Birch Avenue: Schedule B Municipal Class Environmental Assessment

Project File Report

Prepared for City of Hamilton
by IBI Group
In associated with ASI and LGL
January 28, 2020

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1 Introduction

The City of Hamilton retained IBI Group to conduct the Birch Avenue Municipal Class Environmental Assessment (EA). Birch Avenue is a minor arterial roadway in north-central Hamilton that was built on reclaimed land from the former Sherman Inlet (Hamilton Harbour). At its lowest point, the road surface is approximately 1.3 m above the average water table, though the separation has come as close as 0.15 m in summer 2019 when record lake levels occurred. This EA is required to develop a preferred solution that addresses drainage issues that occur when the storm system reaches capacity. The preferred solution may have property impacts depending on the outcome (e.g. land for a pumping station).

While drainage is the trigger for this EA, there are a number of inter-related topics explored within it that influence the development and selection of a preferred solution. These include:

- **Active Transportation**: the City's active transportation policy supports the installation of cycling facilities along Birch Avenue and through routine accommodation to fill in sidewalk gaps. The preferred active transportation facility may impact drainage requirements if the road surface needs to be widened;
- **Substandard Roadway Clearance**: three rail bridges travel across the corridor: one is unused and is planned to be removed, while the other two carry daily rail traffic. All three bridges provide substandard vertical roadway clearance, which poses a safety hazard in the event a tall truck or bus strikes the bridge. Addressing this is needed to create a safe, reliable roadway as Hamilton Transit (HSR) plans to construct a bus facility at Brant Street which will use Birch Avenue as its primary access route. Increasing clearance may impact drainage if the roadway needs to be lowered as the lowest points are located at rail underpasses; and,
- **Flow Reduction Measures**: given that the existing sewer system can reach capacity, options to explore reducing flow volumes and/or increasing capacity are explored within this EA. These could help reduce the demands placed on the local storm system and the potential volume of water that needs to be pumped.

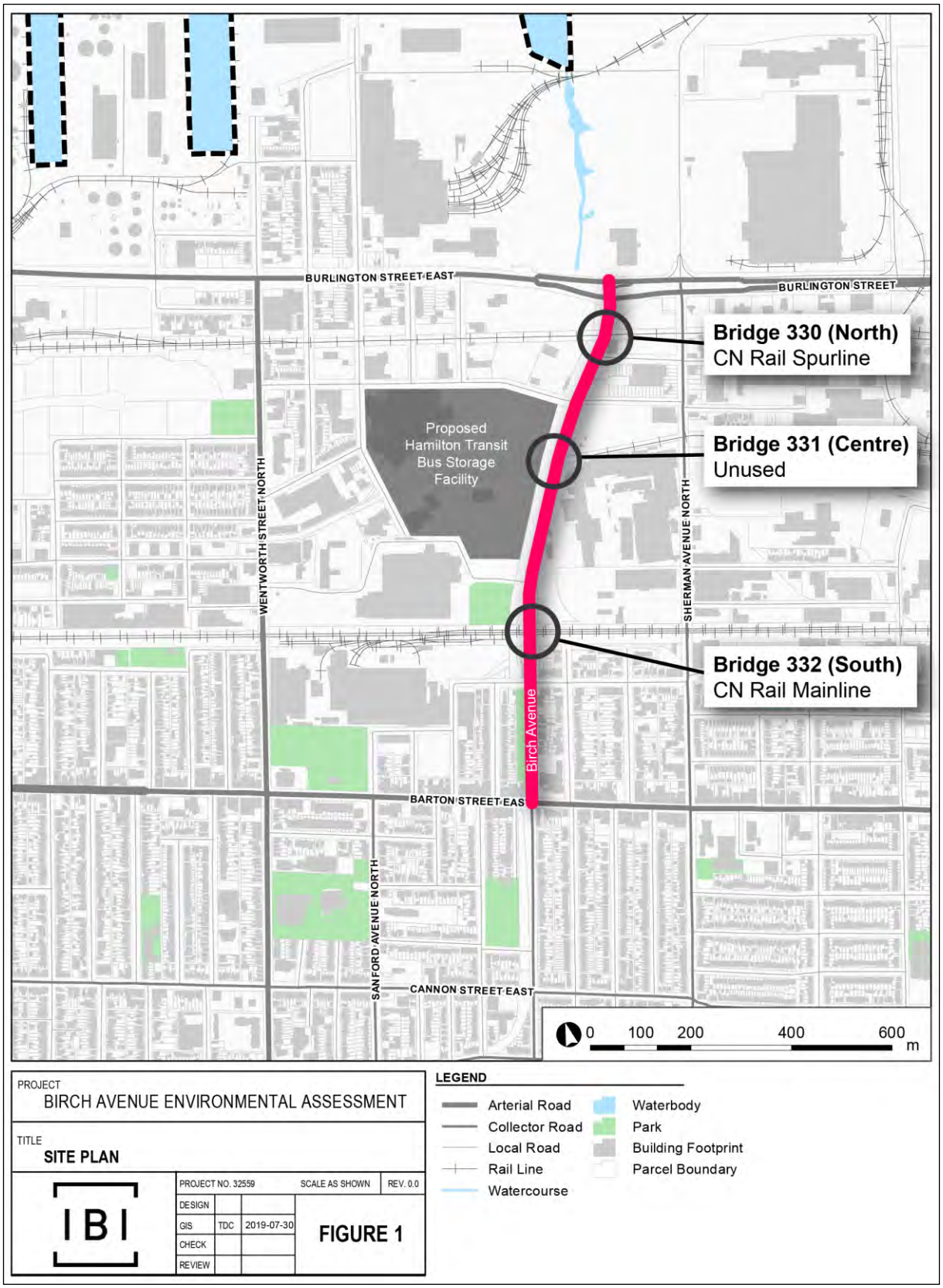
These three topics will be explored within this EA, as well as potential siting opportunities for pumping stations.

1.1 Study Area

The study corridor is Birch Avenue corridor between Burlington Street East and Barton Street East in the City of Hamilton (Exhibit 1.1).

A hydro corridor runs along the immediate west side of the roadway. North of the CN Rail mainline, the primary land use is industrial. South of the CN Rail line, the east side is residential. The west side contains park land within the hydro corridor, which is adjacent to residential lands.

Exhibit 1.1: Map of the Birch Avenue MCEA Study Area



1.2 Study Context

Birch Avenue, between Burlington Street East and Barton Street East, currently has three lanes in the southbound direction. The road was identified as a preferred candidate for two-way conversion in the 2018 Transportation Master Plan. While the conversion to two-way traffic is approved under the MCEA process, there are a number of other physical and operational constraints to be resolved in this EA.

The road has three rail bridges referred to in the City's database as Bridges 330, 331, and 332. Bridge 330, south of Burlington Street E, is a CN spurline that serves industrial users in the area. Bridge 332 north of Barton Street is CN's mainline to the USA. Both Bridge 330 and Bridge 332 have vertical clearance below standards and are a safety risk for tall vehicles. Bridge 331, south of Brant Street, is abandoned and slated for removal.

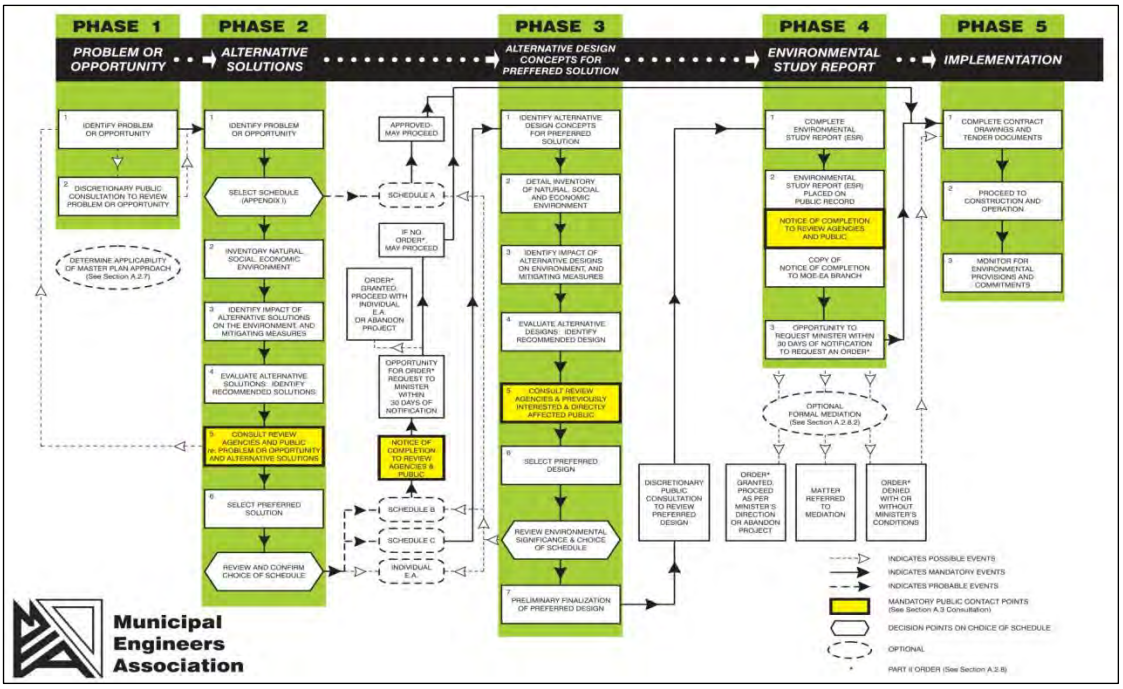
There are drainage and stormwater issues along the corridor and in particular at the rail crossings where the road elevation is approaching the average water table level. These areas are prone to flooding, and this complicates the bridge clearance issue as lowering the roadway to improve clearance will worsen the drainage issue. A pumping station may be required to address existing and future drainage issues, which is the trigger for this EA.

The City has identified Birch Avenue as an active transportation corridor with preliminary plans for a multi-use trail along the west side of the road, though plans are to be reviewed and refined as part of this EA and through detailed design.

1.3 Municipal Class Environmental Assessment Process

The Municipal Class Environmental Assessment (MCEA) process is a five-phase planning procedure under the Ontario Environmental Assessment Act, which applies to public infrastructure projects (Exhibit 1.2). Projects undertaken through this planning process are classified as one of four Schedule types in accordance with their degree of anticipated environmental impact and magnitude.

Exhibit 1.2: Municipal Class Environmental Assessment Process (Municipal Engineers Association)



This study follows the Schedule B process. Schedule B EAs generally include improvements and minor expansions to existing facilities where there is the potential for some adverse environmental impacts, and therefore, the municipality is required to proceed through a screening process including consultation with those who may be affected. Schedule B covers the first two phases of the MCEA process:

- **Phase 1 Problem or Opportunity:** which identifies the deficiency or opportunity. The problems or opportunities may or may not be evident to the public, but it is necessary to document factors which lead to the conclusion that an improvement or change is needed. The outcome of this phase is a clear statement of the problem or opportunity being addressed.
- **Phase 2 Alternative Solutions:** develop alternative solutions that can solve the problem and evaluate them against environmental criteria. This step includes taking an inventory of the natural, social and economic environments and provides consultation with review agencies and the public to solicit comments and inputs. The outcome of this phase is the selection of the preferred solution.

A Project File Report is required for Schedule B projects and documents the EA process carried out. To complete the process, a Notice of Completion will be submitted to review agencies, stakeholders and the public for a period of at least 30 days for comment and input. The Notice will include notification for provision to request a Part II Order.

Part II Order

If concerns are raised that cannot be resolved through discussions with the City as the EA proponent, the Part II Order appeal process may be initiated. If no appeals are brought forth by the expiry of the review period, the project is considered to have met the requirements of the MCEA process and the City may proceed with the project.

As part of the MCEA process, it is suggested that all stakeholders work together to determine the preferred means of dealing with a problem or opportunity. If concerns regarding a project cannot be resolved in discussion with the proponent, members of the public, interest groups or technical review agencies may request the Minister of the Environment, Conservation and Parks (MECP) to require a proponent comply with Part II of the Environmental Assessment Act before proceeding with the proposed undertaking. The Minister then decides whether to deny the request, refer the matter to mediation or require the proponent to comply with Part II of the *Environmental Assessment Act*.

The procedures for dealing with concerns are outlined as follows:

1. For Schedule ‘B’ projects a person or party with a concern should bring it to the attention of the City of Hamilton (the proponent) in Phase 2 of the planning process.
2. Should the person or party with the concern wishes to pursue the matter, they may write the MECP or delegate, or request a Part II Order. These requests shall be copied by the requestor to the City of Hamilton and the Director of the Environmental Approvals Branch at MECP at the same time they are submitted to the Minister, or delegate. For a Schedule ‘B’ project, a written request must be submitted to the Minister or delegate within the 30 day review period after the Notice of Completion has been issued.

1.4 Study Organization and Project Team

The study organization reflects the general administrative and technical needs of the study as well as the study's consultation program. The latter has been developed to ensure that all of those with a potential interest in the study will have the opportunity to participate and provide input during the process

The study was carried out under the direction of the Project Team comprised of staff from the City of Hamilton and IBI Group:

- Megan Salvucci, Project Manager, Asset Management, City of Hamilton
- City of Hamilton representatives from:
    - Asset Management
    - Design
    - HSR
    - Hamilton Water
    - Cultural Heritage
    - Natural Heritage
    - Transportation Planning
    - Transportation Operations & Maintenance
- Bruce Mori, Project Director, IBI Group
- Scott Johnston, Project Manager, IBI Group
- Trevor Jenkins, Environmental Assessment Coordinator, IBI Group

2 Relevant Policies and Studies

The following City documents were reviewed to provide background information on this study.

2.1 City of Hamilton Urban Official Plan

The Urban Hamilton Official Plan came into effect on August 16, 2013.

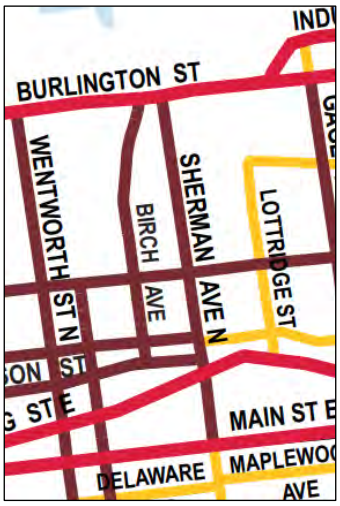
2.1.1 Functional Road Classification

Birch Avenue is a 'Minor Arterial' in the Schedule C – Functional Road Classification map (Exhibit 2.1). Relevant policies for this classification are:

- The primary function of a minor arterial road shall be to carry moderate volumes of intra-municipal and inter-regional traffic through the City in association with other types of roads.
- Land accesses shall be permitted with some controls.
- Bicycle lanes may be in place to accommodate cyclists and sidewalks shall generally be provided on both sides of the street for pedestrians.
- Gateway features may be permitted where required.
- On-street parking and loading may be prohibited or at minimum be restricted in the peak hours.

The corridor is part of the full-time truck route network (Section 2.3.6).

Exhibit 2.1: Functional Road Classification from UHOP

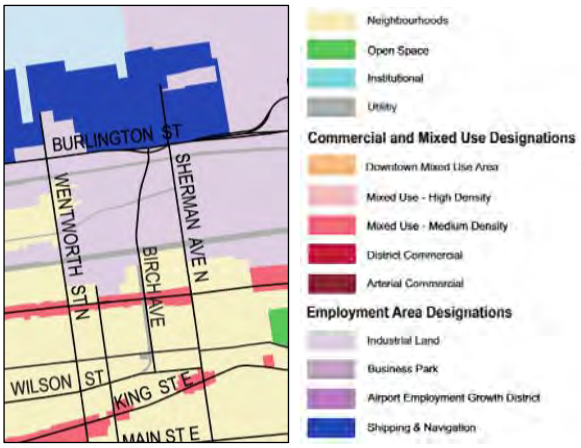


2.1.2 Land Use Designations

The land use designation adjacent to the study area varies by segment (Exhibit 2.2):

- **Barton Street:** properties fronting onto Barton Street are designated 'Mixed Use – Medium Density'.
- **Birch Avenue from Barton Street to CN Mainline (Bridge 332):** the lands on the east side of Birch Avenue are designated 'Neighbourhoods.' The lands immediately to the west are zoned 'Utility' and 'Neighbourhoods' on the other side of the far side of the hydro corridor.
- **CN Mainline (Bridge 332) to Burlington Street:** this area is designated as 'Industrial Land.'

Exhibit 2.2: Land Use Designation from UHOP



2.2 Previous Drainage Studies

2.2.1 Birch Avenue Sewer Capacity Analysis (2018)

The City retained GM BluePlan to carry out sewer capacity assessment of the Birch Avenue Assessment sewer for the sewer sections between Wilson Street and Burlington Street East. The work used the updated Mike Urban 2014 model. The modelling results confirm that there are capacity issues along the corridor, and drew the following observations:

- **Barton Street to Princess Street:** hydraulic grade line (HGL) at Princess Street is less than 1.8 m below ground level under a five year storm + growth scenario.
- **Princess Street to Brant Street:** the model predicts overland flooding of approximately 0.5 m above ground under a five year storm + growth scenario.
- **Brant Street to Burlington Street:** the HGL is less than 1.8 m below ground level under a five year storm + growth scenario.

The analysis did not identify any improvements to address capacity deficiencies.

2.2.2 Birch Avenue Stormwater Modelling and Flood Relief (2013)

The City retained McCormick Ranking Corporation to review remedial measures to address flooding problems. The purpose of the study was to assess the capacity of the existing storm relief sewer on Birch Avenue between Barton Street and Burlington Street and to identify and develop alternatives to alleviate flooding related to this sewer.

Modelling work shows that Birch Avenue has inadequate capacity to convey required flows, which can result in flooding and reduced level of service at the railway underpasses. The report concludes that “while there is an opportunity to construct additional capacity into the Birch Avenue storm sewer at the time of its required reconstruction, this measure is not recommended. Instead, a new storm relief sewer on Sherman Avenue is the prime recommendation.” This proposed solution would result in a hydraulic grade line in the Birch Avenue trunk storm relief sewer that would be below the ground surface during 5-year events.

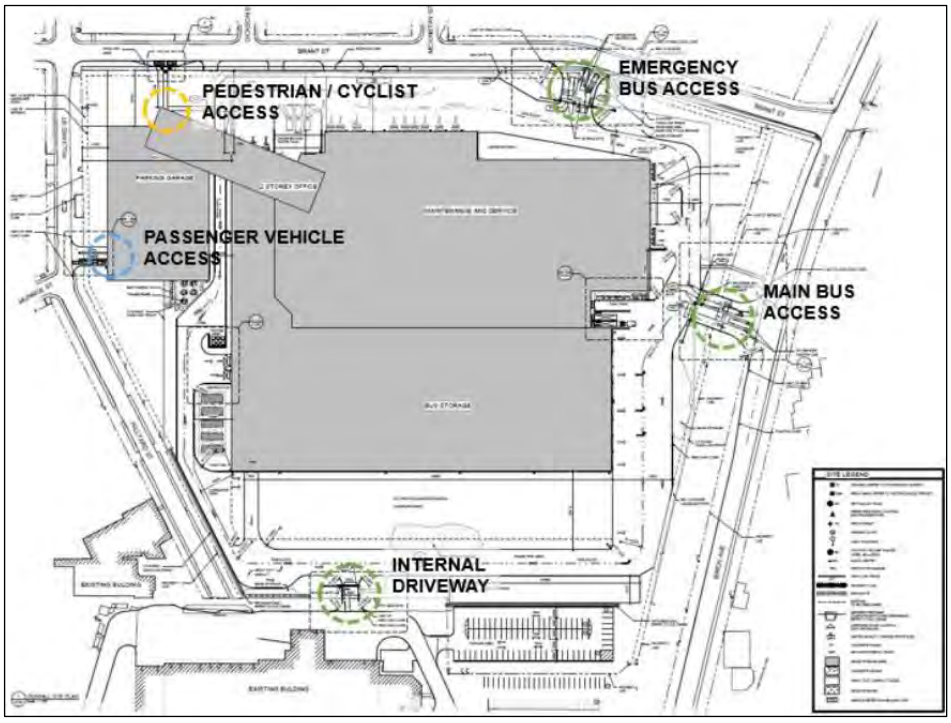
2.3 Transportation and Structural Studies

2.3.1 Hamilton Transit Bus Maintenance and Storage Facility

The City of Hamilton is conducting a separate environmental assessment for a new bus maintenance and storage facility. Upon its opening, the facility will be able to support approximately 200 buses and can be expanded to accommodate an additional 100 buses (300 total). At full build-out, there will be approximately 820 staff using the facility, and at peak times will have around 300 employees reporting to the facility.

The main bus access for the facility will link to Birch Avenue and will be in proximity to Bridge 331 (Exhibit 2.3). An emergency secondary access point will connect to Brant Street just west of Brant Street. As Birch Avenue will be the primary access route for buses travelling to and from the facility, the roadway needs to be safe and efficient to maintain optimal operations for vehicles travelling to and from the facility.

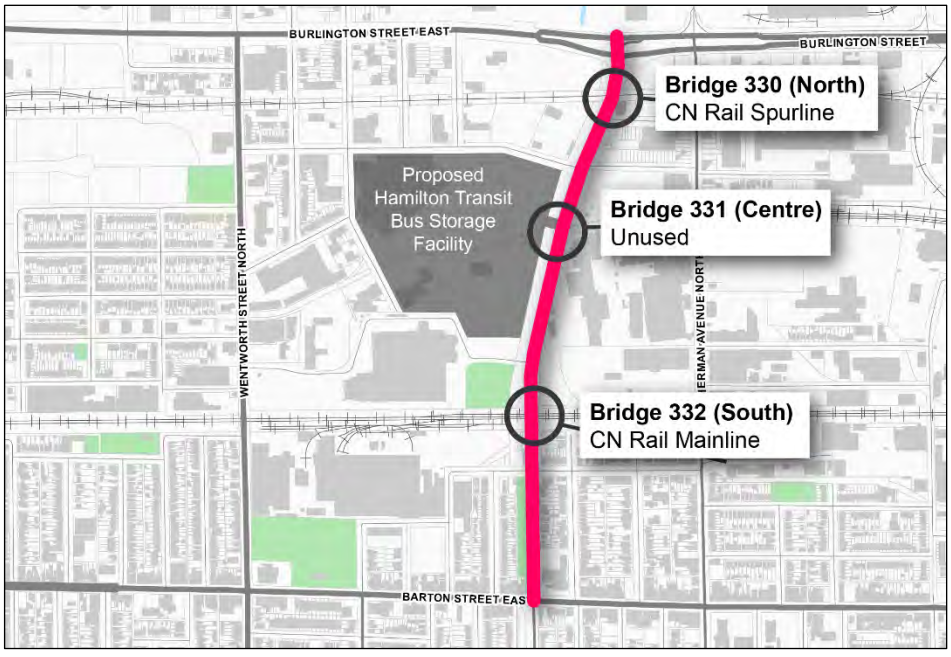
Exhibit 2.3: Access Points to Bus Maintenance and Storage Facility



2.3.2 Bridges 330 and 332 Functional Study Reports (2017)

SNC-Lavalin was retained to conduct functional studies for Bridge 330 (North) and Bridge 332 (South), as shown in Exhibit 2.4. The purpose was to review the alternatives crossings possible at the two locations to reduce the associated maintenance costs and resolve low vertical clearance.

Exhibit 2.4: Railway Bridge Locations



Bridge 330 has a clearance of 4.1 m, and Bridge 332 has a clearance of 4.2 ms. Both are lower than the MTO standard of 4.8 m of clearance.

The options considered for both sites include:

- Option 1: Replacement of the existing crossing with a new structure; or,
- Option 2: Modification of the road profile to convert the existing bridge to an at-grade crossing (50km/h and 60km/h design speed options).

Conceptual plans and profile drawings for each option were prepared. They were evaluated based on property impacts, utilities, road profile, construction staging and time, and financial analysis. Both studies recommended at-grade crossings at the two sites. The option has the lowest construction cost and will have minimal maintenance cost relative to the bridge replacement option. However, it would have the most impact on utilities, property and road profile.

A third option for both crossings was explored in a separate memo. Option 3 would close the road at Bridges 330 and 332 and replace the bridges with retaining walls and slopes. The specific road closures would be:

- Bridge 330: from Princess Street to the City's Operation Centre Entrance (approximately 195 m)
- Bridge 332: from Gerrard Street to Burlington Street (approximately 195 m). The option would remove the traffic signals and dual left-turn lanes at the Birch Avenue and Burlington Street intersection.

This road closure option was compared against Options 1 and 2 using the same criteria and was found to be the preferred option. It was found to be the most economical, least disruptive to the rail tracks, and have the lowest impact on private property. However, closing the road is no longer a viable option as the bus facility requires Birch Avenue for access.

2.3.3 Transportation Master Plan Update (2018)

City Council endorsed the Hamilton Transportation Master Plan (TMP) in August 2018. The TMP is a multi-modal plan addressing all modes including walking, cycling, transit, automobiles and goods movement. It "provides a comprehensive and attainable transportation blueprint for Hamilton as a whole that balances all modes of transportation to become a healthier city. The success of the plan is based on specific, measurable, achievable, relevant and programmed results." The plan includes discussion papers on relevant policy areas that are integrated into the final TMP. Select policy areas are discussed below.

Complete-Livable-Better Streets

The TMP proposes adopting a Complete-Livable-Better (CLB) Streets approach to right-of-way design, drawing on elements of the complete streets movement. The CLB approach aims to balance the needs of all uses and users regardless of age, ability or mode of transportation in an equitable manner. It represents a shift from traditional street design approaches where the primary focus is moving vehicular traffic. Development of a CLB Design Manual is a future action though the principles should be integrated into this work.

Two-Way Conversion

The *Background Report: Street (One- to Two-Way) Conversions* provides a screening procedure to facilitate the technical review of future two-way conversions for the remaining one-way streets in Hamilton. The criteria were developed and included in the TMP to guide staff and Council in the decision-making process. The preliminary review was applied to select streets for potential

conversion, including Birch Avenue from Burlington Street to Wilson Street. The preliminary findings rank the conversion of Birch Avenue as the second-highest priority of those examined.

Road Safety and Vision Zero

Road safety is a crucial component of the updated TMP. A balanced and sustainable transportation system is comfortable for travellers, integrates safety into CLB street design and ensures the movement of people and goods for economic growth and prosperity happens safely.

Vision Zero is a proactive approach to road safety, with a simple and clear goal of zero fatalities or serious injuries on roadways. A central element of Vision Zero is that road safety takes precedence over operations and convenience. Vision Zero focuses on:

- Fatalities and serious injuries;
- Flaws in the transportation system as a cause of collisions;
- Perfecting road systems for imperfect human behaviour; and,
- Safety initiatives to reduce societal costs.

Safety for all users – drivers, passengers, cyclists and pedestrians – using Birch Avenue will be a factor in the selection of a preferred solution. This will include addressing road safety for vulnerable road users of all ages and ability and encouraging a healthy lifestyle.

2.3.4 Cycling Master Plan Update (2018)

The Cycling Master Plan (CMP) identifies a future cycling infrastructure project on Birch Avenue from Burlington Street to Wilson Street (Exhibit 2.5).

The design concept suggests installing bike lanes on each side of the road as part of a two-way conversion road diet. There are currently no separated or dedicated facilities along Birch Avenue.

Exhibit 2.5: Cycling Master Plan Update (2018)

2.3.5 Pedestrian Mobility Plan (2013)

The Pedestrian Mobility Plan contains a toolbox of options for improving the pedestrian experience throughout Hamilton. This plan uses an evidence-based approach to creating safe and exciting pedestrian environments by applying public health science and transportation research to the City's built environments.

The plan identifies the Study Area as an 'Industrial' context area. The characteristics of it are:

> "The heavy industrial area adjoining Hamilton Harbour is the City's heavy industrial and port area and along Burlington Street. Pedestrian environments exist to a limited extent where streets have sidewalks. Goods movement and heavy industrial activities characterize this zone. Aside from public transit facilities, little opportunity exists to enhance this pedestrian environment except in peripheral areas like Windemere Basin."

The plan embeds a "Routine Accommodation" policy within City decision making. Infrastructure development/renewal should address improved pedestrian environments by using appropriate solutions. The Toolbox Checklist identifies solutions that may be appropriate for the 'Industrial' context area.

2.3.6 Truck Route Master Plan (2010)

The Truck Route Master Plan is intended to recommend a truck route network, and the policies and implementation strategy that will assist the City in managing the truck route network. It provides recommendations for future action, policies for truck route signage, and a methodology for dealing with truck route network issues in the future.

The most recent truck route network (Exhibit 2.6) identifies Birch Avenue as a full-time (24 hour) truck route from Burlington Street to Barton Street. From Barton Street to Cannon Street, it is a part-time route (7:00 a.m. to 7:00 p.m.).

An update to the Truck Route Master Plan study will commence in 2019.

Exhibit 2.6: Truck Route Network (April 2017)

3 Problem/Opportunity Statement

Phase 1 of the MCEA process involves identification of the problem and/or opportunities and documentation of the considerations leading to the determination that improvements are required.

3.1 Need and Justification

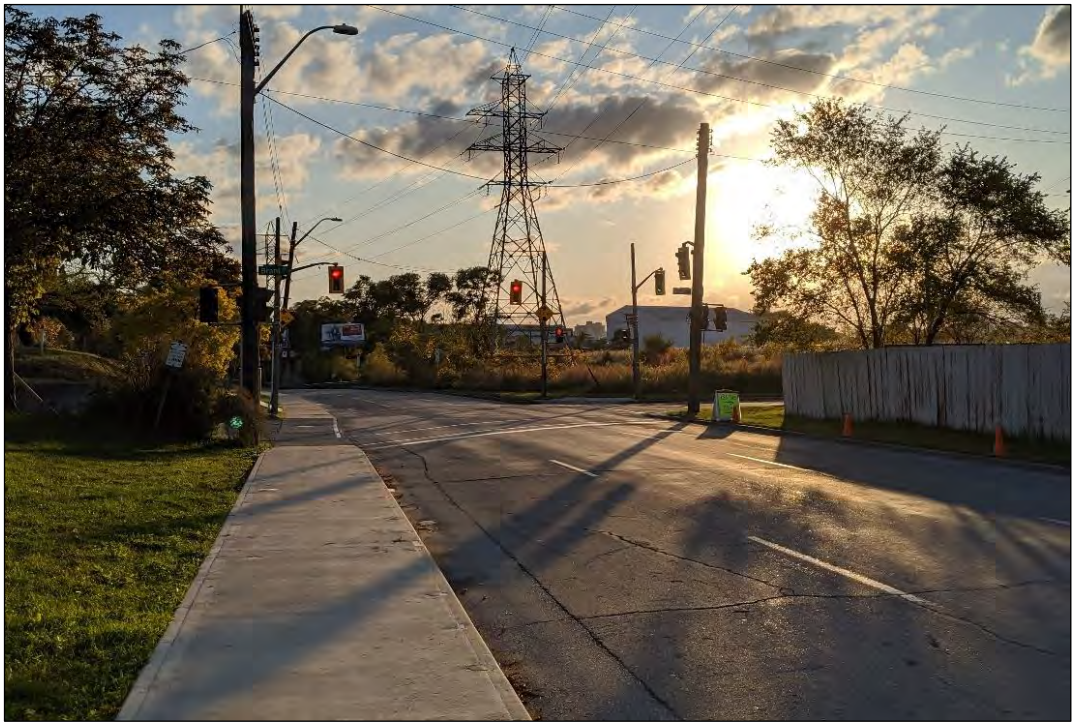
A number of background studies have been completed which identify the need and justification to address drainage issues along the corridor.

3.2 Problem and Opportunity Statement

Phase 1 of the MCEA requires a Problem/Opportunity Statement that captures the key components that will be addressed in the study. Through the project terms of reference and input from the public at Public Information Centre 1, the following statement was developed:

> *Birch Avenue is a one-way, minor arterial serving local, through and goods movement traffic. Two bridges on the corridor are nearing the end of their design life and need to be replaced. The height of the bridges above the road (clearance) is substandard, and there are drainage issues that can cause flooding.*
>
> *In the near-term, the road will be converted to two-way traffic and will become the primary access route to the Hamilton Transit Bus Maintenance and Storage Facility.*
>
> *The City is looking for opportunities to resolve clearance, address drainage issues, and implement active transportation infrastructure and traffic operational improvements for the benefit of users.*

Exhibit 3.1: Looking south towards Brant Street (IBI Group)



4 Existing Conditions

4.1 Natural Environment

A Natural Heritage Report was completed by LGL Limited. The investigation was completed to inventory and survey the habitat, vegetation and wildlife within the study area. Key findings are summarized within this section.

The full report is available in Appendix B.

4.1.1 Habitats

Designated Natural Areas

A review of the Ministry of Natural Resources and Forestry Natural Heritage Information Centre database and the City of Hamilton Urban Official Plan indicates that there are no Areas of Natural and Scientific Interest, Provincially Significant Wetlands or Environmentally Sensitive Areas located within 120 m of the study area.

Aquatic Habitat

There are no watercourses or waterbodies located within the study area; therefore, no fish habitat is present.

Terrestrial

Limited wildlife and wildlife habitat were found within the study area. Natural heritage features consisted primarily of manicured grass, cultural meadow and cultural thicket. The highest quality wildlife habitat found within the study area is provided by the cultural thicket and cultural meadow communities.

4.1.2 Vegetation

Flora

A total of 67 plant species have been recorded within the study area. Of the 67 plants identified to species, 25 (37%) plant species identified are native to Ontario and 42 (63%) plant species are considered introduced and non-native to Ontario.

Trees

A tree inventory was completed for the Study Area by an ISA certified arborist. The inventory identifies the species, measurement at breast height, location and health assessment. A total of 112 trees consisting of 24 species were inventoried during the field investigation.

Overall, trees within the study limits range in size from 4 to 55 cm diameter at breast height and are generally considered to be in good to fair condition. One plant species regulated as Threatened under the *Endangered Species Act, 2007* was observed: four Kentucky coffee trees were noted as planted amenity trees. Consultation with Ministry of Environment, Conservation and Parks Management Biologists have advised that streetscape Kentucky coffee-trees likely are cultivars and as such, they are not protected under the *Endangered Species Act*.

4.1.3 Wildlife

Field investigations revealed that the study area supports an assemblage of common species that are typical of a highly disturbed landscape. The breeding bird community was primarily composed of urban, tolerant, habitat generalist bird species. Significant wildlife habitat (amphibian breeding, reptile hibernacula, etc.) was not identified within the study area. No significant wildlife movement or passage corridors were identified within the lands examined.

Birds

Field investigation revealed that the study area contained a moderate number of breeding bird species representing several habitat types. Breeding evidence was obtained for 20 species of birds. Breeding evidence was confirmed in one species, probable in six species, possible in seven species, and observed in an additional six species.

Bird species identified in the study area include:

- American Goldfinch
- American Robin
- Bank Swallow[1]
- Barn Swallow[1]
- Blue Jay
- Chimney Swift[1,2]
- Common Grackle
- European Starling
- Gray Catbird
- House Finch
- House Sparrow
- Indigo Bunting
- Mourning Dove
- Northern Cardinal
- Northern Mockingbird
- Red-winged Blackbird
- Ring-billed Gull
- Rock Dove (Pigeon)
- Song Sparrow
- Yellow Warbler

The rail bridges may provide nesting opportunities for Barn Swallow, but during field surveys no nests were observed under any of the three bridges. No nests of migratory bird species were identified during field investigations.

Mammals

Four mammal species were identified during field investigations in the study area:

- Eastern cottontail
- Eastern gray squirrel
- Northern raccoon
- Groundhog

The mammal species documented represent an assemblage that readily utilizes human influenced landscapes. None are identified as species at risk.

4.2 Social, Economic and Cultural Environments

4.2.1 Socio-Economic

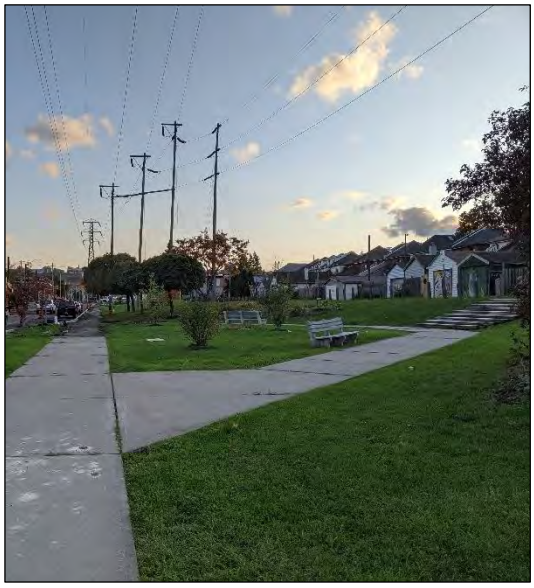
The Study Area is located in the neighbourhoods known as Industrial Sector B/Keith (north of Bridge 332) and Gibson (south of Bridge 332). The section of Birch Avenue between Princess Street and Burlington Street is primarily industrial in nature, while the section between Princess Street and Barton Street is primarily residential on the east side and open space under the hydro corridor on the west side.

There are two community parks within the study area (Exhibit 4.1). The first is the Birch Avenue Dog Park, which is located at the southeast corner of the Public Works Facility and is accessed

[1] Identified as Threatened under the provincial *Ontario Endangered Species Act*
[2] Identified as Threatened under the federal *Species at Risk Act*

through the Public Works Facility driveway. The second is Birch Park, which is located underneath the hydro corridor from just south of Princess Street to just north of Barton Street.

Exhibit 4.1: Birch Avenue Dog Park (left) and Birch Park (right) (IBI Group)



Both the Keith and Gibson neighbourhoods are included in the City of Hamilton's Neighbourhood Action Strategy, which identifies areas of Hamilton where social and economic inequalities are having impacts on residents' health. The Social Planning and Research Council of Hamilton prepared neighbourhood profiles[3] for the two communities that identify challenges the neighbourhood face[4]:

- There is a larger proportion of residents with activity limitations than in the City;
- The poverty rate in the area is more than double the city average. More than four in ten Keith residents (43%) and over one in three Gibson residents (37%) are living in poverty;
- The rate of students not completing high school in Keith (17.4%) is more than three times the city-wide median, while in Gibson the rate is slightly lower (15.5%) but still above the city-wide median; and,
- The average age of death in Keith is 65.6 years, which is 9.7 years younger than the Hamilton median. In Gibson, the average age is higher at 71.5 years, which is still 3.7 years lower than the city median.

It is apparent that this road runs through a community in need. This study presents an opportunity to support vulnerable road users and residents that travel or live along the corridor.

4.2.2 Built and Cultural Heritage Landscape

A Cultural Heritage Resource Assessment was completed by ASI. The report presents an inventory of cultural heritage resources within the study area and identifies the existing conditions, potential impacts to heritage resources and proposed appropriate mitigation measures. The report identified that area is historically and contextually associated with the early twentieth century land use patterns in the City of Hamilton.

[3] http://www.sprc.hamilton.on.ca/wp-content/uploads/2012/03/2012-Report-Neighbourhood_Profiles_March.pdf
[4] The Gibson neighbourhood was included in a larger "South Sherman" neighbourhood profile.

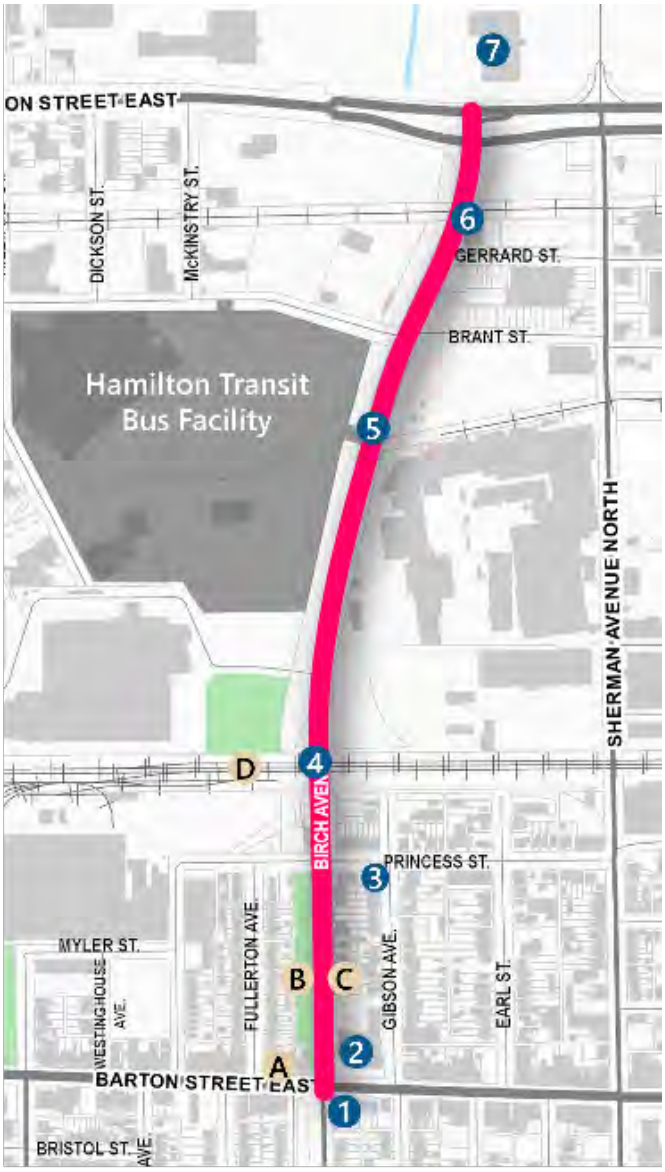
A field review of the study area confirmed there are 11 cultural heritage resources (Exhibit 4.2) consisting of the following within or immediately adjacent to the study area:

- Three bridges,
- Two commercial buildings,
- One former school,
- One industrial building complex,
- Two streetscapes, and
- Two transportation corridors area.

Three of the cultural heritage resources are identified by the City of Hamilton as Inventoried, one was identified by the City of Hamilton on the Register, the three bridges were previously identified by the City of Hamilton Heritage Bridge Inventory, and the remainder were previously identified by ASI in 2012 during a field review.

The report is available in Appendix C.

Exhibit 4.2: Map of identified built heritage resources and cultural heritage landscapes



Built Heritage Resources

1. 594 Barton St. East
2. 601 Barton St. East: former Gibson School
3. 241 Gibson St.
4. Bridge 332
5. Bridge 331
6. Bridge 330
7. 651 Burlington St.

Cultural Heritage Landscapes

- A 595-583 Barton St. streetscape
- B Former Hamilton Radial Electric Railway corridor
- C 156-188 Birch Ave. streetscape
- D GWR Main Line railway corridor

4.2.3 Archaeology

A Stage 1 Archaeology Assessment was completed by ASI. The purpose of the study is to investigate the past and present land use, the settlement history, and any other relevant historical information pertaining to the study area.

As can be seen in Exhibit 4.3, the section of the Birch Avenue north of Bridge 332 was part of the Sherman Inlet (Hamilton Harbour) as recently as 1909. Over the course of the nineteenth and twentieth centuries the area experienced substantial change and development, including the infill of the Sherman Inlet and complete alteration of the Hamilton Harbour shoreline, as well as industrial, commercial and residential development.

Exhibit 4.3: Study Area (approximate) overlaid on the 1909 NTS Hamilton Sheet

Based on the findings in the report, it is recommended that no further archaeological studies be completed.

The report is in draft form and has been submitted to the Ministry of Heritage, Sport, Tourism and Culture Industries for review. The report is currently pending entry into the Ontario Public Register of Archaeological Reports and, once accepted, will be confirmed to have satisfied the Ministry's standards.

4.3 Sewer System and Flooding Issues

4.3.1 Storm Relief Sewer

Under existing conditions, runoff from Birch Avenue is primarily collected by catch basins, conveyed by storm relief sewers and finally discharged into Lake Ontario through the outlet located north of Burlington Street East.

The existing storm relief sewer along Birch Avenue is a concrete structure with the size of 1450 mm by 1800 mm located under the sidewalk on the east side of Birch Avenue between Burlington Street East and Princess Street. South of Princess Street along Birch Avenue, the size of the storm relief sewer changes to 1200 mm by 1550 mm. The slope of the storm relief sewer along Birch Avenue between Barton Street East and Burlington Street East varies from 0.05% to 0.4%. These low gradients reduce the sewer capacity. The sewer obvert is above the road elevation, particularly where the road sags at the railway underpasses. The storm relief sewer is integral to the footings of each of the three railway bridge abutments.

4.3.2 Combined Sewer

The catchment area located south of Princess Street is serviced by the existing combined sewer system. The existing sewer along Birch Avenue also has a combined sewer which varies in size and gradient. The combined sewer between Wilson Street and Princess Street has a 600 mm by 900 mm non-circular section and the slope varies from 0.3% to 0.6%. Between Barton Street East and Princess Street, there is a parallel storm relief trunk sewer (1200 mm by 1314 mm) in addition to the 600 mm by 900 mm combined sewer. The storm relief sewer flows north towards Burlington Street East, while the combined sewer (600 mm by 900 mm) connects to the Princess Street combined sewer system and continues to flow east.

The combined sewer network located at the intersection of Birch Avenue and Princess Street discharges wet weather flow into the Birch Avenue storm relief sewer through an overflow

chamber located at the intersection of Birch Avenue and Princess Street. The low sanitary flow is conveyed east along Princess Street through the combined sewer system. As a result, the storm and sanitary sewer system are completely separate along Birch Avenue from Princess Street to the outfall located north of Burlington Street.

4.3.3 Sanitary Sewer

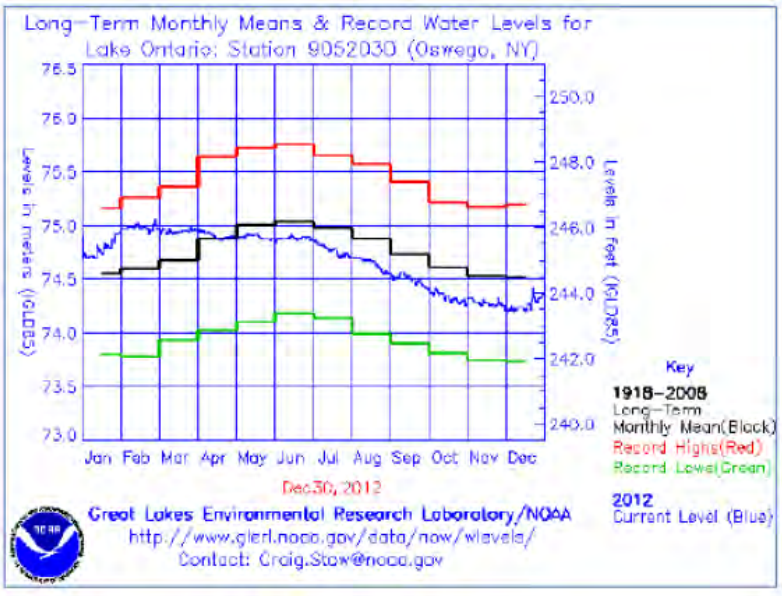
There is a sanitary sewer that runs towards north along Birch Avenue to service roadway adjacent areas. This sanitary sewer starts at the railway crossing north of Princess Street (Bridge 332), continues north and discharges to the Burlington Street sanitary sewer system.

4.3.4 Flooding Issues

There are three low points along Birch Avenue at the three railway bridges. The slope of the existing storm relief sewer between Barton Street East and Burlington Street East varies from 0.05% to 0.4%. These low gradients reduce the sewer capacity. It is well recognized that the capacity of the existing storm sewer on Birch Avenue is not adequate to convey the required design flows. This inadequate flow capacity of the storm sewer results in undesirable flooding and level of service under the bridges. The storm relief sewer obvert is also above the road elevation at some locations, particularly at/near the railway underpasses.

A significant factor for flooding is the level of Lake Ontario and its hydraulic effect on the sewer's outlet. Summer average lake level is approximately 75.0 m as shown in Exhibit 4.4. The road elevation at the bridge low-points are 75.69 m (Bridge 330), 76.0 m (Bridge 331) and 76.40 m (Bridge 332) from north to south respectively. The sewer height ranges from 74.29 m at Burlington Street, 75.0 m just north of Bridge 332, 75.20 m at Princess Street and 76.29 m at Barton Street. This means that the water table is reaching the physical sewer infrastructure until just north of Bridge 332, which can contribute to drainage issues.

Exhibit 4.4: Lake Ontario Average Water Levels



4.4 Transportation and Structural

4.4.1 Existing Traffic Operations

A transportation assessment was completed to determine existing traffic operations through the study area and at nearby intersections. A copy of the memo is available in Appendix D.

The primary metric for traffic flow performance is level-of-service (LOS). It is a measure of intersection performance based on the average delay experienced by drivers (Exhibit 4.5). An intersection operations analysis was conducted using Synchro (version 9) and following Highway Capacity Manual (HCM 2000) methodologies of intersection analysis.

Exhibit 4.5: Intersection Level of Service (LOS) Reference

Level Of Service	Control Delay Per Vehicle (s)	
	Signalized	Unsignalized
A	≤10	≤10
B	>10 and ≤20	>10 and ≤15
C	>20 and ≤35	>15 and ≤25
D	>35 and ≤55	>25 and ≤35
E	>55 and ≤80	>35 and ≤50
F	>80	>50

Analysis periods were the weekday a.m. and p.m. peak hours, when background traffic is considered highest (Exhibit 4.6).

Based on the results, the intersections in the study area are currently operating well, with signalized intersections at level-of-service B or better (Exhibit 4.7). No movements in either peak periods are considered critical according to the City's traffic impact study guidelines, indicating stable traffic conditions without significant delay or disruptions

Exhibit 4.6: Existing Traffic Conditions: Traffic Volumes

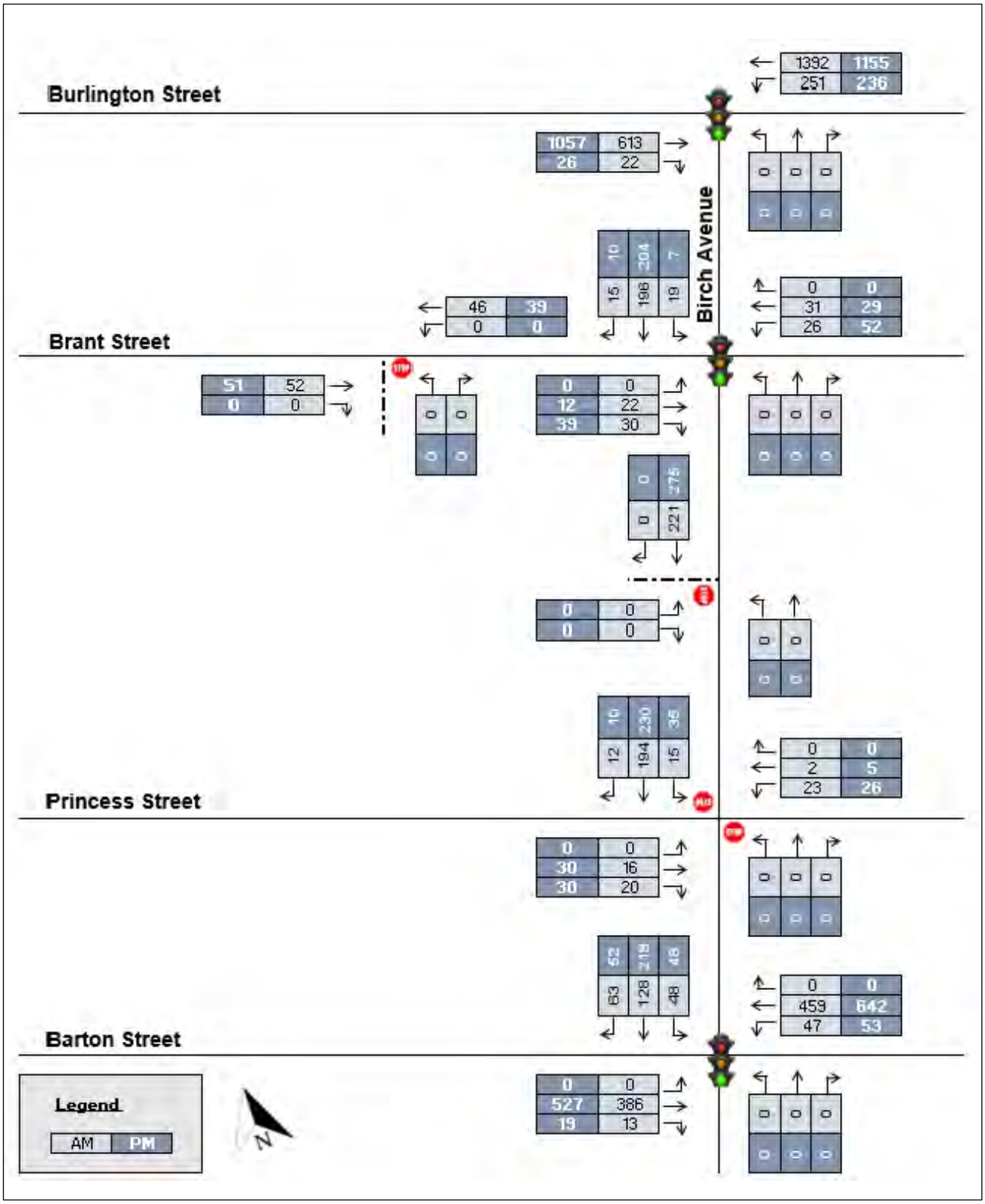


Exhibit 4.7: Existing Traffic Analysis (All Movements) Summary

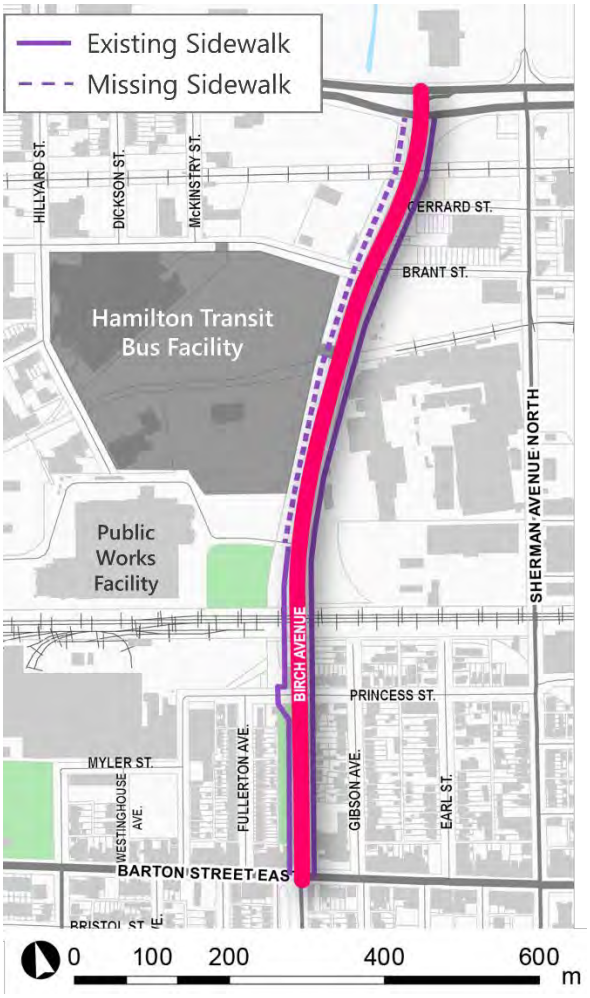
Intersection Name	Overall LOS	All Movements			
		Mvmt	LOS	V/C Ratio	95th Percentile Queue (m)
AM Peak					
Birch Avenue & Burlington Street E (***Signalized***)	A	EBTR WBL WBT	A C A	0.25 0.34 0.35	23 31 -
Birch Avenue & Brant Street ***(Signalized)***	B	EBTR WBTL SBTLR	B B A	0.06 0.09 0.13	9 13 21
Birch Avenue & Princess Street ***(Unsignalized)***	-	EBTR WBTL SBTLR	A A -	0.05 0.04 0.01	1 1 0
Birch Avenue & Barton Street E ***(Signalized)***	B	EBTR WBL WBT SBTL SBR	B B B A A	0.30 0.15 0.33 0.12 0.05	34 12 39 6 -
PM Peak					
Birch Avenue & Burlington Street E ***(Signalized)***	A	EBTR WBL WBT	A C A	0.39 0.31 0.28	41 29 -
Birch Avenue & Brant Street ***(Signalized)***	B	EBTR WBTL SBTLR	B B A	0.05 0.14 0.12	8 18 20
Birch Avenue & Princess Street ***(Unsignalized)***	-	EBTR WBTL SBTLR	B B -	0.10 0.05 0.02	2 1 1
Birch Avenue & Barton Street E ***(Signalized)***	B	EBTR WBL WBT SBTL SBR	B B C B A	0.42 0.22 0.50 0.15 0.04	50 15 61 11 3

4.4.2 Active Transportation

The following infrastructure is available along Birch Avenue (Exhibit 4.8):

- A continuous sidewalk on the east side of the street from Barton Street to Burlington Street;
- A sidewalk on the west side between Barton Street and the Public Works Facility driveway. There is no sidewalk from the Public Works Facility driveway to Burlington Street;
- Signalized pedestrian crossings are available at Barton Street and at Brant Street. At Burlington Street, the existing signals allow pedestrians to cross east-west on the south side of the intersection, but not in any other direction; and,
- Cyclists using the corridor today ride within mixed-traffic.

Exhibit 4.8: State of pedestrian infrastructure



4.4.3 Bridges

Three rail bridges span Birch Avenue. All three have substandard vertical clearance compared to the MTO design standard of 4.8 m[5]. Of the three bridges, two are currently in use by CN Rail (Bridges 330 and 332), while the third is unused and planned to be removed (Exhibit 4.9).

Exhibit 4.9: Summary of Rail Structures crossing Birch Avenue

Bridge ID	Location	Use	Vertical Clearance	Notes
330 (North)	75 m south of Burlington Street East	CN Rail spurline	Substandard	
331 (Centre)	125 m south of Brant Street	Unused	Substandard	Planned to be removed
332 (South)	95 m south of Princess Street	CN Rail mainline	Substandard	Part of the Lakeshore West GO Rail corridor

[5] MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, June 2017, Section 3.3.5.5, requires 4.8 m for railway bridges over roadways

Bridge 330

The northernmost bridge carries a CN Rail spurline over top of Birch Avenue and is known municipally as Bridge 330. It is located 75 m south of Burlington Street East. It is a through plate girder structure with concrete deck. The substructures consist of concrete abutments and concrete and steel piers. The bridge was constructed in 1923 and repairs to the structural steel members indicate that the bridge has been rehabilitated.

Exhibit 4.10: Looking south towards Bridge 330 from Burlington Street (IBI Group)

The structure is generally in poor to fair condition with moderate-severe corrosion and rust jacking of various members of the steel pier; severe rusting at the north girder's west end with perforation hole, local repair works on the girders and steel bent indicate the previous impact damages on these elements; as well as localized delamination/spall on the concrete pier and abutments.

The existing vertical clearance of 4.1 m on the western portion and 4.2 m on the eastern section is below the required minimum of 4.8 m. Due to its condition, the bridge is planned to be replaced. The new structure will be required to meet the minimum clearance.

In 2002, the bridge had been assessed as having moderate heritage value (Class C) in the Heritage Structure Report. However, a Cultural Heritage Evaluation Report (CHER) conducted in 2017, did not find the bridge to have significant cultural heritage value or interest when assessed using Ontario Regulation 9/06 and the Hamilton Bridge Guideline.

Bridge 331

The centre bridge is an unused rail bridge that carries a single rail track over Birch Avenue, and is known municipally as Bridge 331. The superstructure of the through girder section of the bridge consists of steel girders that are fastened together with steel angles and rivets. The top flange of both girders is curved at the abutments. Four timber trestles are located immediately west of the through girder section of the bridge and comprise the remaining four spans

Exhibit 4.11: Looking north at Bridge 331 from the east side of Birch Avenue (IBI Group)

The bridge previously carried a T.H. & B. Railway spurline over the roadway. However, the bridge is now unused and the tracks on the west side have been removed. The bus facility (Section 2.3.1) is planned for the lands to the west of the hydro corridor and will prevent tracks from being installed again.

The bridge is planned to be removed. The bridge has been found to have cultural heritage value or interest in a CHER. A Heritage Impact Assessment was completed by the City of Hamilton to determine an appropriate plan for its removal (Appendix C).

Bridge 332

The southernmost bridge is known municipally as Bridge 332. The structure carries the CN Rail mainline to/from Niagara Region and the US, and GO Transit's Lakeshore West rail service between Hamilton and Niagara. The bridge is a two-span through plate girder structure with a concrete deck. The substructures consist of concrete abutments and structural steel bent pier.

Exhibit 4.12: Looking south at Bridge 332 across from the Public Works Facility driveway (IBI Group)

The structure is generally in fair condition with minor impact damage to the girders and gusset plates, severe corrosion on the bottom flange of the floor beam near the west abutment, structural steel coating failure, and, localized delamination/spall on the concrete abutments.

The existing vertical clearance of 4.2 m is sub-standard and below the required minimum of 5.5 m. The bridge is planned to be replaced.

In 2002, the bridge had been assessed as having moderate heritage value (Class C) in a Heritage Structure Report. A CHER conducted in 2017 did not find the bridge to have significant cultural heritage value or interest when assessed using Ontario Regulation 9/06 and the Hamilton Bridge Guideline.

5 Active Transportation and Roadway Clearance

There are two separate, but closely integrated, considerations that will influence the development and evaluation of the alternative solutions to address drainage. These topics were considered within the context of this EA to ensure their potential impact on drainage was properly captured when developing and evaluating alternative solutions:

- **Active Transportation:** the preferred active transportation facility for the corridor may increase the impervious surface area. It will also require horizontal space under the bridges which may influence the preferred roadway clearance option; and,
- **Roadway Clearance:** the bridge structures along the corridor have substandard roadway clearance. It is likely that the preferred option to increase clearance will involve lowering the roadway, which will impact drainage requirements.

These two subjects are not the trigger of this EA but are contemplated within it.

5.1 Active Transportation

As previously discussed, Birch Avenue has been identified for cycling facilities in the Cycling Master Plan (Section 2.3.4), and the Pedestrian Mobility Plan supports route accommodation (Section 2.3.5). This section explores how cycling and pedestrian facilities can be incorporated.

The selection of a preferred active transportation facility type has potential to impact the preferred drainage solution. If the road needs to be widened to accommodate an on-street or in-boulevard facility, then the drainage area will increase, while if a facility is located off-street, then the drainage area would remain the same.

5.1.1 Alternative Facility Type Selection

A Cycling Facility Selection Review was undertaken to determine which type of cycling facilities would be appropriate for the corridor. The process for selecting facility class is summarized below.

The facility class selection memo is available in Appendix D.

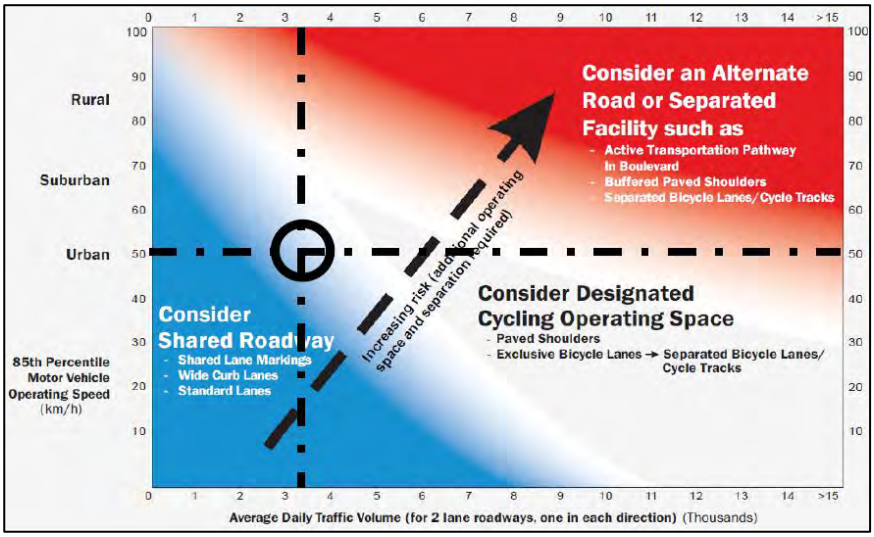
1. Pre-Selection of Facility Class

The cycling facility selection tool provided in Ontario Traffic Manual (OTM) Book 18 was used to select the minimum level of cycling facility required for the study area. The classes considered by the tool can be broadly defined as follows:

- **Shared Facilities** – consisting of signed routes, bicycle boulevards or advisory bike lanes (most appropriate along low-volume, low-speed roadways);
- **Designated Facilities** – consisting of bike lanes along urban roadways or paved shoulders along rural roads (typically most appropriate along collector type; and,
- **Separated Facilities** – consisting of buffered or protected bike lanes, cycle tracks or multi-use trails (typically most needed along arterial roadways, or as part of an all ages and ability (AAA) or priority network).

It was determined that designated or separated facilities would both be appropriate based on current/future traffic volumes and the posted speed limit (Exhibit 5.1).

Exhibit 5.1: OTM Book 18 Minimum Facility Selection Tool



2. Detailed Review of Facility Classes

The two facility classes were evaluated against a set of criteria (Exhibit 5.2). The purpose was to determine whether any specific roadway, safety, user or operational considerations preclude either a designated or separated cycling facility along the corridor.

Exhibit 5.2: Detailed Facility Class Review Criteria

Primary Criteria	Secondary Criteria
• Speeds	• Costs
• Volumes	• Anticipated User
• Street Function	• Level of Use
• Vehicle Mix	• Route Function
• Collision History	• Road Projects
• Available Space	• Parking
	• Intersections

The evaluation confirmed that designated or separated cycling facility are appropriate for the corridor context.

3. Alternative Facility Options

The selection of an appropriate cycling facility type within the designated and separated classes depends on several factors. For example:

- **Continuity** – How will the link connect to cycling facilities upstream or downstream of the study area? How can the link provide a continuous and cohesive cycling facility?
- **Land Use Context / Driveways** – How will the land use context influence the demand for cycling facilities? Are driveways closely spaced or intermittent?
- **Access to Key Destinations** – Are destinations located on both sides of the street or only one side of the street? What key destinations does this route serve?
- **Existing / Future Demand** – Is there low/ high ridership presently? Are significant changes in land use anticipated that will impact future ridership?

Based on the outcome of the review, three facility types were advanced for further evaluation:

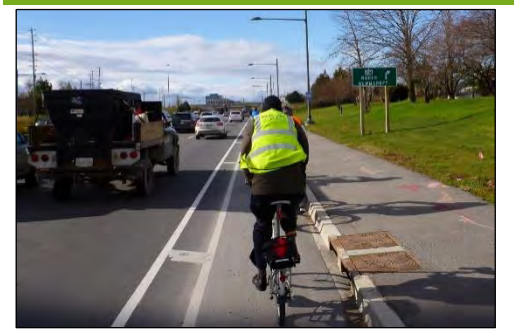
1. Bike Lanes (Conventional or Buffered);
2. Multi-Use Path on the west side; and,
3. Cycle Track along the corridor.

Representative photos of these types of facilities are shown in Exhibit 5.3. These are provided for reference and should not be considered indicative of the final design.

Exhibit 5.3: Representative photos of alternative cycling facility options (IBI Group)

Bike Lanes: Conventional

Bike Lanes: Buffered



Multi-Use Path

Cycle Track

5.1.2 Evaluation Criteria

Each of the three facility class types were evaluated against four criterion:

- **Appropriate for Road Context:** the facility class is appropriate given the land use and traffic attributes of the study area;
- **Comfortable and Attractive:** the option provides a comfortable and attractive option to cyclists. Preference is given to facility types that would be separated from traffic, particularly given the truck and bus traffic volumes expected along the corridor;
- **Continuous and Connected:** the preferred option would provide a continuous, seamless connection to the broader cycling network; and,
- **Feasibility and Cost:** the cycling facility can be accommodated within the existing horizontal bridge clearance and is an affordable solution.

5.1.3 Evaluation Results

The results of the facility type evaluation are shown in Exhibit 5.4. The results indicate that the multi-use path performs best, however the other two options are both viable options.

Exhibit 5.4: Evaluation of Cycling Facility Types Options

Criterion	Option 1: Bike Lanes (Conventional Or Buffered)	Option 2: Multi-Use Path	Option 3: Cycle Track
Appropriate for Road Context	● Appropriate based on OTM Book 18.	● Appropriate based on OTM Book 18.	● Appropriate based on OTM Book 18.
Comfortable and Attractive	◕ Has minimal separation from heavy vehicles which may be unattractive to less experienced cyclists.	● Is separated from traffic. Separated facilities can form part of an all ages and abilities cycling network.	● Is separated from traffic. Separated facilities can form part of an all ages and abilities cycling network.
Continuous and Connected *A multi-use path is planned south of Princess Street.*	◕ Would require a transition at/near Princess Street to connect with the planned multi-use path. Would add time to a trip.	● Can provide a seamless, continuous connection to the path planned south of Barton Street. Would detour around some obstacles (e.g. hydro towers) but the user would not need to transition on or off the pathway. Meets goal of providing pedestrian facilities on the west side.	◑ Would require a vertical transition at/near Princess Street to connect to the planned multi-use path. Would add time to a trip. Necessary to detour around the hydro tower south of Bridge 331.
Feasibility and Cost	● Least expensive option. Feasible primarily within the existing ROW.	◕ More costly than bike lanes; comparable to cycle track. Would require an easement to run within the hydro corridor and for the centre pier of Bridge 332 to shift slightly. Potential property impacts north of Brant Street.	◕ More costly than bike lanes; comparable to cycle track. Would require an easement at some locations (e.g. hydro towers) to fit. Potential property impacts north of Brant Street.
Overall Evaluation	◕ Viable; not selected.	● **Preferred Option.**	◕ Viable; not selected.

5.1.4 Summary of Preferred Cycling Facility Option

Option 2 (Multi-Use Path) was selected as the preferred option as:

- The path will resolve the sidewalk gap on the west side of Birch Avenue;
- While traffic volumes are expected to be fairly low, there will be a mix of large vehicles (e.g. bus and trucks) given that the corridor will be located near the new bus storage facility, is within an industrial area, and is on the truck route network;
- A path on the west side will connect seamlessly to the path planned for south of Princess Street. This will eliminate the need for a transition at Princess Street that would increase delay for cyclists; and,
- It will require an easement to run on some sections of the corridor, but generally fits within the existing right-of-way including under the existing bridges.

5.2 Roadway Clearance

The vertical clearance under the rail bridge structures is below the MTO design standard of 4.8 m[6] (Exhibit 5.5). The low clearance poses a hazard as a tall vehicle could strike a bridge, which could result in prolonged closure of Birch Avenue to vehicle traffic and the rail bridges to freight and passenger traffic. The HSR has indicated that they may consider using double decker buses in the future and the existing roadway clearance could preclude them from accessing the new facility.

Exhibit 5.5: Roadway Clearance at Bridges 330 and 332

Bridge	Existing Clearance		Additional Clearance Required	
	West Span	East Span	West Span	East Span
330	4.1 m	4.2 m	+0.7 m	+0.6 m
332	4.2 m	4.2 m	+0.6 m	+0.6 m

The preferred approach to addressing roadway clearance will have a direct impact on drainage. As discussed in Section 4.2.3, the study area was historically part of the Sherman Inlet (Hamilton Harbour) until the early twentieth century when it was filled. The water table within the study area follows that of the broader Hamilton Harbour/Lake Ontario trends. Historically, Lake Ontario's water table has been at 74.76 m though it fluctuate monthly between 74.53 to 75.06 m on average[7]. In recent years, the water level has been increasing on average, including a record maximum water level in August 2019 of 75.92 m.

The roadway height varies across the study corridor, reaching a low at the Bridge 330 underpass (76.07 m) to a high of 82.08 m approaching Barton Street. This means that on average, the roadway is 1.31 m above the water table at its lowest point. At the record maximum, the water table was approximately 0.15 m below the lowest point of the roadway, putting it at the elevation of the sanitary sewer.

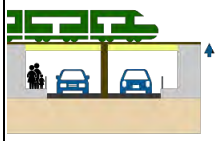
Due to the water table level, any alternative that would lower the roadway would bring the roadway closer to or below the water table. If the roadway was below the water table, near constant pumping would be required at times to remove water. It is therefore necessary to evaluate the roadway clearance options within the scope of this study in order to be able to properly address drainage issues.

[6] MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, June 2017, Section 3.3.5.5, requires 4.8 m for railway bridges over roadways
[7] Great Lakes Environmental Research Laboratory/NOAA

5.2.1 Alternative Options

Five alternative options to address roadway clearance were developed, including the "Do Nothing" option. These are summarized graphically in Exhibit 5.6 and are discussed below.

Exhibit 5.6: Roadway Clearance Alternative Options

Option	1. Do Nothing	2. Raise The Bridge	3. Lower the Road	4. Raise the Bridge & Lower the Road	5. Shallower Bridge Deck
					
Raise Bridge	0.0 m	0.6 / 0.7 m	0.0 m	0.3 / 0.4 m	0.0 m
Lower Road	0.0 m	0.0 m	0.6 / 0.7 m	0.0	0.0 m
Total Clearance	4.1 / 4.2 m	4.8 m	4.8 m	4.8 m	4.1 / 4.2 m

** Drawings are not to scale. For illustrative purposes only.*

5.2.1.1 Option 1: Do Nothing

Description: This option would see both Bridge 330 and 332 replaced with structures that have the substandard clearance.

Discussion: The new structure would face the risk of a vehicle collision with either the superstructure or substructure (depending on the design). This option would not address the clearance issue. Collisions with the structure could disrupt the use of the bridge for extended periods of time until partial or full replacement of the structure could take place.

This option would require pumping to address existing drainage issues at both Bridge 330 and 332.

5.2.1.2 Option 2: Raise the Bridge

Description: The two bridges would be raised 0.6 to 0.7 m to increase roadway vertical clearance.

Discussion: The existing bridge clearances are 4.1 m (Bridge 330) and 4.2 m (Bridge 332). Provision of 4.8 m clearance will require a 0.70 m lift of Bridge 330 and a 0.6 m lift for Bridge 332, with consequential raises in track profiles. If the track is adjusted at 1% approach grade, approximately 100 m of track profiling in each direction will be required. Retaining walls may be required to accommodate the raised tracks, depending on the property limits. There may be impacts to at-grade crossings located east and west of the structures, particularly to the west of Bridge 330 in the Keith residential neighbourhood.

If the option is implemented when the bridge is replaced, adjustments can be made during detailed design. If this is implemented with the existing structure, significant reconstruction works will be required to prepare the abutments for jacking and to provide adequate bearing for the raised super-structure. The work will require track blocks or re-routing/detour to facilitate the lift.

This option would require pumping to address existing drainage issues at both underpasses.

5.2.1.3 Option 3: Lower the Road

Description: Lower the existing roadway between 0.6 to 0.7 m to increase vertical clearance.

Discussion: The existing footings have a cover of 4 feet (1.2 m), which is the minimum required depth to provide frost protection to the footing base. Lowering the roadway grade will result in footing embedment less than 1.2 m and a loss of protection.

If this is implemented when the bridge is replaced, this can be mitigated during detailed design. If the option is implemented before the bridge is replaced, this can be satisfactorily addressed by the installation of insulation within the road-bed to provide protection to the foundation base. The increase in clearance will be limited by the thickness of construction required to include insulation. Further, the width of the roadway will be limited to the width between the footing elements at the foundation level. This will result in lane width reductions, and pier protection may also be required.

As the roadway is lowest at the underpasses, special consideration needs to be given to drainage. Lowering the road will take it closer to the water table, and below the record level.

Pumping will be required and the need will increase the deeper the road is lowered.

5.2.1.4 Option 4: Raise the Bridge and Lower the Road

Description: Raise the bridge by 0.3 m and lower the existing roadway by 0.4/0.5 m to increase clearance

Discussion: This is a combination of Options 2 and 3. The discussion from those two options apply but to a lesser extent.

For lowering the road, the change in elevation will be less than in Option 3, meaning that there will be greater separation from the water table but will still result in increased pumping compared to the ‘Do Nothing’ scenario.

For raising the bridge, the approach tracks will need to be raised but the shorter distance reduces the need for retaining walls and limits impacts to the at-grade crossings to the east and west.

This option would require pumping to address existing drainage issues at both underpasses.

5.2.1.5 Option 5: Replacing the bridge with a shallow-depth structure.

Description: Replace the existing bridge deck with a thinner option. This could free up vertical clearance without having to jack the bridge up or lower the roadway.

Discussion: The existing bridges’ girders plus track ballast height is about 1 m. This is already a very economical design height. The shallow new structure will have similar structural depth to the existing structure. This would include super-structure reconstruction on new abutments giving the flexibility of increased bridge opening (roadway width). It is unlikely that the existing abutments warrant retention under the bridge lifting/jacking option.

Work would require track detours and significant track works similar to the bridge lifting option. This option would require pumping to address existing drainage issues at both underpasses.

5.2.2 Evaluation Methodology and Criteria

The five clearance options were evaluated using a two-stage process:

Step 1: Feasibility Screening: the options were screened to determine if the option i) met the required 4.8 m clearance standard, and ii) if they had other significant impacts that would have adverse impacts to the social, economic, cultural or natural environments. The options that passed the screening advanced to Step 2.

Step 2: Technical Evaluation: the technical evaluation evaluated the feasible alternatives against a set of environmental and technical criteria to determine the preferred solution (Exhibit 5.7). A Drainage and Stormwater Assessment was prepared to inform the evaluation process. A copy of the report is available in Appendix E.

Exhibit 5.7: Roadway Clearance Evaluation Criteria

Criterion	Description
Transportation	
Two-way conversion	Does not preclude Council-approved conversion to two-way traffic.
Active transportation	Enables the installation of two-way active transportation facilities (e.g. cycling, walking) on both sides of the street.
Roadway safety	Travelling through the underpasses is safe for all road users.
Drainage and Construction	
Construction area impacts	The size of the expected construction zone and its impacts.
Pumping requirements	The frequency of pumping required to remove water from the underpasses.
Drainage assessment	Consideration of other drainage requirements not captured in the above criteria (e.g. backwater flow, lake levels).
Natural Environment	
Surface water and aquatic habitat	Disturbance to aquatic habit; change/removal of existing habitat; sedimentation of adjacent water bodies during construction.
Regulated areas	Impacts on floodplains and other regulated lands; approvals required.
Vegetation and vegetation communities	Removal or disturbance of trees/ground flora.
Wildlife and habitat	Reduction or deterioration of wildlife habitat.
Species at risk	Impact to aquatic, terrestrial and flora species at risk.
Social and Cultural	
Cultural heritage impact	Disruption of significant cultural heritage resources.
Archaeological impact	Disruption of identified archaeological sites.
Construction	Impacts to surrounding properties during construction and operations, and impacts to traffic operations during construction.
Consistent with planning policies	Consistent with the City's Urban Hamilton Official Plan, Transportation Master Plan and Water & Wastewater Master Plan.
Property impacts	Impacts to existing properties, including property acquisition.
Economic	
Capital costs	Comparison between order of magnitude capital costs of the options.
Operating costs	Comparison between order of magnitude operating costs of the options.

5.2.3 Evaluation Results

The following section contains the results of the two-step evaluation described in Section 5.2.2.

Step 1: Feasibility Screening Results

The results of the Step 1 evaluation are shown in Exhibit 5.8.

Exhibit 5.8: Results of Step 1: Feasibility Screening

Alternative	Raise Bridge	Lower Bridge	Total Clearance	Infeasible or Major Impact?
1: Do Nothing	0 m	0 m	4.1 m (substandard)	**Yes** – does not address clearance issue. *Removed from consideration.*
2: Raise Bridge	0.7 m	0 m	4.8 m	**Yes** – raising the bridge would have significant impact on rail operations. *Removed from consideration.*
3: Lower Road	0 m	0.7 m	4.8 m	**No – advance to Step 2.**
4: Raise Bridge & Lower Road	0.3 m	0.4 m	4.8 m	**No – advance to Step 2.**
5: Thinner Bridge Deck	0 m	0 m	4.1 m (substandard)	**Yes** – does not address clearance issue. *Removed from consideration.*

As can be observed from the exhibit:

- Option 1 (Do Nothing) and Option 5 (Thinner Bridge Deck) both failed to meet the 4.8 m clearance requirement. As they did not provide the roadway clearance minimum, they *were removed from further consideration*;
- Option 2 (Raise Bridge) met the clearance requirement, however the impact during construction on the broader environment was considered significant enough to *remove it from consideration*. Raising the tracks by 0.7 m would require a prolonged shutdown of the rail corridors during construction which would impact CN Rail and GO Transit operations. As well, the construction footprint would be significant given the need to raise the approach tracks; and,
- Option 3 (Lower Road) and Option 4 (Raise Bridge & Lower Road) both meet the roadway clearance requirement and were found to be feasible with minimal impacts compared to the other options.

Based on the evaluation, Options 3 and 4 advance to Step 2: Technical Evaluation.

Step 2: Technical Evaluation

The evaluation of the road clearance options is provided in Exhibit 5.9. The evaluation shows that both options perform comparably, but Option 4 is preferred.

Exhibit 5.9: Evaluation of Alternative Roadway Clearance Options

Criteria Category	Option 3: Lower The Road	Option 4: Raise Bridge & Lower Road
Transportation • Two-way conversion • Active transportation • Roadway safety	◑ • Does not preclude two-way conversion. • Allows for active transportation facilities to be installed for cyclists and pedestrians. • Grades on the south approach of Bridge 330 would be over 6%, which is steep.	◕ • Does not preclude two-way conversion. • Allows for active transportation facilities to be installed for cyclists and pedestrians. • Roadway grades are comparable for both options.
Drainage and Construction • Construction area impacts • Pumping requirements • Drainage assessment	◑ • Construction area impacts are comparable to Option 4. Limited to previously disturbed lands. • Would require more frequent pumping due to lower roadway. • The option is the least preferred from the assessment as the underpass elevations are below recorded highs in the lake, the exposed sewer depth is high, and it requires a backwater flow preventer.	◕ • Construction area impacts are comparable to Option 3. Limited to previously disturbed lands. • Frequent pumping is lower than Option 3. • The option is the preferred option from the assessment as the underpass elevations are still above lake levels, exposed sewer depth is lesser, and it does not require backwater flow preventer.
Natural Environment • Surface water and aquatic habitat • Regulated areas • Vegetation/vegetation communities • Wildlife and habitat • Species at risk	● • No impacts to surface water or aquatic habitat. • Not within a regulation area. • No impacts to significant wildlife/vegetation. • No species at risk identified in the area.	● • No impacts to surface water or aquatic habitat. • Not within a regulation area. • No impacts to significant wildlife/vegetation. • No species at risk identified in the area.
Social and Cultural • Cultural heritage impact • Archaeological impact • Construction • Consistent with planning policies • Property impacts	◕ • No impacts to cultural heritage resources. • No impacts to archaeology sites. • Direct impacts to area businesses (both bridges) and adjacent residential areas (Bridge 332) during construction (e.g. noise, dust). Comparable to Option 4. • Consistent with the Official Plan and Transportation Master Plan. • No property impacts expected; will require easements during construction.	◕ • Minimal impacts to CN Rail cultural heritage landscape due to track raising. • No impacts to archaeology sites. • Direct impacts to area businesses (both bridges) and adjacent residential areas (Bridge 332) during construction (e.g. noise, dust). Comparable to Option 3. • Consistent with the Official Plan and Transportation Master Plan. • No property impacts expected; will require easements during construction.
Economic • Capital costs • Operating costs	◕ • Lower capital costs; replacement of two bridges already budgeted for. • Higher operating costs.	◑ • Higher capital costs; replacement of two bridges already budgeted for. • Lower operating costs.
Overall Evaluation	◕ Viable; not selected.	◕ **Preferred Option.**

5.2.4 Summary of Evaluation of Roadway Clearance Options

Based on the evaluation of the two roadway clearance options (Exhibit 5.9), it can be observed that both Option 3 and Option 4 perform comparably well. The preference of Option 4 over Option 3 is due to:

- Option 3 has steeper grades approaching the two underpass locations in order to avoid impacting the grading at nearby intersections (i.e. Burlington Street, Princess Street). The steeper grades are undesirable from a roadway safety perspective.
- The lower roadway elevation proposed in Option 3 means that there is potential for more frequent instances of flooding at the underpasses during weather events. This poses undesirable safety risks as well and could impact transit bus operations if the system cannot keep up; and,
- From an economic perspective, Option 4 will have larger capital costs due to the need to adjust the bridge design and associated works with raising the tracks. However, the long-term pumping costs will be lower as the roadway surface will be further from the water table than Option 3, lessening the long-term operational costs.

While both are potentially feasible, the preferred choice is Option 4. It sees the bridge raised 0.3 m and the roadway lowered 0.4 m. The specific adjustments will need to be confirmed during functional and detailed design. It is preferable to limit how much the roadway is lowered by to minimize drainage impacts (i.e. being close to the water table), however the corresponding increase in bridge height can also have significant impacts to the rail corridor.

6 Alterative Solutions and Evaluation Process (EA Phase 2)

As part of Phase 2 of the Class EA process, defining the framework and criteria for evaluating the alternative solutions for the pumping station location is undertaken and reasonable and solutions that can be implemented to address the problem and/or opportunity are identified.

The following sections describe the alternative solutions, evaluation methodology and criteria.

6.1 Alternatives Solutions: Pumping Station Locations

The alternatives to reduce peak flows (Section 6.2) all require at least one pumping station near Bridge 330 (North) or Bridge 332 (South), with the exception of the 'Do Nothing' alternative. The selection of a preferred solution to reduce peak flows will dictate how many pumping stations are required.

Two potential sites for pumping stations in the north (Exhibit 6.1), and three in the south were identified (Exhibit 6.2). These sites generally need to be located in close proximity to the bridge they are pumping at.

Exhibit 6.1: List of Alternative Locations for the North Pumping Station

ID	Location	Approximate Location	Discussion
Bridge 330: North Pumping Station Location Alternatives			
N1	Southwest Corner of Birch Avenue and Burlington Street		The pumping station would be located to the northwest of Bridge 330. The site would be approximately 15 m by 20 m in size. A driveway would be required from Birch Avenue for maintenance staff to access the pumping station. The pumping station would be setback from the road and would require property acquisition from the adjacent parcel. The land is currently manicured lawn and fauna and is approximately 80 m from the business that occupies the land. The site is outside of the hydro corridor.
N2	Southeast Corner of Birch Avenue and Burlington Street		The pumping station would be located in close proximity to Bridge 330. The site would be approximately 15 m by 20 m in size. A driveway would be required from Birch Avenue for maintenance staff to access the pumping station. The site is on City-owned land and contains impacted materials. The site would be outside of the hydro corridor.

Exhibit 6.2: List of Alternative Locations for the South Pumping Station

ID	Location	Approximate Location	Discussion
Bridge 332: South Pumping Station Location Alternatives			
S1	South End of Hydro Corridor		The pumping station would be located to the north-west of Bridge 332, within the hydro corridor. The site would be approximately 12 m by 15 m in size. The site may have minor impacts to the adjacent dog park. The site would require an easement from Hydro One to allow the driveway to be built to access the station by maintenance staff and to construct the building. Hydro One's policy does not allow permanent structures to be built within their corridors.
S2	Birch Avenue Dog Park		The pumping station would be located in the south-east corner of the Birch Avenue dog park. The site would be approximately 12 m by 15 m in size. The site would have direct impacts on the park. It would require an easement for a driveway to be built from Birch Avenue across the hydro corridor to allow maintenance staff to access the station and mitigate further impacts to the park.
S3	Public Works Facility Parking Lot		The pumping station would be located on the parking lot adjacent to the Public Works facility. The site would be approximately 12 m by 15 m in size. The land is owned by the City and is used for parking by staff and visitors to the dog park. The site is outside of the hydro corridor.

6.2 Alternatives Solutions: Flow Reduction Measures Solutions

A number of potential peak flow reduction measures were considered to reduce the underpass pumping rates required to address flooding.

Option 1: Do Nothing

Description: This alternative would maintain the status-quo (i.e. no pumping station).

Discussion: Since this option does not address the drainage issue at the centre of this EA, the existing negative risks remain. If the existing roadway profile and low clearance at the two railway crossing locations are maintained, the existing risk associated with flooding will continue. Depending on the severity of weather events, this may impact transit operations related to the bus facility if a road closure is required to allow the existing infrastructure to drain the roadway.

Option 2: Maintain the Existing Storm Relief Sewer

Description: This alternative would see no changes made to the existing stormwater infrastructure, but would require a pumping station at each of the bridges.

Discussion: Maintaining the existing stormwater infrastructure would mean no additional capacity is added to the sewer system. However, one pumping station would be required at each bridge (two pumping stations total) that would need to handle larger pumping rates than the system can handle in some storm events (280 to 780 litres per second). This option has the largest capital cost to construct the pumping stations and annual operating costs, though it has no costs to construct new or expanded sewer infrastructure.

Option 3. Low Impact Development (LID) Measures

Description: In this alternative, an underground infiltration system is installed upstream of the south and north underpasses underneath the proposed multi-use path in the hydro corridor. The current catch basins upstream of Bridge 332 on the west side of Birch Avenue would be disconnected from the existing storm line and a combination of catch basins and side-inlets would capture major flows conveyed along the west gutter of Birch Avenue.

Discussion: The measure will reduce the amount of major overland flow that enters the underpasses and will reduce the pumping cost. The LID will provide some hydraulic benefits, though it will not alleviate the underpass flooding completely. The design of the storage facility would reduce outflows to an acceptable peak level, and would minimize the impact on the Birch Avenue trunk sewer downstream. However, 15 m of horizontal clearance is required around each Hydro One tower structure to preserve the work zone required for line maintenance and to ensure the geotechnical stability of the towers.

Option 4: Increased Capacity along Existing Storm Sewer Alignment

Description: Upgrade the existing Birch Avenue storm sewer to provide additional hydraulic capacity. This option would include a pumping station at both bridges.

Discussion: The concrete box sewer size can be increased *horizontally* however, this will involve changes to the current road cross-section at the underpasses. The east wall of the sewer forms an integral part of the overhead railway bridge abutments and increasing the width of sewer will result in reduced traffic lane width at the east side of the road.

Due to the physical constraints of the sewer's existing location enlarging the sewer *vertically* was deemed infeasible for the following reasons:

- The average water level in Hamilton Harbour (Lake Ontario) is above the invert of the sewer throughout the majority of the study area. Lowering the sewer will not provide an appreciable increase in sewer capacity; and,
- The sewer is at the road surface from Burlington Street to just north of Bridge 332 and significantly above the low points of the roadway at the underpasses. Providing additional capacity above the existing sewer will not benefit the surface flooding problem.

Option 5: Diversion of Flow to New Sherman Avenue Storm Relief Sewer at Princess Street

Description: This option would involve redirecting a portion of the storm flows to Sherman Avenue to the new storm relief sewer there. A schematic showing the extent of these changes is presented in Exhibit 6.3. This option would require one pumping station located near Bridge 332.

Discussion: Diverting flows to the new Sherman Avenue storm relief sewer would significantly reduce storm sewer flow and overland flow at the two bridges (Exhibit 6.4). The option is considered hydraulically effective and technically feasible.

Exhibit 6.3: Proposed Flow Diversion at Princess Street toward Sherman Avenue

Exhibit 6.4: Storm Sewer Flow Conveyance Improvements

Location	Storm Event	Existing Storm Upgrade Under Birch Avenue			Flow Diversion To New Sherman Avenue Storm Relief Sewer		
		Storm Sewer Flow (m^3/sec)	Overland Flow (m^3/sec)	Depth (m)	Storm Sewer Flow (m^3/sec)	Overland Flow (m^3/sec)	Depth (m)
North Bridge (330)	2-Year	4.42	0.67	0.60	2.39	0.026	0.079
	5-Year	4.50	1.74	0.97	2.89	1.57	0.635
South Bridge (332)	2-Year	4.78	0.21	0.47	0.72	0.00	0.015
	5-Year	5.82	0.30	0.53	0.97	0.00	0.057

6.3 Evaluation Process and Criteria

A two-step evaluation option was used to assess and evaluation the location of pumping stations. The alternatives listed in Section 6.1 and Section 6.2 went through a process similar to that of the roadway clearance options (Section 5.2):

Step 1: Feasibility Screening: the options were screened to eliminate alternatives and locations that are not technically feasible or would have significant impacts.

Step 2: Technical Evaluation: the technical evaluation assessed the feasible alternatives against a set of environmental and technical criteria to determine the preferred solution (Exhibit 5.7).

Exhibit 6.5: Pumping Station Location Evaluation Criteria

Criterion	Description
Drainage (Flow Reduction Measures Alternatives)	
Outlet to arbour	Can the existing outlet to the harbour be used?
Hydraulic modelling results	Relative level of pumping capacity.
Constructability	Required modifications to existing infrastructure and utilities.
Secondary benefits	Other benefits to the sewer system within the study area and beyond.
Economic	
Capital costs	Initial costs for construction.
Operating costs	Expected operation and maintenance costs, including pump/electric costs.
Natural Environment	
Surface water and aquatic habitat	Disturbance to aquatic habit; change/removal of existing habitat; sedimentation of adjacent water bodies during construction.
Regulated areas	Impacts on floodplains and other regulated lands; approvals required.
Vegetation and vegetation communities	Removal or disturbance of trees/ground flora.
Wildlife and habitat	Reduction or deterioration of wildlife habitat.
Species at risk	Impact to aquatic, terrestrial and flora species at risk.
Social and Cultural	
Cultural heritage impact	Disruption of significant cultural heritage resources.
Archaeological impact	Disruption of identified archaeological sites.
Construction	Impacts to surrounding properties during construction and operations, and impacts to traffic operations during construction.
Consistent with planning policies	Consistent with the City's Urban Hamilton Official Plan, Transportation Master Plan and Water & Wastewater Master Plan.
Property impacts	Impacts to existing properties, including property acquisition.
Noise	Impacts of construction and operating noise on sensitive receptors.
Air quality	Impacts of construction and operating air quality on sensitive receptors.

7 Evaluation of Alternative Solutions

The following section contains the results of the evaluation of alternatives.

7.1 Evaluation Results: Pumping Station Locations

The following section contains the results of the two-step evaluation for the preferred flow reduction measure solution listed in Section 6.2.

7.1.1 Step 1: Feasibility Screening Results

The results of the Step 1 evaluation are shown in Exhibit 7.3. The results indicate that:

- N2 is not feasible as the impacted material at the location poses a potential risk; and,
- S1 is not feasible as Hydro One does not permit the construction of permanent structures within their corridors. This precludes any part of the hydro corridor being used for a pumping station.

Based on the evaluation, Options 2, 4 and 5 advanced to Step 2: Technical Evaluation.

Exhibit 7.1: Results of Step 1: Feasibility Screening

Pumping Station Location	Infeasible or Major Impact?
North Pumping Station	
N1: Southwest Corner of Birch Avenue and Burlington Street	**No – advance to Step 2.**
N2: Southeast Corner of Birch Avenue and Burlington Street	Yes – impacted materials at the site is a significant risk to constructing a pumping station. *Removed from consideration.*
South Pumping Station	
S1: Southern End of Hydro Corridor	Yes – Hydro One does not permit the construction of permanent structures within their corridors. *Removed from consideration.*
S2: Dog Park	**No – advance to Step 2.**
S3: Parking Lot	**No – advance to Step 2.**

7.1.2 Step 2: Technical Evaluation

The technical evaluation results are shown in Exhibit 7.4. Two preferred locations are required: one at Bridge 330 (North) and one at Bridge 332 (South).

Exhibit 7.2: Evaluation of Alternative Pumping Station Locations

Criteria Category	N2: Southwest Corner of Birch Avenue and Burlington Street Intersection	S2: Birch Avenue Dog Park	S3: Public Works Facility Parking Lot
Economic • Capital cost • Operating cost	◑ • Would require acquiring property at 680 Burlington Street East. • Maintenance costs would be comparable to the other locations.	◕ • No land acquisition is required. Remediation of the lands may be required. • Maintenance costs would be comparable to the other locations.	● • No land acquisition is required. • Maintenance costs would be comparable to the other locations.
Natural Environment • Surface water and aquatic habitat • Regulated areas • Vegetation and vegetation communities • Wildlife and habitat • Species at risk • Noise • Air quality	◕ • No impacts to surface water or aquatic habitat. • Located outside of regulated areas, but is in close proximity to lands regulated by the Hamilton Conservation Authority. • Potential impact to the tree canopy, however this may be mitigated during detailed design. • Minimal impact to manicured lawns. • No impacts to significant wildlife/vegetation communities. • No species at risk identified in the area. • Minimal noise and air quality impact on nearby sensitive receptors; site is setback from nearby businesses.	◑ • No impacts to surface water or aquatic habitat. • Not within a regulated area. • Moderate impact to tree canopy due to construction of the station and access road. • Access road would have minimal impacts on CUM1-1 vegetation community. • No impacts to significant wildlife/vegetation. • No species at risk identified in the area. • Moderate noise and air quality impact on nearby sensitive receptors; site is in a park and close to a residential area.	● • No impacts to surface water or aquatic habitat. • Not within a regulated area. • No impacts to significant wildlife/vegetation communities. • No species at risk identified in the area. • Moderate noise and air quality impact on nearby sensitive receptors; site is near park and close to a City facility.
Social and Cultural • Cultural heritage impact • Archaeological impact • Construction • Property impacts	◕ • Minimal impact to cultural heritage resources. Would require driveway to travel across the former Hamilton Electric Radial corridor. • No impacts to archaeological sites. • Construction may require temporary lane closures at/near the intersection. • Property would be required from 680 Burlington Street East. The polygon of land required is vacant and a significant distance from the rest of the business's operations.	◑ • Minimal impact to cultural heritage resources. Would require driveway to travel across the former Hamilton Electric Radial corridor. • No impacts to archaeological sites. • Construction may require closing all or part of the dog park for a period of time. • Would require reallocating space in the City-owned Dog Park. Given the limited amount of park space in the study area, this would have a significant impact on the local community.	◑ • No impacts to cultural heritage resources. • No impacts to archaeological sites. • Construction may require closing all of part of the parking lot and may impact access into the Public Works Facility. • City-owned property; minimal impacts are anticipated. Additional parking may be required elsewhere at the Public Works Facility to offset the loss.
Overall Evaluation	◕ **Preferred North Location.**	◑ Viable location; not selected.	◕ **Preferred South Location.**

7.1.3 Summary of Evaluation of Pumping Station Locations

Based on the evaluation of the alternatives, the preferred pumping station locations are N2 (southwest corner of Birch Avenue and Burlington Street intersection) and S3 (Public Works Facility parking). The third site S2 (Birch Avenue Dog Park), is a viable location. However, due to the social impact of reallocating park space, it is not the preferred location but can be considered should S3 not prove to be viable.

Per the discussion in Section 6.2, two of the flow reduction alternatives require less than two stations pumping:

- Option 1 (Do Nothing) requires no pumping stations; and,
- Option 4 (Diversion of Flow via Princess Street) requires one station in the north.

While the results above indicates that N2 and S3 are the preferred locations, the flow reduction evaluation must be completed before the need for both, one or neither pumping station can be confirm. This will be completed in the next section.

7.2 Evaluation Results: Flow Reduction Measures Solutions

The following section contains the results of the two-step evaluation for the preferred flow reduction measure solution listed in section 6.2.

7.2.1 Step 1: Feasibility Screening Results

The results of the Step 1 evaluation is shown in Exhibit 7.3. As can be observed:

- Option 1 it failed to address the drainage issue that is at the core of this EA. It was removed from consideration; and,
- Option 3 is not feasible as the alternative cannot be constructed and still comply with Hydro One's 15 m tower buffer zone. It was removed from consideration;

Based on the evaluation, Alternatives 2, 4 and 5 advanced to Step 2: Technical Evaluation.

Exhibit 7.3: Results of Step 1: Feasibility Screening

Alternative	Infeasible or Major Impact?
1: Do Nothing	**Yes** – does not address drainage issues along the corridor. *Remove from consideration.*
2: Maintain Existing Storm Relief System	**No – advance to Step 2.**
3: Low Impact Development Measures	**Yes** – Hydro One requires a 15 buffer zone around hydro corridors. The construction of a storm relief line/ infiltration chambers within this hydro corridor is not feasible. *Remove from consideration.*
4: Increase Capacity Along Existing Alignment	**No – advance to Step 2.**
5: Diversion to new Sherman Avenue Storm Relief Sewer at Princess Street	**No – advance to Step 2.**

7.2.2 Step 2: Technical Evaluation

The evaluation of flow reduction measures is provided in Exhibit 7.4.

Exhibit 7.4: Evaluation of Alternative Flow Reduction Measures

Criteria Category	Option 2: Maintain Existing Storm Relief System	Option 4: Increase Capacity Along Existing Alignment	Option 5: Diversion to Sherman Storm Relief Sewer at Princess Street
Drainage Remedial Measures • Number of pumping stations required • Outlet to harbour • Hydraulic modelling results • Constructability • Secondary benefits	◑ • Requires two pumping stations (one north, one south). • Can use existing outlet to the Harbour. • Has high pumping rates (280 litres per second and 780 litres per second). • No secondary benefits.	◑ • Requires two pumping stations (one north, one south). • Can use existing outlet to the Harbour. • Provides 5-year level of service to Birch Avenue. • Reduces pumping at underpasses.	◕ • Requires one pumping station (north). • Requires new outlet to the harbour. • Benefits study area but does not provide 5-year level of service due to additional flows from upstream areas. • Reduces pumping at underpasses. • Provides relief to upstream areas. • Force main to pumping station can be turned into gravity sewer.
Economic • Capital cost – stormwater • Capital cost – pumping • Annual operating cost – Pumping	◕ • No capital cost to change stormwater system (uses existing infrastructure). • Cost to construct two pumping stations is $8,938,000. • Estimated annual operating costs of $217,500.	◑ • $6,000,000 capital cost to construct upgrade 2.4 m by 1.8 m relief sewer (~810 m). • Cost to construct two pumping stations is $7,950,000. • Estimated annual operating costs of $191,000.	◕ • $5,300,000 to construct the 1.8 x by 1.8 m Princess Street diversion (~ 1 km). • Cost to construct one pumping station is $4,400,000. • Estimate annual operating costs of $92,000.
Natural Environment • Surface water and aquatic habitat • Regulated areas • Vegetation and vegetation communities • Wildlife and habitat • Species at risk • Noise • Air quality	● • No impacts to surface water or aquatic habitat. • Not within a regulation area. • No impacts to significant wildlife/vegetation. • No species at risk identified in the area.	◕ • No impacts to surface water or aquatic habitat. • Not within a regulation area. • Possible impacts to trees located on the east side of Birch Avenue to provide for the wider sewers. • No species at risk identified in the area.	◕ • No impacts to surface water or aquatic habitat. • Additional outlet would be within the Hamilton Conservation Authority regulated areas. • No impacts to significant wildlife/vegetation. • No species at risk identified in the area.
Social and Cultural • Cultural heritage impact • Archaeological impact • Construction • Property impacts	◑ • No impacts to cultural heritage resources. • No impacts to archaeological sites. • No impacts during construction. • Property will be required for two pumping stations. Would impact either the dog park or parking at the Public Works Facility.	◑ • No impacts to cultural heritage resources. • No impacts to archaeological sites. • Lane closures and/or road closures likely along Birch Avenue in order to allow for construction of the upgrade sewer. • Property will be required for two pumping stations. Would impact either the dog park or parking at the Public Works Facility.	◕ • No impacts to cultural heritage resources. Mitigation may be required to the building located at 241 Gibson. • No impacts to archaeological sites. • Lane closures and/or road closures likely along Princess Street in order to allow for construction of the diversion. • Property only required for one pumping station to the north. Removes impact associated with south station (e.g. dog park).
Overall Evaluation	◑ Viable; not selected.	◑ Viable; not selected.	◕ **Preferred Solution**

7.2.3 Summary of Evaluation of Flow Reduction Measures

Based on the analysis of the alternatives, the preferred solution is Option 5 (Diversion to Sherman Avenue Relief Sewer at Princess Street). The other two alternatives are both viable but do not perform as well as Option 5. As Option 5 only requires one pumping station (at the north), the preferred location is site N2.

8 Preferred Alternative Solution

8.1 Description of the Preferred Alternative

Pumping Station Layout

The proposed equipment layout for the north pumping station is shown in Exhibit 8.2. As can be observed in the drawing, the following features will be provided:

- A cast in place concrete wet pit/well. It will measure 8 m by 4 m;
- Two access hatches for access inside the pit, complete with access ladders and safety platforms. A separate smaller access hatch will be provided for floats access;
- Three submersible pumps (one on stand-by) will each pump the storm water in the vicinity of the lake at the proposed location. Pumps will have a control panel, floats and SS guide rails. Discharge piping from each pump will be tied to a common header inside the station. Alarms for pump failure and high water level inside the pit will be sent to a supervisory control and data acquisition (SCADA) system;
- For pump maintenance an appropriate monorail/hoist will be provided; and,
- The wet well will be located below grade level and is sized to provide adequate storage of stormwater between pump starts. The surface area of each wet well measures is provided in Exhibit 8.1.

Exhibit 8.1: Pumping Station Details

Pumping Station	Location	Flow Rate (lps)	Pump Type	Wet Well	Pumping Station Size	Comment
North Station (Bridge 330)	Southwest quadrant of Birch/Burlington intersection	43	XFP151E-CB2-60HZ	8 m x 4 m	11 m x 8 m	Combined pumping flow will be 69 lps
South Station (Bridge 332)	Not required.	N/A	N/A	N/A	N/A	

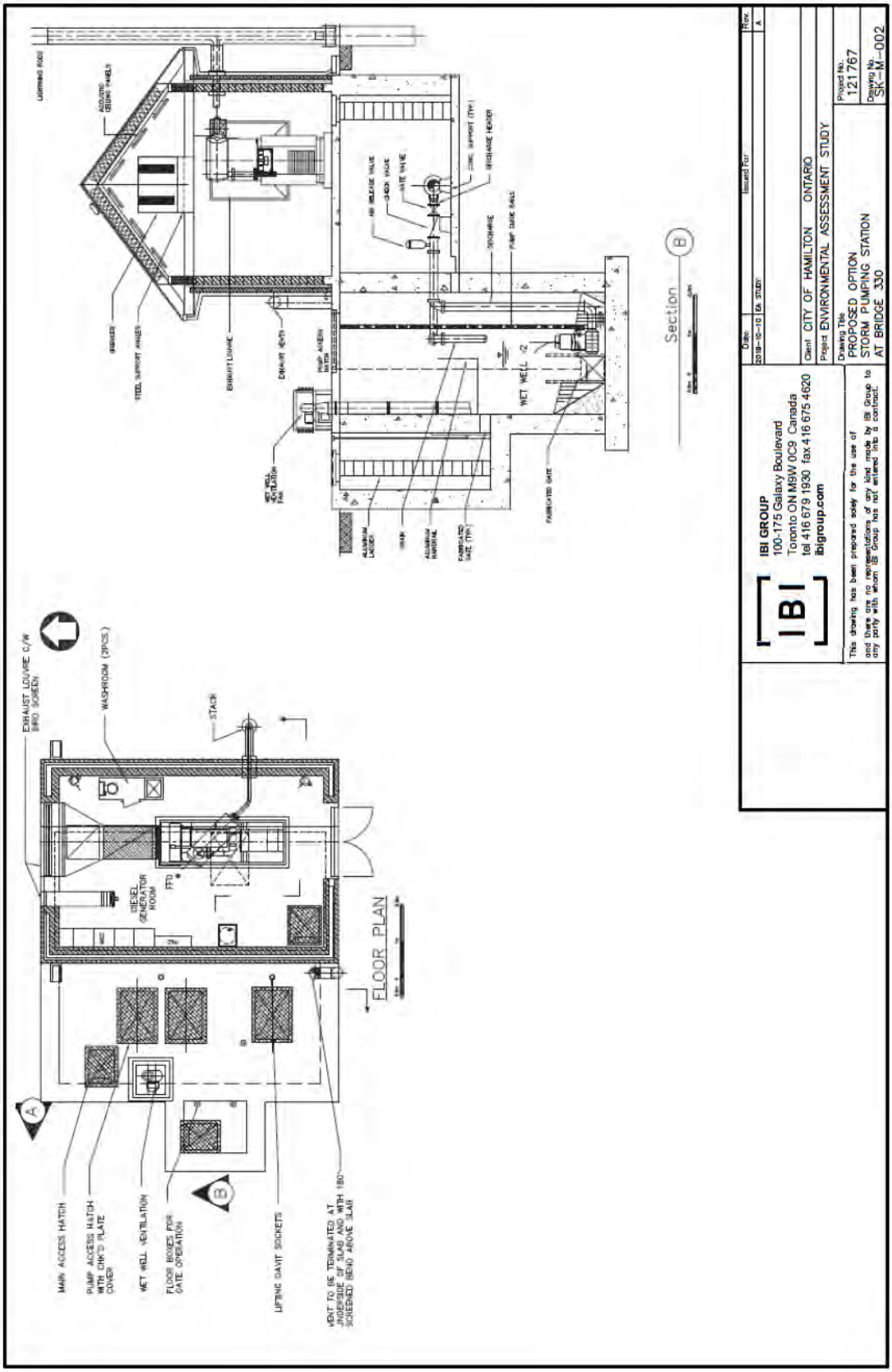
Heating and Ventilation System

The ventilation rate for the pumping station will be at four air changes per hour. Fresh air intake louvres and an exhaust fan will be interlocked and controlled by room thermostat to maintain 38°C maximum temperature inside the space. Heating will be provided by two electric unit heaters in order to maintain pumping station temperature above 9°C (adjustable). Temperature inside the pumping station will be monitored. Low and high temperature alarms will be connected to a SCADA system.

General

Piping and valves will be labelled and tagged.

Exhibit 8.2: Pumping Station Equipment Layout (Combined Station)



Generator Area and Noise Control

The control room will house a diesel generator to provide back-up power in the event of interruption of providing power supply. Fresh air will be provided to the room via a louvre and a damper combination. Although the station is in an industrial area and involves stormwater pumping, the provision for odour control of the wet well exhaust will be considered in detailed design. The generator sizing is provided in Exhibit 8.3.

Exhibit 8.3: Generator Sizing Details

Pump Flow (Litre/Sec)	Pump Type	Generator Sizing		Cost
		HP	Alternator (kW)	
235	SULZER XFP306M-CB260HZ-235lps	250	600	$155,000
381	SULZER XFP301M-CH260HZ_381lps	400	800	$380,00
780	XFP_400M-CH2__60_HZ 780lps 20ft head	350	800	$250,000
180	XFP_300_J_CH2_60HZ_180lps 20ft	50	125	$70,000
580	XFP_351M-CH3__60_HZ_580 20ft	400	800	$380,000
26	XFP_80C_CB1_60HZ_(wet_pit) 26lps 20ft	-	-	-
43	XFP150G_CP_60HZ_(wet_pit_dry_pit) 43lps 6m 20ft	-	-	-
69	XFP151E_CB2_60HZ_(wet_pit) 69lps 20ft	20	50	$45,000

Dewatering Costs

Based on preliminary estimates, the dewatering costs may vary from $50,000 to $65,000 depending on the location. The City should budget for $55,000 in dewatering costs. This cost estimate should be confirmed during detailed design. A summary of the dewatering cost estimates is shown in Exhibit 8.4. A full cost breakdown is available in Appendix E.

Exhibit 8.4: Summary of Dewatering Costs

Item	Cost
Labour	$20,700
Materials & Equipment	$23,332
Subtotal: Labour, Materials & Equipment	**$44,032**
General Contractor & Indirect Costs (15%)	$6,605
Escalation (10%)	$4,403
Total Cost	**$55,040**

8.2 Approvals

8.2.1 City of Hamilton

Building and development site plan approvals will be required for the pumping station that is not located on road allowances.

8.2.2 Ministry of Environment, Conservation and Parks

Environmental Compliance or Certificate of Approval related to air quality and noise will be required.

8.2.3 Hamilton Conservation Authority

Pending detailed design, the location of the pumping station will be in close proximity to the Hamilton Conservation Authority's regulated area of Hamilton Harbour. Should the facility be located within the area, a permit will be required.

8.2.4 CN Rail

CN Rail operates spurline (Bridge 330) and mainline operations (Bridge 332) through the corridor. They should be consulted on the proposed Roadway Clearance alternatives and involved during planning for construction staging.

8.2.5 Hydro One

Approval of the design will be required for works that are planned within the hydro corridor. This will include an easement for the access driveway to the pumping station and the multi-use path along the west side of the road.

8.2.6 Ministry of Heritage, Sport, Tourism, and Culture Industries

Removal of Bridge 331 will require the completion of the Documentation and Salvage Report, which will need to be submitted to the Ministry for approval.

9 Impacts, Mitigation Measures and Commitments

9.1 Social and Economic

9.1.1 Property Impacts

Based on the preliminary site layout provided in Appendix A, up to three parcels of land may be required:

- A parcel approximately 280 m^2 in size from the west side of the property located at 237 Birch Street;
- A parcel approximately 800 m^2 in size from the east side of the property located at 171 Brant Street; and,
- A parcel approximately 1,200 m2 in size from the east side of the property located at 680 Burlington Street East.

Exact property requirements will be confirmed during detailed design. Easements will be required from Hydro One to permit sections of the multi-use path to be constructed, for construction staging and to potentially provide driveway access to the pumping station. Temporary grading easements may also be required from other property owners during construction and shall be arranged with the appropriate owner.

9.1.2 Future Traffic Operations

The Transportation Assessment analyzed traffic conditions for in 2031, which reflects the City's travel demand forecasting model year. The assessment considers two-way traffic on Birch Avenue from Burlington Street to Wilson Street, and assumes that the bus facility is fully built-out. The assessment was conducted following the City of Hamilton's Traffic Impact Study guidelines, in consultation with City staff.

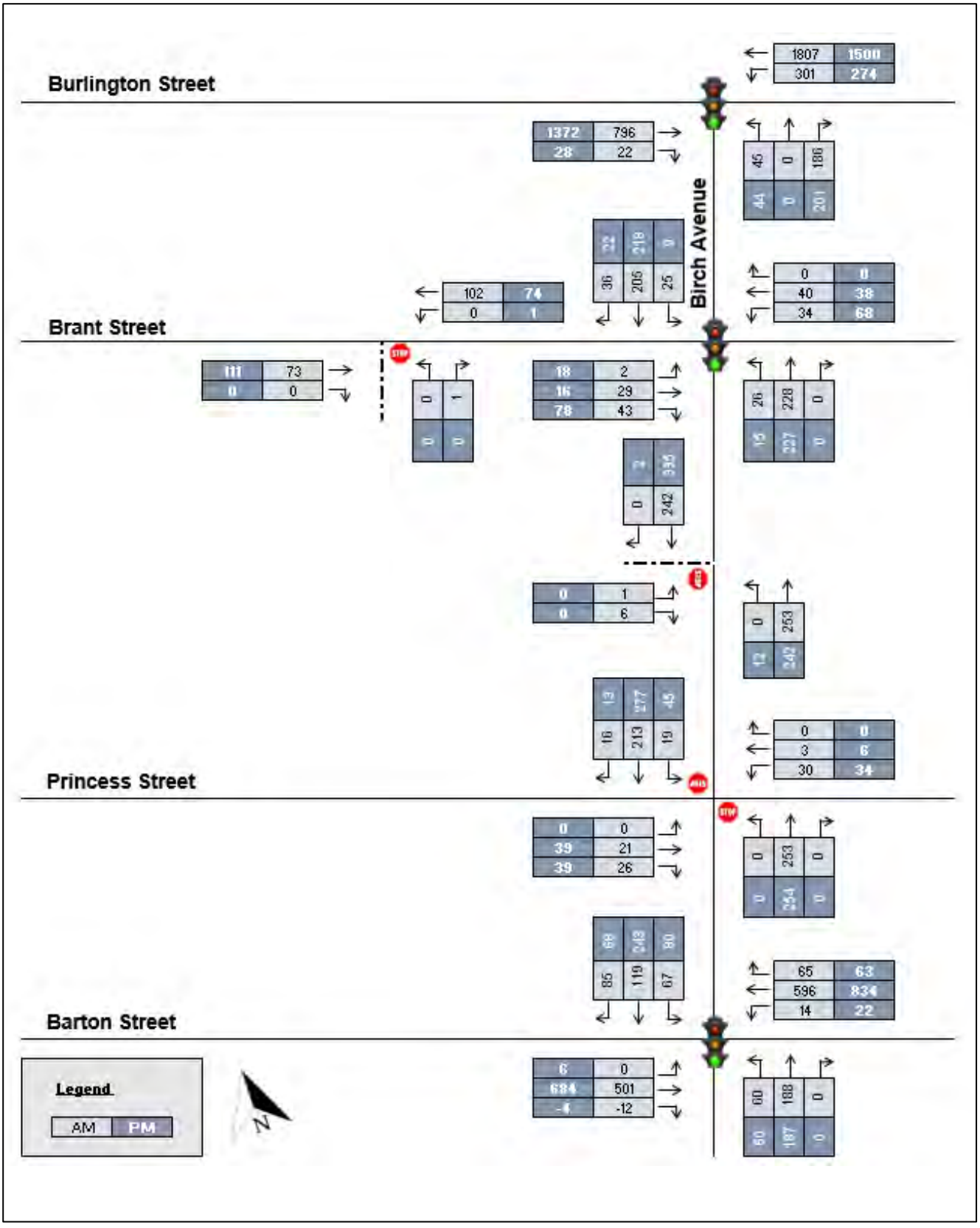
Traffic Volumes (2031)

Future year traffic volumes were forecasted using two sources:

- The City's EMME travel demand model was applied to estimate growth and the effects of conversion to two-way traffic will have on travel patterns; and,
- The *Hamilton Transit Bus Maintenance and Storage Facility Traffic Impact Study* (Draft) analyzed traffic operations for the proposed facility. It includes both bus and employee related trips. As trips to and from the facility will primarily occur outside of the p.m. and a.m. peak periods, the volume of trips during the peak is relatively low.

The forecast of total future traffic volumes in 2031 is shown in Exhibit 9.1

Exhibit 9.1: Future 2031 Two-Way Traffic Volumes



Traffic Operations (2031)

The initial lane configuration for two-way traffic was taken from the City of Hamilton's proposed pavement marking plan. The lane configuration includes the following:

- Reduction of westbound left at Burlington Street from double-left turn to single;
- Shared left, through, and right turning lanes for all approaches at Birch Avenue and Brant Street; and,
- Shared left, through, and right turning lanes for all approaches at Birch Avenue and Princess Street.
- Dedicated left-turning and shared through-right turning lanes for the northbound and southbound approach at Birch Avenue and Barton Street.

For the 2031 horizon year (Exhibit 9.3, next page), all study intersections will continue to operate well with no critical movements or capacity concerns compared to existing conditions:

- The study area performs well with all intersections having at a level-of-service of C or greater, and all movements are below capacity;
- The bus facility access is expected to operate well, with expected general free-flow conditions during both peak periods; and,
- Delays at Birch Avenue and Barton Street, and Birch Avenue and Burlington Street increase marginally due to the introduction of northbound movements. However, both intersections continue to perform well overall.

Overall, the network is still performing well with no movements operating past capacity at any of the study intersections indicating stable traffic conditions without significant delay. The full study is available in Appendix D.

Mitigation Measures

A signal warrants analysis and lane requirements review was completed using the 2031 operations output. The recommended measures by intersection location is summarized in Exhibit 9.2. These have been incorporated into the draft roll plan available in Appendix A.

Exhibit 9.2: Signal Warrants and Lane Requirements

Birch Avenue Intersecting	Signalized	Signal Warranted	Lane Requirements	Lane Constraints
Burlington Street	Yes	Yes	Reduction to a single WBL lane Preferably a NBL: 30 m Storage	Hydro tower
Brant Street	Yes	No, but are needed due to sight line concerns	Provide if space permits	
Bus Facility Access	No	No	NBL: 30 m Storage	May require relocation of hydro tower south of Bridge 330
Princess Street	No	No	SBL: 15 m Storage Opposing NBL	Possible constructability issues due to hydro on west side
Barton Street	Yes	Yes	SBL: 45 m Storage NBL: 20 m Storage	

Exhibit 9.3: Future 2031 Two-Way Traffic Analysis (All Movements) Summary

Intersection Name	Overall LOS	All Movements			
		Mvmt	LOS	V/C Ratio	95th Percentile Queue (m)
AM Peak					
Birch Avenue & Burlington Street East ***(Signalized)***	C	EBT	B	0.43	46
		WBL	E	0.95	116
		WBT	A	0.55	48
		NBL	C	0.28	20
		NBR	C	0.3	58
Birch Avenue & Brant Street ***(Signalized)***	B	EBT	B	0.1	12
		WBT	B	0.12	16
		NBT	C	0.45	62
		SBT	B	0.5	65
Birch Avenue & Bus Facility Access **(Unsignalized)**	-	EBL	B	0	0
		EBR	B	0.02	1
		NBL	A	0	0
		NBT	A	0	0
		SBTR	A	0.19	0
Birch Avenue & Princess Street ***(Unsignalized)***	-	EB	B	0.11	3
		WB	C	0.13	3
		NB	-	0	0
		SB	-	0.02	0
Birch Avenue & Barton Street East ***(Signalized)***	B	EBT	B	0.48	52
		WBL	B	0.26	17
		WBT	B	0.48	57
		NBL	B	0.12	12
		NBT	C	0.41	56
		SBTL	B	0.51	31
		SBR	A	0.07	-
PM Peak					
Birch Avenue & Burlington Street East ***(Signalized)***	C	EBT	C	0.73	93
		WBL	E	0.87	104
		WBT	A	0.46	36
		NBL	C	0.37	23
		NBR	C	0.57	85
Birch Avenue & Brant Street ***(Signalized)***	B	EBT	B	0.12	14
		WBT	B	0.19	22
		NBT	C	0.55	79
		SBT	B	0.46	67
Birch Avenue & Bus Facility Access **(Unsignalized)**	-	EBL	-	0	0
		EBR	-	0	1
		NBL	A	0.01	1
		NBT	A	0.02	1
		SBTR	A	0.25	0
Birch Avenue & Princess Street ***(Unsignalized)***	-	EB	C	0.26	8
		WB	C	0.24	7
		NB	-	0	0
		SB	-	0.04	1
Birch Avenue & Barton Street East ***(Signalized)***	C	EBT	C	0.67	77
		WBL	C	0.44	23
		WBT	C	0.66	86
		NBL	B	0.20	14
		NBT	C	0.58	83
		SBTL	D	0.90	114
		SBR	A	0.06	4

9.1.3 Noise

During construction, the City of Hamilton's By-Law No. 11-285 Noise Control By-Law governs when a permit may or may not be required during construction. Generally, noise impacts during construction can be mitigated by working during day time hours.

Noise resulting from pumping station equipment will be considered during detailed design. A Ministry of Environment, Conservation and Parks Environmental Compliance Approval or Certificate will be required.

9.1.4 Dust and Vibrations

Dust generated during construction can be mitigated by following industry best practices. Dust suppression techniques such as using water or calcium chloride to minimize particles should be identified prior to construction and be incorporated into tender documents.

Vibrations from construction should be monitored and compared against industry standards. As will be discussed in Section 9.2.1, should construction take place within 15 m of an identified cultural heritage resource, then the impacts of the vibrations should be investigated through an engineering assessment and any necessary mitigation measures should be implemented prior to construction.

9.1.5 Public Notifications

Residents, businesses and property owners within the construction area will receive notification letters prior to the start of construction activities. Signage informing the public of the ongoing construction works will be posted at the site, and will include a project contact to handle inquiries during construction.

9.2 Cultural Environment

9.2.1 Cultural Heritage

The Cultural Heritage Resource Assessment considered the potential impacts of the proposed works. Those resources where a direct or indirect impact have been identified or there is potential for, are summarized in Exhibit 9.4.

The full report is available in Appendix C.

Exhibit 9.4: Cultural Heritage Resources and Mitigation Strategies for sites with an impact or potential impact

Location/ Name	Direct Impact	Indirect Impact	Mitigation Measures
594 Barton Street East / Former Gibson School	No	Potential	No direct impacts are anticipated. Since the building sits close to the Birch Avenue study area limit, construction should be planned at a distance as far away as possible. If heavy construction is to be within 15 m, the impacts of the vibrations should be investigated through an engineering assessment and any necessary mitigation measures should be implemented prior to construction.
Bridge 330	Yes	Yes	No further work required. A CHER completed in 2017 did not find the bridge to have significant cultural heritage value or interest. A Heritage Impact Assessment is not warranted.
Bridge 331	Yes	Yes	A CHER completed in 2017 found the bridge to have cultural heritage value or interest. A Cultural Heritage Documentation Report will be completed prior to removing the bridge.

Location/ Name	Direct Impact	Indirect Impact	Mitigation Measures
Bridge 332	Yes	Yes	No further work required. A CHER completed in 2017 did not find the bridge to have significant cultural heritage value or interest. A Heritage Impact Assessment is not warranted.
651 Burlington Street East / Deering Harvester Building	No	Potential	No direct impacts are anticipated. Since the building sits close to the Birch Avenue study area limit, construction should be planned at a distance as far away as possible. If heavy construction is to be within 15 m, the impacts of the vibrations should be investigated through an engineering assessment and any necessary mitigation measures should be implemented prior to construction.
597-583 Barton Street East	No	Potential	No direct impacts are anticipated. Since the landscape sits close to the Birch Avenue study area limit, construction should be planned at a distance as far away as possible. If heavy construction is to be within 15 m, the impacts of the vibrations should be investigated through an engineering assessment and any necessary mitigation measures should be implemented prior to construction.
Former Hamilton Radial Electric (HRER) Corridor	Yes	Yes	No further work required. Use of the former HRER corridor for transportation purposes can be considered adaptive (sympathetic) reuse.

9.2.2 Archaeology

As discussed in Section 4.2.3, a Stage 1 Archaeology Assessment was completed. Based on the findings in the report, it is recommended that no further archaeological studies be completed.

The report is in draft form and has been submitted to the Ministry of Heritage, Sport, Tourism and Culture Industries for review. The report is currently pending entry into the Ontario Public Register of Archaeological Reports and, once accepted, will be confirmed to have satisfied the Ministry's standards.

Should artifacts or remains be found on the site during construction, work will stop and a licensed archaeologist will be retained to examine the findings and determine their significance in accordance with provincial legislation.

9.3 Natural Environment

9.3.1 Fisheries

There is no fish or fish habitat located in the study area.

Appropriate erosion and sedimentation control measures will be installed and maintained during construction. Silt fence will be installed around the work area and catch basins will be protected from sedimentation.

9.3.2 Vegetation

The planned improvements have the potential to impact vegetation and vegetation communities. Effects on vegetation related to the proposed road improvements could include:

- Displacement of and/or disturbance to vegetation and vegetation communities; and,

- Displacement of and/or disturbance to Rare, Threatened or Endangered Vegetation and Vegetation Communities.

Clearing of vegetation will be required to accommodate the proposed road and drainage improvements to Birch Avenue. Overall, disturbance to vegetation communities as a result of the proposed improvements are considered to be minor since the majority of vegetation located adjacent to the Birch Avenue right-of-way have been previously disturbed by the existing roadway and surrounding land-uses.

With respect to trees:

- 23 trees have been recommended for removal as a result of the proposed works. These include trees within the proposed grading limits and those trees outside of the grading limits where the amount of critical root zone that will be removed will likely cause significant and irreversible decline of the health of the tree;
- 39 trees have been identified for retention but minor encroachment into the minimum tree protection zone (TPZ) will occur. These trees will likely require root and/or canopy pruning; and,
- 50 trees are identified for retention.

To mitigate impacts, tree protection fencing will be installed. The contract administrator will be required to review and approve the fencing prior to the commencement of any grading work and the fencing will be maintained until all construction is complete.

In addition, in an effort to compensate for trees and other vegetation removed, and to enhance the aesthetics of the works and reduce any potential visually intrusive effects, streetscaping may be provided, as appropriate, in accordance with the City of Hamilton Street Tree Planting Policy.

9.3.3 Wildlife

The proposed works will result in minimal impact to wildlife and wildlife habitat. Impacts such as temporary disturbance or displacement of habitat resulting from construction will not have any significant effects on wildlife. No impacts to species at risk are anticipated as a result of the proposed works.

To minimize potential impacts to wildlife:

- Before removal of bridge structures, an inspection should be completed to screen for any Barn Swallow nests;
- As a precaution to protect bats, it is recommended that no tree removal occur between April 1 and September 30, of a given year; and,
- Tree clearing shall not be conducted during the Migratory Bird Convention Act (MBCA) breeding season commonly considered April 1 to August 31, unless under appropriate permitting.

10 Refinements for Detailed Design

The following refinements should be explored during detailed design.

10.1 Active Transportation and Roadway Design

Birch Avenue at Burlington Street Intersection

Installing a north-south pedestrian crossing at Burlington Street requires further refinement during detail design. This needs to be done in coordination with the design of the new northbound left-turn movement and with consideration given to future cycling facilities identified in the Cycling Master Plan for Burlington Street. It is not known at this time what cycling facilities will be installed on Burlington Street in the future. A cross-ride should be considered at the intersection if there is potential for a cycling facility on the north-side of Burlington Street.

Multi-Use Path north of Brant Street

Two options have been developed for the multi-use path north of Brant Street that both involve acquiring property. These options should be explored further during detail design and discussion with both property owners should be undertaken to determine a willingness to sell.

The first involves the path going between the hydro tower and roadway. This requires the roadway to shift to the east and will require a small portion of land from the property located at 237 Brant Street. This will require that the sewer (located under the sidewalk) to be rebuilt. The second option involves taking the multi-use path behind the hydro tower, which will require property from the industrial property at 171 Brant Street. This removes the impact from the sewers on the east side of the road, however this property is used to store materials outdoors and it is not known if there may be contaminants present.

Birch Avenue at Princess Street

The hydro tower at the south-west corner of this intersection results in the multi-use trail crossing being offset from the intersection. This creates a situation where the stop bar for eastbound traffic has to stop back from the intersection. The building at the northwest corner of the intersection limits views of traffic on the northern leg of the intersection. This should be examined in further detail during detailed design. The City should consider purchasing the building at 33 Princess Street to address potential sightline issues. This site could also be useful for construction stage of Bridge 332.

Birch Avenue at Barton Street Intersection

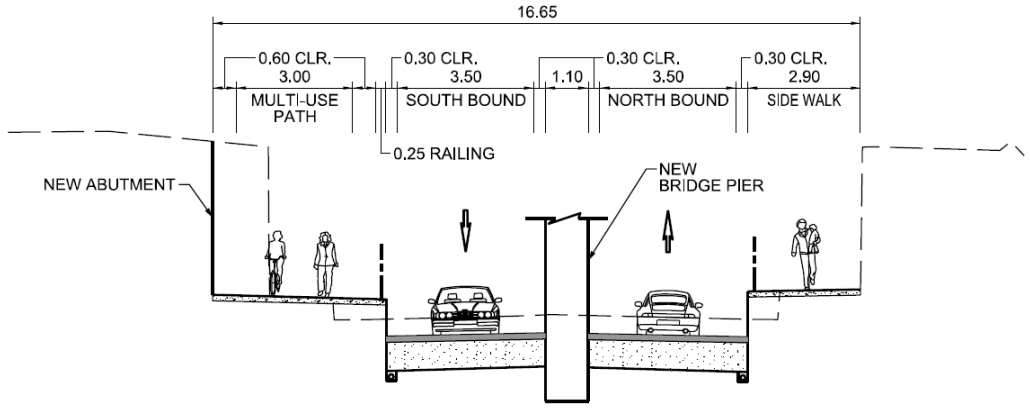
The lane alignment at Birch Avenue and Barton Street is subject to change during detailed design, as the configuration south of the Barton Street (outside of the study area) has not been determined. The hydro tower located at the south-west corner of the intersection poses creates an obstacle. In addition, the northeast corner of the intersection may not facilitate right turn movements of large vehicles (e.g. trucks, buses) without entering into opposing traffic. Should this movement be desirable to allow, further refinement should be done during detailed design.

10.2 Roadway Clearance

Centre Pier of Bridge 332

It is necessary to reallocate space under Bridge 332 to fit the 3.0 m multi-use path within the horizontal clearance and widen the underpass by 0.45 metres. This will require shifting the centre pier of the bridge slightly to the east, as shown in Exhibit 10.1. This should be confirmed during detailed design by revisiting the functional designs developed by SNC Lavalin (Section 2.3.2).

Exhibit 10.1: Proposed Cross-Section at Bridge 332



11 Consultation and Engagement

Public, stakeholder and agency consultation is a key feature of MCEA planning and design process. This section outlines the approach and stakeholders that were contacted and consulted with to shape the process and solution.

11.1 Engagement Approach

11.1.1 Engagement and Communication Strategy

A Consultation and Engagement Strategy was developed at the onset of the study. The purpose of the strategy was to provide a framework of key audiences that would be engaged, and identify the tactics, techniques and events to engage them. The strategy was structured into two components:

1. **Stakeholder Management Plan:** which provides an overview of the key audiences that will be engaged, and a demonstration of the project's team commitment to the planning process; and,
2. **Engagement and Communication Plan:** an overview of the proposed consultation and engagement techniques and tactics which would be used to gather input over the course of the study, including the proposed public information centre.

The strategy was developed as a flexible framework, and was a living document that could evolve over time.

11.1.2 Identification of Potentially Interested Parties

A list of potentially interested parties was created and maintained during the project. The initial list was developed using a variety of sources, including:

- The City of Hamilton's Environmental Assessment contact list;
- A list of property owners and occupants from the municipal tax roll; and,
- A desktop review to identify potentially interested parties near the Study Area.

The identified groups are listed in:

- Exhibit 11.1 (Public, Community and Industry Stakeholders);
- Exhibit 11.2 (Indigenous Communities), and,
- Exhibit 11.3 (Public Agencies, Utilities and Railways).

The project mailing list is included in Appendix F.

Exhibit 11.1: List of Public, Community and Industry Stakeholders

Property Owners and Occupants	Other Community Organizations
The owners and occupants of properties in close proximity to the Study Area.	Ontario Trucking Association Southern Ontario Gateway Council
BIAs and Neighbourhood Groups	**Other Community Groups**
Barton Village BIA Gibson Landsdale Planning Team (GALA) Keith Neighbourhood Hub Lucy Day Group North Central Community Association Sherman Hub Community Planning Team	Citizens at City Hall (CATCH) Citizens for Citizens Ward Three Neigbourhoods Environment Hamilton Hamilton Community Foundation Hamilton Wentworth Council of Home & School Associations Weaver Community Hub

Exhibit 11.2: List of Indigenous Communities

Indigenous Communities	
Haudenosaunee Confederacy Council	Mississaugas of the Credit First Nation
Huron-Wendat Nation Council	Six Nations of the Grand River Territory
Métis Nation of Ontario	

Exhibit 11.3: List of Public Agencies, Utilities and Railways

Federal Government And Agencies	City of Hamilton
Canadian Environmental Assessment Agency Crown-Indigenous Relations and Northern Affairs Canada Hamilton Oshawa Port Authority Indigenous and Northern Affairs Canada	City Manager's Office Community & Emergency Services Hamilton Fire Department Hamilton Police Service Planning & Economic Development Public Works Transit (HSR) Ward 3 Councillor's Office
Provincial Government and Agencies	**Utilities and Railways**
Hamilton Conservation Authority Infrastructure Ontario Metrolinx Ministry of Indigenous Relations and Reconciliation Ministry of Municipal Affairs & Housing Ministry of Natural Resources Ministry of Natural Resources and Forestry Ministry of the Environment, Conservation & Parks Ministry of Tourism, Culture & Sport Ministry of Transportation Ontario Provincial Police	Alectra BellCanada Canadian Pacific Railway CN Rail Cogeco Cable Inc Hamilton Utilities Corporation Hydro One Rogers Source Cable Southern Ontario Railway Union Gas
Schools	
Hamilton-Wentworth Student Transportation Services	

11.2 Notice of Study Commencement

The Notice of Study Commencement was published on November 1, 2019, and was distributed to all groups listed in Section 11.1.2. A summary of the channels used to disseminate the notice is summarized in Exhibit 11.4.

Exhibit 11.4: Publication Details for Notice of Study Commencement

Channel	Date	Stakeholder Group
Hamilton Spectator Newspaper	November 1 and 8, 2019	General public
Mail (Canada Post)	October 21, 2019: property owners and occupants, and Indigenous communities	Property owners and residents/businesses; Indigenous communities
Email	October 21, 2019: public agencies, utilities and railways October 29, 2019: community groups and associations	Elected officials; public agencies, utilities and railways; Indigenous communities
Project Website (Hamilton.ca/BirchEA)	October 21, 2019	General public

11.3 Indigenous Communities

During the study, City of Hamilton staff directly engaged with Indigenous communities. The intent was to understand:

- Their level of interest in the Project;
- Identify any concerns they may have with the preliminary preferred solution; and,
- Determine the community's consultation needs and requirements.

The Project Team provided each community with an opportunity to participate in the engagement process, and strived to be flexible to meet the specific and unique needs of each community.

Engagement with Indigenous communities included:

- Mailing and emailing all of the identified communities a letter that included a map of the Study Area, an overview of the Project, contact information for the City's Project Manager, and an invitation to the PIC; and,
- Follow-up telephone calls to ensure that they were aware of the Project, and received the notice.

No comments were received from any Indigenous community.

11.4 Public Agencies, Utilities and Railways

The purpose of consultation with public agencies, utilities and railways during the study centred on the following topics:

- Introduce the Project to relevant stakeholders;
- Seek guidance on any agency requirements relevant to the study;
- Identify any concerns they may have with the preliminary preferred solution; and,

- Understand each agency's desired level of involvement and fulfill any data requests.

All agencies received the notice via email during the study, which:

- Introduced the Project and outlined the Study Area;
- Invited them to PIC and to review the information boards once they were posted to the website;
- Provided contact information of the Project Team; and,
- Invited them to confirm their involvement, and if alternate contacts may need to be included.

Specific activities and feedback received during this period include:

- **City of Hamilton Active Transportation Project Manager:** Support for the multi-use path along the west side to provide a continuous link with the path planned south of Barton Street;
- **City of Hamilton Parks:** Received a briefing on the project and the potential need to use part of the dog park for a potential pumping station at Bridge 332;
- **Ward 3 Councillor's Office:** Received a briefing on the project prior to the PIC, which included discussion for potentially using the dog park for a pumping station.

Correspondence was received from the Ministry of Heritage, Sport, Tourism and Culture Industries. A copy is included in Appendix F.

11.5 Public and Community Consultation

The public and community consultation engagement program included property owners and occupants that live, work or own property nearby to the Study Area. The focus on engagement for these individuals was to

- Introduce the Project to relevant stakeholders;
- Identify any concerns they may have with the preliminary preferred solution; and,
- Determine if they wanted to receive project notifications during the study.

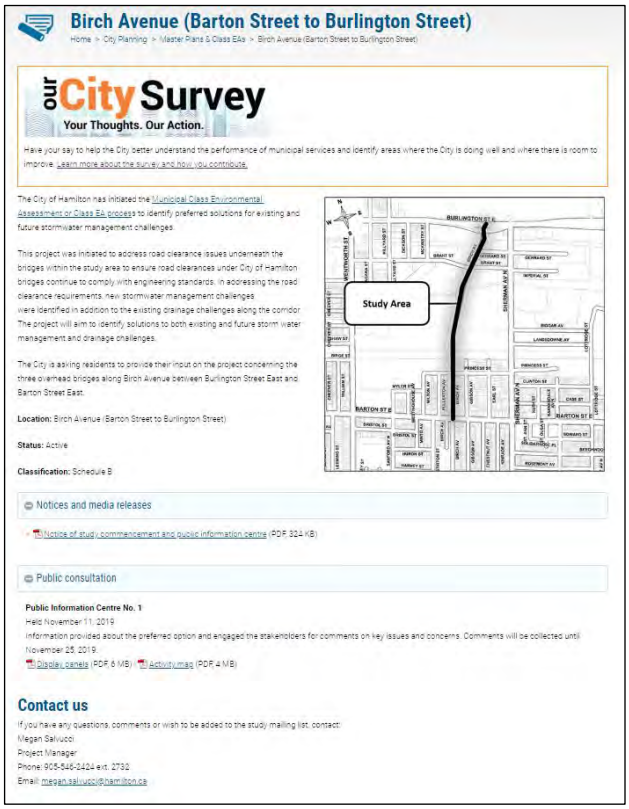
11.5.1 Project Webpage

A webpage was created on the City of Hamilton's website. During the course of the study, the webpage included:

- A summary of the study purpose;
- A map of the study area;
- Notice of Study Commencement and Public Information Centre;
- Public Information Centre boards and roll plan; and,
- Project Team contact information.

The webpage was maintained throughout the course of the study and was updated as materials became available (Exhibit 11.5).

Exhibit 11.5: Screenshot of the Project Webpage



11.5.2 Public Information Centre

The PIC was held on Monday, November 11, 2019 at the Norman Pinky Lewis Recreation Centre (192 Wentworth Street N., Hamilton) from 6:00 to 8:00 p.m. The event followed a drop-in format, and provided opportunities for attendees to learn about the project and provide their input. The purpose of the PIC was to:

- Introduce the study to the public and stakeholders;
- Review the issues, needs and opportunities that can be improved upon when two existing bridges on Birch Avenue are replaced;
- Present the alternative solutions and preliminary preferred solution to address existing drainage issues;
- Understand community concerns and collect feedback related to the project and the alternative solutions; and,
- Provide an opportunity to participate in the planning and decision making process, by providing your comments to the Project Team.

A summary report of the PIC is available in Appendix F.

11.5.2.1 Notification

Notice of PIC was circulated with the Notice of Study Commencement. For details on who and how it was distributed, see Section 11.2 and Appendix F.

11.5.2.2 Event Format

The event had a drop-in format, and members of the Project Team and the Ward 3 Councillor's office were in attendance. Attendees were:

- Asked to sign-in and were asked to indicate if they wanted to join the project mailing list;
- Able to review 21 presentation boards that provided information on the project. Boards were posted to the website the following day;
- Provided comments forms for written feedback and questions;
- Invited to ask questions and give input to the Project Team in-person; and,
- Invited to submit any additional comments, questions, or feedback to the Project Team by email, mail, or phone by November 25, 2019.

Event details are summarized in Exhibit 11.6.

Exhibit 11.6: Summary of the Public Information Centre Meeting Details

Attribute	Details
Date and Time	Monday November 11, 2019; 6:00 to 8:00 p.m.
Location	Norman Pinky Lewis Recreation Centre 192 Wentworth Street North, Hamilton
Number of Attendees that Signed-In	2
Comment Sheets Received	0
Information Presented	• The purpose of the PIC • The MCEA process, issues and opportunities and key draft problem/opportunity statement. • The preliminary preferred solution • An overview of the technical studies that were completed, including the approach, findings and mitigation measures • Next Steps, project timelines and Project Team contact information

11.5.2.3 Feedback Received at the PIC

Verbal comments were received at the PIC from one resident who had witnessed flooding at the underpasses and felt it posed a safety risk and were supportive of addressing the drainage issues. No comment forms were received.

11.5.2.4 Feedback Following the PIC

An accessible version of the PIC boards and the roll plan were posted to the project webpage following the PIC. Individuals were asked to submit comments by November 25, 2019, a two week period following the PIC. The City of Hamilton twitter account posted a tweet on November 20, 2019 requesting feedback from residents.

No comments were received.

Appendix A: Design Drawings

Appendix B: Natural Heritage

Appendix C: Cultural Heritage and Archaeology

Appendix D: Transportation Assessment and Cycling Facility Selection Analysis

Appendix E: Drainage Assessment

Appendix F: Consultation and Engagement