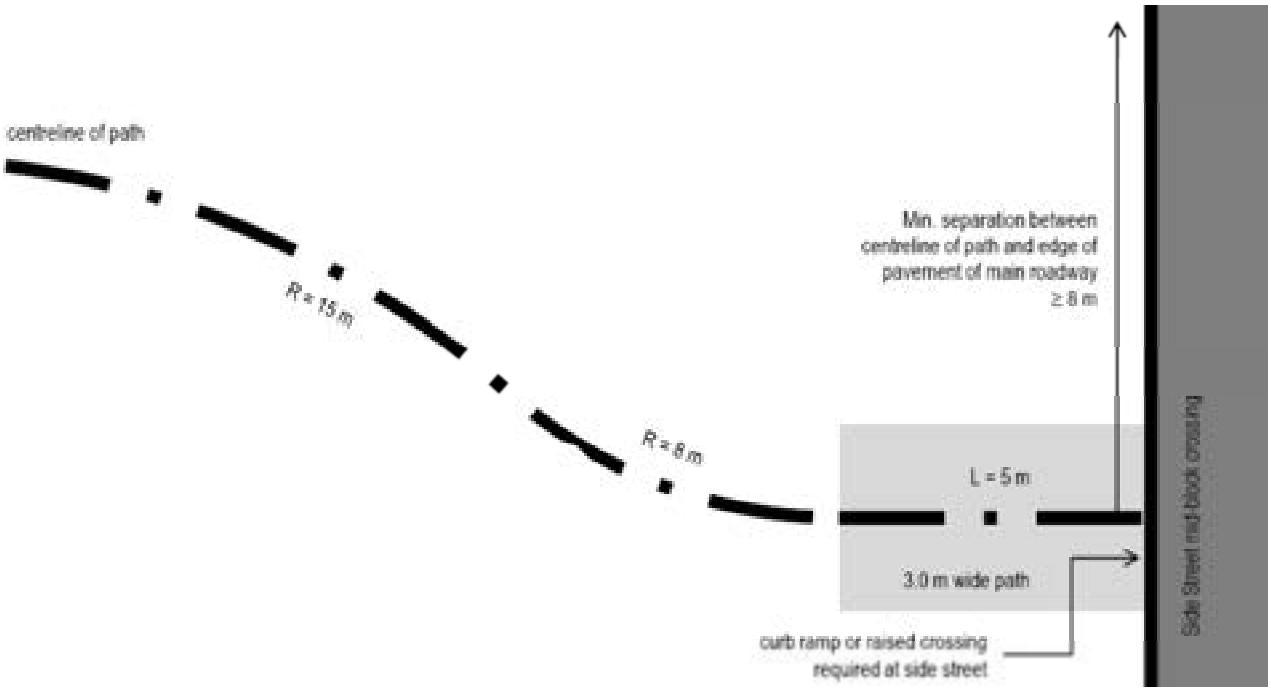
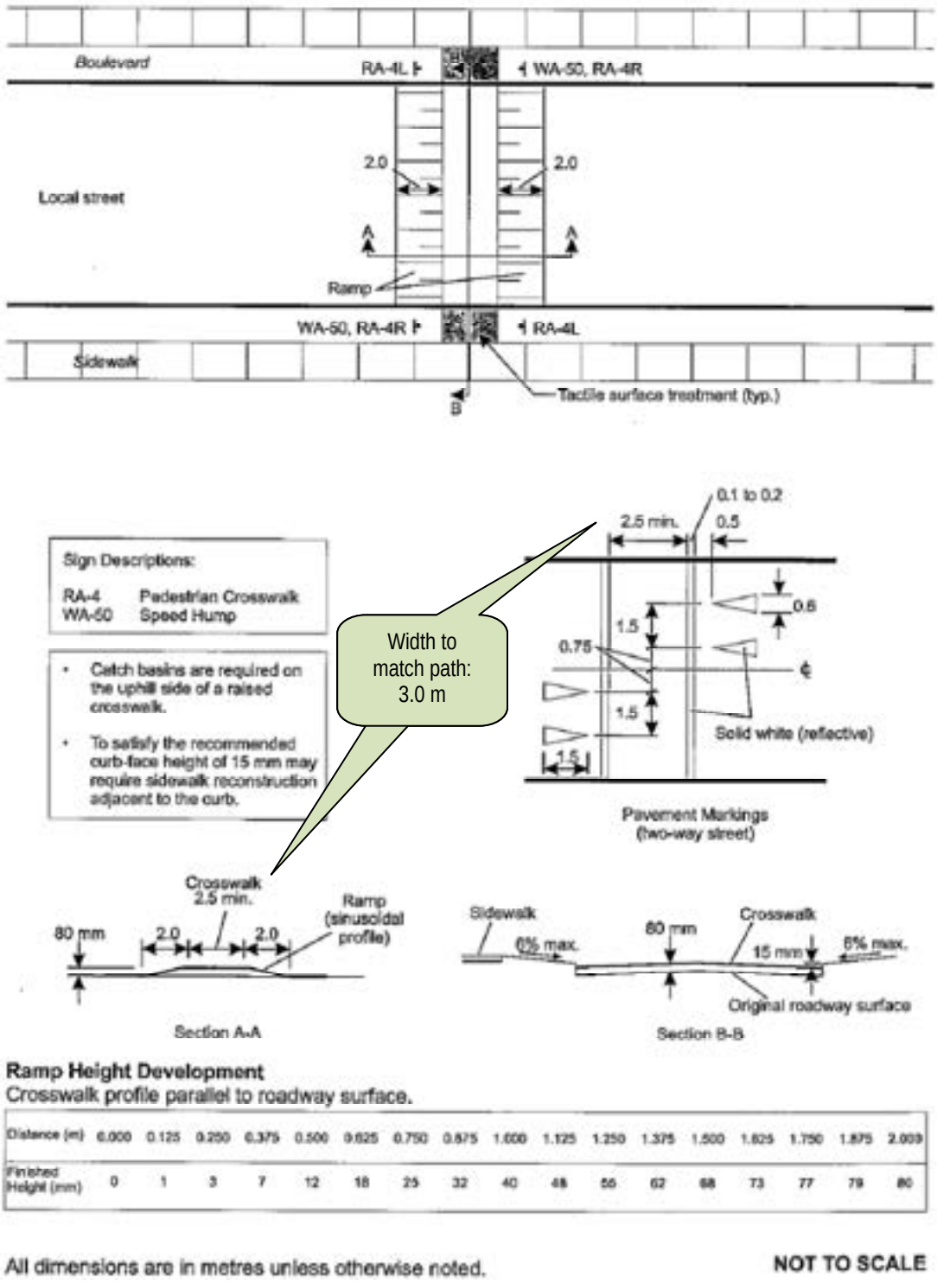


Exhibit 9: Raised Crosswalk Design Concept



From: *Canadian Guide to Neighbourhood Traffic Calming*, Canadian Institute of Transportation Engineers, Transportation Association of Canada, December 1998

2.7 Signage

2.7.1 CBRM ACTIVE TRANSPORTATION AND PATH ETIQUETTE SIGNS

Share the Path, Keep Right / Pass Left, and Destination / Distance (Mayflower Mall, Cape Breton University, Airport, Reserve Mines): Install Share the Path every 200 to 300 m, and all signs 15 m after every major intersection crossing (both directions); see Exhibit 10:

- Highway 125
- Garth Wilson Avenue
- Kytes Hill Drive / Yolanda Drive
- University Boulevard
- CBU easterly access
- Gardiner Road / Evergreen Drive
- Silver Dart Way
- Sunnyside Drive / Tompkinsville Road
- At rest areas (3)

Exhibit 10: CBRM Active Transportation Signage and Path Etiquette Signs

2.7.2 VEHICLE PROHIBITION SIGNS

At locations along the path where motorized vehicles may attempt to gain access, user prohibition signs (600 mm by 600 mm) are installed, including:

- Automobiles and Motorcycles Prohibited Sign (TAC RB-89)
- All-terrain Vehicles Prohibited Sign (TAC RB-87)
- Snowmobiles Prohibited Sign (TAC RB-65)

Exhibit 11: Vehicle Prohibition Signs (if required)

AUTOMOBILES AND MOTORCYCLES PROHIBITED SIGN
Rb-89
600 mm x 600 mm

ALL-TERRAIN VEHICLES PROHIBITED SIGN
Rb-87
600 mm x 600 mm

SNOWMOBILES PROHIBITED SIGN
RB-65
600 mm x 600 mm

2.7.3 CROSSING AHEAD WARNING SIGNS

At side street intersections along Grand lake Road controlled by a Stop sign, vehicles must yield to path users in the crosswalk. However, traffic turning right onto Grand Lake Road may not see path users approaching from their right (motorists are looking left to accept a gap in traffic), and traffic on Grand Lake Road turning left into the side street may not see path users (motorists are accelerating through a gap in on-coming traffic).

At side street crossings where the side street intersection on Grand Lake Road is controlled by a stop sign, install Pedestrian and Bicycle Crossing Ahead warning sign and Crossing supplementary tab (TAC WC-46 and WC-7S) on side street in advance of crossing, 30 m if available. The new Trail Crossing Side Street warning sign and Trail Crossing supplementary tab can be installed on Grand Lake Road 300 m in advance of the side street. See Exhibit 12.

On the path 30 m in advance of the side street crossing, install Watch for Turning Vehicles sign; See Exhibit 12. Stop signs are not recommended, as discussed in Section 2.7.4: Stop Signs

Recommended locations include:

- Kytes Hill Drive
- Yolanda Drive
- Silver Dart Way

- Old Airport Road

Exhibit 12: Crossing Ahead Warning Signs

Install on side street 30 m in advance of path crossing

PEDESTRIAN AND BICYCLE CROSSING AHEAD SIGN
WC-46
600 mm x 600 mm

CROSSING TAB SIGN
WC-7S
600 mm x 300 mm
Required mounted below below WC-46

Install on Grand Lake Road 300 m in advance of side street intersection

TRAIL CROSSING SIDE STREET SIGN
(LEFT)
Install on north side of Grand Lake Road
facing westbound traffic
600 mm x 600 mm

TRAIL CROSSING SIDE STREET SIGN
(RIGHT)
Install on south side of Grand Lake Road
facing eastbound traffic
600 mm x 600 mm

TRAIL CROSSING TAB SIGN
600 mm x 300 mm
Required mounted below below Trail
Crossing Side Street Sign

Install on path 30 m in advance of side street crossing

TRAIL CROSSING SIDE STREET SIGN (LEFT)
Install on east side of side street facing westbound path users
450 mm x 450 mm

TRAIL CROSSING SIDE STREET SIGN (RIGHT)
Install on west side of side street facing eastbound path users
450 mm x 450 mm

TURNING TRAFFIC TAB SIGN
450 mm x 225 mm
Required mounted below below Trail Crossing Side Street Sign

2.7.4 STOP SIGN

At mid-block crossings where path users do not have right-of-way, a **reduced-size** stop sign (TAC RA-1) 450 mm by 450 mm is installed on the path just in advance of the crossing. Locations include where the path crosses main thoroughfare or access routes in the Mayflower Mall parking lot.

Where the path crosses a side street at an intersection with Grand Lake Road, path users would have right-of-way over traffic on the side street if the side street traffic is controlled by a stop sign, and would have right-of-way on the "walk" signal if it is controlled by traffic signals. If a stop sign was erected for the path, it would be visible to traffic on Grand Lake Road and may confuse drivers. Any changes to the rights-of-way that contradict the Motor Vehicle Act would be difficult to enforce Thus stop signs are not recommended when the path is crossing where a the typical crosswalk (marked or unmarked) is located.

2.7.5 SPECIAL PEDESTRIAN CROSSWALK RA-5

Special crosswalks may be installed at pedestrian crosswalks where:

- Posted speed is not greater than 60 km/h (Grand Lake Road in Reserve Mines is posted 50 km/h)
- Roadway has four lanes or less (Grand Lake Road in Reserve Mines is two-lanes wide)
- Spaced a minimum of 200 m from adjacent traffic control signals (there is a traffic control signal on Grand Lake Road at Main / Station Streets, 800 m east of Tompkinsville Road /)
- Safe stopping sight distance is available for motorists (for a design speed of 60 km/h, stopping sight distance is 80 m)

For the pedestrian crosswalk proposed in Reserve Mines, the recommended design features for a Special Pedestrian Crosswalk consists of the following, as illustrated in Exhibit 13:

- High Visibility (ladder) Crosswalk Marking (see Section 2.8, page 24)

- Two white on black Pedestrian Crosswalk signs (RA-5, 900 mm by 1200 mm) mounted overhead for each approach, over the centre of the right and left halves of the roadway oriented to face the toward the centre of the roadway, with internally illumination, down-lighting for the crosswalk and a flashing yellow beacon (200 mm lens) on each sign)

- Four side-mounted Pedestrian Crosswalk (RA-4, 600 mm by 750 mm) signs mounted back-to-back

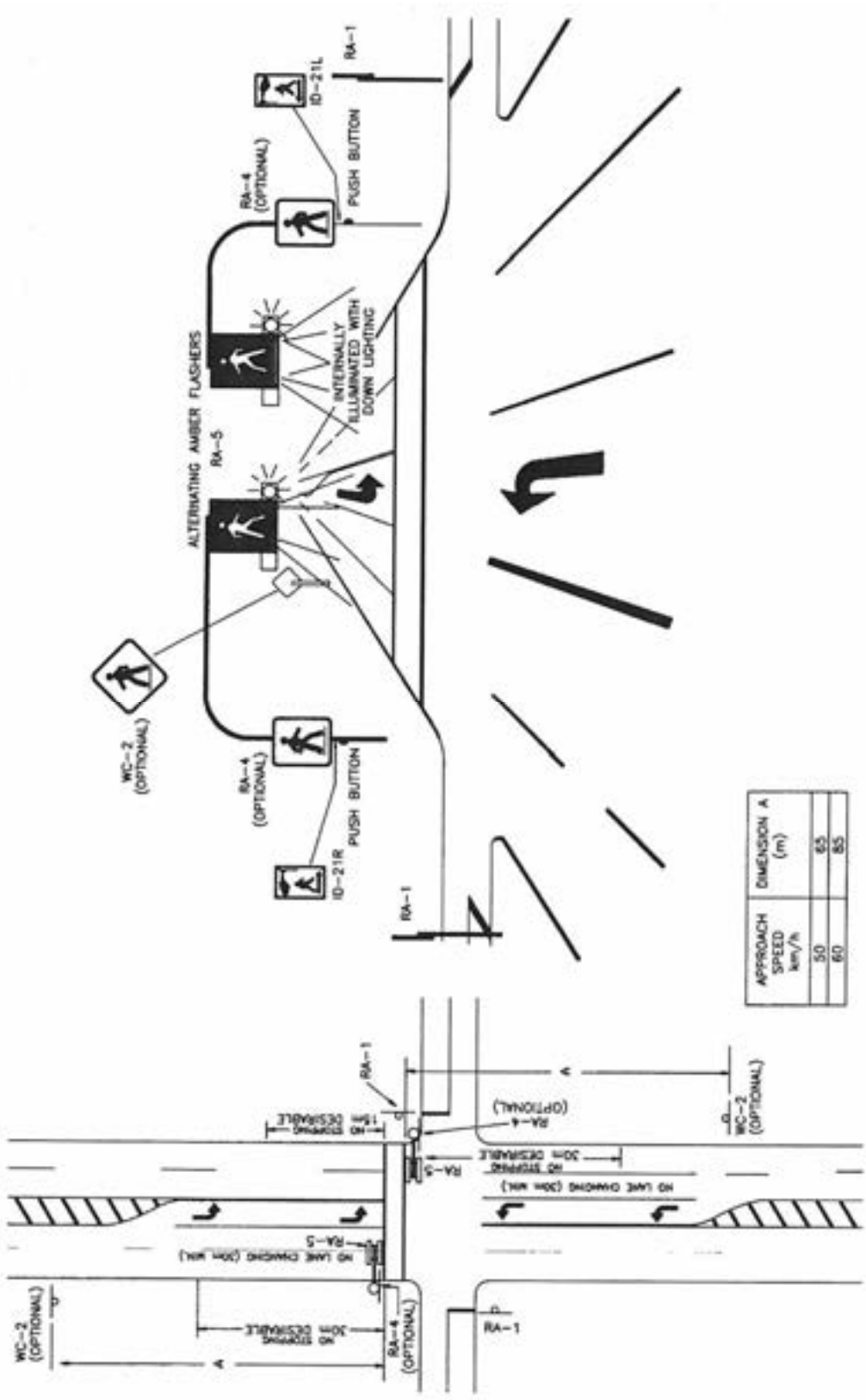
- Yellow beacons to flash alternately upon activation by pedestrian

- If visibility of crosswalk is limited, install Pedestrian Crosswalk Ahead (WC-2) warning signs 65 m in advance of the crosswalk

- Prohibit no stopping 30 m in advance on the near side of the special crosswalk and 15 m on the far side (RB-55 signs)

- Prohibit passing 65 m in advance of the crosswalk

Exhibit 13: Special Pedestrian Crosswalk



2.8 Pavement Markings

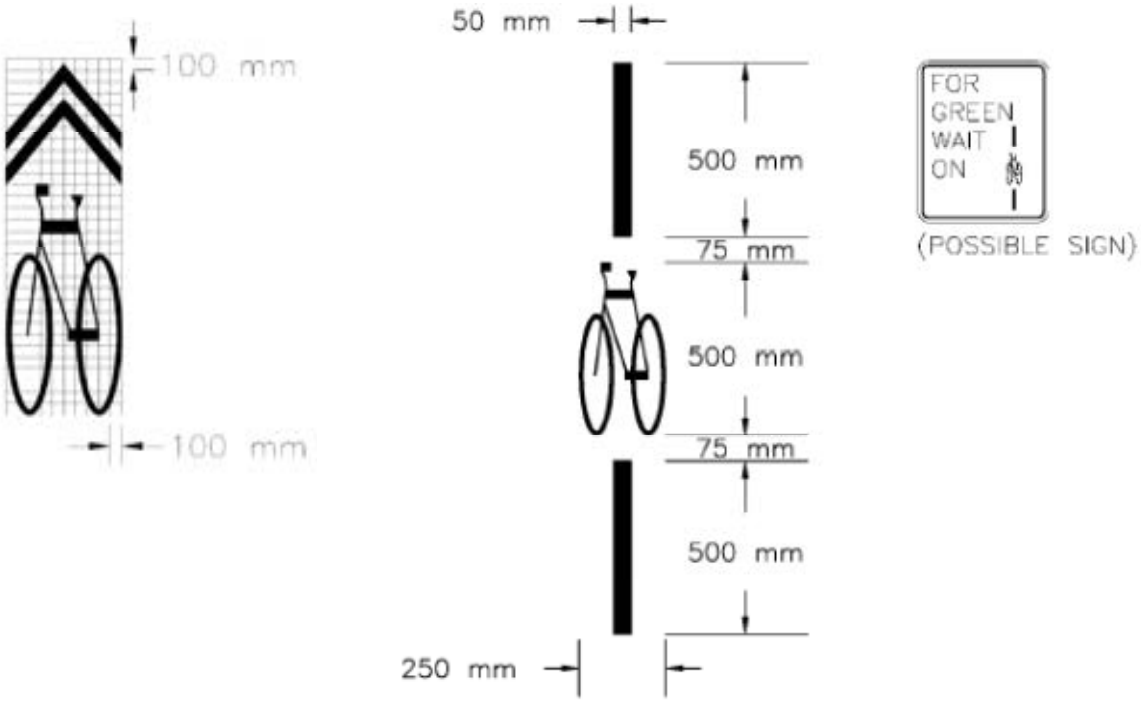
2.8.1 MARKED SHARED LANES

Apply shared-use lane pavement marking where path ends and cyclists share the roadway with motorists, i.e. CBU internal campus roadway; see Exhibit 14. Install middle of symbol 0.75 m from edge of pavement, place immediately after path ends and space a maximum of every 75 m.

2.8.2 BICYCLE DETECTION

In order to make the path accessible to cyclists approaching from or departing to side streets that are controlled by actuated traffic signals, the vehicle detection will require testing and marking to ensure that cyclists are detected. This would apply at the following intersections, if the signals are actuated: Garth Wilson Avenue / Mayflower Mall (north and south legs), and Gardiner Road / Evergreen Drive (north and south legs). An aluminum bicycle wheel can be used to test the detection. If it is an inductive loop, the location most sensitive to detect a bicycle is marked with the Bicycle Loop Detector Marking and Sign; see Exhibit 14.

Exhibit 14: Bicycle with Chevrons Shared-use Lane Marking and Bicycle Loop Detector Marking and Sign

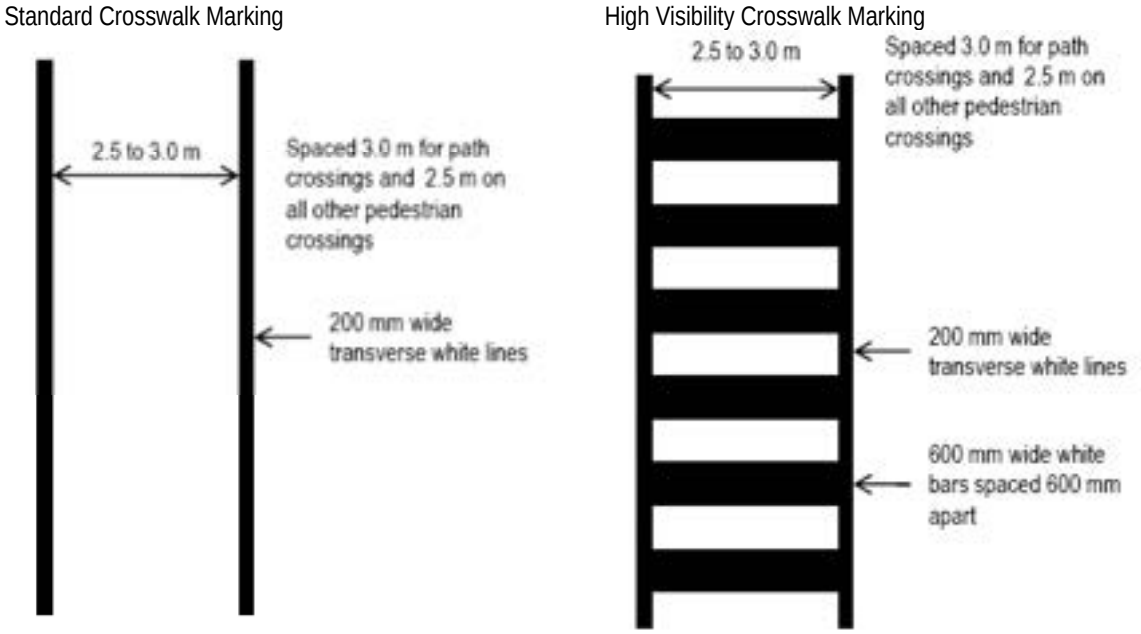


2.8.3 CROSSWALKS

Install durable high visibility “ladder” crosswalk markings at intersections controlled by traffic signals, with high volumes of traffic or controlled by the special pedestrian crosswalk (RA-5); and standard crosswalk markings at all other side street intersections controlled by traffic signals or stop signs, see Exhibit 15. Provide the ladder crosswalk marking at the following intersections on Grand Lake Road:

- Highway 125 / Sydney Port Access Road—south legs (all crossings including those under yield control)
- Garth Wilson Avenue / Mayflower Mall—north, south, east and west legs
- University Boulevard—south leg
- Gardiner Road / Evergreen Drive—south, east and west legs
- Silver Dart Way—south leg
- Special Pedestrian Crosswalk in Reserve Mines

Exhibit 15: Standard and Ladder Crosswalk Markings



2.8.4 PATH CENTRELINE

If conflicts between users are reported, a yellow centreline, 100 mm wide, can be used to mark the centreline of the path and to supplement the “keep right / pass left” signs. The centreline is solid for 20 m approaching intersections (both sides), for 10 m approaching and through driveways, and where sight distance is deficient; and broken elsewhere along the path with a 1 m long centreline segment and 3 m long gap.

2.9 Lighting

Levels of lighting on multi-use paths are lower than those for roadways and other outdoor lighting applications. The average and minimum levels of horizontal and vertical illumination are 5 lux and 1 lux respectively, hence a uniformity ratio of 5:1. Luminaires are to be full cut-off to reduce spill light and glare. Light standards (poles) should be at a pedestrian scale, i.e. no taller than 4.5 m. Horizontal and vertical clearances to the path apply to pole placement. The provision of lighting is not included in the construction cost estimate; a detailed design is required.

2.10 Fences or Railings

All railings or fences adjacent the path used to protect users from hazards (see Section 2.4 on clearances and embankments) or control property access, are to be 1.1 m high to prevent users from toppling over the railing / fence. For railings, three horizontal components are recommended, with the lowest 0.5 m or less above the ground.

2.11 Motor Vehicle Barriers

Motor vehicle barriers are generally not recommended, since the barriers themselves are hazards to trail users, unless a particular location is prone to use by prohibited vehicles. Two approaches can be applied:

- **Split entrance**: Design a split path with two, one-way paths near the intersection where motor vehicles are expected to attempt access. Plant low-growing shrubs that attain a height of 0.6 m in the island between the split paths. Tires of maintenance vehicles straddle the island to gain access.

- **Bollards**: Reserved for locations with continual motorist encroachment since they are a hazard and hamper maintenance. Space 1.5 m apart; use an odd number of bollards (3 in the case of a 3.0 m wide path) to divide the path into an even number of pathways. The middle bollard can be hinged to allow it to be dropped down for maintenance vehicle access. Bollard height to be 1.2 m. They should be installed 5 m from the intersection. Paint in colour contrasting with path and environment and with retro-reflective white bandings 100 mm wide spaced 100 mm to increase visibility during the day and at night time. Yellow centreline markings in a diamond shape around the base of the bollard are recommended, offset along the width of the path from the bollard by 0.3 m, and 1.5 m long on each side of the bollard.

3. DESIGN DISCUSSIONS

3.1 Path Location

The proposed path along Grand Lake Road is recommended to be located on the south side of the roadway replacing the existing sidewalk. Key destinations, such as Mayflower Mall, CBU NSCC campuses and Sydney Airport are located on the south side. The path will provide direct access to these destinations without the need for path users to cross Grand Lake Road.

3.2 Buffer Width

The multi-use path is proposed to be offset from the back of the concrete curb along Grand Lake Road by a buffer width of 1.0 m. This width meets NSTIR draft Walking and Multi-use Trail Treatments (August 2009), i.e. 1.2 m wide buffer measured from the face of the barrier curb to the edge of the path.

3.3 Path Width

The multi-use path is recommended to be 3.0 m wide for shared use between cyclists and pedestrians, reducing it to possibly 2.5 m for short sections if impacts to adjacent property or other features can be avoided. NSTIR's draft Walking and Multi-use Trail Treatments (August 2009) recommends a 4.0 m wide path.

3.3.1 SPACE OCCUPIED BY VARIOUS PATH USERS

The space that various path users occupied is illustrated in Exhibit 16. Pedestrians require 0.9 m of comfortable lateral clearance; cyclists require 1.5 m of comfortable lateral clearance, and in-line skaters in motion require 2.3 m of comfortable lateral clearance. The types and numbers of users that can share various widths of paths are described in Exhibit 17.

Exhibit 16: Space Occupied by Path Users

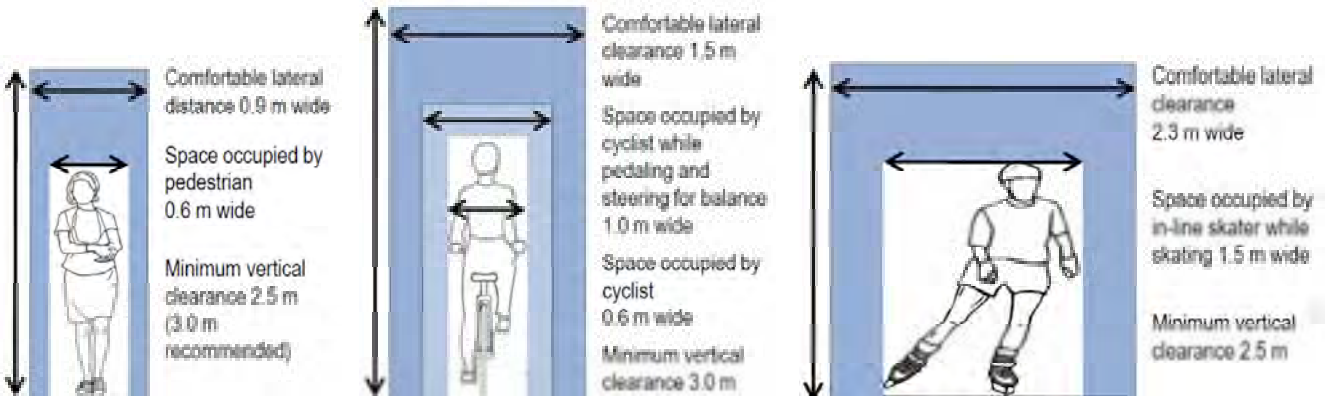


Exhibit 17: The Number of Different Types of Users that Can Share Various Widths of Paths

2.5 m Wide Path	3.0 m Wide Path	4.0 m Wide Path
3 pedestrians can walk side-by-side		4 pedestrians can walk side-by-side
2 cyclists cannot ride side-by-side	2 cyclists can ride side-by-side	3 cyclists can ride side-by-side or pass each other
A cyclist can pass a pedestrian	A cyclist can pass 2 pedestrians	2 cyclists can pass 2 pedestrians
An in-line skater in motion can pass a pedestrian		An in-line skater in motion can pass 2 pedestrians
2 in-line skaters in motion cannot skate side-by-side or pass each other		2 in-line skaters can skate side-by-side or pass each other
A cyclist cannot pass an in-line skater in motion		A cyclist can pass an in-line skater in motion

3.3.2 SHARED-USE PATH LEVEL OF SERVICE

To understand the impact of the path width on the users' level of service, we analyzed the path width using the Federal Highway Administrations (FHWA) Shared-used Path LOS (SUPLOS) calculator[2]. The SUPLOS assigns a level of service (LOS) from A (excellent) to F (failing) to trail segments considering the ability for cyclists to maintain speed and to manoeuvre, i.e., meet other users, active passes, delayed passes, and the perceived ability to pass. In general, grades A to C can be considered acceptable levels of service and D to F can be considered degraded levels of service with demand exceeding capacity, as explained in Exhibit 18.

The inputs to the SUPLOS model are as follows:

- Path width to the nearest 0.5 ft. (the model is only calibrated for the nearest 0.5 ft in width)
- Centerline will not be painted on the trail (The research found that the presence of a centerline stripe results in a significant reduction in the LOS. It appears that cyclists may feel less comfortable making a same-direction passing movement when a centerline stripe is present. While this finding might appear initially to mean that a centerline stripe should not be used, it is important to note that there may be other valid safety reasons for providing a centerline stripe, particularly on crowded trails, on curves with limited sight distance, and in other appropriate circumstances.)
- One-way trail volume for all users
- Mix of trail users, i.e. one-way mode split for adult bicyclists, pedestrians, runners, in-line skaters, and child bicyclists; default values are provided based on the average modal split for the trails used to calibrate the model

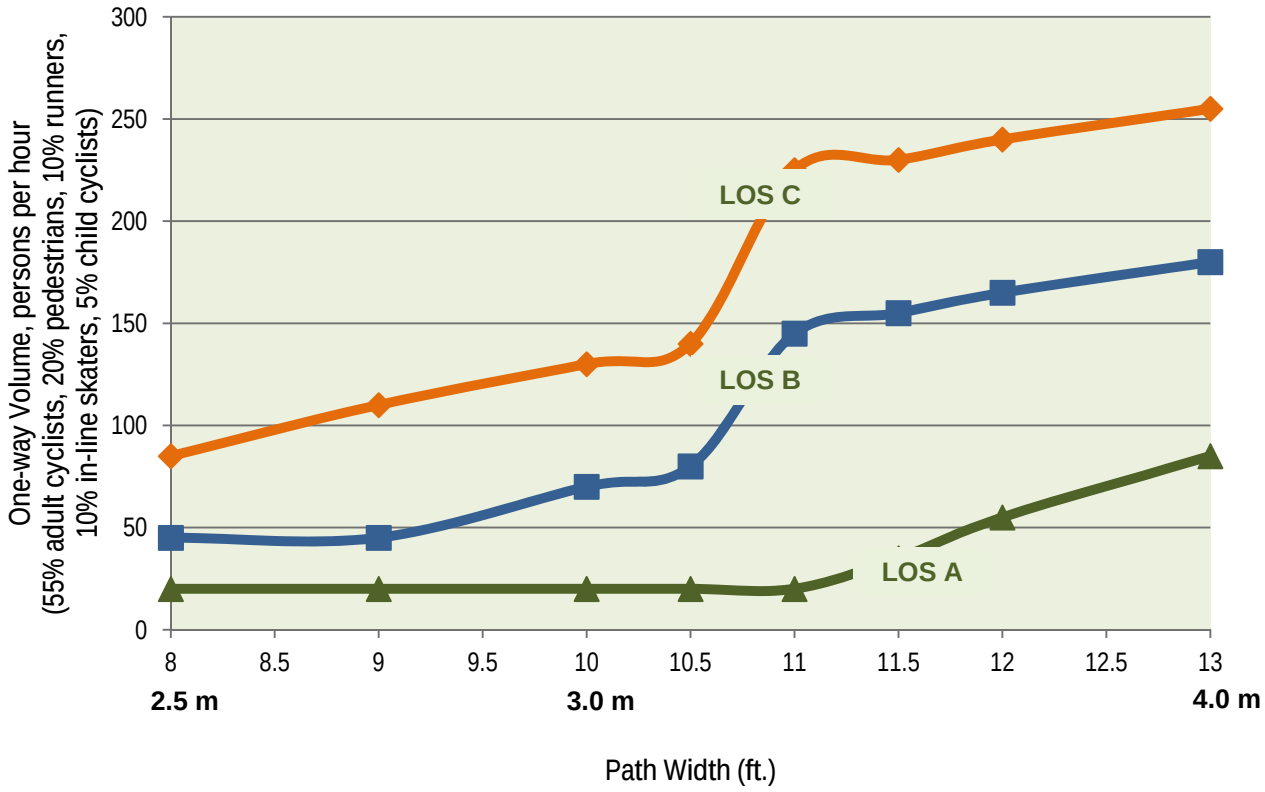
A sensitivity analysis was completed for various volumes and path widths to determine the corresponding level of service. The results of the analysis are illustrated in Exhibit 19.

[2] U.S. Department of Transportation, Federal Highway Administration, Shared-Use Path Level of Service Calculator, http://www.fhwa.dot.gov/publications/research/safety/pedbike/05138/ (July 2011).

Exhibit 18: Interpreting SUPLOS Grades / Scores

LOS Grade	LOS Score	Explanation of Trail Condition
A	≥4.0	Excellent—Trail has optimum conditions for individual bicyclists and retains ample space to absorb more users of all modes, while providing a high-quality user experience. Some newly built trails will provide grade-A service until they have been discovered or until their ridership builds up to projected levels.
B	3.5 to <4.0	Good—Trail has good bicycling conditions, and retains significant room to absorb more users, while maintaining an ability to provide a high-quality user experience.
C	3.0 to <3.5	Fair—Trail has at least minimum width to meet current demand and to provide basic service to bicyclists. A modest level of additional capacity is available for bicyclists and skaters; however more pedestrians, runners, or other slow-moving users will begin to diminish LOS for bicyclists.
D	2.5 to<3.0	Poor—Trail is nearing its functional capacity given its width, volume, and mode split. Peak period travel speeds are likely to be reduced by levels of crowding. The addition of more users of any mode will result in significant service degradation. Some bicyclists and skaters are likely to adjust their experience expectations or to avoid peak-period use.
E	2.0 to <2.5	Very Poor—Given trail width, volume, and user mix, the trail has reached its functional capacity. Peak-period travel speeds are likely to be reduced by levels of crowding. The trail may enjoy strong community support because of its high usage rate; however, many bicyclists and skaters are likely to adjust their experience expectations, or to avoid peak period use.
F	<2.0	Failing—Trail significantly diminishes the experience for at least one, and most likely for all user groups. It does not effectively serve most bicyclists; significant user conflicts should be expected.

Exhibit 19: Acceptable Levels of Service (A to C) of Shared-use Path at Various Widths and One-way, Per Hour Volumes



The populations that will be served by the path, as illustrated on an attached map and graph, are as follows:

- ~45,000 people who live in Sydney
- ~20,000 people who live in Glace Bay
- ~400 CBU faculty and ~1,500 CBU students live within 10 km of the campus
- ~900 people who work at Mayflower Mall during peak season

Considering the community populations only, assuming 2% use active transportation, 10% use the path during the peak hour[3] and a 50 / 50 directional split, and then the estimated one-way, hourly volume would be 65 persons per hour. Considering the CBU and Mayflower Mall populations only, assuming 15% of students, 2% of employees use active transportation, 10% use the path during the peak hour and a 50 / 50 directional split, then the estimated one-way, hourly volume would be 15 persons per hour. Thus it is expected that the demand on the proposed Grand Lake Road multi-use path would be much less than 100 persons one-way. Since peak demand is not likely to exceed 100 persons one-way, at a width of 3.0 m (10 ft.), the path would operate at an acceptable LOS C or much better during peak periods.

[3] National Bicycle and Pedestrian Documentation Project, Adjustment Factors, http://bikepeddocumentation.org/ (July 2011).

3.3.3 RECOMMENDED PATH WIDTH

For the proposed Grand Lake Road path, a 3.0 m wide path is generally recommended as appropriate to accommodate the estimated demand of mostly cyclists, some pedestrians, and occasional in-line skaters. In some locations, the path is recommended to be 2.5 m wide to avoid moving a row of utility poles, avoid relocating traffic signal poles, avoid extending larger culverts, etc. The space occupied by pedestrians and cyclists on a 3.0 m wide path and a 2.5 m wide is illustrated in Exhibit 20: Shared Use on 3.0 m and 2.5 m Wide Paths

. The 3.0 m wide path is illustrated in comparison to the existing sidewalk in Exhibit 21.

Exhibit 20: Shared Use on 3.0 m and 2.5 m Wide Paths

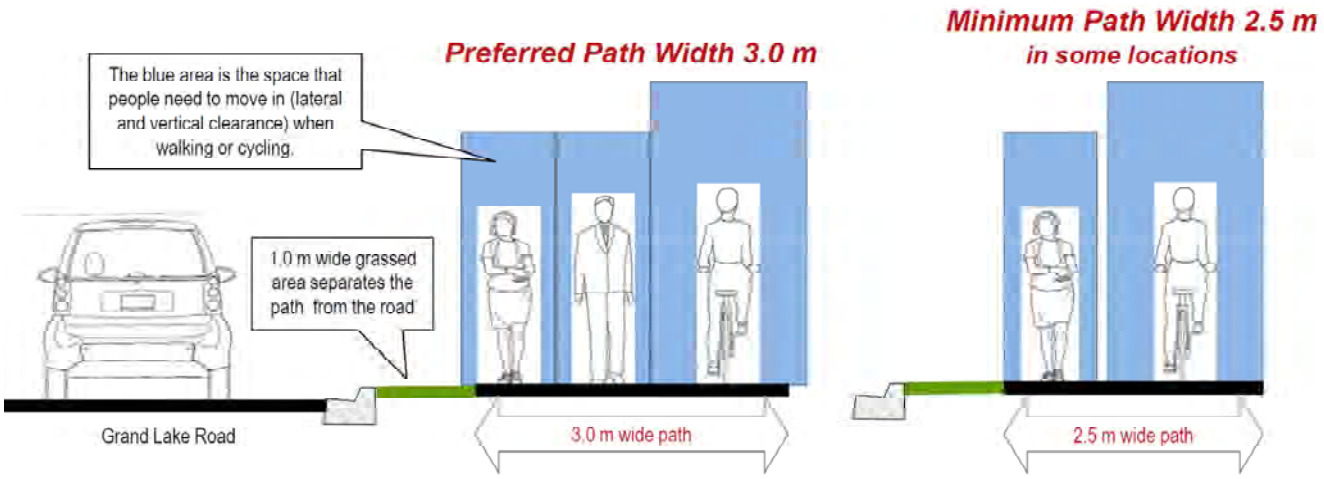
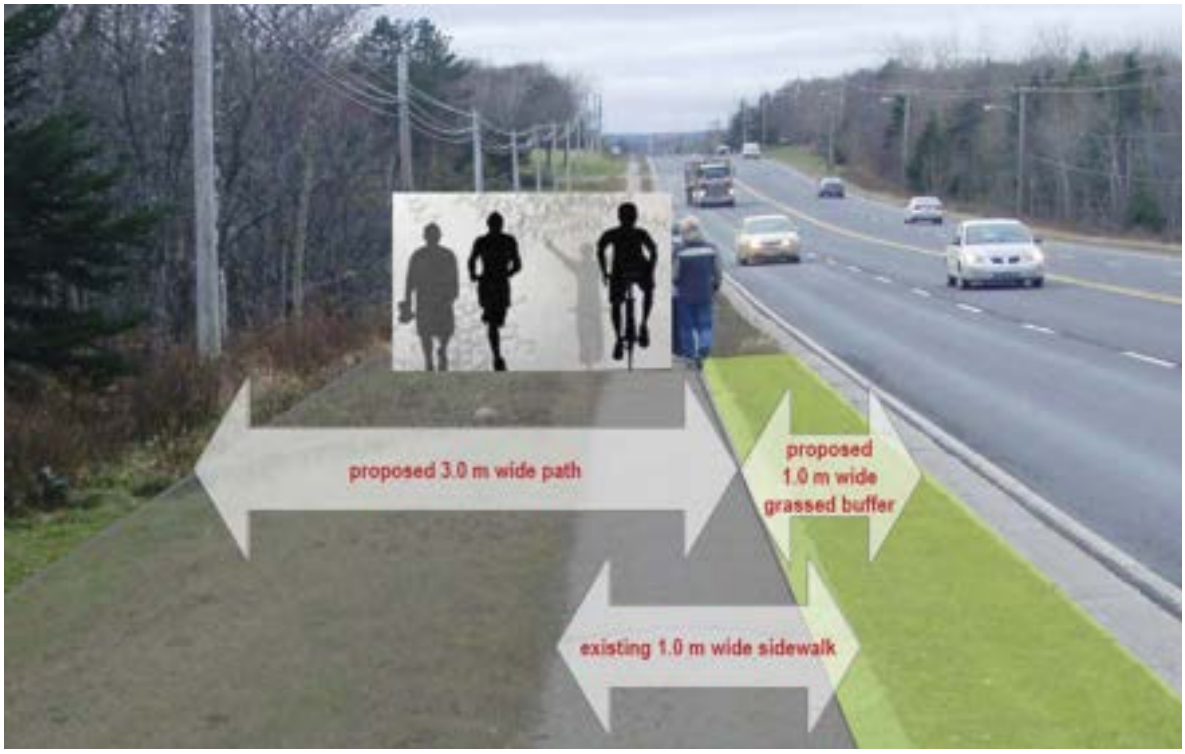


Exhibit 21: Proposed 3.0 m Wide Path Compared to the Existing Sidewalk along Grand Lake Road



3.4 Winter Maintenance

CBRM will maintain the proposed multi-use path during the winter from the east side of the Mayflower Mall to Reserve Mines. Based on current practice, NSTIR ploughs snow from the road which results in a bank of snow piled onto the existing sidewalk. Once the roadway has been cleared, CBRM uses a snow blower to clear the snow from the sidewalk. This practice would continue with the wider multi-use path and any snow that accumulates from ploughing the roadway will be removed in the same manner.

3.5 Mayflower Mall / Fire Station Options

Various options for the path alignment were developed to connect the path to Mayflower Mall, the bike lanes and sidewalk on Garth Wilson Drive, and the multi-use trail planned to connect from the future Cow Bay Road overpass of Highway 125.

The **Garth Wilson Drive / Mayflower Mall connection** is recommended to be a multi-use path along the east side of the easterly access to the Mall. Path users can use the traffic signals to cross Grand Lake Road. Cyclists heading northbound from Mayflower Mall to Garth Wilson Drive can transition from the multi-use path on one side of Grand Lake Road to the bike lane on the other side. However, southbound cyclists in the bike lane on Garth Wilson Drive will have to cross over to access the multi-use path on the east side. Bicycle detection and pedestrian countdown signals will increase the convenience for path users at this busy signalized intersection. This alignment is illustrated on Drawing 14-2 and in Exhibit 22.

Connecting Garth Wilson Drive and Mayflower Mall easterly along Grand Lake Road is constrained by the Tasty Treat and Fire Hall located on the southeast corner of Grand Lake Road

and the easterly access to Mayflower Mall (across from Garth Wilson Drive). Although the existing sidewalk traverses the frontage, the driveways and parking for these developments limit the ability to provide a one metre wide buffer and a three metre wide path. In addition, there is concern about routing path users in front of the Fire Hall where emergency vehicles access Grand Lake Road. Alternatives considered include behind the Tasty Treat, on the east and west side of the Fire Hall, and behind the Fire Hall through the parking lot for The Bay store at Mayflower Mall. The recommended alignment is along the east side of the Fire Hall at the edge of a wooded area, crossing a drainage ditch located between the Fire Hall and the parking lot for The Bay, and then through The Bay parking lot. This alignment is illustrated on Drawing 14-2.

To connect cyclists to the multi-use trail from Cow Bay Road on the west side of Mayflower Mall, two options were considered, as illustrated on Exhibit 22:

- From the path alignment through The Bay parking lot, continue directly across the Mayflower Mall parking lot, cross the westerly access to the Mall, and then construct a path on the north and west sides of the parking lot.

- From the path alignment through The Bay parking lot, traverse in front of the Mayflower Mall within the fire access lane.

Traversing behind the Mayflower Mall was considered. However, the condition of the access road, isolation from the activity in front of the Mall, lack of access to the store fronts and truck traffic loading and unloading made this alternative undesirable.

The path alignment through the Mayflower Mall, crossing the westerly access and then north and west of the parking lot was preferred by the Mall management and owners. It provides a direct connection between the future multi-use trail from Cow Bay Road and the Grand Lake Road path. It does not interfere with the activities of shoppers along the front of the Mall and the fire access lane.

There are several possible treatments of the path as it crosses through the parking lots in front of Mayflower Mall and The Bay. Shared lane pavement markings (“sharrows”) are appropriate in The Bay parking lot where the volume of traffic is lower, as illustrated in Exhibit 23. The Bay requires that no parking spaces be removed to accommodate the path through this area. In the Mayflower Mall parking lot, the path can be buffered from traffic using a combination of pavement markings, delineators or concrete curb stops, as illustrated in Exhibit 24. Some parking spaces in this lot would be removed to accommodate the path.

It is recommended that CBRM encourage Mayflower Mall to improve the parking lot and access configuration for all users. The current configuration is such that motorists are not limited to where they enter / exit the parking lot, often driving diagonally through the lot at higher speeds than is suitable for mixing with pedestrian and bicycle traffic.

Exhibit 22: Path Alignment Options through Mayflower Mall

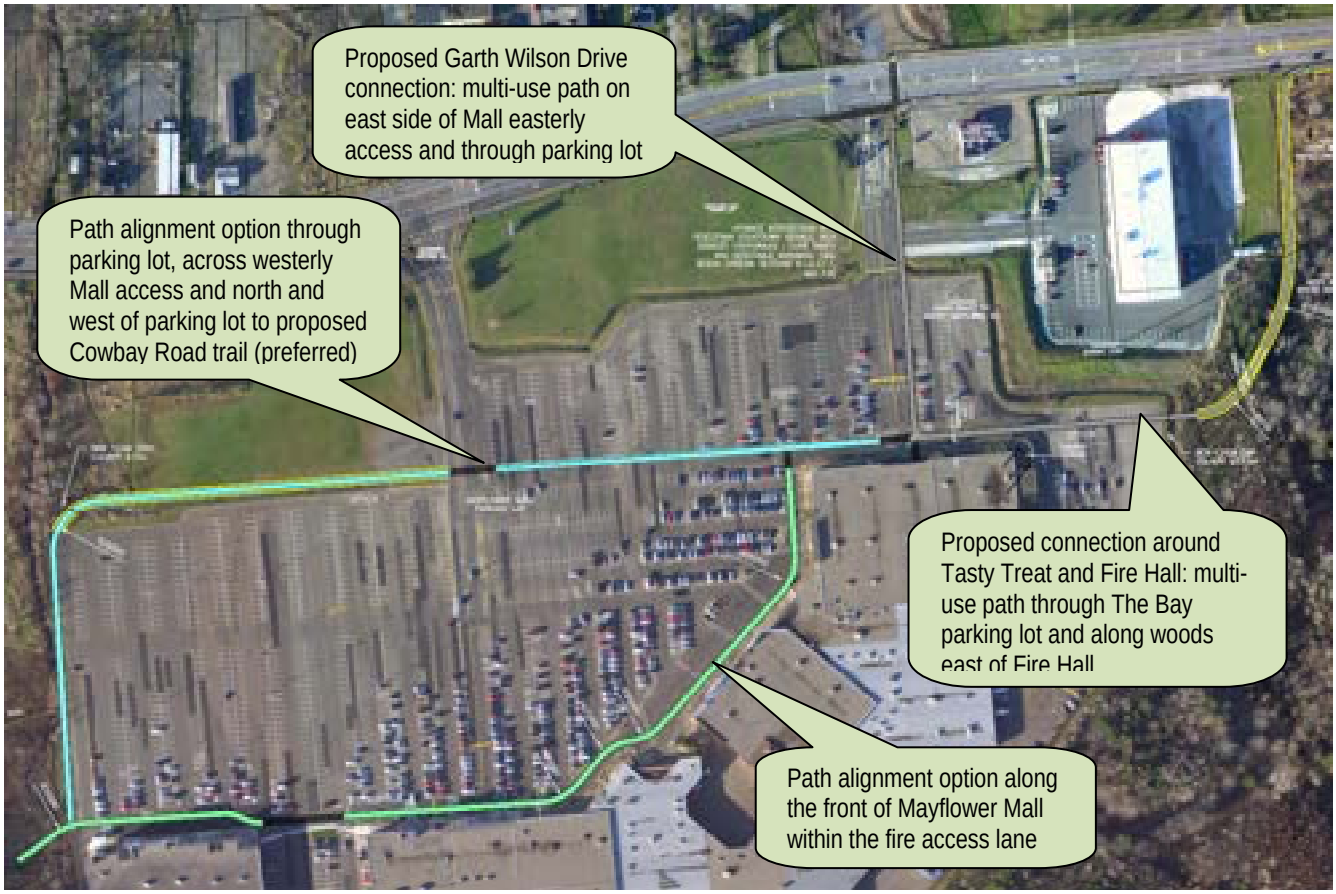


Exhibit 23: Options for Marking the Path through the Bay Parking Lot

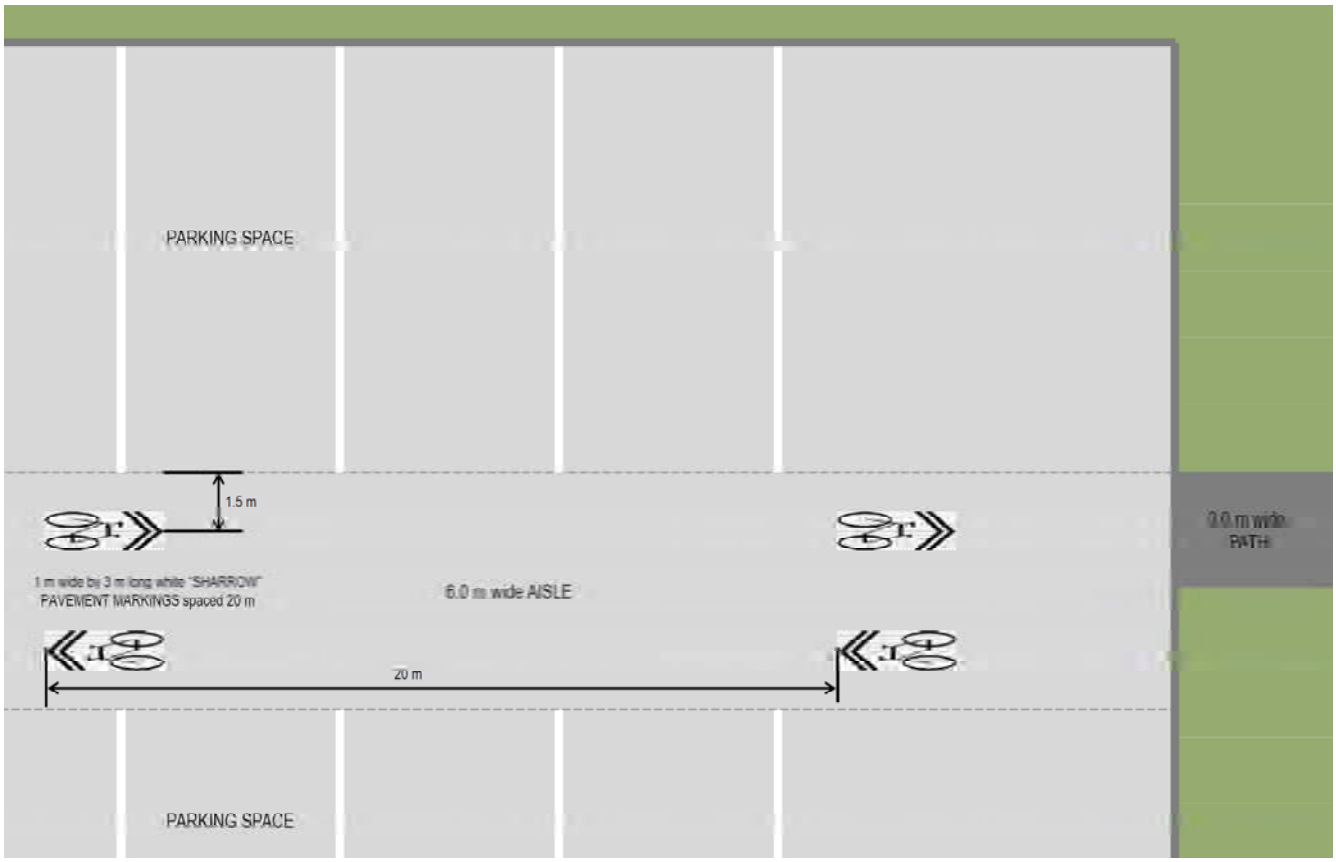
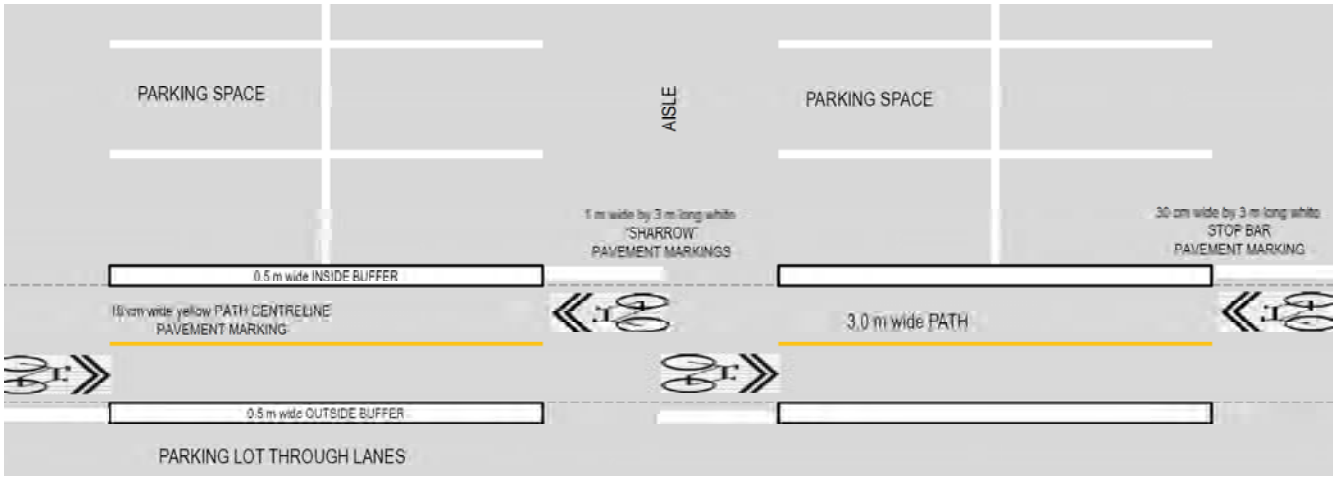
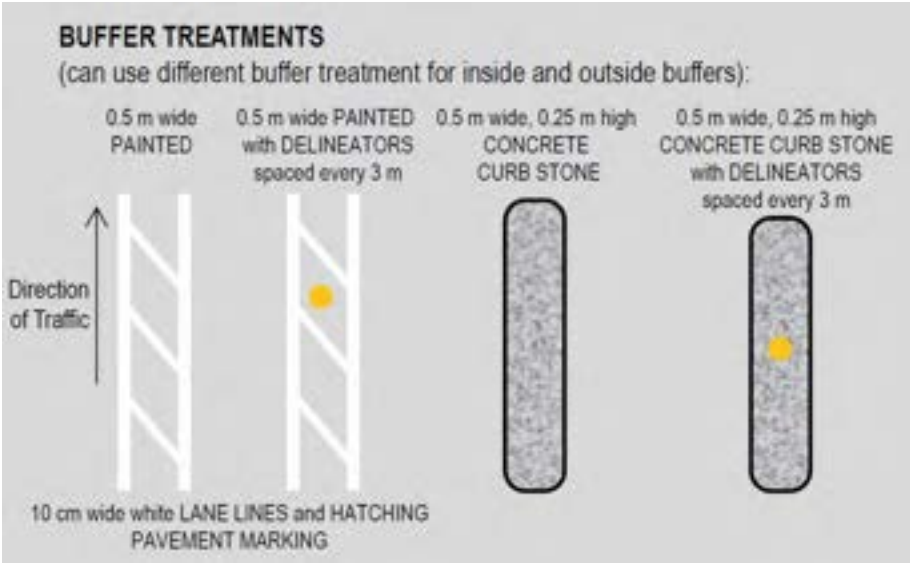
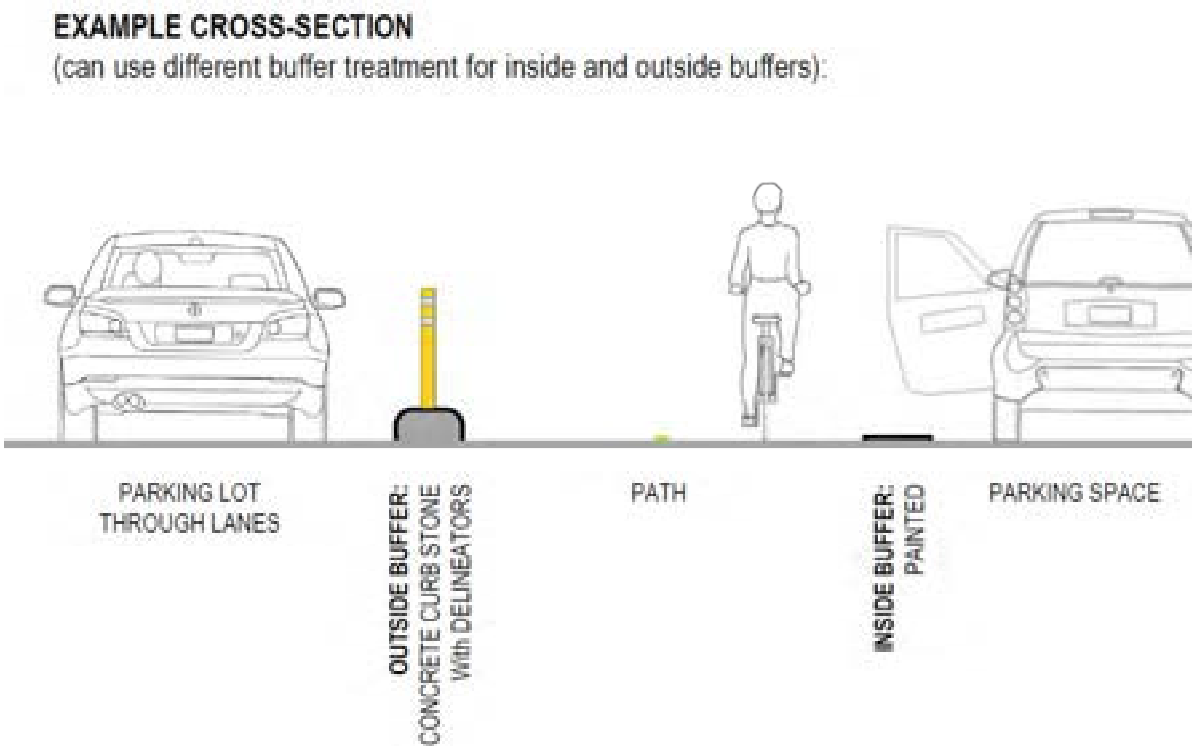


Exhibit 24: Options for Delineating the Path through the Mayflower Mall Parking Lot







3.6 Tramline Alignment

An abandoned tramline right-of-way traverses from Victoria Road in Sydney easterly across Grand Lake Road, through CBU campus, Sydney Airport and onto Reserve Mines. The portion of the tramline right-of-way from the former Speedway to CBU campus was considered as an alternative to a path adjacent Grand Lake Road. However, a portion of the right-of-way is in private ownership. All-terrain vehicles use the right-of-way. The terrain is low lying and wet. There were also concerns about the personal security of path users being isolated from the roadway. Thus, this alignment was considered less feasible than remaining adjacent Grand Lake Road.

3.7 CBU Campus Integration

The existing sidewalk along Grand Lake Road across the CBU campus frontage is located on the north side of the rock wall. There are utility poles between the sidewalk and rock wall. To better integrate the path with the campus, the path will be located on the south side of the rock wall. It will follow a new sidewalk and access road in front of the new Centre for Sustainability in Energy and Environment Building, and cross in front of the Marvin Harvey Building and the Arseneau-Britten Science Building. Shared lane pavement markings ("sharrows") are recommended on the access road. The path will cross the easterly access to Grand Lake Road. A raised path crossing is recommended to slow traffic at this crossing. The path will then swing back towards Grand Lake Road beyond the end of the rock wall. The path alignment at CBU is illustrated on Drawing 14-9.

CBU is considering some improvements to the easterly access at Grand Lake Road. The raised path crossing could be constructed at the same time as any improvements to the intersection, reducing traffic speeds and enhancing safety. The raised crossing design is presented in Section 2.6.5, page 15.

CBU is interested in supporting active transportation on campus. Additional enhancements to consider include short-term and longer-term bicycle parking at the residences and for faculty and students at all other buildings, bike lanes on University Avenue, and connections to the trail network at the south end of the campus.

3.8 Reserve Mines Connection

Existing active transportation facilities in Reserve Mines consist of a sidewalk on the north side of Grand Lake Road / Sydney Road and paved shoulders from where Grand Lake Road transitions from four lanes to two lanes wide. The proposed path needs to connect to these facilities. Various options were considered. One of the key issues is developing a transition that encourages cyclists to ride with traffic in the paved shoulders. A crosswalk on Grand Lake Road is required in order to enable cyclists riding westbound to cross the road to the path, and to allow pedestrians to cross from the path on the south side to the sidewalk on the north side.

Various locations for a crosswalk were considered such as extending the path to Tompkinsville Road where there is an existing crosswalk. The recommended location for the crosswalk is at the end of the existing sidewalk. This location avoids impacting to the front porch of a house on the south side of Grand Lake Road and relocating a fire hydrant should the path have been extended farther east. NSTIR will have to undertake a review of the proposed RA-5 crosswalk at this location.

The speed limit on Grand Lake Road is 80 km/h reducing to 50 km/h in Reserve Mines. The transitions in speed limits are located near the end of the existing sidewalk. **It is recommended that the reduced speed limit signs be relocated farther west**, at least 100 m from the proposed crosswalk. Given that the roadway changes from four lanes to two west of this location and there are some adjacent residences, relocating the speed limits may fit with driver expectations. NSTIR will have to review the relocation of any changes to speed limit signs. In addition, NSTIR is considering repainting the transition from four lanes to two lanes to provide positive guidance to motorists; the existing transition results in a wide travel lane that may be inducing higher operating speeds.

3.9 Rest Areas

Rest areas are integral elements of path developments, providing areas for path users to rest and enjoy their surroundings. Opportunities to develop rest areas were sought during the study: logical

locations to provide seating, places of scenic interest, and locations where property would be available. Three rest areas are recommended as follows:

- **South West Brook** (Station 5+800, approximately 4.5 km east of the start of the path at Garth Wilson Drive)—CBU owns the property at South West Brook. The brook and surrounding wooded area are scenic. Once one steps away from Grand Lake Road to a slightly lower elevation towards the brook, traffic noise decreases significantly. It is also about halfway along the path between Mayflower Mall and Reserve Mines. Two levels of benching are recommended: one accessible at the level of the path and one slightly lower with a view over the brook. The rest area could include a waste receptacle, signage including a campus map, bike rack, a drinking fountain if water service is available, pedestrian lighting, a handrail along the headwall of the culvert, and plantings. CBU is supportive of constructing a rest area on their property.

- **Gardiner Road / Evergreen Drive** (Station 6+700, approximately 1 km east of South West Brook rest area)—A vacant property exists on the southeast corner of Gardiner Road /Evergreen Drive. This is one of the busier bus stops for CBRM Transit. Buses stopping at this location delay traffic on Grand Lake Road. A rest area is recommended at this location that incorporates a bus lay-by so that the bus can pull out of traffic to pick-up / drop-off passengers. The rest area could include a bus shelter, bench, a waste receptacle, signage, bike rack, and plantings.

- **Sydney Airport** (Station 8+600, approximately 2 km west of the rest area at Gardiner Road / Evergreen Drive and 1.5 km east of the end of the path at Reserve Mines)—The airport property frontage includes mown turf and a wooded area to the east. A rest area is recommended just at the edge of the wooded area set back from Grand Lake Road by about 10 m. The rest area could include a bench, a waste receptacle, signage, bike rack, and plantings. The Airport Authority is supportive of constructing a rest area on their property.

The landscape designs for the rest areas are illustrated on the Landscape Concept Drawings 1 through 4. Materials selected are intended to be low maintenance including concrete paving, standard benches and bus shelter typically used by CBRM, and low maintenance trees, shrubs and grasses.

3.10 Residential Tree Plantings

Tree plantings may be considered to enhance the view where the Grand Lake Road Path crosses in front of residential properties. Such plantings could be part of a path enhancement sponsorship program, or form part of a compensation package to property owners where partial property purchases or easements are required. Sample species are shown in Exhibit 25.

Exhibit 25: Sample Tree Plantings

common name	botanical name
TALL 10-15m	
1. Horsechestnut	Aesculus hippocastanum
2. Red Oak	Quercus rubra
3. Red Maple	Acer rubrum
4. Tamarack	Larix laricina
5. Black Spruce	Picea mariana
MEDIUM 5-8m	
6. Amur Maple	Acer ginnala
7. Pagoda Dogwood	Cornus alternifolia
8. Downy Hawthorn	Crataegus mollis
9. Bean Tree	Catalpa bignonioides
10. Mountain Ash	Sorbus americana

4. IMPLEMENTATION

4.1 Opinion of Construction Cost

An opinion of the cost to construct the proposed multi-use path was prepared based on the preliminary design as presented in this report. The construction items, quantities, unit costs and total costs in 2012 dollars are listed in Exhibit 26. Major items are as follows:

- **Site preparation and grading** is estimated to cost approximately $0.9 M. This reflects the need to widen the platform on which the current sidewalk was built to accommodate the wider buffer to the roadway and the wider path for multi-use. This consists of a significant amount of fill, some cutting of embankments, rock excavation and ditching.

- **Drainage works** are estimated to cost almost $0.6 M. This consists of lining of ditches, 128 concrete culvert extensions, 273 concrete and corrugated metal driveway culvert replacements, 523 new concrete culverts, and 44 timber culverts transitioning to concrete culvert extensions.

- **Path works** consist of an estimated $1.9 M of construction. The granular base and asphalt surface make up $0.9 M of this cost, which is similar to the cost of constructing a 1.5 m wide concrete sidewalk the entire length. Almost 2.9 km of chain-link fencing is required where the embankment adjacent the path is relatively high and steep, at an estimated construction cost of about $0.2 M. Sod, topsoil and seeding are estimated to cost almost $0.3 M.

- **Traffic signals** include minor relocations, enhancements to the existing traffic signals (pedestrian countdown signals and bicycle detection), and a new pedestrian crosswalk with pedestrian-activated amber flashing lights in Reserve Mines. The estimated cost of construction for traffic signals is $0.06 M.

- The three **rest areas** are estimated to cost $0.09 M to construct.

- Allowances are included for **traffic control, environmental protection plan and pavement markings** for almost $0.2 M.

- **Engineering and contract administration** is assumed to be 8% of the cost of construction, or $0.3 M.

- A **contingency** of 15% (approximately $0.6 M) is included.

- **Utility pole and service relocation** costs need to be confirmed by Aliant. Pole relocations are based on a clearance of 0.6 m between the face of the pole and the edge of the path; some poles may not need to be moved if this clearance can be tolerated / reduced to 0.4 m.

- **Partial property purchases** to accommodate the path and **additional illumination** may be required in some locations but are not included in the opinion of construction costs.

Exhibit 26: Opinion of Construction Cost

Item	Description	Estimated Quantity	Unit of Measure	Estimated Unit Rate	Estimated Cost (2012 Dollars)
Site Preparation and Grading					
1	Clearing & Grubbing	68,175	m^2	$7	$477,225
2	Cuts	2,848	m^3	$7	$19,936
3	Fills	24,647	m^3	$7	$172,529
4	Rock Fills	9,505	tonne	$15	$142,575
5	Rock Excavation	645	m^3	$60	$38,700
6	Ditching	5,000	m^3	$13	$65,000
				Subtotal	$920,000
Drainage Works					
7	Lining of ditch with Type 1 Geotextile	8,000	m^2	$4	$32,000
8	Lining of ditch with C4 Clear Stone (200 mm thickness)	8,000	m^2	$5	$36,000
9	Concrete Culvert Extensions				
	310 mm dia. Concrete culvert	75	m	$250	$18,750
	375 mm dia. Concrete culvert	40	m	$270	$10,800
	450 mm dia. Concrete culvert	5	m	$300	$1,500
	610 mm dia. Concrete culvert	8	m	$390	$2,925
10	Concrete Culvert Driveway Replacements				
	310 mm dia. Concrete culvert	20	m	$250	$5,000
	375 mm dia. Concrete culvert	63	m	$270	$16,875
	450 mm dia. Concrete culvert	10	m	$300	$3,000
11	New Concrete Culvert				
	375 mm dia. Concrete culvert	10	m	$270	$2,700
	450 mm dia. Concrete culvert	135	m	$300	$40,500
	610 mm dia. Concrete culvert	343	m	$390	$133,575
	1200 mm dia. Concrete culvert	35	m	$800	$28,000
12	Corrugate Metal Pipe Extensions				
	375 mm dia. CMP culvert	6	m	$150	$900
13	Corrugate Metal Pipe Driveway Replacements				
	375 mm dia. CMP culvert	138	m	$150	$20,700
	450 mm dia. CMP culvert	42	m	$220	$9,240
14	PVC Piping				
	150 mm dia.	6	m	$200	$1,200
	200 mm dia.	12	m	$230	$2,760
15	Transitions : Wooden to Concrete Culverts (Allowance)	11	each	$14,000	$154,000
16	Wooden Culverts to Concrete Culverts				
	560X410 (W) to 600 mm dia. concrete	5	m	$390	$1,950
	610X450 (W) to 600 mm dia. concrete	3	m	$390	$975
	600X600 (W) to 750 mm dia. concrete	5	m	$430	$2,150
	600X600 (W) to 750 mm dia. concrete	5	m	$430	$2,150
	600X600 (W) to 750 mm dia. concrete	5	m	$430	$2,150
	890X910 (W) to 1050 mm dia. concrete	5	m	$600	$3,000
	910X610 (W) to 900 mm dia. concrete	8	m	$500	$3,750
	910X910 (W) to 1050 mm dia. concrete	5	m	$600	$3,000
	1150X1200 (Timber) to 1350 mm dia. Concrete	3	m	$800	$2,000
	630X630 Concrete c/w headwall to 750 mm dia. Concrete	5	m	$430	$2,150
	910X1240 Concrete to 1200 mm dia. concrete	3	m	$700	$1,750

Item	Description	Estimated Quantity	Unit of Measure	Estimated Unit Rate	Estimated Cost (2012 Dollars)
17	Concrete driveway trench	15	m	$1,700	$25,500
				Subtotal	$570,000
Path Works					
18	Gravels				
	Type 1 (100 mm)	6,550	Tonnes	$14	$91,700
	Type 2 (200 mm)	13,710	Tonnes	$13	$178,230
19	Asphalt Type D-HF (75 mm)	5,500	Tonnes	$115	$632,500
20	Driveway Reinstatements	2,800	m^2	$60	$168,000
21	Sign Relocations				
	single post signs	14	each	$200	$2,800
	double post signs	8	each	$400	$3,200
	double post signs c/w electrical	1	each	$3,000	$3,000
	Highway Signs	2	each	$4,000	$8,000
	Highway Signs c/w electrical	1	each	$5,000	$5,000
22	Hydrant relocations	3	each	$1,000	$3,000
23	Fencing	2,895	metres	$75	$217,125
24	Gabion Baskets	171	m^2	$300	$51,300
25	Manholes	7	each	$6,000	$42,000
26	Catch Basins	3	each	$4,000	$12,000
27	Catch Basin leads (300 mm dia. PVC)	36	metres	$350	$12,600
28	Valve Box Adjustments	6	each	$200	$1,200
29	Grade Rings	1	each	$480	$480
30	Concrete Curb	150	metres	$90	$13,500
31	Asphalt patching	11	Tonnes	$170	$1,870
32	Retaining Wall (Allan Block)	110	m^2	$400	$44,000
33	Handrail top of Retaining Wall	53	metres	$400	$21,200
34	Concrete sidewalk / curb ramps	400	m^2	$80	$32,000
35	Detectable warning at curb ramps (truncated domes)	16	each	$200	$3,200
36	Active Transportation multi-use path signs (Allowance)	30	each	$250	$7,500
37	High visibility crosswalks	9	each	$1,500	$13,500
38	Sod c/w topsoil	17,520	m^2	$11	$192,720
39	Hydro-seeding c/w topsoil	22,887	m^2	$5	$102,992
40	Cribbing culverts at driveways (Allowance 3 m^3 per driveway)	66	each	$1,000	$66,000
41	Buffer treatment through Mayflower Mall parking lot (see note 1)	143	m	varies	-
				Subtotal	$1,930,000
Traffic Signals					
42	RA-5 Pedestrian Crosswalk	1	each	$35,000	$35,000
42	Relocate 2 Traffic signals at Tanglewood (Allowance)	2	each	$6,000	$12,000
43	Pedestrian countdown signals at Grand Lake Road/Garth Wilson, CBU, Evergreen	12	each	$500	$6,000
44	Bicycle detection at Grand Lake Road/Garth Wilson:	2	each	$1,000	$2,000
				Subtotal	$60,000
General Requirements					
46	Traffic Control (Allowance based on 200 days)	1	Lump Sum	$130,000	$130,000
47	Environmental Protection Plan (Allowance)	1	Lump Sum	$7,000	$7,000
48	Pavement Markings (Allowance)	1	Lump Sum	$15,000	$15,000
				Subtotal	$150,000
				SUBTOTAL	$3,630,000

Item	Description	Estimated Quantity	Unit of Measure	Estimated Unit Rate	Estimated Cost (2012 Dollars)
	Additional Engineering and Contract Administration			8%	$290,000
	Contingency (see note 2)			15%	$540,000
			SUBTOTAL		$4,460,000
Rest Areas					
South West Brook					
	Site preparation and grading (140 m^s)	1	Lump Sum	$9,000	$9,000
	CIP concrete pavers (with saw-cut pattern)	45	m^2	$90	$4,050
	Limestone steps	6	Linear m	$200	$1,200
	Metal hand rail	18	Linear m	$350	$6,300
	Bench	2	each	$2,000	$4,000
	Waste receptacle	1	each	$1,000	$1,000
	Signage	1	each	$2,000	$2,000
	Bike rack (4 bicycles, galvanized)	1	each	$500	$500
	Drinking fountain (exclusive of water service)	1	each	$5000	$5,000
	Pedestrian lighting and pole (exclusive of power service)	1	each	$5000	$5,000
	Large tree	3	each	$450	$1,350
	Shrub	20	each	$40	$800
	Native grasses (1 gal.)	65	each	$28	$1,820
	Engineering and Contingency (10%)				$4,200
				Subtotal	$46,000
Gardiner Road					
	Site preparation and grading (50 m^s)	1	Lump Sum	$3,600	$3,600
	CIP concrete pavers (with saw-cut pattern)	50	m^2	$90	$4,500
	Bench	1	each	$2,000	$2,000
	Waste receptacle	1	each	$1,000	$1,000
	Signage	1	each	$2,000	$2,000
	Bike rack (4 bicycles, galvanized)	1	each	$500	$500
	Transit shelter	1	each	$15,000	$15,000
	Medium tree	3	each	$360	$1,080
	Shrub	11	each	$40	$440
	Native grasses (1 gal.)	14	each	$28	$392
	Engineering and Contingency (10%)				$3,100
				Subtotal	$34,000
Sydney Airport					
	Site preparation and grading (50 m^s)	1	Lump Sum	$3,000	$3,000
	CIP concrete pavers (with saw-cut pattern)	24	m^2	$90	$2,160
	Bench	1	each	$2,000	$2,000
	Waste receptacle	1	each	$1,000	$1,000
	Signage	1	each	$2,000	$2,000
	Bike rack (4 bicycles, galvanized)	1	each	$500	$500
	Large tree	3	each	$360	$1,350
	Shrub	19	each	$40	$760
	Native grasses (1 gal.)	10	each	$28	$280
	Engineering and Contingency (10%)				$1,300
				Subtotal	$14,000
				SUBTOTAL Rest Areas	$94,000
49	Opinion of utility pole and service relocation costs (see note 3):	62	each	$3,000	$186,000

Item	Description	Estimated Quantity	Unit of Measure	Estimated Unit Rate	Estimated Cost (2012 Dollars)
			TOTAL		$4,740,000

Notes:
1. Various buffer treatments options possible with variable costs; costs assumed to be the responsibility of the property owner
2. Environmental controls to be identified are considered part of the contingency
3. Pole relocations are based on a clearance of 0.6 m between the face of the pole and the edge of the path; some poles may not need to be moved if this clearance can be tolerated / reduced to 0.4 m; some cost-sharing with utility agency may be possible depending on condition of poles and service lines
4. Possible partial land purchases are not included in the above costs
5. Additional illumination of the path that may be required in some locations is not included in the above costs

The opinion of construction cost, not including the rest areas, utility relocations, partial property purchases and any additional illumination, is $3.6 M plus engineering and construction administration (8%) and contingency (15%) for a total of $4.5 M.

4.2 Funding Strategies

Under the current funding strategy for CBRM's *Active Transportation Plan*, a project of this magnitude would take several years to implement. However, based on the prominence of CBU and Sydney Airport as engines of the regional economy, and the benefits of this active transportation link, the project should attract economic development investments from partners such as ECBC.

Some of the drainage works may be required in the future as part of on-going highway maintenance and cost-sharing with the Province should be investigated. The condition of the utility poles and services is unknown. Some poles that require relocation may be planned for upgrades and thus the responsibility of Aliant. Nova Scotia Power could be a partner in upgrading illumination along the corridor where it is currently insufficient for the roadway. Business partners, service clubs and other community groups or individuals may be willing to sponsor aspects of the path such as the rest areas or signage.

4.3 Potential Strategies to Reduce Costs

The construction of the path can be phased or to accommodate the availability of funding. Construction cost reduction and phasing strategies include:

- Complete the path from Mayflower Mall to CBU first. This section is expected to receive the heaviest use.

- Reduce the width to 2.5 m. This will reduce the amount of grading and site preparation, and path works required. However, it will not provide the same level of service to users as a 3.0 m wide path, making it more uncomfortable for them to share and pass each other on the path. This will result in a lower quality active transportation link on what is a key intercommunity link.

- Phase elements of the construction, such as completing the site preparation, grading, drainage and granular base in the first few years; and adding the asphalt surface, illumination, signage and rest areas in later years. This approach will have limited benefits since the granular base is not really intended as a walking and cycling surface. Erosion may degrade the base requiring additional work / costs prior to laying the asphalt surface.

4.4 Performance Monitoring

It is recommended that CBRM consider installing an automated counter along the path to monitor its use. Counter technology and services allow for installation of devices that count various types of users by time of day, automatic reporting and even web-based summaries that the public can view. Monitoring use will allow CBRM to understand peak hours, weekday / weekend variations, and month and seasonal variations in use and types of users. This information can be used to demonstrate the benefit of the project and assist in planning maintenance activities.

4.5 Permits

The following permits may be required prior to construction proceeding.

4.5.1 NOVA SCOTIA DEPARTMENT OF TRANSPORTATION AND INFRASTRUCTURE RENEWAL WORK WITHIN HIGHWAY RIGHT-OF-WAY PERMIT

Any activity / work within a Provincial highway right-of-way requires a permit from the Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) prior to starting the work. CBRM will be required to complete the application and submit it to the Area Manager for review.

4.5.2 NOVA SCOTIA DEPARTMENT OF ENVIRONMENT AND LABOUR WATERCOURSE ALTERATION APPROVAL

Any activity that may alter a watercourse or water resources or any natural body of water requires a permit from Nova Scotia Department of Environment and Labour (NSEL). Such activities include (this is a partial list only):

- Constructing or maintaining a culvert (Category I or II)
- Using equipment closer than 3 m from the watercourse (Category II)
- Diverting a water course from its natural channel (Category III)
- Placing rock or other erosion protection material in a surface water course (Category II)

CBRM will be required to complete the application and submit it to the Regional or District Office for review. Review by the Department of Fisheries and Oceans (Canada), Transport Canada, local authorities and community organizations may form part of the review process.

"Watercourse" means any creek, brook, stream, river, lake, pond, spring, lagoon or any other natural body of water, and includes all the water in it, and also the bed and the shore (whether there is actually any water in it or not). It also includes all ground water. "Water resource" means all fresh and salt (marine) waters, including all surface water, groundwater and coastal water.

4.5.3 NOVA SCOTIA DEPARTMENT OF ENVIRONMENT AND LABOUR WETLAND ALTERATION APPROVAL

Any alteration to a wetland requires an approval. “Alteration” means filling, draining, flooding, or excavating a wetland. CBRM may be required to complete the application and submit it to the NSEL. CBRM would need to retain the services of a person(s) qualified in the field of wetland hydrology and wetland ecology to prepare a report characterizing various aspects of the wetland. NSEL will consider a mitigative sequence approach, i.e. avoidance, minimization and compensation for impacts.

"Wetlands" are land commonly referred to as marshes, swamps, fens, bogs, and shallow water areas that are saturated with water long enough to promote wetland or aquatic processes. Salt marshes are also wetlands.

4.5.4 NOVA SCOTIA DEPARTMENT OF ENVIRONMENT AND LABOUR ENVIRONMENTAL ASSESSMENT PROCESS

The Grand Lake Road Path is not included in the Class 1 and Class 2 undertakings requiring an Environmental Assessment.

4.5.5 CANADA DEPARTMENT OF FISHERIES AND OCEANS AUTHORIZATION

Canada's *Fisheries Act* provides for the protection of fish and fish habitat. The Act includes fish habitat protection provisions that prevent anyone from carrying out works or undertakings in or near water that prevents fish passage, reduces flow, results in fish mortality by means other than fishing, or the harmful alteration, disruption or destruction of fish habitat unless such impacts have been authorized by Fisheries and Oceans Canada. The habitat protection provisions also apply to the ongoing operation, modification, maintenance or other works or undertakings associated with an existing facility or structure in or near water.

Nova Scotia Department of Environment and Labour (NSEL) is the first point of contact to review activities that occur in or near freshwater. Through CBRM's application for Watercourse Alteration, NSEL will contact DFO if further review is required with respect to fish habitat.

4.5.6 KWILMU'KW MAW-KLUSUAQN (KMK) PROCESS

Approval for the project may be required from the Kwilmu'kw Maw-klusuaqn (KMK) Negotiation Office. The role of KMK is to address the historic and current imbalances in the relationship between Mi'kmaq and non-Mi'kmaq people in Nova Scotia and secure the basis for an improved quality of Mi'kmaq life.

4.6 Project Timelines

Various permits will be required prior to proceeding with construction (see Section 4.4, page 45), along with easements to construct back slopes and utility poles or guys on private property, and partial property purchases in some locations to accommodate the path. The following timelines for activities are suggested to prepare for construction of the path.

<table>
<tr><th>Upon completion of the Design Feasibility Study</th><th>2 years prior to construction</th><th>1 year prior to construction</th><th>Year(s) of Construction</th></tr>
<tr><td rowspan="2">• Request Council to endorse the AT Committee and staff continuing to move the project forward, with funding approval to be sought from Council at a later date</td><td colspan="2">• Pursue funding sources
• Negotiate for easements and partial property purchases from adjacent land owners
• Continue to work with stakeholders along the path on other active transportation facilities such as path connections, bicycle parking, signage, etc. that would be complementary to the trail and support and encourage AT</td><td rowspan="2">• Construct path
• Organize Opening Day event to celebrate the completion of the path, thank funders and supporters, and encourage people to try out the path</td></tr>
<tr><td>• Submit Design Report and Preliminary Design Drawings to NSTIR for review and approval in principle
• Submit Design Report and Preliminary Design Drawings for KMK process
• Negotiate with Aliant for the relocation of utility poles and services
• Negotiate with Nova Scotia Power to review illumination requirements
• Seek Council approval to fund surveys / reviews
• Undertake any outstanding ground survey required to finalize the design
• Negotiate with NSTIR to undertake culvert condition surveys
• Undertake watercourse, wetland and fisheries reviews to support potential NSEL Watercourse and Wetland Alternation Permits and DFO Authorization</td><td>• Seek Council approval to fund preparation of tender
• Finalize the design and prepare the tender package
• Apply for NSTIR Work within Highway Right-of-Way Permit
• Apply for NSEL Watercourse Alternation Permit and determine if DFO
• Apply for NSEL Wetland Alternation Permit, if required
• Seek Council approval to fund capital costs to construct path
• Relocate utility poles and services in advance of path construction
• Finalize all agreements with adjacent land owners, as required</td></tr>
</table>