

# HALIFAX

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**Item No. 15.1.1**  
**Halifax Regional Council**  
**December 3, 2019**

**TO:** Mayor Savage and Members of Halifax Regional Council

**SUBMITTED BY:**

Original Signed by 

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Jacques Dubé, Chief Administrative Officer

**DATE:** September 25, 2019

**SUBJECT:** Intersection of Beaver Bank Connector (Hwy 101 Access) & Old Sackville Road

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## **ORIGIN**

Item 15.1 of the June 5, 2018 session of Halifax Regional Council.

MOVED by Councillor Craig, seconded by Councillor Blackburn THAT Halifax Regional Council direct the Chief Administrative Officer to work with staff of the Nova Scotia Department of Transportation and Infrastructure, and develop a staff report and recommendation regarding the feasibility of the following:

1. Develop a functional plan for improvements (including consideration of a roundabout) to the intersection of Beaver Bank Connector (Hwy 101 access) and Old Sackville Road;
2. Possible transfer of a portion of provincial Beaver Bank Connector of the intersection at Old Sackville Road to Sackville Drive to Halifax Regional Municipality.

MOTION PUT AND PASSED

## **LEGISLATIVE AUTHORITY**

HRM Charter, Part XII, subsection 322(1), "The Council may design, lay out, open, expand, construct, maintain, improve, alter, repair, light, water, clean, and clear streets in the Municipality."

## **RECOMMENDATION**

It is recommended that Halifax Regional Council direct the CAO to:

1. Work with NSTIR to move forward with implementation of proposed countermeasure 1, "Enhance Signage and Pavement Markings" as an immediate first step to improve operations and safety conditions at the Beaver Bank Connector / Old Sackville Road intersection;
2. Continue to work with staff from NSTIR, based on options provided in the consultant report, to further develop the most appropriate treatment(s), for more substantial modification / upgrade to the Beaver Bank Connector / Old Sackville Road intersection, including potential funding partnerships for consideration in future capital plans; and
3. Not pursue transfer of a portion of provincial Beaver Bank Connector between Old Sackville Road and Sackville Drive to HRM at this time.

## **BACKGROUND**

The Highway 101 Beaver Bank Connector / Old Sackville Road intersection is located along the approximately 1.2 km long Beaver Bank Connector, about 400 metres north of Highway 101. The Beaver Bank Connector is a provincially designated arterial road that provides a connection between Highway 101 and Trunk 1 (Sackville Drive). Old Sackville Road is a two lane collector road that provides access to a mix of residential and commercial properties. NSTIR owns the traffic signals and the Beaver Bank Connector legs of the intersection while HRM owns the Old Sackville Road legs of the intersection.

The Beaver Bank Connector is four lanes along its entire length and widens to six lanes on both approaches (northbound / southbound) to the traffic signals to provide two through lanes and separate left and right turning lanes in each direction. The right turn lanes are channelized with slip lanes and islands on both approaches. Old Sackville Road is two lanes with some widening on the westbound approach to provide a separate left turn along with a shared through-right lane. The eastbound approach is a single shared left-through-right lane. Right turns on both Old Sackville Road approaches are channelized with slip lanes and islands.

Traffic volume at the Beaver Bank Connector / Old Sackville Road intersection is more than 30,000 vehicles per day, including a high volume of commuter traffic. Vehicle flows at the Beaver Bank Connector / Old Sackville Road intersection are influenced by the nearby Old Sackville Road / Walker Avenue / Downsview Drive intersection, which is only about 70 metres away.

## **DISCUSSION**

HRM partnered with NSTIR to engage a consultant (exp Services) to undertake an operational and safety review of the intersection with an aim to identifying potential modifications to improve safety and traffic flow. Because of its proximity to, and influence on, the Beaver Bank Connector / Old Sackville Road intersection, the project also considered the Old Sackville Road / Walker Avenue / Downsview Drive intersection as part of the review. The scope of the study included:

- Review of available background information (traffic volume, signal timing, collision history, etc.);
- Consultation with key stakeholders from HRM, NSTIR and Police to identify existing areas of concern and constraints;
- Completion of an operational level of service analysis on the existing intersections;
- Conducting an in service safety review for both day time and night time conditions;
- Review of existing roadway geometry and current design guidelines;
- Identification and evaluation of potential countermeasures to improve safety and traffic flow;
- Establishing order of magnitude cost estimates for potential countermeasures.

When this project was initiated, there were no separate left turn phases provided for any of the intersection approaches. Shortly after initiation, NSTIR made changes to the traffic signal operation to provide an advanced protected left turn phase for the Beaver Bank Connector approaches. Operational assessments conducted by the consultant were done for conditions with and without the protected signal phasing.

For the Beaver Bank Connector / Old Sackville Road intersection, results of the operational assessment conducted for the condition prior to the implementation of the protected left turn phase showed that overall the intersection is working very well during the am peak with no issues identified for any movements. However, during the pm peak, results indicated that some movements are experiencing operational difficulties that would require improvement. The westbound left turns from Old Sackville Road and northbound left turns from the Beaver Bank Connector were identified as the problematic movements.

After implementation of the protected left turn phasing for the Beaver Bank Connector approaches, results of the operational assessment showed that the intersection is working well for both am and pm peak periods with no operational deficiencies noted.

Looking at the Old Sackville Road / Walker Avenue / Downsview Drive intersection, results of the operational assessment at this intersection showed that the intersection is operating well during the am peak with no operational issues identified for any movements. During the pm peak, however, the intersection is experiencing operational issues that require improvements to accommodate existing demand. In particular, the stop controlled Walker Avenue and Downsview Drive approaches are experiencing long delays and long queues.

Both Walker Avenue and Downsview Drive are stop controlled and have single lane approaches. The Downsview Drive approach has a high right turn demand with low through and left turn volumes. The single lane approach results in the low through and left movements holding up the high demand right turn movement, causing long delays and queuing.

Available collision data was provided by NSTIR for the period of January 1, 2014 to December 31, 2018. The collision data showed a total of 32 reported collisions occurring at the Beaver Bank Connector / Old Sackville Road intersection and included 20 property damage only collisions, 11 injury collisions and 1 fatality. The collision pattern showed that the majority were associated with vehicles approaching the intersection from the north and south along the Beaver Bank Connector where a vehicle either turned left across on-coming traffic or were rear-ended by another vehicle. These types of collision configurations are somewhat common at signalized intersections where through traffic is travelling at higher speeds and sight lines may not be adequate.

Collision data for the same period was also provided for the Old Sackville Road / Walker Avenue / Downsview Drive intersection. The data showed a total of 10 reported collisions occurring at this intersection and included 6 property damage only collisions and 4 injury collisions. There were no fatal collisions identified for this location during the reporting period. The collision pattern showed that the majority were rear-end collisions involving traffic approaching the intersection on the stop controlled Walker Avenue and Downsview Drive legs. This type of collision configuration is somewhat common at stop controlled intersections and generally occur where through traffic may be travelling at higher speed and sight lines may be limited. Table 1 provides a summary of collisions at both intersections.

**Table 1 – Intersection Collision Summary (2014 – 2018)**

Intersection	Beaver Bank Con / Old Sackville Rd	Old Sackville Rd / Walker Ave / Downsview Dr
Total Collisions	32	10
Property Damage Only	20	6
Injuries	11	4
Fatalities	1	0
Left-Turn Collisions	4 NB, 4 SB, 1 WB	0
Rear-End Collisions	10	6
Other Configurations	13	4
Nighttime Collisions	10	3
Winter Month Collisions	14	6

*\*Taken from exp report "Operational & Safety Review for Beaver Bank Connector & Old Sackville Road (2019-04-25)*

As part of the in service safety review, the consultant visited the site to gather information related to sight lines, signage, warning lights and pavement markings. Site visits were conducted on February 14<sup>th</sup> and 15<sup>th</sup>, 2019 and included morning and evening peak hours, daytime off peak hours and nighttime. In addition to the information related to the physical characteristics, the consultant also made observations related to traffic control, vehicle / pedestrian interaction and the overall operation of the intersection. Vehicle speed data for the area was also provided to the consultant which was used in conjunction with observations made during site visits to help identify issues related to speeding.

As part of the site reviews, the consultant investigated the location of the collision involving a fatality to identify any factors that may have contributed to the incident and considered potential remedial measures to help reduce the chance of a severe event such as this occurring again in the future.

Based on the safety and design reviews, the consultant compiled a list of observed issues and potential improvements that considered the collision frequencies and patterns identified in the collision data as well as other specific issues identified through the site reviews. A summary of the results of the safety and design reviews along with potential improvements is included in Attachment 1.

Flowing from the observations and potential solutions, the study identified and evaluated several options / countermeasures to provide for incremental improvement to operations and safety at the intersection. Short-term, low cost solutions as well as longer term, higher cost alternatives were provided, and include:

1. Enhance Signage & Pavement Markings

This would involve the installation of new signage, replacement or adjustment to existing signage and installation of new pavement markings at the two intersections. This option would provide a positive impact on safety by increasing visibility and awareness of objects and pedestrians, ensure consistency with best practice guidelines for sign placement and provide enhanced guidance for both pedestrians and motorists.

2. Install Smart Right-Turn Channels and Acceleration Lanes

This option would involve reconfiguring the existing right-turn slip lanes on the Beaver Bank Connector approaches into smart right-turn channels and installing dedicated acceleration lanes for the right-turn slip lanes that exit from Old Sackville Road. Installation of the smart right-turn channels acceleration lanes is expected to have a positive impact on safety by improving sightline angles for turning vehicles, improving sightlines at pedestrian crossings and encouraging more uniform vehicle operating speeds, all of which helps to reduce the likelihood of rear-end collisions. A sketch of this concept is provided in Attachment 2.

3. Address Pedestrian Continuity on North Side of Old Sackville Road

This option could be implanted in one of three ways:

1. Eliminate the existing pedestrian facilities on the north side of Old Sackville Road between Downsview Drive and the Beaver Bank Connector;
2. Remove the existing crosswalk and pedestrian signals on the north leg of the Beaver Bank Connector / Old Sackville Road intersection; or
3. Extending the sidewalk on the north side of Old Sackville Road, west of the Beaver Bank Connector, to improve pedestrian connectivity.

Elimination of the existing pedestrian facilities on the north side of Old Sackville Road would allow for the consolidation (removal) of six existing crosswalks with minimal inconvenience to pedestrians. Regardless of which option is chosen, the crossing of the westbound approach is redundant and could be removed. This would reduce the opportunity for pedestrian vehicle conflict and would also address the identified issue of the alignment of the signal pole in relation to the pedestrian ramp. Extension of the sidewalk along the north side of Old Sackville Road, at a minimum to Lindsay Court, would provide a continuous facility for pedestrians and reduce the number of crossings required to move along the facility.

4. Install Coordinated Traffic Signals at Old Sackville Road / Walker Avenue / Downsview Drive

This option would involve the installation of new traffic signals at the Old Sackville Road / Walker Avenue / Downsview Drive intersection. These signals would be coordinated with the existing signals at the Beaver Bank Connector / Old Sackville Road intersection with the goal of reducing delay and improve operation of the existing stop controlled movements on Walker Avenue and Downsview Drive. This option has the potential to provide some general improvement to operations, including providing a signalized pedestrian crossing; however, given the short

separation between the two intersections (approximately 70 metres), queuing resulting from the heavy westbound left turn onto the Beaver Bank Connector and eastbound left turn onto Downsview Drive in the pm peak is likely to result in spill-back between the two intersections and queue back-ups onto the Beaver Bank Connector. **Given the queuing issues expected, this would not be considered a viable option to pursue.**

5. Enhance Traffic Signal Layout & Crosswalk Illumination

This option involves improvements to traffic signal display by removing existing secondary signal heads from the poles and placing them on truss arms over the roadway. This would improve visibility and conspicuity of the signal displays. Also included as part of this option is the installation of additional lighting or upgrading existing lighting to provide better lighting levels and lighting uniformity around the intersection, especially in pedestrian areas.

6. Convert Walker Avenue to One-Way + Provide Dedicated Transit Lane

This option would see Walker Avenue converted to one-way southbound with a dedicated contra-flow transit lane provided between the transit terminal entrance and Old Sackville Road. This configuration would remove the all northbound movements, except for transit vehicles, from Walker Avenue. Combined with the addition of a separate right-turn lane on Downsview Drive, this configuration has the potential to significantly improve operations at the Old Sackville Road / Walker Avenue / Downsview Drive intersection with no impact to the Beaver Bank Connector / Old Sackville Road intersection. From a safety perspective, this option would greatly reduce the potential conflicts at the Old Sackville Road / Walker Avenue / Downsview Drive intersection, thereby improving safety for all road users at this intersection. Further investigation of this option would be required; however, because of the unconventional operation of the road as well as potential issues associated with the configuration of the bus and parking lot entrances which would create potential vehicle conflicts at that location. There would also need to be further investigation into the traffic impacts at the other end of Walker Avenue where it meets Old Sackville Road in a tee intersection to determine if the intersection can accommodate the increased traffic. A sketch of this concept is included in Attachment 2.

7. Conversion of the Beaver Bank Connector / Old Sackville Road Intersection to a Roundabout

The final improvement option put forward by the consultant involves converting the existing signalized intersection into a roundabout. Although roundabouts tend to result in less severe collisions as compared to signalized intersections because of lower vehicle operating speeds and reduction of head-on and right-angle type collisions, existing topography at this location does not lend itself to implementation of a roundabout. A roundabout at this location would have grades significantly outside recommended guidelines and would result in a higher than normal frequency of rear-end collisions to be expected. Also, a roundabout at this location would not address the operational issues at the Old Sackville Road / Walker Avenue / Downsview Drive intersection and could lead to increased queue spill-back due to the short distance between the two intersections (which would decrease with construction of a roundabout). **Significant right of way requirements, unacceptable approach grades, high capital costs and limited benefit associated with this option would make this a non-viable option and it should not be pursued.** A sketch of this concept, providing the lane configuration for two of the most probable layouts, is included in Attachment 2.

Each option identified above provides differing levels of potential impact related to intersection operations, safety and cost. A side-by-side comparison of the seven options, based on order of magnitude cost, traffic impacts, safety impacts and other considerations is provided in Attachment 3.

The findings presented by the consultant are intended to provide HRM and NSTIR with information to assist in making an informed decision about potential improvements, based on each organization's own prioritization of operational, safety, and financial criteria.

Regarding the transfer of a portion of the provincial Beaver Bank Connector, between Old Sackville Road and Sackville Drive, discussion with NSTIR has identified that given the purpose of this connector road as it relates to the 100 series highway (Highway 101) and trunk highway (Highway 1 / Sackville Drive) network, as well as the potential impact this road could have on the operation of the Highway 101 interchange, NSTIR is not in a position to entertain transferring a portion of the Beaver Bank Connector to HRM.

### **FINANCIAL IMPLICATIONS**

There are no immediate financial implications associated with the recommendations provided in this report. Work associated with implementation of the “Enhance Signage and Pavement Markings” countermeasure option can be accommodated within the existing operating budget.

Financial requirements would be associated with implementation of any of the identified countermeasure options 2 through 7. Based on the preliminary order of magnitude cost estimates outlined in the option comparison in Attachment 3, costs could range anywhere from \$30,000 up to \$4 million, depending on the chosen treatment or combination thereof. As these figures are order of magnitude, once an option is chosen and more detailed design investigations are undertaken, it is likely the potential cost will be higher.

Potential cost for implementation of any of the options 2 through 7 are not currently identified in the capital budget.

### **RISK CONSIDERATION**

There are no significant risks associated with the recommendations put forward in this report.

### **COMMUNITY ENGAGEMENT**

Community engagement was not required as part of this report as it deals with assessments conducted in response to public feedback surrounding the operations of the subject intersection.

### **ENVIRONMENTAL IMPLICATIONS**

There were no environmental implications identified.

### **ALTERNATIVES**

As noted in the report, after this project was initiated the Province made changes to the traffic signal phasing to include a protected left-turn phase for traffic travelling along the Beaver Bank Connector. Introduction of the protected left-turn phase would represent a safety improvement for the intersection and analyses showed this change also resulted in an improvement to the intersection operation. Council could choose to direct the CAO to have staff continue to monitor the intersection and not move forward with recommendation 2 as outlined in this report.

### **ATTACHMENTS**

- Attachment 1 – Summary of Existing Issues and Potential Solutions
- Attachment 2 – Concept Sketches
- Attachment 3 – Comparison of Improvement Concepts

A copy of this report can be obtained online at [halifax.ca](http://halifax.ca) or by contacting the Office of the Municipal Clerk at 902.490.4210.

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## Summary of Existing Issues and Potential Solutions – Beaver Bank Connector / Old Sackville Road

ID	Observation	Potential Improvements
1	The Old Sackville Road / Downsview Drive / Walker Avenue intersection operates at an overall LOS F during the PM peak period, resulting in significant delays and queuing that impede the flow of the NB right turn movement from Beaverbank Connector onto Old Sackville Road.	- Install coordinated traffic signals at Old Sackville Road / Downsview Drive / Walker Avenue intersection.
2	Viewing angle for EB right turn to SB is difficult for yield condition.	- Install smart right turn channel at this location.
3	Pedestrian facility terminates at the end of northwest crosswalk (i.e. no receiving sidewalk).	- Extend sidewalk along north side Old Sackville Road. to the west of Beaverbank Connector.
4	Crosswalk ramps not cleared of snow during time of audit.	- Keep all pedestrian facilities free of snow and ice (to the extent practical).
5	Refuge island in NE quadrant provides challenges for mobility impaired due to small size.	- Upgrade island geometry to allow adequate space for pedestrian
6	Curb drops & ramps for pedestrians and wheelchairs, located at traffic islands, may not be appropriate size.	- Assess pedestrian facility for deficiencies. Improve conditions, where possible.
7	Traffic signal pole placement within the NE traffic island is located directly within the natural pedestrian paths.	- Relocate pole base to better facilitate pedestrian movements.
8	Lack of continuity lines at the end of NW and SE slip lanes.	- Install/upgrade continuity lines at all slip lanes.
9	Lack of pedestrian signage for crosswalk on all slip lanes.	- Install appropriate pedestrian signage.
10	Lack of object marker signage on all islands.	- Install object markers where missing.
11	Illumination at WB-NB right slip lane crosswalk is limited.	- Improve lighting at this location.
12	Lack of signal ahead sign on Beaverbank Connector.	- Install sign at appropriate distance from intersection.
13	Limited sightlines for SB left turn due to horizontal curvature.	- Provide protected only left turn phase.
14	Three of the four secondary vehicle traffic signal placements appear to be located outside 40-degree cone of vision.	- Move secondary vehicle traffic signals to within appropriate cone of vision.

*\*Adapted from exp report "Operational & Safety Review for Beaver Bank Connector & Old Sackville Road (2019-04-25)*

## Summary of Existing Issues and Potential Solutions – Old Sackville Road / Walker Avenue / Downsview Drive

ID	Observation	Potential Improvements
1	Significant delays and queuing observed on Walker Avenue and Downsview Drive during the PM peak period leads to aggressive behavior.	- Install traffic signals.
2	Pedestrian facility crossing Old Sackville Rd immediately adjacent to the intersection exposes pedestrians to congested traffic flows where their presence is less conspicuous.	- Consider installing Rectangular Rapid Flashing Beacons (RRFBs) or traffic signals at crossing location
3	The traffic island at Walker Avenue/Old Sackville Road includes a utility pole inside the clear zone, with no object marker.	- Consider moving utility pole or adding object marker.
4	Lack of continuity lines and yield signage on SW slip lane.	- Improve continuity lines and install yield signage on slip lane.
5	Lack of pedestrian signage on crosswalk at slip lane.	- Install pedestrian signage at slip lane.

*\*Adapted from exp report "Operational & Safety Review for Beaver Bank Connector & Old Sackville Road (2019-04-25)*

Concept Sketches

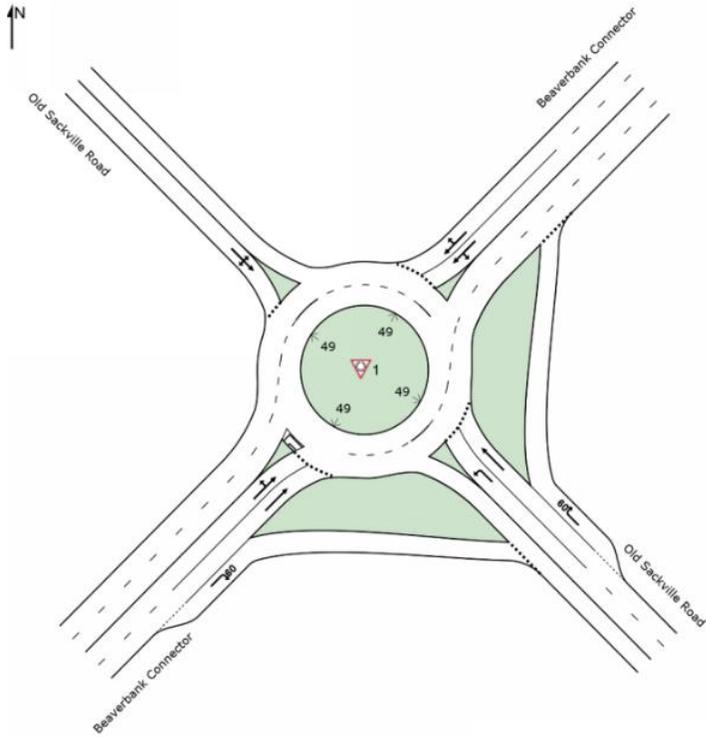
Concept Option 3 – Smart Right-Turn Channels & Acceleration Lanes



Concept Option 6 – Convert Walker Avenue to One-Way + Provide Dedicated Transit Lane

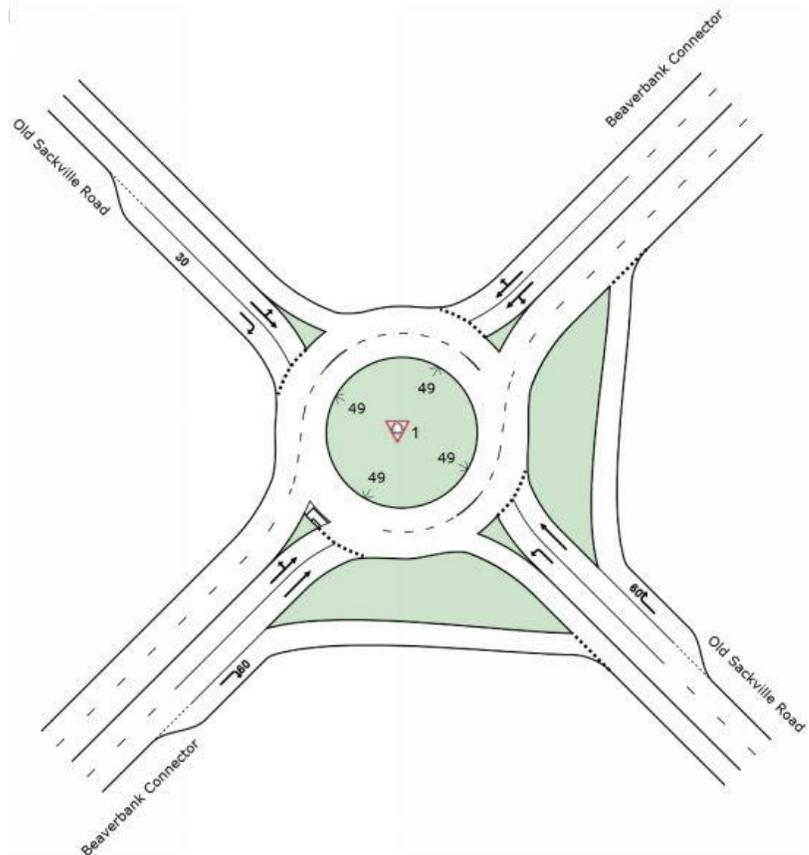


Concept Option 7 – Roundabout



Option A – Eastbound Shared Lane

Option B – Eastbound Right-Turn Lane



Comparison of Improvement Concepts

Option	Option 1 (Enhance Signage)	Option 2 (Smart RT Channels)	Option 3 (Pedestrian Continuity)	Option 4 (Coordinated Signals)	Option 5 (Signals & Illumination)	Option 6 (Transit lane)	Option 7 (Roundabout)
<b>Order of Magnitude Cost</b>	< \$5,000	\$350,000	\$30,000	\$200,000	\$30,000	\$50,000	\$4,000,000
<b>Traffic Impacts</b>							
Delay / LOS	●	●	●	●	●	↑	↑
Queuing	●	●	●	●	●	↑	↑
Transit Priority	●	●	●	↑↑	●	↑↑	●
<b>Safety Impacts</b>							
Sightlines	↑	↑↑	●	↑↑	↑↑	↑↑	↑
Vehicle Speeds	↑	↑↑	●	↑↑	↑	●	↑↑
Vehicle Conflicts	↑	↑↑	●	↑↑	↑	↑↑	↑↑
Pedestrian Safety	↑	↑↑	↑↑	●	↑↑	↑↑	↑↑
Intersection Visibility	↑	↑↑	↑↑	↑↑	↑	↑↑	↑↑
Geometry	●	↑↑	●	↑↑	●	↑↑	↑↑
<b>Other Impacts</b>							
Property Acquisition	●	↓	●	●	●	●	↓↓
Access Management	●	●	●	↑↑	↑↑	↓	●
Way Finding	↑↑	↑↑	●	↑↑	↑↑	↓	↑↑
Public Acceptance	↑↑	●	●	↑	↑↑	↓	↑

↑↑ Large positive impact   ↑ Moderate positive impact   ● Negligible impact   ↓ Moderate negative impact   ↓↓ Large negative impact

\*Taken from exp report "Operational & Safety Review for Beaver Bank Connector & Old Sackville Road (2019-04-25)