Brunswick Street Complete Streets AT Connection

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1.0 Introduction

1.1 Background

Brunswick Street and Rainnie Drive are at the intersection of the old downtown and new downtown districts and the gateway to the north end. Bordering the north and east walls of the Halifax Citadel, this corridor provides an important link for residents and tourists alike connecting residential areas to a major employment centre, retail and entertainment as well as providing access to Dalhousie University, the hospitals, and downtown transit hubs. Citadel Hill is a cultural centre for Halifax and has been home to concerts, festivals, and as the founding feature of the city, it is an important tourist attraction drawing more than half a million visitors annually.

In the past decade, Brunswick Street has seen significant development activity as residential density in the downtown core increases. The Doyle and Grafton Park developments have frontages along Brunswick Street and The Pearl faces Gottingen Street between Rainnie Drive and Brunswick Street. In addition, hotel properties at the north end of Brunswick Street have been renovated and re-branded in recent years bringing additional tourist traffic to the area. Potential future development in the area include a new hotel at the corner of Brunswick Street and Gottingen Street (this application was withdrawn due to the Covid-19 pandemic but the zoning preserved to allow it to be resubmitted), a hotel and residential building currently under construction at the north west corner of Cogswell Street and Brunswick Street, the proposed relocation of the Mi'kmaw Native Friendship Centre to the corner of Rainnie Drive and Gottingen Street, as well as the potential relocation or renovation of both the Halifax Regional Police Headquarters and Centennial Pool.

In 2016, HRM engaged WSP to prepare draft concepts for an All Ages and Abilities (AAA) bicycle network connection from the Halifax Common along Rainnie Drive and Gottingen Street to Brunswick Street, and along Brunswick Street to Spring Garden Road. Two options were completed and internal evaluation by staff determined a bi-directional bikeway along the west side of Brunswick Street to be the preferred choice. This plan forms the framework for work done as part of this project and can be found in Appendix A.

The Integrated Mobility Plan (IMP) and Centre Plan both highlight this area for enhanced streetscaping and the addition of an AAA bicycle facility. This route is also identified in the Active Transportation Priorities Plan as candidate or desired routes. Rainnie Drive and Brunswick Street create an important link between existing segments of the active transportation network. The current Brunswick Street bike lane ends at Sackville Street leaving cyclists to find their own connections to the existing Dalhousie active transportation facilities. Pedestrian facilities also deteriorate south of Sackville Street making it challenging for those on foot to access the Spring Garden Road business area. This is discussed in more detail in section 2 of this report.

1.2 Project Objectives and Goals

This report outlines the conceptual design and public engagement process that informed the functional plan design following a complete streets approach as outlined in the Municipal Design Guidelines (2021) The

complete streets approach applies strategies to create environments that provide comfortable, convenient, and safe access to all users regardless of age, ability, or chosen mode of transportation. Several design elements are considered part of a complete street, the following features will form an important part of the design:

- Pedestrian infrastructure (sidewalks, crosswalks, curb cuts, and tactile warning indicators)
- Traffic calming measures (narrowed lanes, medians, shorter curb radii, and elimination of right-turn slip lanes)
- Bicycle infrastructure (protected or dedicated bicycle lanes, bicycle parking, and multi- use path)
- Public transit accommodations

This project assesses the impacts of lane reconfiguration and allocation of space to create an improved active transportation link in the downtown area providing improved pedestrian amenities and a permanent protected bicycle lane while maintaining necessary vehicular functions along the corridor.

1.3 Project Area

The project area encompasses Brunswick Street from Cogswell Street to Spring Garden Road, Gottingen Street between Rainnie Drive and Brunswick Street (see figure 1). The project area has been broken into smaller segments based on their different functional needs:

1. Gottingen Street (blue)
2. Brunswick Street between Cogswell Street and Sackville Drive (green)
3. Brunswick Street between Sackville Drive and Spring Garden Road (yellow)

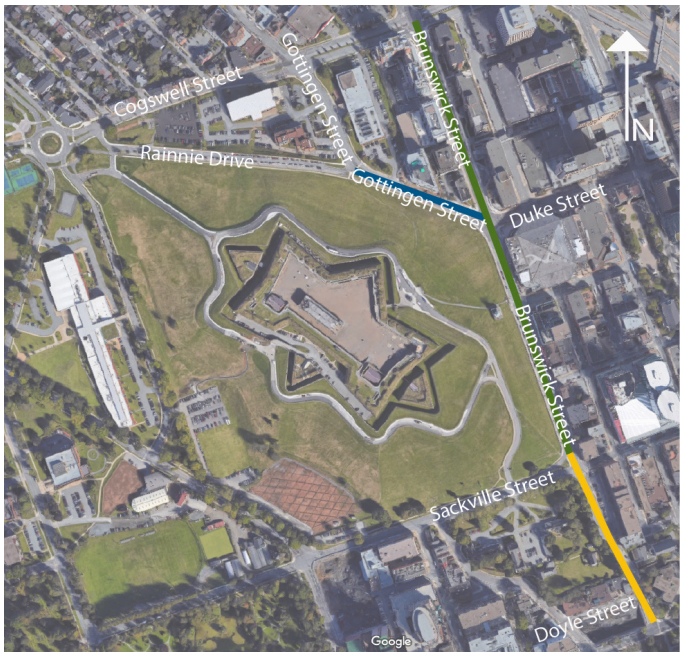


Figure 1 - Location Map

1.4 Policy Context

Integrated Mobility Plan

The IMP, passed unanimously by Regional Council in December 2017, identifies Rainnie Drive and Brunswick Street as an important multi-modal corridor, particularly important in terms of active transportation. Specifically, the IMP identifies Rainnie Drive and Brunswick Street as a key connector for the AAA bicycle network.

The IMP recommends adopting a complete streets approach for design and maintenance (Policy 2.3.5a), prioritization of walking and cycling when allocating road right of way space (Policy 2.3.5b) and the utilization of elements to create a sense of place (Policy 2.3.5c). A complete streets approach considers how the street functions as a destination while incorporating opportunities for multi-modal transportation and accessibility for all user groups. The goal of a 'Complete Streets' approach is to improve the comfort and safety of all users with a focus on active transportation (walking, rolling, and cycling) instead of motor vehicles. The IMP also calls for the implementation of pedestrian infrastructure that is accessible to all ages and abilities (Policy 3.1.5a) and the creation of an AAA bicycle network that is functional year round (Policy 3.1.5b).

To achieve the mode share targets adopted in the 2014 Regional Plan by the 2031 target, opportunities for non-auto transportation need to be increased. Implementation of projects outlined in the IMP are key components to reaching these goals and the similar goals set forth in HalifACT 2050 - most notably, the decarbonization of our transportation network.

The IMP requires the public to be engaged for all projects located in high profile areas, if changes are going to be made to the layout of a road, or service levels may be impacted. Consultation should ensure that the parameters of the project are understood and the rationale and benefits are clearly explained to the public. Typically, public engagement for a project of this nature would be done in the form of large public meetings and an online survey. Due to the uncertainties regarding Covid-19 during the project engagement was completed in a completely virtual format. More information about public engagement can be found in section 6 of this report.

Figure 2 - Project context IMP Proposed AAA Network

Active Transportation Priorities Plan

Making Connections: Halifax Active Transportation Priorities Plan (AT Plan) issued in 2014 identifies the need for it to be easy and convenient to choose to leave the car at home'. Ensuring the entire trip can be made comfortably by all ages and abilities is a major factor in uptake of these initiatives. Currently a gap in the AT network exists between the Commons and Spring Garden Road as well as the Commons and Downtown. That link is Rainnie Drive and Brunswick Street. Through the implementation of this project, major portions of the peninsula will be connected allowing residents and visitors to walk, roll, and cycle to their destinations.

HalifACT 2050

HalifACT 2050 was adopted by Regional Council in the summer of 2020. The climate action plan puts forth aggressive targets for HRM to reduce carbon and greenhouse gas emissions over the next three decades. To achieve these targets the Municipality will have to focus on active transportation models as well as public transit. An increase in non-auto mode share will be critical to meeting the carbon emission goals set forth in the plan. As we see an increase of extreme weather events it becomes more critical that infrastructure be designed considering climate adaptation and the incorporation of sustainable practices.

Municipal Design Guidelines (2021)

In November 2021 regional council unanimously adopted a revised set of Municipal Design Guidelines for right of way construction within the urban centre. These revised design guidelines focus on following a complete streets approach reducing lane widths and improving active transportation facilities. The revised guidelines move the focus from the single user automobile to active forms of transportation and multi-occupancy vehicles. Section 1.3.1 sets forth the guiding principles for complete streets.

- Streets support their intended functions and complement adjacent land uses
- Streets consider all ages and abilities
- Streets are multi-functional and multi-modal
- Connected networks are critical
- Streets require collaboration
- Streets contribute to the sustainability of the region

The creation of an accessible environment ensures access to barrier-free and safer journeys for everyone.

1.5 Historical Context

The Halifax Citadel, formally known as Fort George, was first constructed in 1749 and formed the central feature of what would eventually become the City of Halifax and now the Halifax Regional Municipality. Brunswick Street provided the eastern boundary of the original town making it one of the oldest streets in the municipality.

The southern end of the project boundary is adjacent to the former Halifax Public Library site which is located within the site of the Poor House Burying Grounds. Given the sensitive nature of this site, additional care will be required when carrying out work in this area.

Figure 3 - Historic Photo of Citadel Hill

1.6 Key Project Considerations

This project reallocates space within the right-of-way from cars to pedestrians and cyclists. This shift of priorities requires careful analysis of the trade-offs and the benefits and drawbacks to each of those trade offs. The reduction in curb-to-curb width may result in narrower drive lanes, lane reductions resulting in the loss of dedicated turning lanes, as well as the removal of parking and curbside access.

Brunswick Street is an important north - south connection in downtown Halifax and also serves as a truck route and carries tour buses, these requirements will need to be considered and balanced with the creation of a street that prioritizes walking, rolling, and cycling.

Existing Conditions

2.0 Transportation

This section provides an overview of existing conditions for mobility in the Study Area. This includes a summary of existing infrastructure, service levels, and demand for each mode. An operational review evaluates existing performance by mode, including an intersection performance analysis and a multimodal level of service analysis (MMLOS).

2.1 Study Area Characteristics and Travel Patterns

Brunswick Street is the western gateway to downtown Halifax, an area that is home to over 9,000 residents and is expected to increase to over 13,000 in the next 10-15 years. The downtown core is also a major employment area with over 33,000 jobs.

Downtown Halifax has the highest non-auto mode share in HRM. Based on 2016 Census data, over 75% of residents choose to walk, roll, bike, or use transit to commute to work. Most residents in Downtown Halifax live within walking distance to their place of employment, either in downtown or the nearby Institutional District.

Downtown Halifax is a large employment centre and is the largest commuter destination in HRM. The majority of commuters come from within the Halifax Peninsula, Fairview and Bedford. A slim majority (52%) of residents from other areas commute to downtown Halifax by private auto, with transit (29%) and active transportation (18%) representing nearly half of all commuters.

2.2 Street Configuration

Brunswick Street is a collector roadway that runs north-south between North Street and Spring Garden Road. The Brunswick Street Complete Streets Functional Plan Study Area includes Brunswick Street between Cogswell Street and Spring Garden Road (i.e., Brunswick Street between Cogswell Street to North Street is not included in the project Study Area) as well as the section of Gottingen Street between Rainnie Drive and Duke Street (175m).

The Study Area consists of eight intersections, including four signalized (Cogswell Street, Gottingen Street/ Duke Street, Prince Street and Sackville Street) and four unsignalized intersections (Gottingen Street/ Rainnie Drive, Carmichael Street, Doyle Street and Spring Garden Road.
In general, Brunswick Street consists of one general purpose traffic lane in each direction with turning lanes provided at the Cogswell Street, Gottingen Street/Duke Street and Sackville Street intersections, as illustrated in Figure 2. Gottingen Street also consists of a single lane in each direction. The posted speed limit for is 50km/h on Brunswick Street and Gottingen Street.

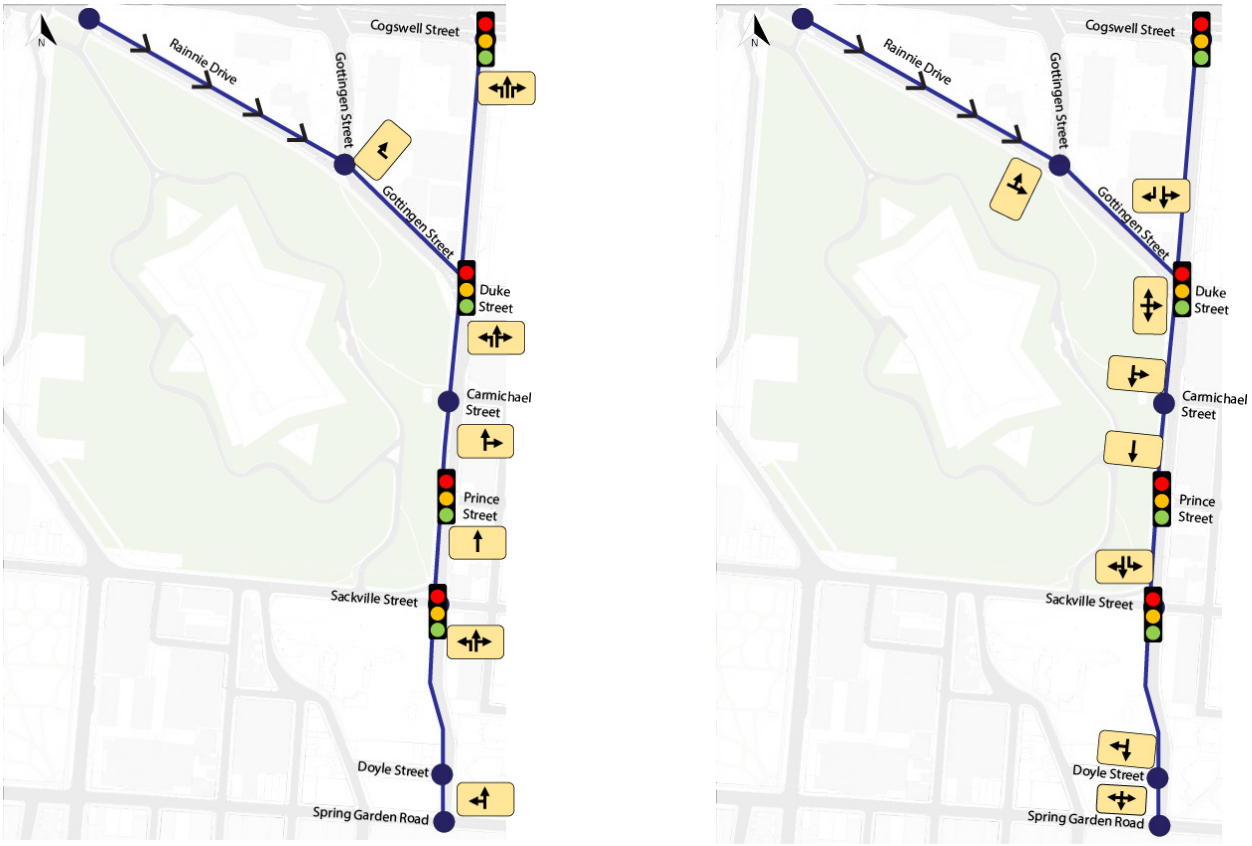


Figure 4 -Existing Intersection Treatments

2.3 Motor Vehicle Traffic

Traffic Data

Peak period intersection turning movement counts were obtained from HRM Traffic Management. A summary of available data is provided in Table 1 and the complete date is provided in Appendix B.

Traffic Volume Projections

Available traffic data were used to develop traffic volume projections for each intersection on the corridor. Intersection turning movement data, collected between 2012 and 2021, were projected to a 2022 base year using an annual background growth rate of 1%, seasonal adjustment factor (varies) and 5% design factor to be conservative. Projected 2022 AM and PM peak hour traffic volumes are provided in Figures B-1-B-4 (Appendix C).

Location	Date	Appendix Table
Brunswick @ Cogswell	Th, September 5, 2019	Table B-6
Brunswick @ Gottingen / Duke	Tu, June 4, 2019	Table B-5
Brunswick @ Carmichael	W, December 12, 2012	Table B-4
Brunswick @ Prince	Tu, October 21, 2014	Table B-3
Brunswick @ Sackville	Th, October 14, 2021	Table B-2
Brunswick @ Doyle	NDA	
Brunswick @ Spring Garden	Mo, May 25, 2015	Table B-1
Rainnie @ Gottingen	Th, August 19, 2021	Table B-7

Table 1 - Summary of available traffic data

Figure 6 - 2022 AM and PM Peak Traffic Volumes

Projected 2022 AM and PM peak traffic volumes on the corridor generally increase from north to south during the AM peak period, and south to north during the PM peak period. The busiest sections of the corridor include the segments on Brunswick Street between Sackville Street and Duke Street (1,380 two-way vph during the AM peak and 1,585 two-way vph during the PM peak). Peak hourly volumes for the 2022 AM and PM peak periods are illustrated in Figure 6.

Traffic Operational Review

Intersection performance analysis was completed to evaluate traffic operations based on the existing intersection configurations and projected 2022 traffic volumes. The analysis was completed for the AM and PM peak periods using Synchro 10.

The level of service (LOS) criteria for unsignalized and signalized intersections is provided in terms of average delay per vehicle in seconds, as shown in Table 2.

LOS	Unsignalized Intersections (seconds of delay per vehicle)	Signalized Intersections (seconds of delay per vehicle)
A	≤10	≤10
B	>10-15	>10-20
C	>15-25	>20-35
D	>25-35	>35-55
E	>35-50	>55-80
F	>50	>80

Table 2 - Level of Service Criteria

The results of the intersection performance analysis indicate generally good operational conditions for motor vehicles, with most movements expected to operate within HRM acceptable limits[1] . Resulting intersection levels of service and operational summaries are provided in Table 3[2] . LOS summary tables and Synchro reports are provided in Appendix D.

Intersection	AM Peak		PM Peak	
Brunswick at Cogswell	B	• Operating within HRM critical limits.	B	• Operating within HRM critical limits.
Brunswick at Gottingen/Duke	E	• Operating at LOS E during the AM peak, which is largely attributed to the eastbound (Gottingen St) movement, given the heavy right-turning volume and the 'No RTOR' restriction. • EB approach is currently operating above capacity and at LOS F. 95th%ile queues extend beyond Rainnie Drive."	C	• Operating within HRM guidelines during the PM peak, with the exception of the NB 95th%ile queue, which is expected to spill back beyond the Carmichael intersection.
Brunswick at Carmichael	A	• The southbound approach is operating at capacity.	F	• Operating at LOS F as a result of extensive delays on Carmichael (stop-controlled). The Carmichael Street approach is operating over capacity and 95th%ile queues extend beyond Argyle Street. Performance indicators on Carmichael Street are likely exaggerated in the model, as right-turning traffic is likely sneaking around left-turning traffic. • The southbound approach is operating over capacity."
Brunswick at Prince	C	• The southbound approach is approaching capacity and 95th%ile queues extend beyond Carmichael Street.	B	• Operating within HRM critical limits.
Brunswick at Sackville	C	• The SB through/right-turn lane is approaching capacity during the AM peak and 95th%ile queues extend beyond Prince Street.	B	• Operating within HRM critical limits.
Brunswick at Spring Garden	A	• Operating within HRM critical limits.	A	• Operating within HRM critical limits.
Gottingen at Rainnie	A	• Operating within HRM critical limits.	A	• Operating within HRM critical limits.

Table 3 - Summary of Existing Conditions Analysis

[1]*Critical limits for intersection evaluation include (A) the intersection v/c exceeds 0.85, (B) the v/c of a through movement or a shared through/turning movement exceeds 0.85, (C) the v/c of an exclusive turning movement exceeds 1.0, and (D) an exclusive turning movement generates queues which exceed the available turning lane storage space.*

[2]*The Brunswick Street/Doyle Street intersection was omitted from the Synchro analysis due to a lack of data availability.*

2.4 Active Transportation

Active transportation (AT) is an important consideration on Brunswick Street, given its prominent location in a densely populated area of the downtown, walking, rolling, and cycling are in high demand. Brunswick Street forms a critical link within the existing HRM AT network since there is currently a lack of cohesive connections between key locations (e.g., the Commons, Dalhousie Sexton Campus, Argyle Street Pedestrian Mall, South Park Street Bike lanes, etc.).

Brunswick Street is an important hub for pedestrian activity, particularly surrounding major events held at the Scotiabank Centre. The Scotiabank Centre, located on Brunswick Street between Duke Street and Carmichael Street, is the largest multipurpose facility in Atlantic Canada and houses the Halifax Mooseheads, the Royal Nova Scotia International Tattoo, and the Halifax Thunderbirds. With seating capacity of over 10,500 and more than 100 events every year, pedestrian activity spikes regularly. Particularly after major events, large groups of pedestrians exit the Scotiabank Centre and spill onto Brunswick Street. Given the large group of attendees, it is normal to observe pedestrians spilling into the painted bike lanes and on the street, as shown in Figure 7.

Figure 7 - Image of pedestrian activity after Mooseheads Game (October 2021)

Walking and Rolling

Conditions for walking and rolling vary within the study area. There are segments that do not meet accessibility thresholds and provide obstacles for able bodied and mobility challenged persons alike.

Figure 8 - Sidewalk conditions

Between Cogswell Street and Sackville Street the existing sidewalk meets or exceeds the minimum required widths at 2m-3.7m on both the east and west sides of Brunswick Street and has consistent surface treatments. South of Sackville Street, extending to Doyle Street much of the sidewalk is in disrepair (60.6% needs to be replaced based on the most recent pavement condition assessment) and is quite narrow, less than 1.2m with pinch points of 1m or less in areas.

Gottingen Street has a significant slope ranging from 10.9% near Brunswick Street to 5.4% at the intersection of Rainnie Drive and Gottingen Street before leveling to just under 2% sloping towards North Park Street. The most significant slope occurs at the north-west corner of Gottingen Street and Brunswick Street. In this location the slope is 10.9%, exceeding accessibility guidelines of 8%. More detail is provided on the streetscaping conditions within the project area in Section 3.0.

Given the numerous destinations within the project area, pedestrian congestion is common. Crowding at crossing locations and entrances to attractions or event spaces creates additional accessibility challenges within the sidewalk.

Cycling

The AT Priorities Plan and the IMP identify Brunswick Street as candidate AAA bicycle route. The Brunswick Street bicycle lanes were the first piece of on-road cycling infrastructure installed by the municipality in 2001. In 2020, a tactical bi-directional bikeway was installed on Gottingen Street, between Rainnie Drive and Brunswick Street, as an interim treatment to connect the painted bike lanes on Brunswick Street to the AAA facility on Rainnie Drive. Many lessons have been learned regarding cycling infrastructure and these facilities do not meet the current expectations for AAA bicycle facilities.

This project will improve bicycle infrastructure to the current best practices and provide a AAA cycling connection from Spring Garden Road to Cogswell Street and from Brunswick Street to the Halifax Common. Proposed AAA cycling connections are provided in Figure 9.

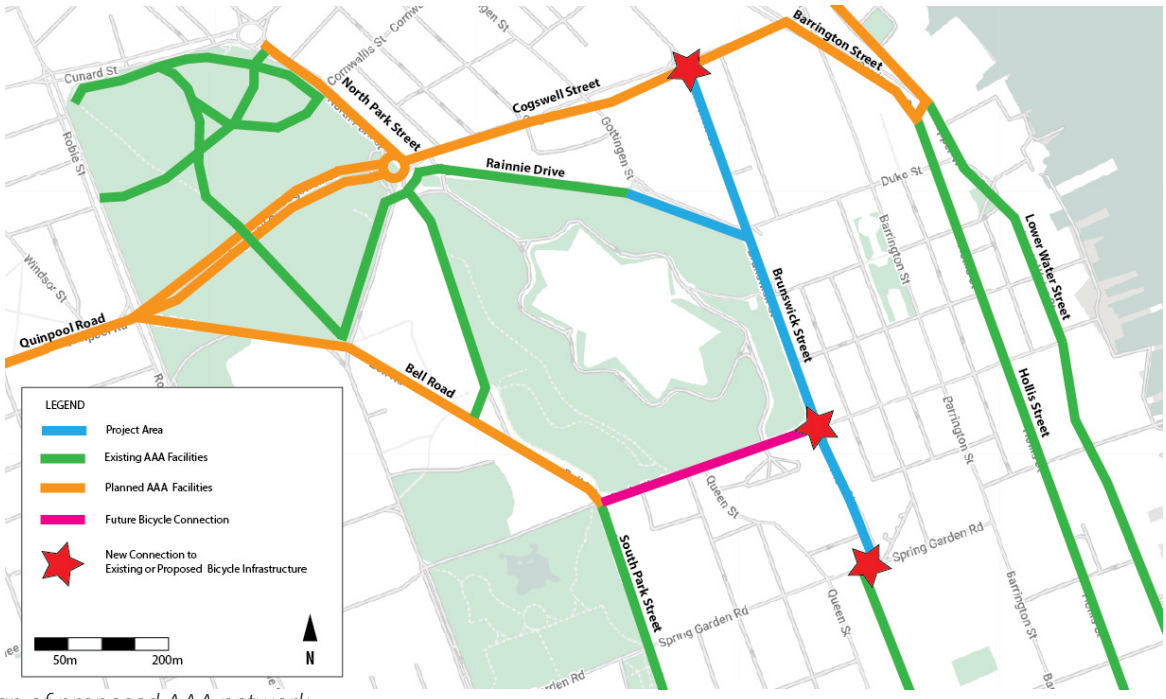


Figure 9 - Map of proposed AAA network

In summary, existing cycling facilities in the Study Area consist of:

- On-street unidirectional painted bicycle lanes on both sides of Brunswick Street between Cogswell Street and Sackville Street. Since the bicycle lane is adjacent to parking, vehicles are required to cross the bicycle lane to park, therefore, cyclists are at risk of dooring from driver side doors.
- The northbound painted bike lane ends approximately 75m prior to the Cogswell Street intersection,

wherein cyclists are required to merge with vehicular traffic.

- There are currently no intersection treatments for cyclists on Brunswick Street (e.g., queue boxes, conflict markings, bike signal phases, etc.)
- On-street tactical bidirectional bicycle lane on Gottingen Street between Rainnie Drive and Brunswick Street. The bicycle lane is buffered from traffic with flexible bollards and pre-cast curbs.
- There is currently no cycling facility present on Brunswick Street between Sackville Street and Spring Garden Road (approximately 240m). Cyclists in this area are required to ride amongst vehicular traffic and parked vehicles.

2.5 Transit Service

Existing Transit Routes

Halifax Transit currently operates three routes along Brunswick Street (Routes 2, 5 and 84 run northbound on Brunswick Street from Duke Street to Cogswell Street) and three express routes along Gottingen Street (Routes 320, 330 and 370). As part of the Moving Forward Together Plan (MFTP), additional service is planned on Brunswick Street between Duke Street and Cogswell Street, and on Gottingen Street.

There are no bus stops within the project area today. This is not expected to change with future transit improvements as the Scotia Square transit terminal is located less than a 500m walking distance (~225m) on Barrington Street. Existing transit routes and stops are provided in Figure 10.

Brunswick Street is occasionally used as a detour route and sees tour busses during events at Scotia Bank Centre. Any changes to lane widths and turning radii will need to ensure access for these vehicles.

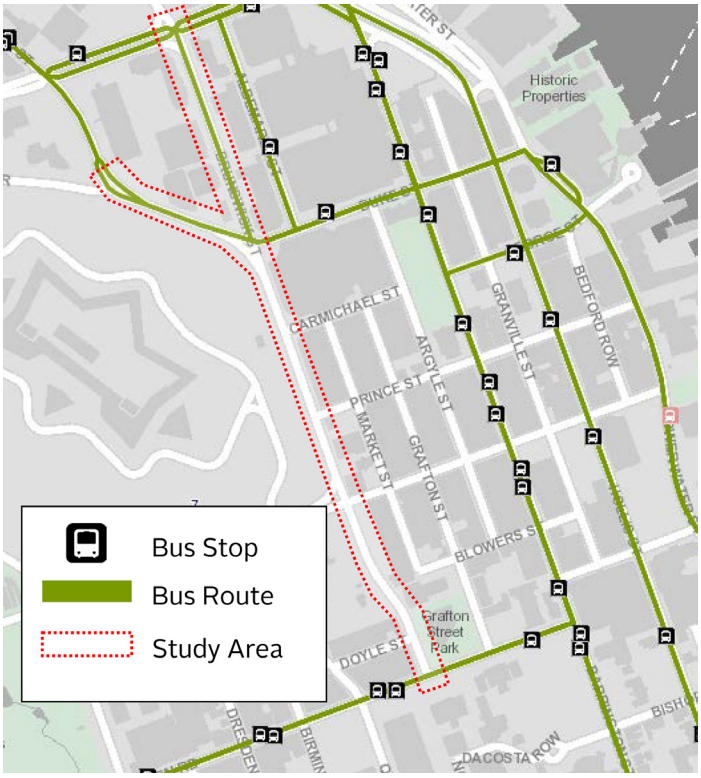


Figure 10 - Existing Transit routes and stops

2.6 Goods Movement

Brunswick Street, between Prince Street and Cogswell Street, is designated as a daytime truck route - daytime 7:00am - 9:00pm and a full time truck route between Sackville Street and Prince Street (Halifax Regional Municipality By-Law No. T-400). It also serves as the primary route for trucks exiting the Scotiabank Centre and Argyle Street area. The most notable loading requirements are those of the Scotiabank Centre, where large trucks access loading bays on the north and south faces of the building on Carmichael and Duke Streets, respectively as well as the need for large tour buses for sporting events, concerts, and the Royal Nova Scotia International Tattoo. Access for these loading activities will need to be maintained.

2.7 On Street Parking and Loading

On Street Parking

Brunswick Street
Curb access varies along Brunswick Street, generally including on-street parking (paid via pay station), bus/ loading, car share parking, and accessible parking spaces.

Figure 11 summarizes curbside access along Brunswick Street and Rainnie Drive and the table includes number, location, and type of space.

Figure 11 - Existing Parking & loading availability

Segment	East	West	Type
Cogswell to Duke	17	8	Hourly
	-	3	Accessible
	-	-	Loading
	-	-	Car Share
Duke to Carmichael	-	4	Hourly
	2	-	Accessible
	2	-	Loading
	-	1	Car Share
Carmichael to Prince	-	9	Hourly
	3	-	Accessible
	5	-	Loading
	-	-	Car Share
Prince to Sackville	-	2	Hourly
	-	1	Accessible
	-	-	Loading
	-	-	Car Share
Sackville to Doyle	20	16	Hourly
	1	-	Accessible
	-	-	Loading
	-	-	Car Share

Table 4 - Summary of Existing curb access

Adjacent Streets

There is additional on-street parking available along Rainnie Drive, Ahern Avenue and Trollope Street to the west of the study area and Albermale Street to the east as well as along Rainnie Drive and Gottingen Street.

On-Street Parking Utilization

Data collected by HRM Parking Services on November 23, 2020 at approximately 2:30pm shows less than 20% utilization of parking along Brunswick Street between Duke Street and Doyle Street. This data was collected during the second wave of the Covid19 pandemic and is reflective of the stay home orders that were in place at the time.

In August 2021 data from the pay stations in the study area was analyzed to determine approximate utilization rates across the month. Based on information from parking services approximately 50% of all sessions are paid for via the Hot Spot app so all figures provided from the pay stations have been doubled and have applied the average length to each session to determine utilization rate. This may result in figures showing more than 100% occupancy. The assumption that people are using the pay station closest to their parking location has been made. These numbers do not account for illegally parked vehicles. The full report received is in Appendix E.

- Brunswick Street – Cogswell Street to Duke Street - approximately 26% utilization
- Brunswick Street – Duke Street to Carmichael Street - approximately 84% utilization
- Brunswick Street – Carmichael Street to Prince Street - approximately 101% utilization
- Brunswick Street – Sackville Street to Doyle Street - approximately 50% utilization

Off-Street Parking

There is off street parking located in surface lots on Cogswell Street, Sackville Street, Bell Road, and Ahern Street. Collectively providing approximately 245 spaces.

There are several parking structures located within a short walk of Brunswick Street, The Scotia Square Parkade, Nova Centre, The Doyle, and Halifax Public Library - Central Branch containing more than 2000 public parking spaces.

Loading

There are 5 loading spaces currently located along Brunswick Street between Carmichael and Prince Streets servicing the businesses along this frontage. There are an additional 2 bus loading spaces in front of Scotiabank Centre between Duke and Carmichael Streets.

2.7 Utilities

Along Brunswick Street, the majority of service lines have been moved underground. There is a section from Sackville Street to Spring Garden Road that remains above ground. The lines along Rainnie Drive also remain above ground. The intention is for remaining above ground utilities to be undergounded both to limit obstructions within the right of way as well as to assist in the beautification of the street. This will be further examined during the detailed design phase.

2.8 Multi-modal Level of Service (MMLOS) Analysis

Multi-modal Level of Service (MMLOS) is an evaluation tool that reviews the degree of service provided at a street segment and an intersection level for all modes of transportation. Traditionally, the measures used in assessing level of service in transportation planning have been focused on the experience of automobile users and based on metrics such as vehicle delay and volume-to-capacity (V/C) ratio. The MMLOS tools measure and consider the experience of all users of a street. HRM's MMLOS guidelines and evaluation framework were used to conduct an analysis for each intersection and segment along Rainnie Drive and Brunswick Street. Figure 12 illustrates the performance measures by mode for intersection- and segment-level analyses.

Area	Realm	Pedestrian	Bicycle	Transit	Goods Movement	Automobile
INTERSECTIONS	Space	# of Uncontrolled Conflicts	# of Uncontrolled Conflicts	% Transit Priority Measures (of Ideal)	Average Curb Lane Width	% Movements with Exclusive Turning Lanes
	Environment	Average Crossing Width	Priority Treatments	Transit Movement V/C Ratio	Average Curb Radius	Turn Prohibitions
	Time	Cycle Lenth	Cycle Length	Transit Movement Delay	Truch Intersection Delay	Car Intersection Delay
SEGMENTS	Space	Pedestrian Facility Width	Driveway Density	Transity Facility Type	Width of Curb Lane	Midblock V/C Ratio
	Environment	Pedestrian Zone Width	Speed x Volume	% of Stopes with Bus Lay-bys	% No Stopping / No Loading	On-Street Parking Availability
	Time	Distance Between Marked Crossings	Block Length	Travel Speed / Ideal Speed	Travel Speed / Ideal Speed	Travel Speed / Ideal Speed

Table 5 - MMLOS Framework

Performance Targets

Mode	Corridor Type	Regional Centre
Pedestrian	Basic	B
	Priority	**A**
Bicycle	Basic	B
	Priority	**A**
Transit	**Basic**	**B**
	Priority	A
Goods Movement	**Basic**	**E**
	Priority	D
Auto	**Basic**	**E**
	Priority	D

Table 6 - MMLOS Targets

HRM's MMLOS guidelines assign a target LOS for each travel mode based on the corridor's location in the municipality (Regional Centre, Suburban, Rural), and priority designation in the most recent policy and transportation plans (e.g. IMP, MFTP, AT Priorities Plan etc.). The table on the right shows the base LOS value for each mode, as well as the maximum LOS target when prioritized.

Along Brunswick Street, pedestrians, and cyclists have been prioritized, and since the corridor is located in the Regional Centre, it received the maximum target LOS per mode. The following is a brief description of the LOS targets established for each mode:

- Pedestrians: given high pedestrian demand and the street's importance as a link to Citadel Hill and the Commons and from the perspective of tourism and civic events. Pedestrians are considered a priority and have been assigned a target LOS A.
- Cyclists: given the street's designation as a AAA bicycle facility in the IMP, cyclists are also considered a priority and have been assigned a target LOS A.

2.9 Summary of MMLOS Analysis

Intersection Analysis

The following sections provide a summary of the MMLOS analysis results for intersections in the study area. It also identifies potential strategies to improve the LOS if a mode does not meet or exceed its target. The detailed analysis as well as the assumptions applied to the methodology are provided in Appendix F.

Pedestrian Level of Service

The analysis indicates that the pedestrian experience at the intersection level could be improved given that none of the intersections meet their LOS A target (figure 12).

Pedestrian LOS is poorest at the Cogswell Street intersection (LOS E) due to large crossing distance (over 25m), and uncontrolled conflict points with vehicles resulting from the two right turn channels and the permitted right on red (RTOR) at each intersection approach.

Pedestrian LOS at the Sackville Street and Duke Street intersections is at LOS D due to large crossing distance (over 18m) and due to uncontrolled conflict points with vehicles resulting from the right turn channels.

Potential strategies to improve pedestrian LOS include:

- Reducing pedestrian crossing distance.
- Removing the right turn channels at Cogswell Street and Brunswick Street.
- Prohibition of turning movements
- Implement protected-only left turns (no permitted lefts)
- Elimination of right turns on red
- Signalization of right turn channels
- One-way street conversion
- Leading pedestrian intervals (at signaled intersections)
- Shortening cycle lengths (reduced pedestrian crossing delay)

Figure 12 - AM/PM Pedestrian Intersection LOS

Cycling Level of Service

Similar to the pedestrian LOS, none of the intersections meet their LOS target of A (figure 13). Four of the nine intersections are currently performing at LOS C for cyclist experience; three are performing at a LOS D (at Sackville Street, Doyle Street and Spring Garden Road) and one intersection is performing poorly at LOS E (at Cogswell Street).

The Cogswell Street intersection performs poorly due to the lack of bicycle priority treatments at the intersection and due to the uncontrolled conflicts with motor vehicles at the right turn channels of Cogswell Street and Brunswick Street. The intersection is also performing poorly due to the number of lane changes that a cyclist needs to make to turn left, as each intersection approach has approximately 2-3 lanes.

Other intersections that perform poorly (LOS C and D) do so primarily due to the lack of bike priority treatments and / or due to the number of lanes at each leg, representing a likely increase in delay for cyclists arriving at the intersection.

Potential strategies to improve the LOS include:

- Adding protected bicycle facilities at the intersections
- Adding two-stage turn boxes to facilitate the left turning movements for cyclists
- Eliminating (or signalizing) right turn channels
- Reducing the number of lanes at each intersection approach and reducing lane width (shorter crossing distance)
- Protecting all vehicular left-turn movements
- Shortening cycle lengths (reduced crossing delays)

Figure 13 - AM/PMCyclist Intersection LOS

Transit Level of Service

The MMLOS analysis was completed for intersections that are included in existing transit routes (i.e., for intersections that are not part of transit routes were omitted from the analysis). Two of the three intersections (Cogswell and Gottingen/Duke) have achieved or exceeded the LOS B target and one intersection (Spring Garden) is performing at LOS C, as shown in Figure 14.

The Spring Garden Road intersection performs at a LOS below the target due to the lack of transit priority treatments along the corridor, which is designated as a Transit Priority Corridor.

Strategies to improve the transit LOS likely will impact the LOS for pedestrians and cyclists (e.g., modifying the

Figure 14 - Transit Level of Service (AM & PM)

traffic signals to prioritize transit, exclusive transit lanes, etc.). Given that transit was determined not to be an MMLOS priority for the project, strategies to improve transit operations in the Study Area should not be prioritized over pedestrians and cyclists.

Figure 15 - Goods Movement LOS (AM & PM)

Goods Movement Level of Service

All intersections exceed the target LOS D for goods movement, as shown in Figure 15. Most intersections have wide curb lanes, and trucks experience relatively low average delays. Intersections that have an LOS B generally have vehicle delays of 11-20 seconds during the AM and PM peaks and an average effective right turning radius between 11 and 18m.

It should be noted that the Doyle Street intersection was not analyzed due to a lack of data for two out of the three LOS indicators (average delay and volume-to-capacity ratio).

Automobile Level of Service

All intersections either meet or exceed their LOS target E, ranging between a LOS E to LOS B, as shown in Figure 16. Most intersections have been penalized for not having exclusive turning lanes. The more movements that are served by turning lanes, the simpler it is for vehicles to move safely through an intersection. The Carmichael Street and Prince Street intersections were also penalized for turn prohibitions associated with being one-way corridors.

Intersection delays were not modeled at Brunswick Street and Doyle Street due to lack of available traffic data. This resulted in a higher weight assigned to the other two indicators (number of turn prohibitions, percent of exclusive turn movements).

It should be noted that the levels of service in Figure 16 do not correspond to the levels of service in Table 3, Section 2.3 – Existing Conditions Traffic Operations. The MMLOS considers the resulting Synchro outputs in addition to factors pertaining to the presence of turning lanes and turning restrictions.

Figure 16 - Automobile LOS (AM & PM)

Segment Analysis

The following section provides a summary of the MMLOS analysis results for the segments along Brunswick Street and Gottingen Street. It also provides possible strategies to improve the LOS if a segment does not meet or exceed its target LOS. The detailed analysis as well as the assumptions applied to the methodology are provided in Appendix F. Please note, transit operations are not included in the segment MMLOS since there are no transit stops within the Study Area.

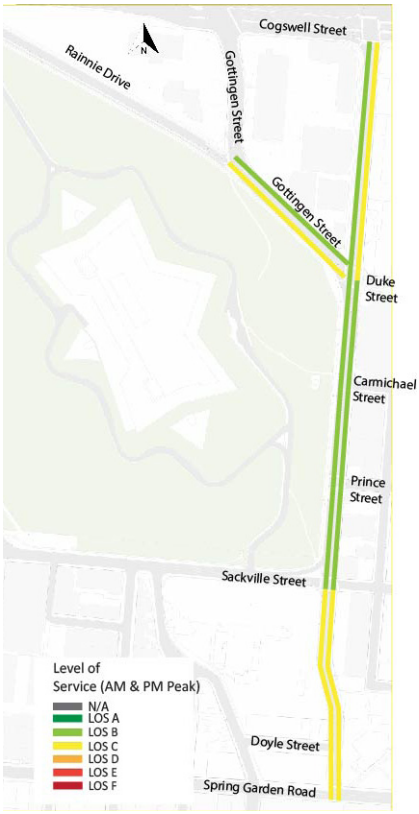


Figure 17 - AM/PM Pedestrian Segment LOS

Pedestrian Level of Service

The pedestrian LOS along the corridor ranges from LOS B to LOS C, as shown in Figure 17. Segments that achieved LOS B have relatively generous pedestrian zones (sidewalk + boulevard) and have a relatively short distance between marked crossings. Segments at LOS C have more narrow pedestrian zones, and longer distances between marked crossings.

Possible strategies to improve the LOS include:

- Widening the sidewalk and boulevard to provide additional separation between pedestrians and the traffic lanes
- Adding mid-block marked crosswalks in long segments

Cycling Level of Service

The cyclist LOS along the corridor ranges from LOS C to LOS D, as shown in Figure 18. Segments do not achieve a LOS A due to a combination of adjacent traffic volumes and the presences of painted unidirectional bike lanes with no separation between traffic/parking, which impacts the cyclists' experience. It should be noted that 'Block Length' was omitted from the cyclist MMLOS, since it was determined to unduly impact the overall performance and would restrict the ability to achieve LOS A with implementation of a AAA facility. It is recommended that HRM revisits the MMLOS tool to reevaluate cyclist performance indicators.

Possible strategies to improve the cycling LOS include:

- Consolidate driveways where possible
- Upgrade existing painted bicycle lanes to 'AAA' facilities
- Reduce vehicle speeds and volumes

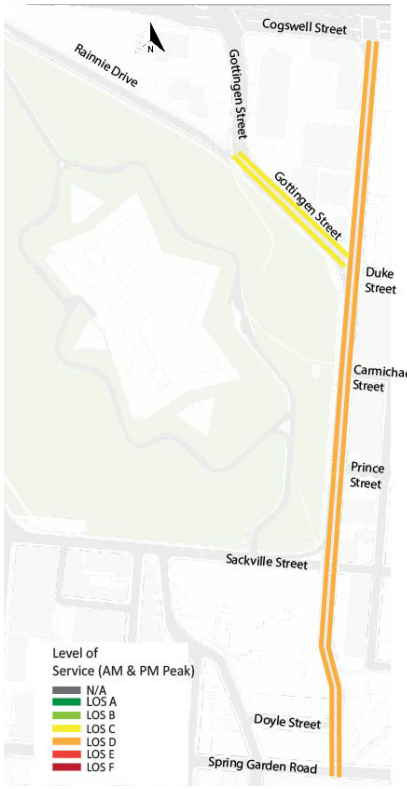


Figure 18 - AM/PM Cyclist Segment LOS

Goods Movement Level of Service

The Goods Movement LOS along the corridor ranges from LOS A to LOS E, as shown in Figure 19. All segments meet / exceed their target LOS E. Segments that perform at a LOS A or B have wide curb and allow stopping for loading purposes. The southbound direction of the segment between Sackville Street and Duke Street performs at LOS E since loading operations is prohibited for the majority of the segment and more narrow curb lane widths are present.

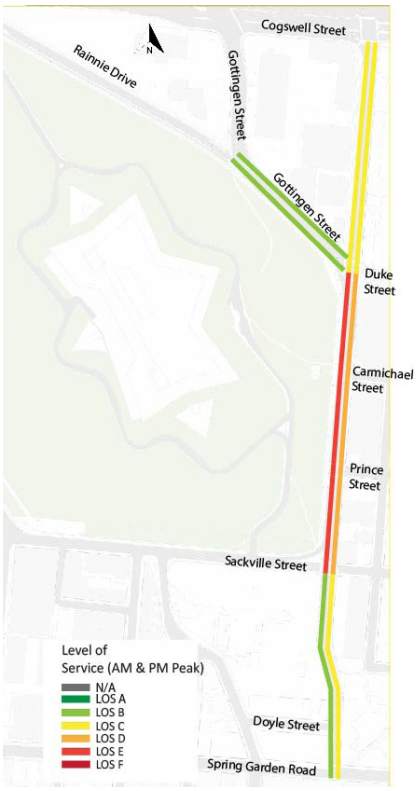


Figure 19 - GM Segment LOS

Automobile Level of Service

The automobile LOS along the corridor ranges between LOS B – LOS F. Apart from the Gottingen Street segment, all other segments in the Study Area meet or exceed their target LOS E, as shown in Figure 20. Segments that perform at LOS C or below, have a relatively high mid-block volume-to-capacity ratio, and do not allow on-street parking. Segments that have a LOS of A, have relatively low mid- block volume-to-capacity ratio, and offer on-street parking.

Potential strategies to improve the automobile LOS would likely impact the LOS of other modes, including:

- Adding on-street parking spaces along the corridor, which would reduce the amount of available ROW width for desired sidewalk and bike lane widths, and associated buffer widths.
- Designing roads to accommodate more vehicle capacity, which would likely involve additional vehicle through/turning lanes and preclude the ability to provide wide sidewalks and bike lanes.
- Divert traffic from the corridor (modal shift, traffic calming / diversion treatments, etc.).

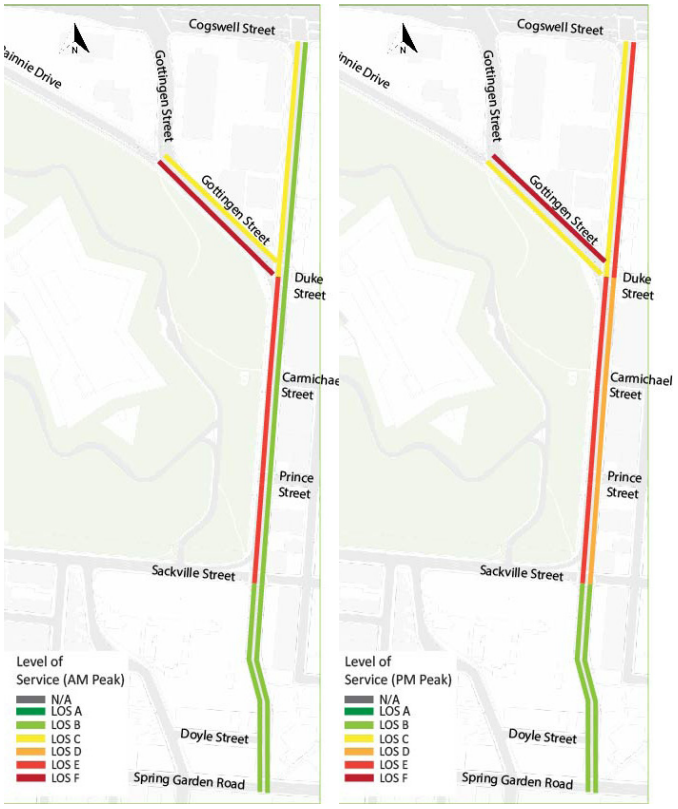


Figure 20 - Automobile Segment LOS

3.0 Existing Conditions: Streetscaping

3.1 Streetscaping

Streetscaping is an important component of the public realm, impacting the experience of pedestrians and other street users. It considers how elements such as trees, lighting, street furniture, surface materials, public art, planters, utilities, and more can be used to animate and support a street's function as a part of the public realm while maintaining function and accessibility. The streetscaping program framework, endorsed by Regional Council in January 2020, aims to enhance the character and identity of pedestrian oriented streets and prioritize projects fronting regionally significant cultural or natural features. With a National Historic Site on one side, and a pedestrian oriented business district on the other, the project streets rank very highly for consideration of enhanced streetscaping features. The framework also aims to create public spaces that contribute to aspects of social life, by making those spaces pleasant and attractive to residents and visitors, while also considering inclusivity and the needs of diverse groups of people.

In the past decade several new developments have been constructed along the Brunswick Street and Rainnie Drive corridor, The Pearl, Grafton Park, The Doyle, 1920, and the Hampton/Homewood by Hilton have all be constructed and there are proposals for additional development along Gottingen Street and Rainnie Drive as well as potential changes to the current Halifax Regional Police headquarters and the Centennial Pool site. These developments all bring additional residents and visitors to the area increasing the need for pedestrian oriented spaces and access to multi-modal forms of transportation. The existing streetscaping conditions are summarized in the table on the following pages.

Brunswick Street		
Segment	Streetscaping Conditions	
	East	West
Cogswell Street to Gottingen Street / Duke Street	• 2m sidewalk, broom finished concrete with 1m paver band • Total clear space 3m • Generally excellent condition	• 3.7m broom finished concrete sidewalk with 2m sod boulevard • Boulevard ends at 1888 Brunswick St, sidewalk remains 3m • Slope at corner of Brunswick and Gottingen Streets exceeds 10%
Gottingen / Duke Street to Sackville Street		• Adjacent to Halifax Citadel National Historic Site • 2.7m wide broom finished concrete sidewalk • No boulevard • Stone retaining wall with fence along western edge adjacent to the Citadel • In generally excellent condition
Duke Street to Carmichael Street	• Adjacent to Scotiabank Centre • 3.1m-4.2m broom finished concrete sidewalk • No boulevard	

	East	West
Carmichael Street to Prince Street	• 3.1m to 3.4m wide broom finished concrete • No boulevard • Partially covered by overhang from HFX sports • Columns reduce clear width to 1.7m	
Prince Street to Sackville Street	• 1.9m to 2.7m wide broom finished concrete • No boulevard • Narrows at 1663 Brunswick Street layby/ parking area	
Sackville Street to Spring Garden Road	• 1.96m broom finished concrete sidewalk with 1.1m concrete or sod between sidewalk and property line of former Halifax Public Library, condition fair to good • 1.8-2m broom finished concrete sidewalk along new Grafton Park development, condition is excellent • Widens to 2.5m along Cambridge Suites frontage	
Sackville Street to Doyle Street		• 1.6m curb to back of sidewalk at corner, utility pole creates 0.9m pinch point • 1.9m broom finished concrete, widens slightly to 2.0m beyond the retaining wall • Pinch point in front of 1528 Brunswick Street between utility poles and raised planting beds 1.1m wide • Condition varies, poor to good
Doyle Street to Spring Garden Road		• 2.15m broom finished concrete sidewalk bordered by a 0.4m paver border and 0.15m concrete curb • 5m sodded boulevard with 5 street trees • Condition is excellent
Gottingen Street (Brunswick Street to Rainnie Drive)	• 1.96m broom finished concrete North-west corner is steepest portion of the segment, 20% at the corner, 12.8% along side of 1872 Brunswick Street • 3.3m broom finished concrete sidewalk in generally good condition • 2.3m broom finished concrete sidewalk with 1m paver boulevard and tree planting along frontage of The Pearl, pavers and trees are in poor condition • Slope decreases to 5.5% along frontage of The Pearl	• 10.3% slope at corner • Reduces to 7% across from The Pearl • 2.7m broom finished concrete sidewalk, narrows to 1.45m sidewalk with 1.15m sod boulevard • bi -directional bikeway implemented as part of 2020 Tactical Urbanism program

4.0 Existing Conditions: Land Use

4.1 Key Land Use Considerations

Integration with other venues and projects

Sports, Conferences and Performing Arts

Brunswick Street is the western gateway to Downtown Halifax and is just one block from the heart of the entertainment district and features many attractions for residents and tourists alike.

Brunswick Street
- The Scotiabank Center

Grafton Street
- The Nova Centre
- 8 Bars & restaurants

Argyle Street
- Neptune Theatre
- 14 Bars & restaurants
- Hotel

Halifax Citadel National Historic Site

Brunswick Street sits at the base of Fort George, most commonly known as the Halifax Citadel. The National Historic Site is operated by Parks Canada and draws approximately 500,000 visitors annually. Visitors can access the site on foot via Brunswick Street, Rainnie Drive, Sackville Street or Ahern Avenue, as well as by automobile from Sackville Street, Rainnie Drive or Ahern Avenue. The Old Town Clock sits on Citadel Hill at the terminus of Carmichael Street, a focal point of downtown Halifax.

4.2 Regional Plan

At a regional scale, Brunswick Street and Rainnie Drive are in Downtown Halifax, part of the Regional Centre along with the Halifax Peninsula and the areas of Dartmouth within the boundaries of the Circumferential Highway. The Regional Centre is recognized as the civic, cultural, and economic heart of HRM as well as being the provincial capital. As a result the Municipality has put in place guiding principles to guide land use planning and strategic investment.

> The Regional Centre Secondary Municipal Planning Strategy applies to lands, which are areas designated for growth within the Regional Centre. It is intended that this Plan will be amended to include all those areas of the Municipality defined as the "Centre Plan Area", and the "HRM By Design Downtown Plan Area" (Downtown Halifax) in the Halifax Regional Municipality Charter.
>
> The Regional Centre offers numerous attractions associated with its history and urban form. Concentrated commercial districts are within walking distance of established neighbourhoods, and within an easy reach of parks and open spaces. Future development in the Regional Centre is key to the ongoing social and economic health of the region and the Province. The overall goal of this Plan is to provide a planning framework that enables the Regional Centre to become one of the most livable communities in Canada
>
> Regional Centre Secondary Municipal Planning Strategy, 2020

4.3 Centre Plan

The Regional Centre Secondary Municipal Planning Strategy (Centre Plan) - Package B was approved by Regional Council in October 2021 and is in effect as of November 27, 2021.

Package B rethinks the way the downtown precincts are identified and simplifies them. The project area will buffer three zones. The North End Gateway designation puts additional importance on Rainnie Drive as a key connection and place within downtown Halifax.

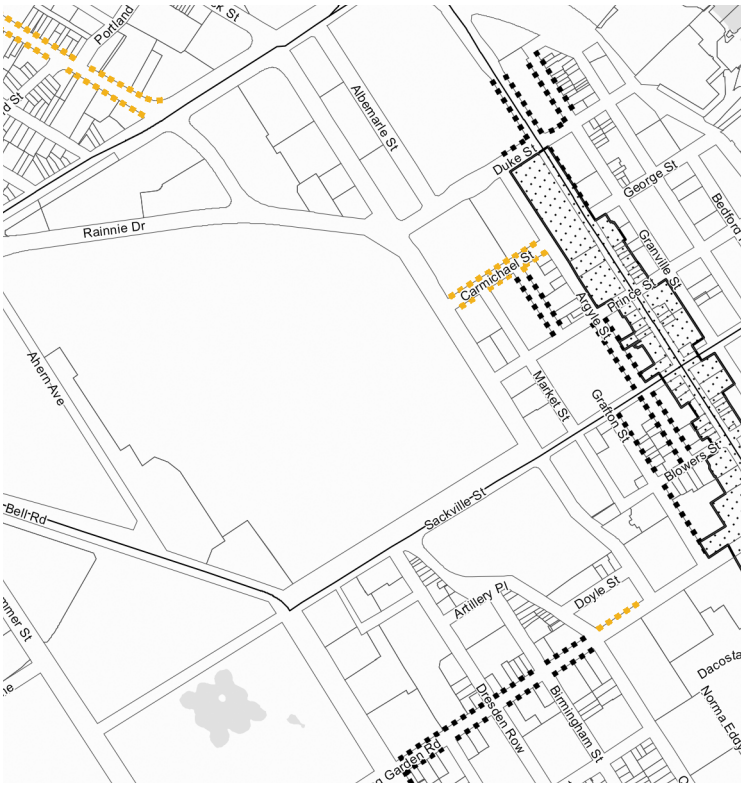


Figure 21 - Pedestrian Oriented Commercial Streets

The North End Gateway and Scotia Square Complex (NSS) Precinct fronts onto the Citadel and interfaces with the existing historic neighbourhoods of the north end. It is within close proximity to the Halifax Common and the services and shops of Gottingen Street. This area's role as a major gateway into the downtown will be signified with open space and public art installations. The North End Gateway is currently undergoing a master planning exercise to determine the future development of this signature site. The transformation of Cogswell into an active boulevard and the treatment of Rainnie Drive will serve to provide this Precinct's residents, businesses, and visitors with a wide range of services and amenities, while enhancing these important pedestrian connections into the downtown from the surrounding areas.

Package B also identifies pedestrian oriented commercial streets. Spring Garden Road, Argyle Street, Carmichael Street, Grafton Street and Gottingen Street are all identified on figure 21 as pedestrian oriented commercial streets. Policy 48 in the draft land use bylaw defines the types of establishments permitted at street level on these routes. Brunswick Street and Rainnie Drive provide an important link to many of these streets. Ensuring a pedestrian friendly environment along this corridor will be a key factor to ensure the success of businesses in the area.

Brunswick Street is identified as a Major Urban Structure Link connecting major nodes at the Halifax Public Library and the intersection of Cornwallis and Gottingen Streets. These are areas where additional growth can be accommodated within walking distance of significant commercial and institutional services, parks and community facilities and transit priority corridors identified in the IMP.

These special areas bring forward built form requirements from the Downtown Halifax plan into the structure of Centre Plan. They also permit existing buildings which do not meet the built form requirements of Centre Plan to expand and renovate, such as the Nova Centre and Scotia Square.

4.4 Future Development

1874 Brunswick Street

In 2019, the Design Review Committee approved an application for a new 12 storey hotel at the corner of Brunswick and Gottingen Streets. Due to the Covid-19 pandemic the application has been withdrawn, however it is worth considering as it is possible that the developer could revisit the project in the future or a similar development may be proposed as zoning for this use was preserved under Centre Plan.

Centennial Pool & The North End Gateway

Built in 1968, Centennial Pool is located on the corner of Gottingen and Cogswell Streets. In 2014 the facility underwent major renovations with the goal of extending its lifespan by approximately 20 years. The municipality is currently in discussions to determine the future of the facility and the site. A master plan for this area, encompassed by the North End Gateway, is currently underway as well as a review of municipal facilities to determine the most appropriate location for a replacement facility. This project should consider potential future uses for the site and access requirements that may result from future development.

Halifax Regional Police Station

The current Headquarters for the Halifax Regional Police (HRP) is located on Gottingen Street, just north of Rainnie Drive. The HRP have indicated capacity and infrastructure issues in their current location and there is possibility for redevelopment of the site either by HRP or an external group should the HRP choose to relocate. The options for the site are currently being reviewed by municipal staff but a timeline for the future of the site is not currently known.

Mi'kmaw Native Friendship Centre

In 2017 the Mi'kmaw Native Friendship Centre entered into discussions with HRM to obtain the site at the corner of Rainnie Drive and Gottingen Street, the former location of the Canadian Red Cross, to construct their new building. The proposal put forth by their consultant team envisions a pedestrian streetscape and connections from Citadel Hill to the new Wije'winen Centre symbolizing the reconciliation efforts being made to heal the historic wrongs that occurred during European settlement in Nova Scotia.

This development has not been finalized and discussions are ongoing for the sale of the land. It is also likely that the building proposal will change through detailed design, however consideration should be given to the design intent and the Mi'kmaw Native Friendship Centre should be considered an important stakeholder in discussions on this project.

1528 to 1536 Brunswick Street

The properties that currently house the Folklore Centre and Steve O'Reno's Cappuccino have been purchased by the same development group who built The Doyle. While there is no current development application for these properties, it is likely that a future proposal will see these parcels converted into mixed-use residential and that the current loading and frontage requirements will change. Changes to the area should ensure that the needs of current businesses are met while not compromising the possibilities for future use or the public experience.

Proposed Conditions

5.0 Functional Plan

This section outlines the design development approach for Brunswick Street and Rainnie Drive as well as the portion of Gottingen Street that connects them. It identifies key design objectives, provides potential improvement options, outlines assumptions and constraints, and establishes the design option(s) that will be carried forward to preliminary and detailed design.

5.1 Design Objectives

The purpose of the design process is to develop reconfiguration options for the Brunswick Street corridor between Spring Garden Road and Cogswell Street as well as Rainnie Drive that balance multi-modal demands. Specifically, this includes attempting to improve facilities for non-auto modes of transportation while remaining adequate for those that are currently served well. With competing demands, the design process requires prioritization of needs and the balancing of trade-offs.

The establishment of design objectives that are tied to policy direction and industry best practices is a useful first step in the development of design improvement options that can ultimately help with option evaluation. As reflected in recent plans and strategies, the municipality has identified Brunswick Street as an important multi-modal corridor in the heart of downtown. It is currently a busy arterial roadway and a goods movement route, it is also identified as a candidate AAA bicycle route.

Specific design objectives, guided by policy direction included in the IMP as well as the Municipal Design Guidelines, and other related municipal plans include the following:

- Enhance the pedestrian realm by improving the connectivity, functionality, and quality of pedestrian infrastructure
- Develop an AAA bicycle facility that provides dedicated space for cyclists and includes features that improve safety, comfort, and convenience
- Complete the AT network connection between the multi-use paths on the Halifax Common and the Spring Garden Area including the bidirectional bikeway on Dalhousie's Sexton Campus between Spring Garden Road and Morris Street
- Continue to accommodate the movement of vehicular traffic, including oversized loads and heavy trucks

The IMP recommends applying a Complete Streets approach to redesigning a street (Policy 2.3.5a). A Complete Streets approach considers how the street functions as a destination or place as well as a transportation link and aims to improve comfort and safety for all transportation modes, especially active transportation and transit. While such features can be added to any street, they make most sense applied to streets with inherent status as 'places', such as the main streets of pedestrian/ commercial spines; streets that front regionally significant cultural or natural features; or streets that connect significant public places. Fronted by the Citadel Hill National Historic Site, and connecting the Commons to the Central Library, the streets in this project have intrinsic value as 'places' that is currently not reflected in their design. Given Brunswick Street's historical significance and importance from the perspective of tourism and civic events, aesthetic appeal is particularly important.

5.2 Improvement Opportunities

This section provides an overview of key improvement opportunities for each mode of transportation along the corridor.

Pedestrians

Sidewalks

A key objective of this project is to improve connectivity along both sides of the corridor. The following table provides a summary of key sidewalk deficiencies along the Brunswick Street and Rainnie Drive corridors.

Issue	Location	Length
Narrow / Obstructed Sidewalk	SW Corner of Sackville St and Brunswick St	15m
	NW corner of Doyle St and Brunswick St	10m
	E side 1700 block Brunswick St	30m

Table 7 - Summary of sidewalk pinch points

In addition to these locations, there are several areas where sidewalk widths are less than ideal from an accessibility perspective (less than 2.0m clear width) considering the heavy pedestrian volumes in the area. Opportunities to increase the width and generally improve the quality of sidewalks throughout the corridor is considered a key objective of this project.

Crosswalks

Crosswalk Location	Distance from nearest crosswalk	Type
Cogswell St	260m	Traffic Signal
Duke St	100m	Traffic Signal
Carmichael St	100m	RA-5
Prince St	115m	Traffic Signal
Sackville St	230m	Traffic Signal
Spring Garden Rd	N/A	RA-4
Gottingen St	190m	RA-4

Table 8 - Summary of crossing treatments

There are currently eight marked crosswalks along the Brunswick Street segment and one at Rainnie Drive / Gottingen Street. There are four at signalized intersections, one with an RA-5 sign and overhead amber flashing beacon, and three at un-signalized intersections with RA-4 signage. There are no marked mid-block crossings.

The table to the left summarizes all existing crosswalks within the project area by type and location. Generally, the distance between crosswalks is between 100m and 200m. The longest gap in crossings is on Brunswick Street between Duke Street and Cogswell Street, a distance of 260m. Crosswalk warrant analyses, using the Decision Support Tool in the TAC Pedestrian Crossing Control Guide, will be completed as part of the preliminary design to determine if a site is a candidate for a pedestrian crossing control. The TAC Pedestrian Crossing Control Guide also provides guidance for appropriate level of control for a pedestrian crossing. All intersections in the Province of Nova Scotia are legal crosswalks, this tool will be used to determine which crosswalk treatment (unmarked, marked, or signaled) is the most appropriate and to determine if mid-block crossings are warranted.

Cycling

In 2015, the municipality engaged WSP to develop concept options that consider improvements to the cycling facilities along Brunswick Street and the implementation of a AAA facility. Both unidirectional and bi-directional options were considered as part of that process. The concepts were reviewed by HRM staff and a bi-directional facility on the west side of Brunswick Street was determined to be the most desirable option.

Permanent AAA bicycle facilities are typically permanently separated from automobile traffic by delineating the bicycle facility from the street with hardscape features - small islands or by raising the facility above street level to sidewalk height or an intermediate height. In addition to providing a more comfortable and aesthetically pleasing experience, these facilities can also provide benefits from a maintenance perspective improving the ease with which snow clearing and street cleaning can be completed. There are a wide variety of design treatments that can be applied incorporating different features in response to the context of the individual street.

The interface of bicycle facilities at intersections is a critical design consideration that has significant implications for user safety, comfort, and convenience. Intersection design should strive to maintain dedicated space for bicycles, mitigate conflicts between cyclists and motor vehicles, and facilitate turning movements in a manner that is intuitive and comfortable.

Where two or more bicycle facilities intersect, special consideration should be given to the accommodation of bicycle turning maneuvers to allow people on bikes to move between the facilities with ease. Design elements of a 'protected intersection', which separate and manage conflicts between bicycles, pedestrians, and motor vehicles, should be considered.

Along Brunswick Street and Rainnie Drive key considerations for bicycle facility type and intersection treatments include:

- Street / ROW width
    - Ability to incorporate an off-street / raised facility combined with improved pedestrian facilities with adequate separation will require that the existing curb-to-curb width (generally 12m to 17m) be narrowed along much of the corridor.
- Interface with the pedestrian realm
    - Management of conflicts between pedestrians and cyclists is an important consideration. Delineation between an off-street bikeway and a sidewalk can be done using surface materials or features such as trees and other plantings. Delineation is particularly important in areas where width constraints limit the amount of horizontal separation that can be provided.
- Maintenance
    - Snow clearing, street sweeping, and other maintenance activities are influenced by the bicycle facility configuration. Generally, bicycle lanes raised to sidewalk level are preferable from a maintenance perspective as these activities can be completed more efficiently.
- Intersections
    - This segment of Brunswick Street corridor intersects with 7 streets, 3 through intersections and 4 three-way intersections. Only Rainnie Drive and Cogswell Street are planned for AAA facilities, all other intersections will require cyclists to merge with traffic or cross to an off-road facility. The use of a bi-directional facility also poses challenges for intersections as cyclists will be moving against the flow of traffic in some instances. The use of bicycle signals will be required to ensure the safety of all users. Design development will include concepts for intersection treatments at all crossings.

Urban Forestry

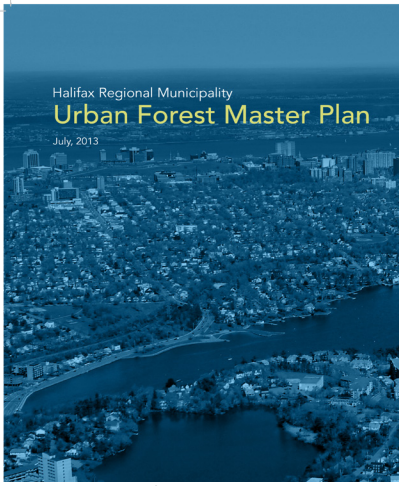


Figure 22 - Urban Forestry Masterplan Cover

The Urban Forest Master Plan (UFMP), adopted in 2013, outlines the objectives for the maintenance and enhancement of the urban forest with in the urban centre. The UFMP focuses on a 15km radius centered on the Halifax Harbour. The UFMP sets forth several targets for the urban forest within HRM, use trees to decrease stormwater in highly impervious areas (A22), improve urban forest conditions around active transportation networks and use the urban forest to increase active transportation opportunities (A28), and integrate UFMP policies in current and upcoming HRM functional plans and land use plans (A31). The goals of the UFMP align with targets set forth in HalifACT and are important considerations for this project. Trees and green space will be the preferred method of separation between the bikeway and sidewalk providing both shade and stormwater management benefits to the project.

Curb Access

The need for curb access varies along the project area. Between Spring Garden Road and Doyle Street there is currently no access, Doyle Street to Sackville Street has heavy curb access and parking along both the east and west side, Sackville Street to Duke Street has parking on both east and west sides, with loading needs isolated to the east side, and Duke Street to Cogswell Street currently has parking on both sides with loading primarily on the west curb. Gottingen Street has limited curb access requirements, although none are permitted currently. Along the north side and there are currently no loading needs along Rainnie Drive.

Figure 23 - Existing curb access

5.3 Design Assumptions

Design Standards (Minimum Dimensions)

This table summarizes minimum widths for street cross section elements for Regional Centre Commercial / Mixed-use (Minor Collector) based on reference standards including the TAC 2017 Geometric Design Guide and the HRM Municipal Design Guidelines 2021 (adopted by Regional Council in September 2021). The cross section recently implemented on Brunswick Street between Doyle Street and Spring Garden Road is also included for reference. The elements listed in the below table are considered required elements. Additionally, space between the bicycle lane and sidewalk is required to ensure adequate separation between user groups for the comfort and safety of all users. Currently the Municipal Design Guidelines do not provide a requirement for the type, width, or height of separation between these facilities. This project proposes a combination of treatments based on current best practices. This is further discussed in the Proposed Design Criteria section.

	Proposed Design Criteria	Municipal Design Guidelines (2021)	
		RC Mixed Use (local)	Minor Collector
Width of Travelled Way (curb to curb)	7.0m-7.4m* where two lanes are maintained 9.6m where curb access in maintained	8.0-13.0m	11.1-14.0m
Through Lane	3.0-3.3m where two lanes are maintained (not including gutter)	3.0-3.7m	3.0-3.7m
Frontage Zone	0.5m	0.5-3.0m	0.5-3.0m
Clear Sidewalk	1.5m minimum 1.8m preferred	1.5-2.1m	1.8-2.1m
Bicycle Lane	3.0m bi-directional	N/A	N/A
Boulevard / Furnishing Zone	N/A	1.5-2.1m	1.5-2.5m
Sidewalk / Bicycle Lane Buffer	0.6m minimum 1.2m preferred	N/A	N/A
Bicycle Lane / Traffic Buffer	0.8m minimum 1.0m preferred	N/A	N/A

* variance approval for this item was obtained on June 3, 2022

Table 9 - Summary of Proposed Design Criteria

Design / Control Vehicles

The Halifax Fire Aerial Ladder truck (Pierce Arrow) has been identified as the control vehicle and the design would still need to accommodate it at all intersections utilizing the ability to encroach on other lanes and areas of the intersection if required. A WB-20 was used to verify turning movements along all segments that are identified as truck routes.

Impacts to Buildings and Private Property

It has been assumed that impacts to existing buildings are to be avoided; therefore, existing building locations are considered a hard design constraint. Impacts to private property are also to be avoided wherever possible; however, they may be considered in locations where additional width is required to improve street elements and can be acquired without significant impacts.

Proposed Design Criteria

The following table outlines the proposed design criteria for roadway, bicycle lane, sidewalk, and required buffer cross-section elements for the Brunswick Street / Rainnie Drive Complete Streets Project and how they compare to the updated Municipal Design Guidelines. Some features proposed as part of this project are not included in the current Municipal Design Guidelines, the proposed dimensions for these elements are based on industry best practices as found in TAC and / or NACTO guidelines.

	Existing (Typical)	TAC (2017)	HRM Municipal Design Guidelines (2021)	Doyle St to Spring Garden Road
Frontage Zone	N/A	N/A	0.5-3.0m	0.5m
Clear Sidewalk	2.8m	2.25-3.0m	1.8-2.1m	2.2m
Bicylce Lane	1.8m	1.8-2.5m (protected)	N/A	N/A
Boulevard / Buffer	N/A	2.0-2.3m	1.5-2.5m	5.0m***
Through Lane	3.7m**	3.3-3.7m	3.0m-3.7m*	3.1m**
Parking	2.5m**	N/A	2.2m**	N/A
Notes:	* minimum 3.3m required for transit & truck routes ** lane widths do not include standard gutter pan *** large boulevard was created to allow for instalation of bicycle lane			

Table 10 - Summary of Design Stanards

5.4 Conceptual Design Options

Based on the project objectives and the proposed design criteria, three core design concepts have been developed. All three concepts assume two travel lanes and east side curb access between Sackville Street and Cogswell Street. The east side was prioritized for curbside access due to the concentration of businesses located along the eastern frontage.

The width of the right-of-way varies along the Brunswick Street corridor. Four key dimensions have been identified. These segments are highlighted on the map to the right. The widest segment averages 23.3m and is the northern-most portion of Brunswick Street - highlighted in green. The right-of-way narrows as it continues south and is 17.3m at the pinch point near Doyle Street.

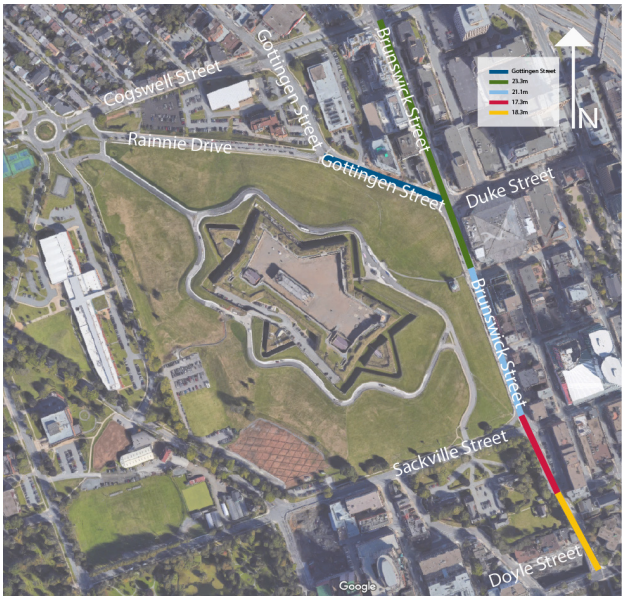


Figure 24 - Project Area Segments

The concepts vary in how space is allocated to accommodate off-street elements. They are summarized as follows:

Option 1- Green Space Priority

All remaining space is allocated to trees and amenity space, pedestrian space is allocated at 1.8m plus frontage zone (2.3m combined)

Option 2 - Balanced

Remaining space is divided between pedestrian space and green space to maximize the potential of both. Minimum of 1.2m is provided for vegetation and 1.8m (plus frontage) is allocated for pedestrians.

Option 3 - Pedestrian Priority

Green space is allocated at 1.2m, all remaining space is allocated to pedestrians.
Segments South of Sackville Street vary slightly from the above noted concepts as the right of way narrows at this intersection. There are two widths in this segment and two concepts for each. They are summarized as follows

17.3m Green Space Priority - Concept 1

Sidewalk is 2.3m including frontage zone (1.8m sidewalk plus 0.5m frontage zone) with a 1.2m landscape buffer.

17.3m Pedestrian Priority - Concept 2

Sidewalk is 2.9m including frontage zone (2.4m sidewalk plus 0.5m frontage zone) with a 0.6m half height curb buffer between the pedestrians and the bicycle lane.

18.3m - Maintain Parking / Loading - Concept 1

Sidewalk is 2.0m including the frontage zone (1.5m sidewalk plus 0.5m frontage zone) with a 0.6m half height curb buffer between the pedestrians and the bicycle lane. A parking / loading zone is provided on the west curb. This width would not allow for any spill out activities (cafes, patios, sandwich board signage, retail spill-out, etc) as a minimum 2.1m clear width needs to be maintained under the by-law

18.3m - Pedestrian Priority - Concept 2

The sidewalk is 4.1m including the frontage zone with a 0.6m half height curb buffer between the pedestrians and the bicycle lane. Parking / loading has been removed and it is anticipated that loading will take place from Doyle Street.

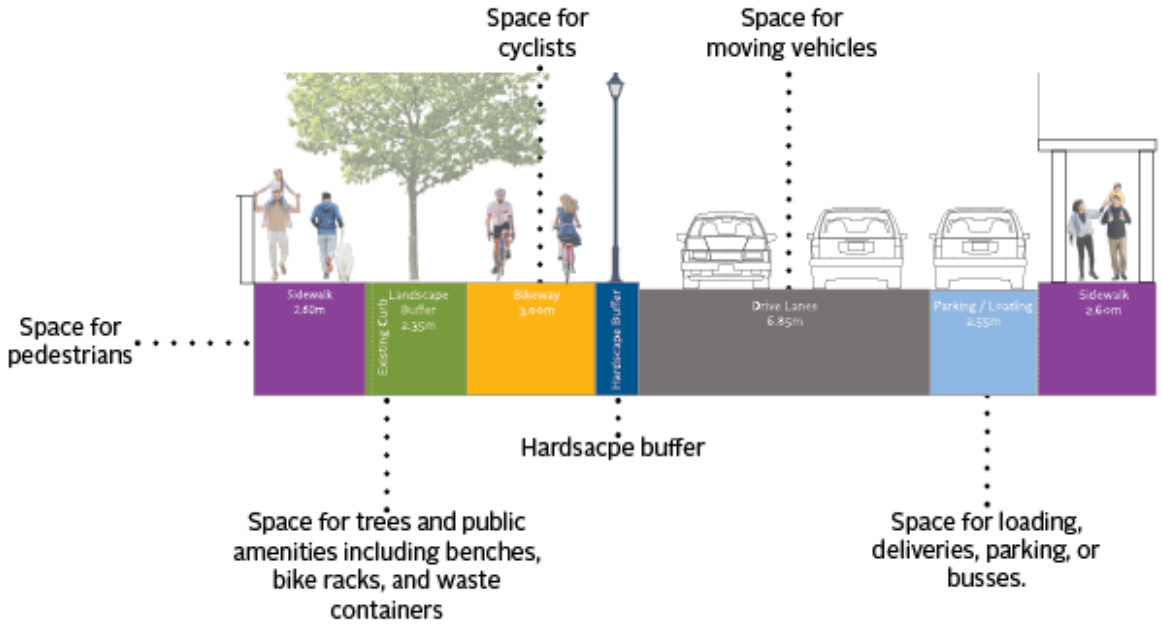


Figure 25 - Explanation of concept diagrams

The following diagrams illustrate how the concepts apply to each cross section and how they compare to each other. The existing west curb is shown for reference to illustrate the change in the amount of pedestrian space available.

For all segments north of Sackville Street the east curb is considered fixed and all changes are measured from the curb line. The complete concept package is in Appendix G.

Figure 26 - Comparison of the options for the 23.3m cross section (Cogswell Street to Carmichael Street)

Figure 27 - Comparison of the options for the 21m cross section (Carmichael Street to Sackville Street)

Figure 28 - Comparison of the options for the 17.3m cross section (Sackville Street to south of Cambridge Suites Hotel)

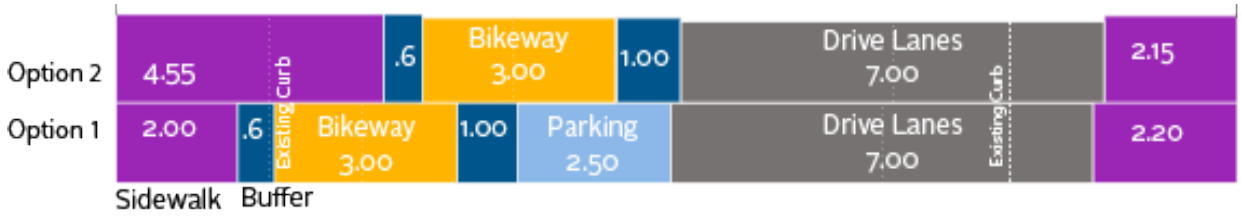


Figure 29 - Comparison of the options for the 18.3m cross section (South of Cambridge Suites Hotel to Doyle Street)

5.5 Transportion

Proposed Lane Configurations

To accommodate the proposed two-way cycle track, sidewalk and associated buffers, some changes to lane configurations are proposed. Modifications to the lane configurations were considered at the following intersections:

- Brunswick Street at Cogswell Street
- Brunswick Street at Gottingen Street / Duke Street
- Brunswick Street at Sackville Street

The proposed modifications to lane configurations are graphically represented in Figure 30 associated traffic impacts are described in Table 13 on pages 40-41 of this report.

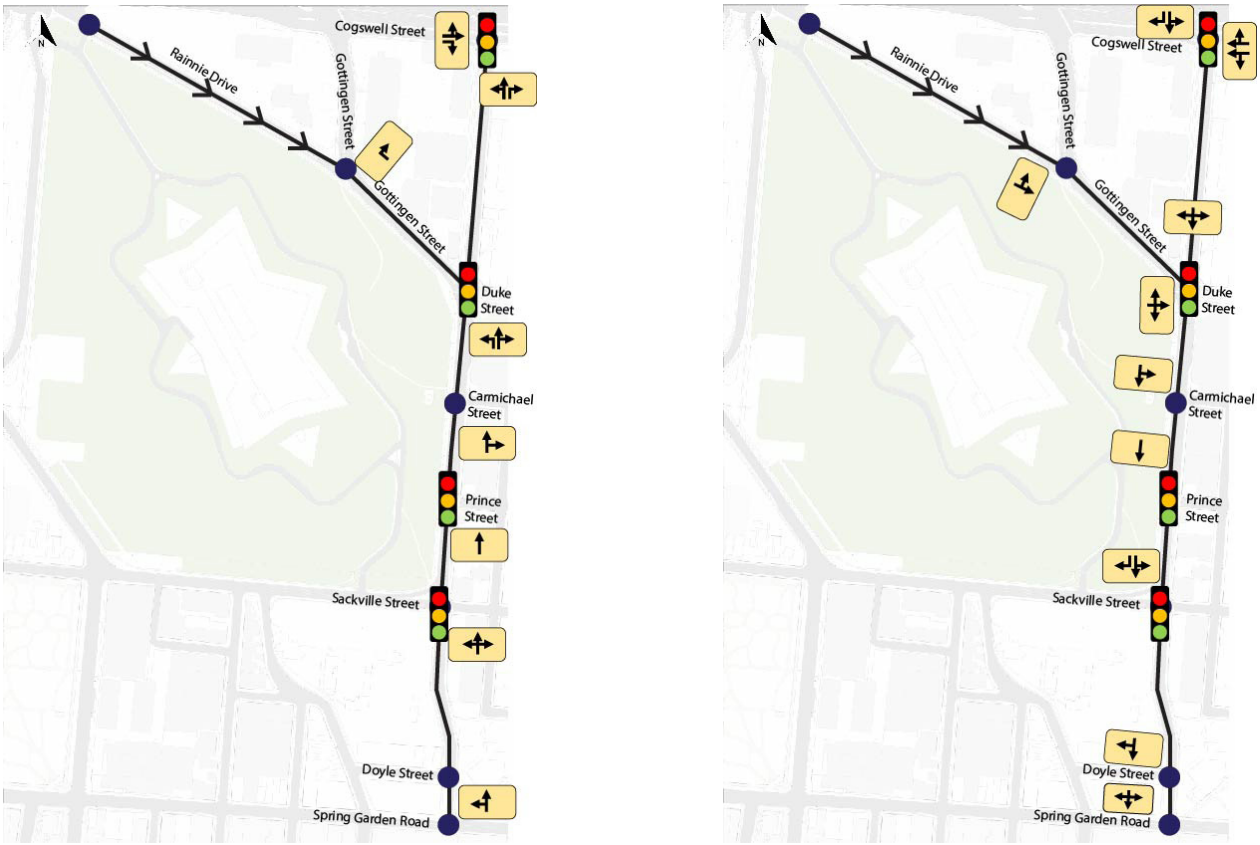


Figure 30 - Proposed Lane Configurations

Analysis Scenarios

To gain an understanding of how implementation of the Brunswick Street bi-directional bikeway is expected to impact traffic operations, several analysis scenarios were investigated. A scenario that considered proposed changes to lane configurations was examined with the existing traffic signal timing plans (TSTPs) to evaluate how these modifications impact traffic operations independently of adjustments to the traffic

signal timing plans. Subsequently, the trade-offs associated with the introduction of leading bike intervals (LBIs) and protected bike phases (PBSs) at signalized intersections were analyzed.

Scenario 1 – Existing Traffic Signal Timing Plans: In this scenario, cyclists maneuver the intersection based on the proposed modifications to lane configurations and existing TSTPs (i.e., there are no dedicated bike signals). In general, northbound/southbound cyclists are permitted during the Brunswick Street vehicle phase and eastbound right turns on red (RTOR) are restricted.

Scenario 2 – Leading Bike Intervals: In this scenario, northbound/southbound cyclists are provided with a short leading phase (approximately 5 seconds) to get a head start in front of turning vehicles. In general, signalized intersections follow existing TSTPs with an LBI introduced at the beginning of the cycle.

Scenario 3 – Protected Bike Phases: In this scenario, northbound/southbound cyclists and pedestrians are provided with a dedicated signal phase, effectively eliminating vehicular conflicts. In general, signalized intersections follow existing TSTPs with a PBS introduced at the beginning of the cycle.

Please Note:

- Qualitative trade-offs associated with the analysis scenarios are provided in Table 11.
- Quantitative implications of Scenario 1, 2 and 3 are provided in Table 13, Table 14 and Table 15, respectively.
- Using the Brunswick Street / Sackville Street intersection as an example, traffic signal phasing schematics are provided in Appendix I.

Scenario	Trade-off Discussion
#1 – Existing Traffic Signal Timing Plans	• No changes to the existing cycle lengths (i.e., no additional delay introduced to any mode) • No protection for any cyclists or pedestrians • The two-way cycle track consists of a contraflow bicycle movement with vehicle traffic, increasing conflict between bikes and vehicles • Conflicts with SB right turning and NB left turning vehicles • Poor sightlines between NB cyclists and NB left turning vehicles • No RTOR condition introduced on EB approaches eliminates conflicts with EB right turning vehicles and NB/SB cyclists • Opportunity: Revist the existing traffic signal timing plans for opportunities to improve performance indicators without introducing protected/permissive bike signals (e.g., reconsider the cycle length, reallocate green time, provide protected phases where possible, etc.).
#2 – Leading Bike Intervals	• NB/SB cyclists/pedestrians are provided with a head start to get in front of turning vehicles • Reduced conflicts between turning vehicles and bikes/pedestrians • No RTOR on the EB approach eliminates conflicts with right turning vehicles and NB/SB cyclists • Minimal increase to cycle lengths, resulting in some additional delay for vehicles and EB/WB AT users • The increase in cycle length does not increase delays for NB/SB cyclists or pedestrians • No SB right turns during the LBI, but are permitted during the EB/ WB phase • Opportunity: Where exclusive left turn lanes are present at signalized intersections, consideration could be given to accommodating left turns in a dedicated phase after bikes receive a red signal to reduce left turn conflicts with bikes and pedestrians (i.e., lagging phase).
#3 – Protected Bike Signals	• NB/SB cyclists and pedestrians are provided with a fully protected signal phase • Delays for NB/SB bikes and pedestrians increase (i.e., no permitted phase for bikes/pedestrians, they are required to wait for a protected signal) • Vehicle turning conflicts with NB/SB bikes and pedestrians are eliminated • No RTOR (on any approach) during the PBS, but otherwise permitted • Protected phasing eliminates sightline concerns with contraflow bike-vehicle movements and where steep grades are present • Additional delays introduced for most vehicle movements and EB/WB pedestrians/cyclists • No protection for EB/WB pedestrians or cyclists • Opportunity: At protected intersections with high bike/pedestrian volumes (particularly where diagonal movements are in high demand) consideration could be given to a bike/pedestrian scramble to mitigate additional delays to EB/WB AT movements (i.e., permit EB/WB cyclist/pedestrian movements during the PSB).

Table 11 - Analysis of Scenarios and Genereal Qualitative Trade-offs

Traffic Operational Review

The following section quantifies how vehicular traffic operations are expected to be impacted with proposed changes to lane configurations and RTOR conditions, and introduction of Leading Bike Intervals (LBI's) and Protected Bike Signals (PBS's). A summary of the material used in this analysis is provided in Table 12.

Intersection	Synchro Reports (Appendix J)						Detailed Summary of Impacts[2]	Level of Service Tables (Appendix H)
	Existing TSTP[1]		Leading Bike Interval		Protected Bike Phase			
	AM	PM	AM	PM	AM	PM		
LOS Figures	Figure 31		Figure 32		Figure 33			
Brunswick Street at Cogswell Street	B-19	B-22	B-25	B-28	B-31	B-34	Table 13	Appendix H Table 6
Brunswick Street at Gottingen Street / Duke Street	B-18	B-21	B-24	B-27	B-30	B-33	Table 14	Appendix H Table 5
Brunswick Street at Sackville Street	B-17	B-20	B-23	B-26	B-29	B-32	Table 15	Appendix H Table 2

Table 12 – Summary of Proposed Conditions Reference Material

1 Considers all associated modifications to intersection lane configurations and RTOR conditions compatible with the existing TSTPs.
2 Scenario 1 impacts reflect a comparison between Existing Conditions and Scenario 1. Scenario 2 and 3 impacts reflect individual comparisons with Scenario 1.

Scenario 1 – Existing Traffic Signal Timing Plans

The results of the intersection performance analysis indicate generally good operational conditions for motor vehicles, with most movements expected to operate within HRM acceptable limits.

Resulting intersection levels of service are graphically represented in Figure 31 and notable impacts are detailed below and summarized in Table 13.

Similar to the Existing Conditions analysis, the Gottingen/Duke Street intersection is the most critical intersection along the corridor, with poor performance indicators largely contained within the AM peak. Despite some operational improvements that were made at the Gottingen/Duke Street intersection from revising the cycle length and reallocating green time, the eastbound (Gottingen Street) and southbound (Brunswick Street) approaches are expected to operate over capacity (v/c > 1.0), at LOS F (delay/vehicle > 80 seconds) with significant queuing. The deteriorated performance of the southbound approach is attributed to the removal of the exclusive left turn lane, which reduced the approach to one lane. The loss of the southbound left turn lane has significant impacts to the approach/intersection performance during the AM peak, given that left turning vehicles are expected to block a heavy through volume (13% left turning traffic, 82% through traffic and 5% right turning traffic). Despite the poor performance of the eastbound/southbound approaches during the morning peak, the overall intersection performance meets targets (LOS E or better) during the morning and afternoon peak periods.

At the Sackville intersection, significant improvements were made to southbound/intersection operations

during the AM peak as a result of the modifications to the southbound lane configuration. The approach was reconfigured to a shared left turn/through lane and a designated right turn lane, since right turning traffic accounts for over 55% of approach traffic during the morning peak.

Figure 31 - Scenario 1, AM/PM intersection LOS

Features		
In general, this scenario involves modifications to the lane configurations and RTOR restrictions associated with implementation of the bi-directional bikeway. The proposed bike facility does not impact lane configurations at stop-controlled intersections (i.e., Spring Garden Road and Rainnie Drive intersections) or signalized intersections without an eastbound approach (Prince Street intersection).		
Intersection	**Proposed Changes**	**Impacts/Conclusions**
Brunswick Street at Cogswell Street	<u>Changes to TSTP:</u> • No EB/SB RTOR • No changes to the TSTP <u>Changes to Lane Configurations:</u> • NB approach is modified to remove left turn lane (L, T, R → LT, R) • EB approach is modified (LT, T, R → LT, R) • SB channelized right turn lane is removed through the Cogswell Redevelopment (L, T, R → L, TR) • WB channelized right turn lane is removed through the Cogswell Redevelopment (LT, T, R → LT, TR) • No RTOR restrictions applied to the SB and EB approaches (no changes to the TSTP)	<u>Impacts:</u> • Minimal impacts to performance indicators during AM/PM peaks <u>Conclusions</u> • The proposed lane changes and RTOR restrictions are expected to have a minimal impact on vehicle traffic operations • Intersection is expected to operate within HRM acceptable limits during both peak periods <u>*Note:*</u> *The proposed changes to the Brunswick/ Cogswell intersection considers modifications to lane configurations resulting from the Cogswell Redevelopment Project. The descriptions of impacts for this intersection are based on a comparison with post-Cogswell Redevelopment conditions (not existing conditions).*

Brunswick Street at Gottingen Street / Duke Street	<u>Changes to TSTP:</u> • No EB RTOR • In the AM peak, the cycle length was revised and green time reallocated compared to existing conditions <u>Changes to Lane Configurations:</u> • SB approach is modified to remove the left turn lane (L, TR → LTR)	<u>Impacts:</u> • The SB approach is expected to operate above capacity at LOS F during the AM peak • The SB 95th%ile queue is expected to increase by approximately 2.3 times the existing length (82m → 189m) during the AM peak • SB 95th%ile queues are expected to approach Cogswell Street (~250m to Cogswell/Brunswick intersection). • Significant impacts to EB 95th%ile queue during the AM peak (212.5m → 291.4m) • Minimal impacts to the intersection during the PM peak. <u>Conclusions:</u> • Removal of the SB left turn lane has significant impacts to the approach performance during the AM peak, given that left turning vehicles are expected to block the heavy through volume (13% left, 82% through and 5% right) • Poor LOS during the AM peak is largely attributed to the removal of the EB right turn lane with the tactical implementation of the existing bi-directional bikeway • Intersection is not expected to operate within HRM acceptable limits during both peak periods
Brunswick Street at Sackville Street	<u>Changes to TSTP:</u> • No EB RTOR • No changes to the TSTP <u>Changes to Lane Configutations:</u> • SB approach is modified to remove channelized right turn lane (L, TR → LT, R) • NB left turn lane is removed (approach is reduced to one lane)	<u>Impacts:</u> • The SB 95th%ile queue is expected to decrease significantly (165m → 70m) during the AM peak • Notable improvements to SB delay and v/c during the AM peak <u>Conclusions</u> • Significant improvements to SB approach during the AM peak resulting from lane configuration changes, given the heavy right turning movement (57% right, 24% through and 20% left) • Minimal impacts during PM peak • Negligible impacts resulting from removal of the NB left turn lane • Restricting EB RTOR has a negligible impact on the intersection/approach performance. • Intersection is expected to operate within HRM acceptable limits during both peak periods

Table 13 - Summary of proposed features and operational impacts of scenario 1

Scenario 2 – Leading Bicycle Intervals

The results of the intersection performance analysis indicate generally good operational conditions for motor vehicles, with most movements expected to operate within HRM acceptable limits with the introduction of LBIs.

Resulting intersection levels of service are graphically represented in Figure 32 and notable impacts are detailed below and summarized in Table 14.

Similar to the Existing Conditions / Scenario 1 analyses, the Gottingen/Duke Street intersection is the most critical intersection along the corridor, with poor performance indicators largely contained within the AM peak. The introduction of LBIs have minimal impacts on individual approaches, therefore, the eastbound and southbound approaches are expected to remain operating over capacity at LOS F during the AM peak. The introduction of the LPI decreases the intersection performance from LOS E to LOS F during the AM peak, and from LOS C to LOS D during the PM peak.

Figure 32 - Scenario 2 AM/PM Intersection LOS

Features		
In general, this option consists of introducing a 5-second leading bike interval at the four-leg signalized intersections and RTOR during the LBI. The proposed bike facility and LBI have no impact on stop-controlled intersections (i.e., Spring Garden Road and Rainnie Drive intersections) or signalized intersections without an eastbound approach (Prince Street intersection).		
Intersection	**Proposed Changes**	**Impacts/Conclusions**
Brunswick Street at Cogswell Street	• 5-second LBI is provided for NB/SB pedestrians and bikes • No EB/SB RTOR at any time • No NB/WB RTOR during LBI, otherwise permitted	Impacts: • v/c for the eastbound approach is expected to increase significantly during both peaks, but is expected to remain within acceptable limits Conclusions: • All movements are expecting to operate within acceptable guidelines during the AM/PM peaks • The proposed LBI and RTOR restrictions are expected to have minimal impacts on traffic operations during both peak periods
Gottingen Street / Duke Street	• 5-second LBI is provided for NB/SB pedestrians and bikes • No EB RTOR at any time • No NB/SB/WB RTOR permitted during LBI, otherwise permitted	Impacts: • During the AM peak, intersection performance decreases from LOS E to LOS F • During the PM peak, intersection performance decreases from LOS C to LOS D • Minimal impact on queuing or v/c during AM/PM peaks Conclusions: • Largely minimal impacts resulting from the LBI • Impacts are primarily attributed to modifications to the lane configuration
Brunswick Street at Sackville Street	• 5-second LBI is provided for NB/SB pedestrians and bikes • No EB RTOR at any time • No NB/SB right turns permitted during LBI, otherwise permitted	Impacts: • v/c for some movements are expected to increase during both peaks, but are expected to remain within acceptable limits Conclusions: • All movements are expected to operate within acceptable limits during the AM/PM peaks • The LBI has negligible impacts on operations during both peaks • If SB RTs are not permitted during the EB phase, SB delays/queues are expected to increase significantly given the volume of right turning traffic, particularly during the AM peak (where 95th%ile queues would be expected to spill back beyond the signalized intersection at Prince St)

Table 14 - Summary of Proposed Features and Operational Impacts of Scenario 2

Scenario 3 – Protected Bicycle Signals

The results of the intersection performance analysis indicate generally good operational conditions for motor vehicles, with most movements expected to operate within HRM acceptable limits with the introduction of PBSs.

Resulting intersection levels of service are graphically represented in Figure 33 and notable impacts are detailed below and summarized in Table 15.

Similar to all other analyses, the Gottingen/Duke Street intersection is the most critical intersection along the corridor, with poor performance indicators largely contained within the AM peak. In general, the introduction of a PBS has minimal impacts on individual approaches, therefore, the eastbound and southbound approaches are expected to remain operating over capacity at LOS F during the AM peak. During the PM peak, northbound and eastbound approaches are nearing capacity. The introduction of PBSs decreases the intersection performance from LOS E to LOS F during the AM peak, and from LOS C to LOS D during the PM peak.

Figure 33 - AM and PM LOS - Scenario 3

Features		
In general, this option consists of introducing a 10-second protected bike signal (PBS) at the four-leg signalized intersections and restricting all right turns during the protected bike phase. The proposed bike facility and protected bike signals have no impact on stop-controlled intersections (i.e., Spring Garden Road and Rainnie Drive intersections) or signalized intersections without an eastbound approach (Prince Street intersection).		
Intersection	**Proposed Changes**	**Impacts/Conclusions**
Brunswick Street at Cogswell Street	• 10-second PBS is provided for NB/SB bikes • No right turns permitted during PSB, otherwise permitted	Impacts: • No impact on overall intersection delays during both peaks • Significant improvement to the EB right turning movement during both peaks Conclusions: • All movements are expecting to continue operating within HRM acceptable guidelines during the AM/PM peaks. • The proposed PBS is expected to have a minimal impact on traffic operations during both peak periods. • Improvement given the presence of an exclusive right turn lane and EB right turns are permitted unless during the PBS (i.e., more permissive opportunities to turn right).
Brunswick Street at Gottingen Street / Duke Street	• 10-second PBS is provided for NB/SB bikes • No right turns permitted during PSB, otherwise permitted	Impacts: • During the AM peak, intersection performance decreases from LOS E to LOS F • During the PM peak, intersection performance decreases from LOS C to LOS D • Minimal impact on queuing or v/c during AM/PM peaks Conclusions: • Largely minimal impacts resulting from the PBS • Impacts are primarily attributed to modifications to the lane configuration
Brunswick Street at Sackville Street	• 10-second PBS is provided for NB/SB bikes • No right turns permitted during PSB, otherwise permitted	Impacts: • v/c for some movements are expected to increase during both peaks, but are expected to remain within acceptable limits Conclusions: • All movements are expected to operate within acceptable limits during the AM/PM peaks • The PBS has negligible impacts on operations during both peaks

Table 15 - Summary of Proposed Features and Operational Impacts of Scenario 3

Conclusion

Scenarios 1 through 3 do not have an impact on unsignalized intersections or signalized intersections without an eastbound (west) leg, therefore, impacts to vehicular operations are limited to the Cogswell Street, Gottingen/Duke Street and Sackville Street intersections.

In general, modifications to the lane configurations are expected to impact performance operations more significantly than changes to the traffic signal timing plans (LBI/PBS). Brief conclusions associated with each scenario and the impacted intersections is provided in Table 16. It should be noted that Scenario 2 and Scenario 3 conclusions are based on comparisons with Scenario 1, whereas Scenario 1 conclusions are based on a comparison with Existing Conditions.

Intersection	Scenario 1 Conclusions	Scenario 2 Conclusions	Scenario 3 Conclusions
Brunswick Street at Cogswell Street	• Negligible impacts	• During the PM peak, the intersection LOS goes from B to C • Minimal impacts during the AM peak	• During both peaks, most v/c's are expected to increase but remain within acceptable limits
	Final Thoughts: Scenario 2 has more significant impacts to vehicular operations than Scenario 3, largely since EB right-turning vehicles are provided with an exclusive lane and are permitted to turn right during the NB/SB vehicle phase, thus improving the approach and intersection delay significantly.		
Brunswick Street at Gottingen Street / Duke Street	• Significant deterioration of the SB approach during the AM peak due to the removal of the SB left turn lane • EB queuing is expected to increase significantly during both peaks as a result of the RTOR conditions • Minimal impacts to the overall intersection LOS during the PM peak • Improvements to the intersection performance can be made during the AM peak by revising the TSTP/ green time allocation	• The LBI has a minimal impact on approach performances • During the AM peak, the intersection LOS goes from E to F • During the PM peak, the intersection LOS goes from C to D	• During both peaks, EB v/c's are expected to exceed capacity and operate at LOS F • During the AM peak, the intersection LOS goes from E to F • During the PM peak, the intersection LOS goes from C to D
	Final Thoughts: Scenario 3 has more significant impacts to vehicular operations than Scenario 2, primarily resulting from the increase to the cycle length.		

Brunswick Street at Sackville Street	• Improvements to the SB approach and intersection LOS during the AM peak • Minimal impacts during the PM peak • Removal of the NB left turn lane is expected to increase v/c and 95th%ile queuing during both peaks, but are expected to remain within acceptable limits	• Intersection is expected to operate at LOS B during both peaks • All movements are expected to remain with acceptable limits	• Intersection is expected to operate at LOS B during both peaks • All movements are expected to remain with acceptable limits
	Final Thoughts: Negligible differences between the operational performance of this intersection between Scenario 2 and 3.		

Table 16 - Summary of Scenario Conclusions

Recommendation

Since there are minimal differences in the impacts on vehicular operations between Leading Bike Intervals or Protected Bike Signals, and Protected Bike Signals significantly improve safety by eliminating conflicts between NB/SB cyclists/pedestrians and turning vehicles, it is recommended that the Preliminary Design proceeds with consideration of Protected Bike Signals at applicable intersections.

In addition, it is recommended that the Preliminary Design consider the following:

- Re-evaluate the duration of the Protected Bike Phase and consider extending the phase to allow NB/SB pedestrians adequate time to cross the intersection, based on the required crossing distance.
- Complete a mid-block crosswalk warrant for Brunswick Street between Gottingen/Duke Street and Cogswell Street.
- Complete an updated crosswalk warrant at the Brunswick Street / Spring Garden Road intersection to determine if an enhanced treatment (RRFB) is warranted.

5.6 Proposed Multi-Modal Level of Service

Proposed Intersection MMLOS

The following subsections provide a summary of the proposed MMLOS analysis results for intersections in the study area. The detailed analysis as well as the assumptions applied to the methodology are provided in Appendix K. It should be noted that the proposed MMLOS was completed based on the recommended analysis scenario, Scenario #3 – Protected Bike Signals.

Pedestrian Level of Service

In general, the proposed project improves the pedestrian LOS at most intersections by one level, whereas the LOS at some intersections does not change compared to existing conditions. A comparison of the existing and proposed pedestrian levels of service are provided in Table 17.

It should be noted that aspects of the proposed project have trade-offs for the pedestrian LOS at signalized intersections, as discussed in Table 11. While the proposed protected signal phase will provide a fully protected opportunity for NB/SB pedestrian crossings, the cycle length increases, which increases wait times. This trade-off is not explicitly considered in the MMLOS analyses, therefore, improvements to safety of this nature may not be obvious in the MMLOS summary.

Features such as reducing the average pedestrian crossing distance (e.g., removal of exclusive turning lanes, reduction of lane widths) and reducing the number of uncontrolled conflicts with vehicles improved the pedestrian LOS at certain intersections. Conversely, features like increasing the cycle length at signalized intersections negatively impacted the pedestrian LOS at other intersections by increasing wait times between crossing opportunities. Generally, these strategies to improve the pedestrian LOS may negatively impact the LOS for vehicles, transit, and goods movement.

Overall, the primary reasons why the pedestrian LOS targets (LOS A) are not met:

- Increase in cycle length at signalized intersections
- Unsignalized intersections are penalized when crosswalks are not marked
- Some pedestrian crossing distances increased with the introduction of the bi-directional bikeway (i.e., pedestrian exposure distance increase since pedestrians are required to cross the bi-directional bikeway)

Intersection	AM Peak		PM Peak	
	Existing	Proposed	Existing	Proposed
Brunswick St at Spring Garden Rd	B	B	B	B
Brunswick St at Doyle St	C	B	C	B
Brunswick St at Sackville St	D	C	D	C
Brunswick St at Prince St	B	B	B	B
Brunswick St at Carmichael St	B	B	B	B
Brunswick St at Gottingen/Duke St	D	D	D	C
Brunswick St at Cogswell St	E	D	E	D
Rainnie Dr at Gottingen St	B	A	B	A

Table 17 - Proposed Intersection MMLOS AM/PM: Pedestrians

Cyclist LOS Level of Service

In general, the proposed project improves the cyclist LOS at most intersections by one or two levels compared to existing conditions. A comparison of the existing and proposed cycling levels of service are provided in Table 18.

Similar to the pedestrian LOS, some strategies to improve the cyclist LOS have negative impacts on the LOS for motorized modes, and some strategies to improve the safety of cyclists can negatively impact the LOS using the MMLOS tool.

In general, significant improvements were made to the cyclist levels of service by incorporating protected cycling facilities on Brunswick Street. While the proposed protected signal phase will provide a fully protected opportunity for NB/SB cyclists, the cycle length increases, which increases wait times.

Overall, the primary reasons why the cyclist LOS targets (LOS A) are not met:

- Most intersections do not have EB/WB cycling facilities (i.e., only Brunswick Street approaches include cycling facilities, whereas most side streets do not)
- Increase in cycle lengths at signalized intersections (i.e., longer wait times for NB/SB bike crossing opportunities)

Intersection	AM Peak		PM Peak	
	Existing	Proposed	Existing	Proposed
Brunswick St at Spring Garden Rd	D	C	D	C
Brunswick St at Doyle St	D	B	D	B
Brunswick St at Sackville St	D	B	D	B
Brunswick St at Prince St	C	B	C	B
Brunswick St at Carmichael St	C	B	C	B
Brunswick St at Gottingen/Duke St	C	B	C	A
Brunswick St at Cogswell St	E	B	E	B
Rainnie Dr at Gottingen St	B	B	B	B

Table 18 - Proposed Intersection MMLOS AM/PM: Cyclists

Transit Level of Service

In general, transit operations at the applicable intersections did not change compared to existing conditions. A comparison of the existing and proposed pedestrian levels of service are provided in Table 19.

It should be noted that this MMLOS analysis does not consider implications from the Transit-Only Pilot on Spring Garden Road (i.e., assumes pre-pilot conditions). In addition, deterioration of the LOS during the PM peak at the Gottingen/Duke Street intersection is attributed to the implications of increasing the cycle length.

As in the Existing MMLOS section, the transit MMLOS analysis was omitted for intersections that are not part of a transit route.

Intersection	AM Peak		PM Peak	
	Existing	Proposed	Existing	Proposed
Brunswick St at Spring Garden Rd	C	C	C	C
Brunswick St at Doyle St	N/A	N/A	N/A	N/A
Brunswick St at Sackville St	N/A	N/A	N/A	N/A
Brunswick St at Prince St	N/A	N/A	N/A	N/A
Brunswick St at Carmichael St	N/A	N/A	N/A	N/A
Brunswick St at Gottingen/Duke St	A	A	B	C
Brunswick St at Cogswell St	A	A	A	A
Rainnie Dr at Gottingen St	N/A	N/A	N/A	N/A

Table 19 - Proposed Intersection MMLOS AM/PM: Transit

Goods Movement Level of Service

In general, the proposed project decreases the LOS at some intersections by one level, whereas the LOS at some intersections does not change compared to existing conditions. A comparison of the existing and proposed goods movement levels of service are provided in Table 20.

Minor deterioration of goods movement LOS is attributed to reducing the effective turning radii (to reduce crossing distances and improve pedestrian LOS) and the increase in cycle lengths to accommodate protected signal phases for bikes/pedestrians.

Intersection	AM Peak		PM Peak	
	Existing	Proposed	Existing	Proposed
Brunswick St at Spring Garden Rd	B	B	B	B
Brunswick St at Doyle St	N/A	N/A	N/A	N/A
Brunswick St at Sackville St	B	C	B	C
Brunswick St at Prince St	C	C	B	B
Brunswick St at Carmichael St	B	B	C	D
Brunswick St at Gottingen/Duke St	D	E	C	D
Brunswick St at Cogswell St	B	C	B	C
Rainnie Dr at Gottingen St	A	A	A	A

Table 20 - Proposed Intersection MMLOS AM/PM: Goods Movement

Automobile Level of Service

In general, the proposed project did not impact the automobile MMLOS analysis compared to existing conditions, except for the Gottingen/Duke Street intersection, wherein the LOS was reduced by one level. The reduction in LOS at the Gottingen/Duke Street intersection is attributed to the removal of the southbound left turn lane. Despite the minor impact to the Gottingen/Duke Street intersection, all intersections exceed their target MMLOS (LOS E), ranging between LOS B to D, as shown in Table 21.

It should be noted that the levels of service in this table do not correspond to the levels of service in Figure 33. The MMLOS considers the resulting Synchro outputs in addition to factors pertaining to the presence of turning lanes and turning restrictions.

Intersection	AM Peak		PM Peak	
	Existing	Proposed	Existing	Proposed
Brunswick St at Spring Garden Rd	B	B	B	B
Brunswick St at Doyle St	D	D	D	D
Brunswick St at Sackville St	C	C	C	C
Brunswick St at Prince St	B	B	B	B
Brunswick St at Carmichael St	C	C	D	D
Brunswick St at Gottingen/Duke St	C	D	B	C
Brunswick St at Cogswell St	B	B	B	B
Rainnie Dr at Gottingen St	C	C	C	C

Table 21 - Proposed Intersection MMLOS AM/PM: Automobile

Proposed Segment MMLOS

The following subsections provide a summary of the proposed MMLOS analysis results for segments in the study area. The detailed analysis as well as the assumptions applied to the methodology are provided in Appendix X . It should be noted that the proposed MMLOS was completed based on the recommended analysis scenario, Scenario #3 – Protected Bike Signals.

Pedestrian Level of Service

In general, the proposed project improves the pedestrian LOS on most segments by one level, as shown in Figure 34. A comparison of the existing and proposed pedestrian levels of service are provided in Table 22.

In general, the segment LOS was improved by increasing the width of pedestrian facilities and pedestrian zones and marking mid-block crosswalks on long segments.

Segments that achieved a LOS A have generous pedestrian facility widths, pedestrian zones and shorter distances between marked crosswalks. Overall, the primary reasons why the pedestrian LOS targets (LOS A) are not met:

- Minimal, or lack of, buffer between sidewalk and roadway, particularly on the east side of Brunswick Street between Spring Garden Road and Sackville Street
- Relatively longer distances between marked crosswalks (100-149m)

Figure 34 - Proposed Segment MMLOS AM/PM: Pedestrians

Segment	AM/PM Peak			
	Southbound		Northbound	
	Ex.	Pro.	Ex.	Pro.
Brunswick St between Spring Garden Rd and Sackville St	C	B	C	C
Brunswick St between Sackville St and Gottingen St / Duke St	B	A	B	B
Brunswick St between Gottingen St / Duke St and Cogswell St	B	A	C	B
Gottingen St between Brunswick St and Rainnie Dr	C	B	B	B

Table 22 - Proposed Segment MMLOS AM/PM: Pedestrians

Cyclist Level of Service

In general, the proposed project improves the cyclist LOS at most intersections by one or two levels compared to existing conditions, as shown in Figure 35. A comparison of the existing and proposed cycling levels of service are provided in Table 23.

In general, significant improvements were made to the cyclist levels of service by incorporating protected cycling facilities on Brunswick Street and Gottingen Street .

Overall, the primary reason why the cyclist LOS targets (LOS A) are not met on certain segments is attributed to a combination of the adjacent roadway volume and vehicle operating speed. Consideration could be given to traffic calming/diversion treatments to further improve the cycling environment.

As indicated in the Existing MMLOS section, 'Block Length' was omitted from the cyclist MMLOS, since it was determined to unduly impact the overall performance and would restrict the ability to achieve LOS A with implementation of a AAA facility. It is recommended that HRM revisits the MMLOS tool to reevaluate cyclist performance indicators.

Segment	AM/PM Peak			
	Southbound		Northbound	
	Ex.	Pro.	Ex.	Pro.
Brunswick St between Spring Garden Rd and Sackville St	D	A	D	A
Brunswick St between Sackville St and Gottingen St / Duke St	D	B	D	B
Brunswick St between Gottingen St / Duke St and Cogswell St	D	B	D	B
Gottingen St between Brunswick St and Rainnie Dr	C	B	C	B

Table 23 - Proposed Segment MMLOS AM/PM: Cyclists

Figure 35 - Proposed Segment MMLOS AM/PM: Cyclists

Goods Movement Level of Service

The proposed project decreases the LOS on all segments by at least one level compared to existing conditions, as shown in Figure 36. A comparison of the existing and proposed goods movement levels of service are provided in Table 24.

Deterioration of goods movement LOS is attributed to reducing the effective turning radii (to reduce crossing distances and improve pedestrian LOS) and the increase in cycle lengths to accommodate protected signal phases for bikes/pedestrians.

Segment	AM/PM Peak			
	Southbound		Northbound	
	Ex.	Pro.	Ex.	Pro.
Brunswick St between Spring Garden Rd and Sackville St	B	F	C	F
Brunswick St between Sackville St and Gottingen St / Duke St	E	F	D	E
Brunswick St between Gottingen St / Duke St and Cogswell St	C	F	C	B
Gottingen St between Brunswick St and Rainnie Dr	B	C	B	C

Table 24 - Proposed Segment MMLOS AM/PM: Goods Movement

Figure 36 - Proposed Segment MMLOS AM/PM: Goods Movement

Automobile Level of Service

In general, the proposed project decreases the automobile LOS on all segments compared to existing conditions, as shown in Figure 37. A comparison of the existing and proposed pedestrian levels of service are provided in Table 25.

Deterioration of the automobile LOS is attributed to the loss of on-street parking, wherein right-of-way designated for on-street parking was reallocated to protected cycling facilities.

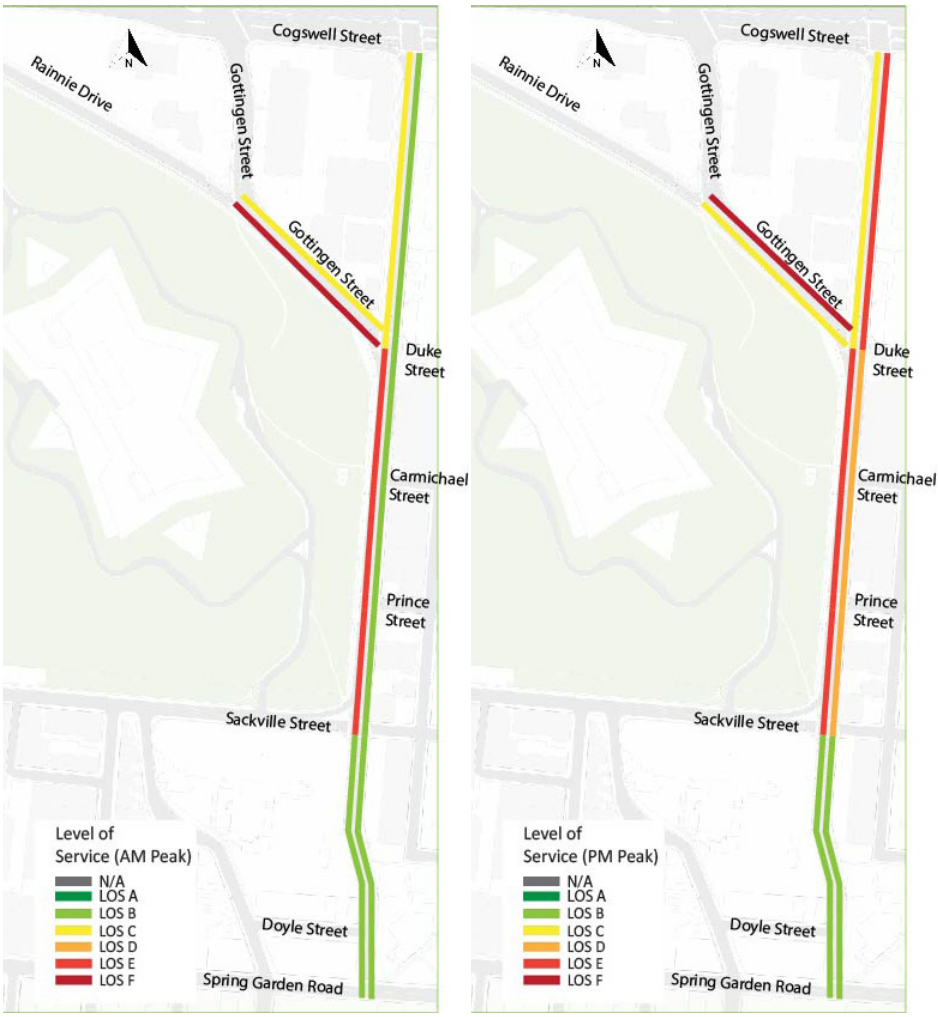


Figure 37 - Proposed Segment MMLOS AM/PM: Automobiles

Segment	Southbound				Northbound			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Ex.	Pro.	Ex.	Pro.	Ex.	Pro.	Ex.	Pro.
Brunswick St between Spring Garden Rd and Sackville St	B	C	B	C	B	C	B	C
Brunswick St between Sackville St and Gottingen St / Duke St	E	F	E	E	B	C	D	F
Brunswick St between Gottingen St / Duke St and Cogswell St	C	C	C	C	B	B	C	B
Gottingen St between Brunswick St and Rainnie Dr	F	F	C	C	C	C	F	F

Table 25 - Proposed Segment MMLOS AM/PM: Automobile

6.0 Public Engagement

6.1 Engagement Process

Public engagement was launched on August 23, 2021 via Shape Your City and YouTube. The survey and recorded presentation were advertised through sponsored posts on Facebook and shared on the municipality's Twitter, Instagram, and Facebook accounts. The survey link was also emailed directly to external stakeholders including businesses along the corridor, as well as various disability and cycling advocacy groups.

The survey closed on September 30, 2021 with 1100 responses, at that time the video had been viewed 325 times on YouTube and the Shape your City page had received more than 3,700 visits.

This section summarizes responses based on survey input. This feedback will assist the project team to determine the most desirable configuration for the Brunswick Street and Rainnie Drive corridors within the parameters of a complete street.

6.2 What We Heasrd - Public

Survey Demographics

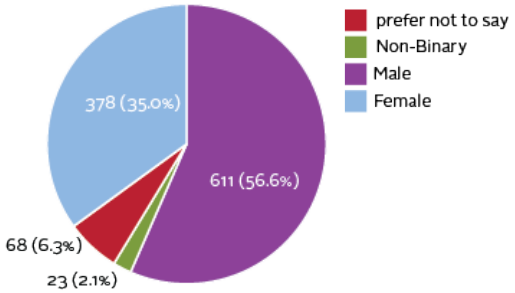
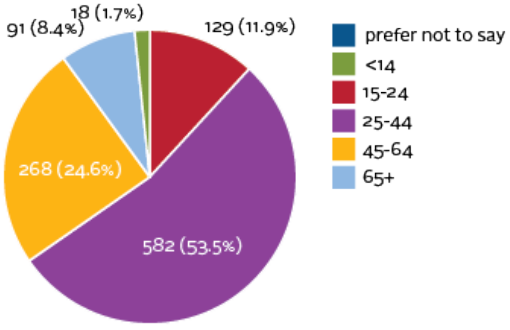


Figure 39 - Survey Demographics: Gender



Figured 40 - Survey Demographics: Age

The charts above illustrate the composition of survey responses by age and gender. The map to the right illustrates the locations of respondents. The map was created using the first 3 characters of postal codes as provided in the survey. A small portion of responses came from outside HRM, the map shows the responses from within HRM.

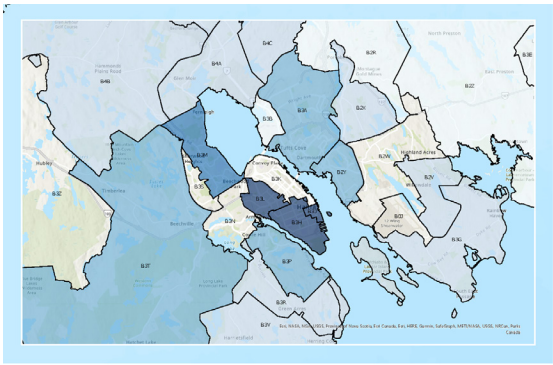


Figure 41- Frequency of Responses by Location

Area Usage & Frequency

Respondents were asked how frequently they visited the project area and for what reasons. The majority indicated at least weekly trips. Reasons for visiting varied, the 'other' category being the most common indicating they work downtown or they use Brunswick Street and Rainnie Drive as part of their commute.

Current Modes of Transportation

Respondents were asked about their current primary mode of transportation when visiting the project area. The majority (53.4%) arrive by car or motorcycle either as a driver or passenger. The full responses are summarized in the table on the right.

Mode	Percentage of Respondents
Car or Motorcycle - Driver	45%
Car or Motorcycle - Passenger	8.4%
Wheelchair or motorized mobility device	0.1%
Taxi / Ride Share	0.3%
Transit	5.3%
Bicycle	13.7%
Pedestrian	24.1%
Other	3.2%

Table 26 - Survey Respondents Modes of Transportation

Key Trends

The survey contained both multiple choice and open ended questions. Respondents discussed a number of topics, the responses are summarized below.

Active Transportation

Pedestrian space was considered very important by the majority of participants with 53%, only 15% of respondents indicated it was not important or having a neutral opinion. Respondents want improved cycling infrastructure and better connections to existing facilities (21%). Respondents discussed the pros and cons of bi-directional versus unidirectional bikeways and the general preference among cyclists for unidirectional facilities.

Green Space

Green space was highly valued by respondents both in the general responses and the response to the options. Many respondents also indicated that green space needs to compliment our pedestrian space and should not be sacrificed to increased paved surfacing.

Safety

Respondents expressed concerns regarding the current configuration of the Brunswick St. / Gottingen St intersection for cyclists. Brunswick Street has unidirectional facilities in the north and south-bound directions, Gottingen Street is a bi-directional east / west facility. The tactical extension of the bi-directional Rainnie Drive bicycle lane does not provide an easy transition for north-bound cyclists turning left (west) to head along Gottingen Street and Rainnie Drive. This intersection was mentioned frequently both on the survey and in social media comments as an item to be addressed.

Transportation

15% of respondents felt that more parking and drive lanes would be more beneficial than bike lanes on Brunswick Street, overall 9% of respondents were against bike lanes in general. The majority of respondents were generally in favour of the addition of active transportation space and wider sidewalks along Brunswick Street.

Brunswick Street

Respondents were asked to rank the current features of Brunswick Street by importance. The results are shown the table to the right.

Parking was split almost in the middle regarding importance in the corridor and received one of the lowest overall ratings (40%), pedestrian space received the highest priority (85%), followed closely by green space and space for cyclists. These preferences were reflected in the comments received on the individual concepts as well. The complete survey results are in Appendix L.

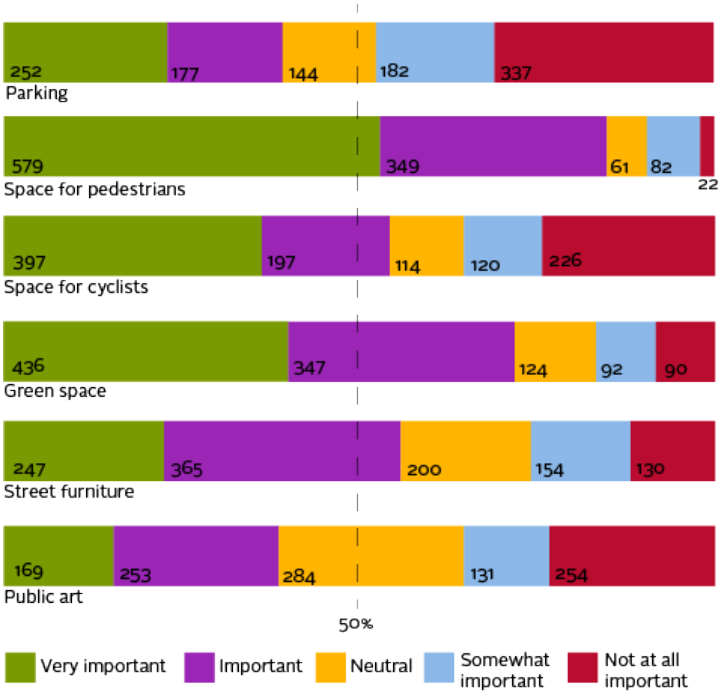


Figure 42 - Importance of Features for Brunswick Street

Rainnie Drive

At the time of public engagement Rainnie Drive was being considered as part of this project. While no concepts were presented for Rainnie Drive, respondents were given the opportunity to rank the importance of key features within for Rainnie Drive, those that currently exists and others that could exist in the future or as part of this project. The chart to the right shows the results of the poll with very important on the left (green) and not at all important on the left (red). Pedestrian space and green space were given the highest priority with 82% and 70% respectively. Parking and public are were the lowest ranked. The results are summarized in the table to the right and the complete results are in Appendix L.

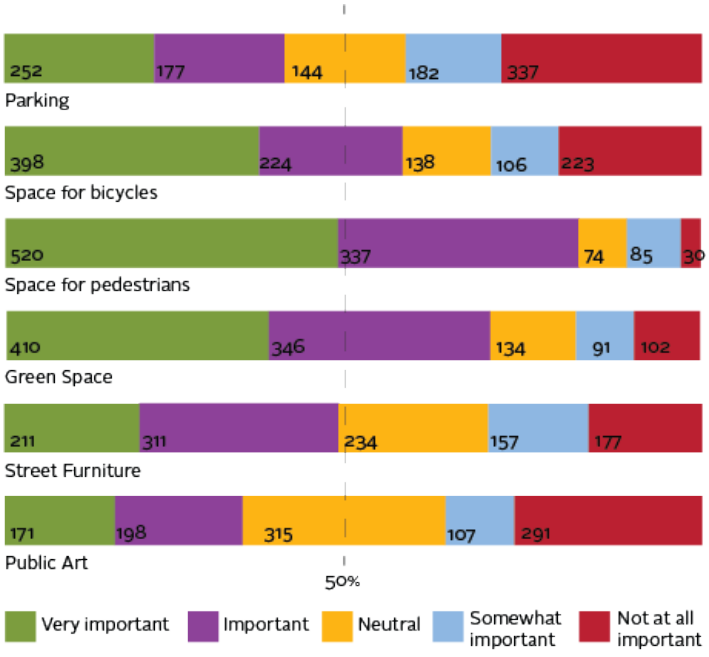


Figure 43 - Importance of features for Rainnie Drive

Concept Feedback

Respondents were asked to select their preferred concept for each segment of the corridor. In all cases the balanced option was the preferred choice, and for the 17.3m segment green space was preferred over pedestrian priority.

23.3m Cross Section

The majority of respondents preferred the balanced option for the 23.3m cross section (55%). This option allowed for a 3.5m sidewalk and 3.3m landscape buffer while maintaining east side curb access.

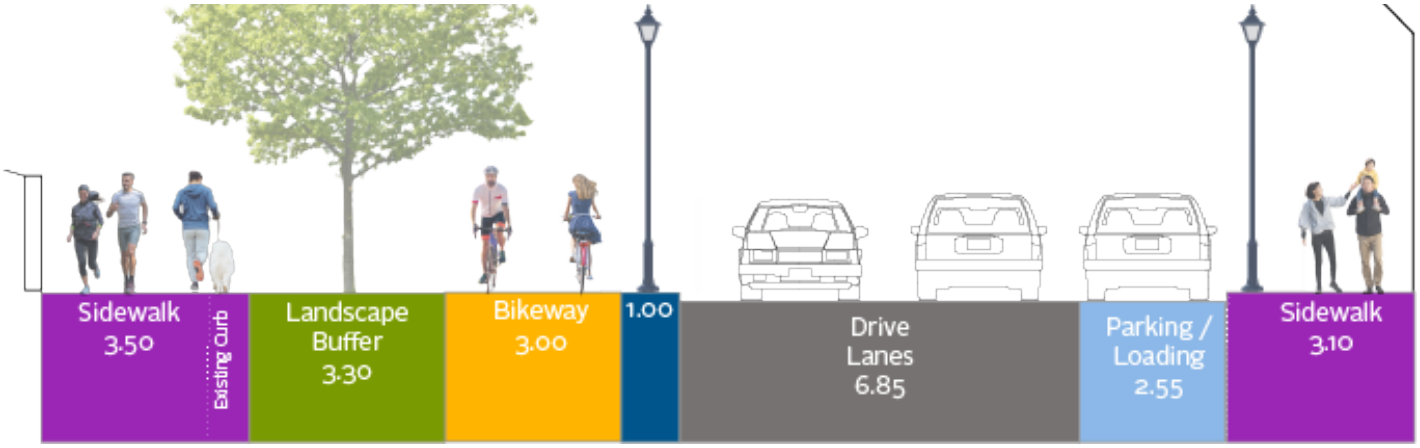


Figure 44 - Prefered Option for 23.3m cross section - Option 3, 'Hybrid'

21m Cross Section

The majority of respondents preferred the balanced option for the 21m cross section (52%). This option allows for a 3m sidewalk and a 1.85m landscape buffer while maintaining east side curb access.

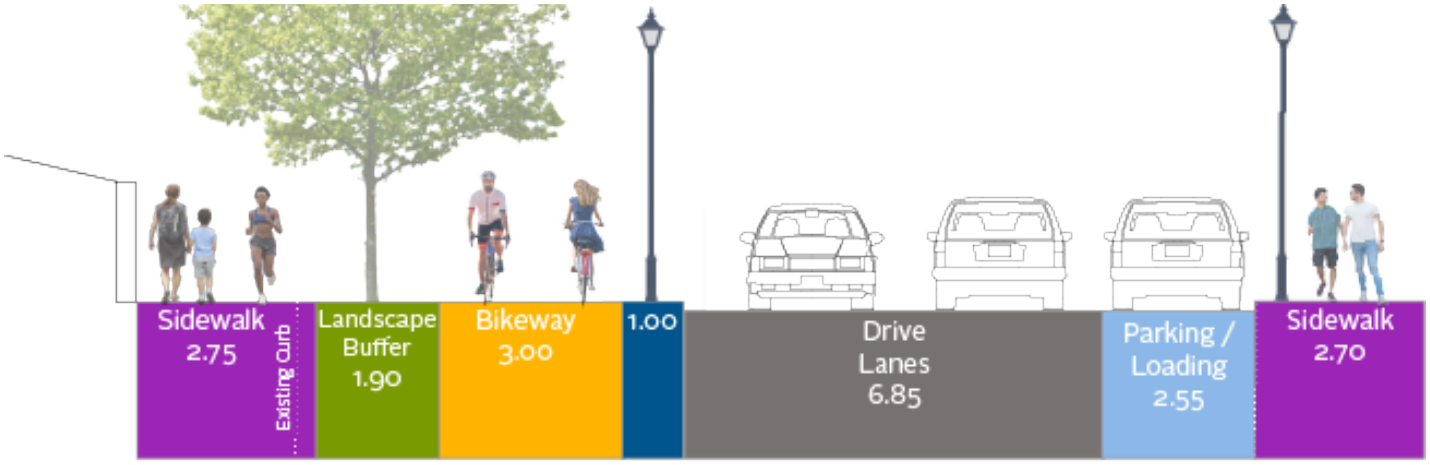


Figure 45 - Prefered option for 21.2m cross section - Option 3 'Hybrid'

17.3m Cross Section

For the 17.3m cross section, our most constrained, only 2 options were presented. The majority of respondents preferred the green space priority option for this segment (65%).

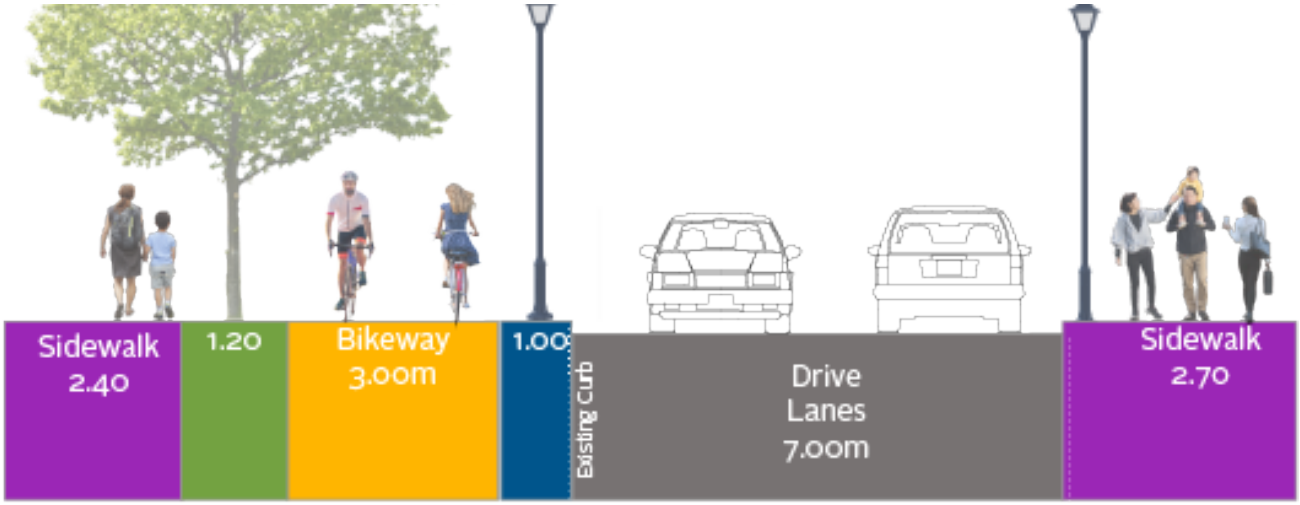


Figure 46 - Preferred Option for 17.3m cross section - Option X 'Green Space'

18.3m Cross Section

For the 18.3m option pedestrian priority received slightly more favour than retaining parking (50.3% to 49.7%), further consultation with businesses and landowners in the area will take place to gain a better understanding of their current and future needs.

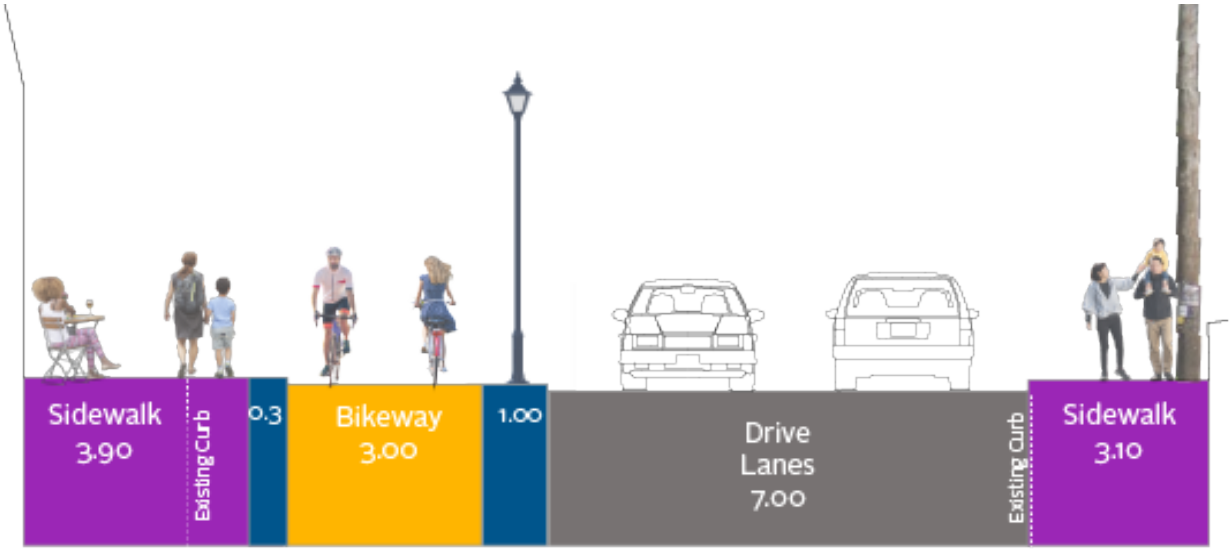


Figure 47 - Preferred Option for 18.3m cross section - Option 2 ' Pedestrian Space'

6.3 What We Heard - Stakeholder

Active Transportation Advisory Committee

On May 19, 2022, a presentation was given to the Active Transportation Advisory Committee (ATAC) about the project. The meeting was held virtually via Zoom and the meeting is available for viewing on YouTube.

Similarly to the public survey, the Duke Street / Gottingen Street intersection was a point of concern. There were several questions about connections through the intersection and ensuring that movements through the intersection can be made safely. The connection through the North Park roundabout was also mentioned, the current configuration requires cyclists to continue onto Cogswell Street to access Rainnie Drive and enter the bike lane. Consideration for access to a multi-use path or the bike lane directly from the roundabout was suggested.

The other primary concern was regarding crossing treatments in general. At the time of the presentation, bicycle signals had just been implemented on Wyse Road and their use was still very new within HRM. There were several questions regarding phasing and timing of the signals, at the time of the presentation the design team was still evaluating options. While a recommendation is made in this report, these questions will be addressed through the detailed design process.

Businesses

On November 25, 2021 a meeting was held with HRM staff and members of the Downtown Halifax Business Association (DHBA) and Spring Garden Area Business Association (SGABA). The primary concerns brought forth at this meeting were related to turning movements from Doyle Street onto Brunswick Street and current sight-line issues due to the offset intersection. These issues will be corrected with the normalization of the intersection through the completion of this project.

All businesses in the area were emailed a survey, the survey was also included in an email newsletter from the business associations in the fall of 2021. Limited feedback was received, but generally concerns were limited to the loss of parking in front of the Cambridge Suites hotel, while businesses do typically load from Market Street, there is some loading that occurs in the parking lot and the perception is that some patrons do use the on-street parking available. Data provided by local business does indicate that the majority of patrons park on-site and do not have difficulty finding parking to attend appointments.

Walk N Roll Halifax

Walk 'n' Roll Halifax was engaged independently to review the proposed concepts and provide direct feedback on the project. The primary concerns brought forth in the comments were related to separation between the bicycle and pedestrian facilities as well as delineation between the pedestrian walking space and the furnishing zone with consistent materials, high contrast, and continuous path of travel.

7.0 Summary of Findings and Recommendations

Brunswick Street has been identified as a priority for a AAA bicycle facility as well as a pedestrian priority corridor. The corridor is not currently meeting the needs of these user groups. Improvements to pedestrian and cyclist facilities have been supported through the results of the engagement activities carried out as part of this project. A number of clear recommendations can be made from the work to date and the LOS analysis that has been completed.

1. Brunswick Street south of Sackville Street functions poorly for pedestrians and cyclists. Sidewalks are narrow and in poor repair - specifically on the west side, and there are no cycling facilities to connect to Dalhousie's Sexton Campus multi-use path and on to future Morris Street bike lane. This area should be a priority for improvements.
2. Brunswick Street at Gottingen Street / Duke Street is an active corner with high pedestrian activity due to increased development and proximity to ScotiaBank Centre. The crossing distances are long and there isn't sufficient pedestrian storage space at the intersection.
3. Rainnie Drive functions mainly as a linear parking lot, it does carry some traffic volume but usage is low.
4. Redevelopment of the North-end Gateway is in the master planning phase and changes to Rainnie Drive should accommodate future changes to the area and be planned in conjunction with that project team.
5. Brunswick Street should include a single lane of traffic in each direction. Parking and loading activities should be retained along the eastern frontage to serve the majority of businesses
6. Right turning movements should be restricted during red lights to ensure the safety of cyclists as north-bound cyclists will be in a contra-flow direction.
7. Traffic analysis does not strongly favour scenario 2 (LBI) over scenario 3 (BSP) however scenario 3 provides the greatest level of safety to cyclists and therefore is the recommended treatment.
8. Bumpouts are considered appropriate for many locations in the project area and should be implemented as part of the detailed design.
9. Priority should be given to ensuring adequate separation between pedestrians and cyclists, a landscape buffer is the preferred option.
10. Trees should be planted wherever possible, soil cells will be required in some areas.

FIgure 48 - Proposed view of Brunswick Street, looking south from Carmichael Street

Figure 49 - Proposed view looking